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Front Cover:
Photo of a teaching display featuring pygmy marmosets, *Cebuella pygmaea*, used for environmental education in northeastern Ecuador. Courtesy of Stella de la Torre and Pablo Yépez.

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SHORT ARTICLES

ENVIRONMENTAL EDUCATION: A TEACHING TOOL FOR THE CONSERVATION OF PYGMY MARMOSETS (*CEBUELLA PYGMAEA*) IN THE ECUADORIAN AMAZON

Stella de la Torre
Pablo Yépez

Introduction

The pygmy marmoset (*Cebuella pygmaea*) is the smallest monkey in the world. It inhabits the upper Amazon basin of Ecuador, Colombia, Peru, Bolivia and Brazil (Soini, 1988). In Ecuador, we have records of the species from about 220 m to 500 m above sea level, in habitats along rivers and lakes in the eastern lowlands (de la Torre, 2000). The habitat specialization of pygmy marmosets makes them particularly vulnerable to anthropogenic impacts, since human settlements and activities are centered on riparian habitats (Meggers, 1989). Thus, despite the relatively wide distribution of pygmy marmosets in eastern Ecuador, we have increasing evidence that this species could be severely disturbed by human activities, altering its social behavior and possibly reducing its population size (de la Torre *et al.,* 2000).

Pygmy marmosets are not included in any of the IUCN categories in the Red Data Book of Ecuadorian mammals; they are listed only in the CITES Appendix II (Tirira, 2001). However, based on the evidence we have gathered during almost seven years of research, we suggest that the status of this species needs to be revised. Indeed, the populations we have studied in northeastern Ecuador have been severely affected by live capture, noise pollution and habitat destruction (de la Torre *et al.*, 2000; Yépez *et al.*, 2003). These factors are related to the development of the petroleum industry, the continuous increase of human populations due to high reproductive and migration rates, and the cultural loss which native communities are experiencing due to their rapid insertion into Western cultures (Ministerio del Ambiente *et al.*, 2001). All these factors have altered the equilibrium of natural ecosystems and are negatively affecting the populations of pygmy marmosets.

Live capture of pygmy marmosets, in particular, is a common practice of children and adults of many indigenous communities. They are also eaten in some areas, or killed for target practice in others. We believe that these problems could be mitigated with a program of environmental education. We began such a program this year, directed to the children of the communities that live close to some of the pygmy marmoset populations we studied. The program was based on a didactic game through which children learned about the ecology, behavior and conservation of these small primates.

Planning Stage

Our study of five different populations of pygmy marmosets in northeastern Ecuador, along with information from other studies elsewhere, allowed us to summarize several aspects of the ecology and behavior of this primate species, such as its habitat preference, feeding behavior, group composition and parental care. We then recreated this information in a wooden poster of 120 x 90 cm, in which we drew a riparian forest, a feeding tree with real holes in the trunk, and the profiles of six animals of different ages and sex (one reproductive pair, one subadult, one juvenile and two dependent infants), representing a typical group of this species. The profiles of these animals were the basis of a puzzle of six wooden figures of the six different animals to be attached to the corresponding profiles by the children during the game (Fig. 1). The wooden poster can be folded up and is easily carried. Large sheets of paper, thin cardboard, color pencils, scissors, glue and stickers allowed children to recreate, in their own drawings, the life of pygmy marmosets based on the poster games.

Process Stage

We carried out this program in two indigenous communities of Ecuadorian Amazonia. The first was the Secoya community of Bellavista on the southern bank of the Río Aguarico (00°16'42"S, 76°25'30"W). The school of this community had 15 children. The second was the Quichua

Credit: Pablo Yépez

Figure 1. Wooden poster of pygmy marmosets used for teaching games in the schools of the Secoya community of Bellavista (on the southern bank of the Río Aguarico), and the Quichua community of Añango (on the southern bank of the Río Napo), Ecuador.

community of Añango on the southern bank of the Río Napo (00°29'29"S, 76°24'59"W), with 20 children in its school. The ages of the children ranged from 4 to 14 years old. Our audiences also included 2-5 young adults (ages 18-20) and 1-2 older adults (more than 30 years old). We selected these communities for our pilot work because we are studying pygmy marmoset groups living close to these settlements, and we have evidence that they are continuously affected by live capture and target practice.

In our presentation we first explained to the children the purpose of our study of pygmy marmosets. We showed children some of the equipment we use, such as binoculars and tape recorders, and showed them how they work. We then began a dialogue to determine what children knew about pygmy marmosets. We had them answer questions about where pygmy marmosets live, what they eat, how many infants are born, how females care for the infants, and how humans could affect them.

After this introduction we began the games with the poster. We first asked the children to solve the marmoset puzzle, pasting each independently moving animal to the corresponding profile in the poster (the two dependent infants were not included in this first game). Different children pasted each of the four marmoset figures while we talked about the riparian habitat in which they live. We then told them about the gum-feeding behavior of pygmy marmosets, and let all the children experience how it might feel by licking a vitamin gel that we poured into the holes of the "gum tree" on the poster. Children later mimicked insect-feeding by finding and eating candies hidden in the classroom.

Finally, we talked about the social organization of these primates: the size and composition of groups, the reproductive pattern and some conspicuous infant-caregiver behaviors (e.g., infant-carrying). We explained to them how important it is for the marmoset infants to be carried and attended by other group members, similar to the way that human infants need their family to survive. The children then participated in a new game with the poster, in which we told them that the two infants of the group were lost and that they were crying for their family. One child participated in the game at a time; first we blindfolded the child, and then simulated infant crying to guide the blindfolded child to the figures of the two infants. Once the child got one of the infants, he or she had to paste it on the back of a caregiver while still blindfolded.

Once this second game was over, children were divided into small groups. Each group was provided with paper, thin cardboard, scissors, color pencils and glue, and began to create their own version of a family group of pygmy marmosets in the forest, based on what they learned from the poster.

Our presentation ended with an explanation of the importance of preserving primates in general and pygmy marmosets in particular, and about the need to maintain and manage wisely the natural resources of the tropical rainforest. We asked the children to commit to conserve primates and their environments. To reinforce this commitment we used happy-face stickers (to make them remember the benefits of conserving the monkeys and the environment) and sad-face stickers (to remember the negative impacts of disturbing monkeys and the environment) that we stuck on opposite sides of each child's face.

Product Stage

We carried out this environmental education program between June and August 2003, and thus the long-term results are still being analyzed. We have anecdotal evidence of the positive effects of the program on the attitude of children of all ages in relation to our work and to pygmy marmosets. After our presentations, children began to accompany us on our daily observations, helping us to carry the equipment and to follow and observe the marmosets. They also frequently told us that they will not disturb monkeys again and that they wanted us to continue to give our presentations in their schools.

We believe that the interactive games we designed with the wooden poster are key to maintaining the attention of children. The interest the children of all ages showed in the poster and their willingness to learn more about pygmy marmosets was remarkable. During our presentations all the children and the accompanying adults were relaxed and frequently laughing while participating in each of the games.

Conclusions

These are our first experiences in this community-based program of environmental education. We are aware of the need to continue in the communities where we have already worked, and to expand it to other communities in the Ecuadorian Amazon. We are currently working on the design of a more systematic evaluation protocol that will allow us to better analyze the results of the program. Although several environmental education programs have been carried out in Ecuador, there is still much to do in order to improve the environmental awareness of the people in our country. We hope that our work will help to increase the environmental awareness of Amazonian inhabitants, and to preserve pygmy marmosets as well as other primate species and their habitats.

Acknowledgements: We thank the children of the Secoya community of Bellavista and the Quichua community of Añango for their participation in the program. We thank the teachers for allowing us to visit the schools and talk to the children and for their support during the presentations. We greatly thank Charles T. Snowdon for his support during all the stages of our work and for his comments on this paper, and Fernanda Tomaselli for her valuable help in the fieldwork. We thank the people of Novarum who helped us in the design and construction of the wooden posters. Our research is supported by NIH Health (Grant 2 R0I MH29775-22). The Ecuadorian Ministry of the Environment allows us to conduct research in these areas.

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THE DISCOVERY OF A NEW POPULATION OF BLACK LION TAMARINS (*LEONTOPITHECUS CHRYSOPYGUS*) IN THE SERRA DE PARANAPIACABA, SÃO PAULO, BRAZIL

Fabio Röhe
André Pinassi Antunes
Cristina Farah de Tófoli

A group of black lion tamarins (*Leontopithecus chrysopygus*) was sighted on 19 December, 2002, at 4:30 pm, at the Fazenda João XXIII (23°53'09"-23°56'29"S, 47°42'30"-47°40'08"W), in the municipality of Pilar do Sul, state of São Paulo, Brazil. The farm belongs to Eucatex S/A and is located in the Serra de Paranapiacaba, near the Carlos Botelho and Intervales State Parks. The farm is a mosaic of *Eucalyptus* plantations (1307 ha) and patches of Atlantic forest, comprising small forest fragments and gallery forest (440 ha) and a large fragment of 611 ha.

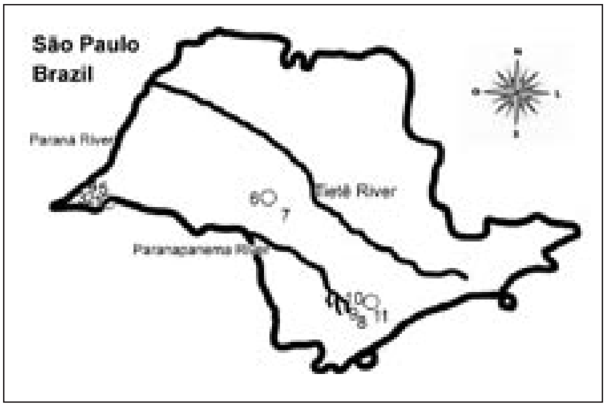

Figure 1. Recorded wild populations of black lion tamarins (*Leontopithecus chrysopygus*). Numbers with circles indicate protected areas.

The group was composed of at least five individuals. They were calling intensely during the observation period at the same time as some bare-throated bellbirds (*Procnias nudicollis*). It is possible that the bellbirds were excited by the presence of the lion tamarins. Foraging associations of black lion tamarins and insectivorous birds have been described in the literature by Passos (1997), who mentioned that the birds were sometimes alarmed by the primates. We were able to observe the lion tamarins at heights of 5-8 m for about 10 minutes, after which they became silent and disappeared. No pictures or audio recordings of their vocalizations were taken.

Until recently, black lion tamarins were known to occur in only three protected areas in São Paulo (Morro do Diabo State Park, Caetetus Ecological Station and Angatuba Ecological Station), and in six other forest fragments located in the western and central regions of the state of São Paulo (see Coimbra-Filho, 1970; Coimbra-Filho, 1976; Mamede-Costa and Gobbi, 1998; Passos, 1994; Valladares-Pádua and Cullen Jr., 1994; Valladares-Pádua *et al.*, 2002). More recently, two new sub-populations were found in forest fragments in the eastern part of the state in the municipality of Buri (Valladares-Pádua *et al.*, 2002) (Fig. 1).

This is the eleventh remaining natural population recorded for this species, and the easternmost record of the distribution of *L. chrysopygus* in recent times. Several specimens were captured by J. Natterer in 1819 and 1822 in the municipalities of Cotia and Ipanema, and by E. Garbe in 1902 at Vitoriana; in addition, the pelt of one specimen from Bauru was given to the São Paulo Zoology Museum (MZSP) by O. Humel in 1905 (Vieira, 1944; Coimbra-Filho, 1976). However, none are known to survive in these regions today. Because the new Serra de Paranapiacaba population is in a relatively large forest, it may represent a new hope for the survival of this species. Surveys and censuses need to be carried out in this forest and others in the region, to better determine more exactly the numbers surviving there.

1. Morro do Diabo State Park (Teodoro Sampaio)*
2. Fazenda Tucano (Euclides da Cunha Paulista)* and Fazenda Rosanella (Teodoro Sampaio)*
3. Fazenda Ponte Branca (Euclides da Cunha Paulista)*
4. Fazenda Santa Mônica (Teodoro Sampaio)**
5. Fazenda Santa Maria I (Teodoro Sampaio)**
6. Caetetus Ecological Station (Gália)*
7. Fazenda Rio Claro (Lençois Paulista)*
8. Fazenda Migrai (Buri)***
9. Rio Apiaiaçu (Buri)***
10. Angatuba Ecological Station
11. Fazenda João XXIII (Pilar do Sul)

*Localities from Valladares-Pádua and Cullen Jr., 1994.
**Localities from Valladares-Pádua *et al.*, 2002.
***C. Valladares-Pádua (unpubl.).

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ON THE OCCURRENCE OF THE BLACK LION TAMARIN (*LEONTOPITHECUS CHRYSOPYGUS*) IN BURI, SÃO PAULO, BRAZIL

Fernando Silva Lima, Izabel Cristina da Silva
Cristiana Saddy Martins, Cláudio Valladares-Pádua

The black lion tamarin (*Leontopithecus chrysopygus*) is one of the most endangered of the Neotropical primates (Valladares-Pádua and Cullen, 1994; Rylands and Chiarello, 2003). Currently, we know of nine locations where this species occurs, with the largest population – about 820 individuals – occurring in the Morro do Diabo State Park (Valladares-Pádua and Cullen, 1994) in the far west of its range, the Pontal do Paranapanema in the state of São Paulo. Acting on new reports of the occurrence of black lion tamarins, in July 2003 the NGO IPÊ – Instituto de Pesquisas Ecológicas initiated a major programme of surveys to cover the entire original distribution of the black lion tamarin, to search for and assess any remaining populations which are as yet unknown to us.

We conducted our first two field surveys in the municipality of Buri, in the southeast of the state of São Paulo, where Valladares-Pádua *et al.* (2000) had observed two groups in a riparian forest. We chose this area because we had been informed of the occurrence of further groups in the region, and because it is near the southeastern limit of the black lion tamarin's geographic range (Coimbra-Filho, 1976; Rylands *et al.*, 2002). Thus far we have confirmed the existence of 18 groups of black lion tamarins, in forests extending through 15 farms (*fazendas*) (Table 1, Fig. 1).

The survey will continue into 2005, when hopefully we will have thoroughly explored the remaining forests where black lion tamarins might still survive. A full understanding of the location and size of the existing populations of *L. chrysopygus* is vital for the Metapopulation Management Plan for the conservation of the species (Valladares-Pádua *et al.*, 2002).

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Table 1. Sightings of *Leontopithecus chrysopygus* in Buri. Fragments were grouped in complexes (1-7, see map).

	Forest Fragment (complex)	Area (ha)	Location	N° of individuals	Coordinates	
01	Capão Bonito National Forest (7)	396	Capão Bonito National Forest	2	23°55'14"S	48°32'45"W
02	Capão Bonito National Forest (7)	396	Capão Bonito National Forest	2	23°55'14"S	48°32'45"W
03	River mouth (6)	83	River mouth (Fazenda Pezzoni)	6	23°55'00"S	48°32'52"W
04	Riparian forest on Apiaí-Mirim and Apiaí-Guaçu (5)	504	Riparian forest, Rios Apiaí-Mirim and Apiaí-Guaçu	2	23°49'16"S	48°34'36"W
05	Riparian forest, Rios Apiaí-Mirim and Apiaí-Guaçu (5)	504	Riparian forest, Rios Apiaí-Mirim and Apiaí-Guaçu	2-3	23°49'19"S	48°34'37"W
06	Riparian forest, Rios Apiaí-Mirim and Apiaí-Guaçu (5)	504	Riparian forest, Rios Apiaí-Mirim and Apiaí-Guaçu	6-7	23°50'02"S	48°34'07"W
07	Fazenda Planebrás (2)	273	Fazenda Planebrás	4	23°49'28"S	48°34'23"W
08	Riparian forest (4)	20	Riparian forest close to the town of Buri	4	23°42'33"S	48°39'15"W
09	River mouth (6)	83	Fazenda Urupês	5	23°47'16"S	48°35'18"W
10	River mouth (6)	83	Fernando Espanhol	2	23°49'53"S	48°33'35"W
11	Fazenda Floresta (3)	346	Fazenda Floresta	5	23°42'01"S	48°38'17"W
12	Fazenda Vale do Apiaí (1)	1007	Fazenda Vale do Apiaí	3	23°39'07"S	48°34'20"W
13	Riparian forest, Rios Apiaí-Mirim and Apiaí-Guaçu (5)	504	Mata/Estrada	3	23°48'40"S	48°35'16"W
14	Riparian forest, Rios Apiaí-Mirim and Apiaí-Guaçu (5)	504	Riparian forest	1	23°48'35"S	48°35'15"W
15	Riparian Forest, Rios Apiaí-Mirim and Apiaí-Guaçu (5)	504	Banks of the Rio Apiaí-Guaçu	4	23°48'59"S	48°32'47"W
16	Riparian Forest, Rios Apiaí-Mirim and Apiaí-Guaçu (5)	504	Olaria	5	23°50'29"S	48°35'17"W
17	Riparian Forest, Rios Apiaí-Mirim and Apiaí-Guaçu (5)	504	Olaria	6	23°50'38"S	48°35'08"W
18	Riparian Forest, Rios Apiaí-Mirim and Apiaí-Guaçu (5)	504	Olaria	4	23°50'33"S	48°35'12"W

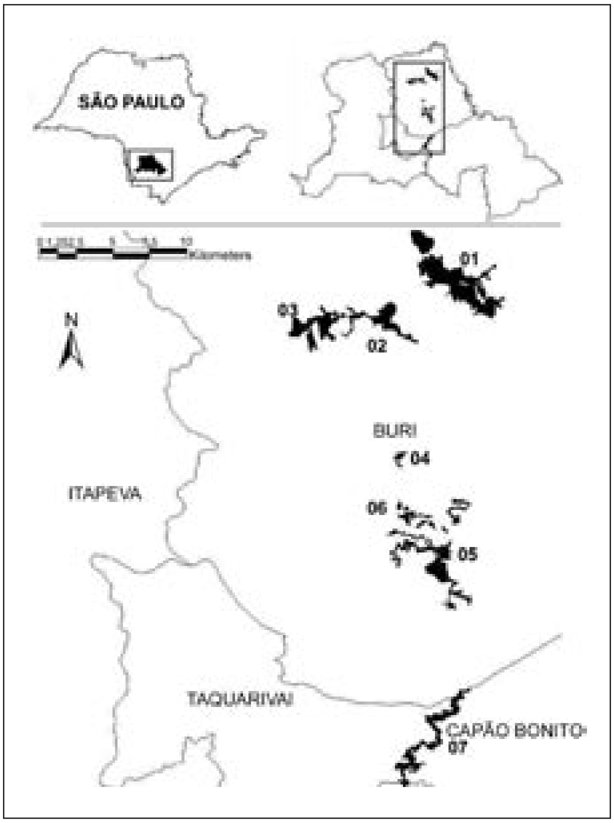

Figure 1. Areas of occurrence of *Leontopithecus chrysopygus* in the municipality of Buri, São Paulo. 01: Apiaí Valley Farm, 02: Fazenda Planebrás, 03: Fazenda Floresta, 04: Riparian forest, 05: Riparian forest complex on the Rios Apiaí-Mirim and Apiaí-Guaçu, 06: River mouth complex, 07: Capão Bonito National Forest.

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DIETA, ÁREA DE VIDA, VOCALIZAÇÕES E ESTIMATIVAS POPULACIONAIS DE *ALOUATTA GUARIBA* EM UM REMANESCENTE FLORESTAL NO NORTE DO ESTADO DO PARANÁ

Lucas de Moraes Aguiar, Nélio Roberto dos Reis
Gabriela Ludwig, Vlamir José Rocha

Introdução

Na porção sudeste do Brasil, *Alouatta guariba* (Humboldt, 1812) é a espécie de bugio característica da Mata Atlântica, limitando sua ocorrência na região do vale do Jequitinhonha, Bahia (Gregorin, 1996), até o município de São Lourenço do Sul, Rio Grande do Sul (Printes *et al.*, 2001). A subespécie encontrada no Paraná, *A. guariba clamitans*, possui dicromatismo sexual: Os machos adultos apresentam coloração castanha avermelhada brilhante com reflexos dourados, e as fêmeas são de padrão castanho escuro (Auricchio, 1995).

A situação dessa espécie no estado do Paraná é preocupante. O estado vem sofrendo intensa devastação principalmente devido a atividades agrícolas cafeeiras e agropecuárias, que dizimam a mata nativa que outrora cobria 84% da área do estado (Lange e Jablonski, 1981). De acordo com a SPVS (1996), restam apenas 7% da cobertura vegetal primitiva. Na região norte, este índice é mais alarmante, uma vez que a floresta original foi reduzida a valores próximos de 1% a 2% (Brasil, Paraná, 1987). Assim, são poucos os relatos da presença da espécie na região baixa do Rio Tibagi, onde provavelmente estão quase extintos.

Os primatas do gênero *Alouatta* Lacépède, 1799 possuem uma dieta variada, que consiste principalmente de folhas, frutos e outras partes vegetais. Chiarello (1992) afirma que as espécies desse gênero são bastante oportunistas, sendo capazes de sobreviver com dietas compostas basicamente por folhas, mas ingerindo os frutos e as flores durante as épocas em que estes itens são mais abundantes. Gómez (1999) observa que devido ao fato de as espécies do gênero incluírem uma porção substancial de folhas na sua dieta, conseguem sobreviver em fragmentos florestais pequenos de até 10 ha.

Um fator determinante no efeito da fragmentação em primatas é sua área de vida, que possibilita as análises de requerimentos de áreas para futuras iniciativas de conservação em fragmentos florestais (Spironello, 2001). Numerosos trabalhos de campo têm avaliado o uso do espaço por diferentes espécies de primatas, contribuindo assim para o esclarecimento da sua ecologia básica (Gómez, 1999).

Em relação às vocalizações, o gênero *Alouatta* há muito é conhecido como um dos mais notáveis primatas que emitem vocalizações de longo alcance. Quanto a isso, *A. guariba* é uma espécie pouco estudada e algumas evidências, restritas a trabalhos com a subespécie *A. g. clamitans*, sugerem que seu estudo poderia fornecer novas perspectivas sobre o comportamento de emissão de chamados de longo alcance nos bugios (Oliveira, 2002).

Portanto, pela importância dos fatos mencionados e devido à escassez de dados da região, surgiu o propósito deste trabalho, o qual objetivou verificar e analisar a dieta, a área de vida, os percursos diários, as vocalizações de longo alcance (rugido) e as estimativas populacionais da espécie no fragmento Mata Doralice.

Material e Métodos

Área de estudo

A Mata Doralice situa-se no município de Ibiporã, norte do estado do Paraná, na bacia do Rio Tibagi, mais precisamente na região do Baixo Tibagi, nas coordenadas 23°16'S e 51°03'W, a 484 m de altitude. É um fragmento florestal de 170 ha, coberto em sua maior parte por uma vegetação florestal primária alterada, do tipo Floresta Estacional Semidecidual. O fragmento limita-se ao sul com o Rio Tibagi e está circundado por plantios de monoculturas, pomares e pastagens (Fig. 1). O solo da região é classificado como terra roxa estruturada eutrófica e caracteriza-se por ter alta fertilidade natural. O clima é subtropical úmido, apresentando as quatro estações bem definidas. A temperatura média anual é de 22,45°C e a precipitação média anual é de 114,8 mm. Os levantamentos fitossociológicos e florísticos realizados por Soares-Silva *et al.* (1992) e Carmo (1995) apontaram as famílias vegetais mais representativas como sendo: Meliaceae, Myrtaceae, Fabaceae, Euphorbiaceae, Moraceae e Mimosaceae, e registraram também a densidade absoluta de 1396 ind./ha, e uma diversidade específica de H' = 3,6 (I = 0,786). Carmo (1995) verificou que a floresta é constituída por um estrato arbustivo e dois arbóreos, além de árvores emergentes com alturas superiores a 20 m.

Metodologia

A coleta de dados foi realizada entre outubro de 2001 e setembro de 2002, através de quatro visitas mensais. O tempo de acompanhamento dos grupos foi dividido igualmente para o período matutino e vespertino. Foram acompanhados diferentemente para cada fim três grupos focais: GI, GII e GIII. GI era constituído por um macho adulto dominante, duas fêmeas adultas, um juvenil e um infante; GII por um macho adulto dominante, uma fêmea adulta e um juvenil; e GIII, por um macho adulto dominante, duas fêmeas adultas, um juvenil e um infante (classificação etária segundo Mendes [1989] e Hirano *et al.* [1996]).

Dieta: Para quantificar a dieta, os três grupos foram acompanhados utilizando-se o método das freqüências de observação, totalizando 122 h de acompanhamento. Na determinação dos itens da dieta foram realizados dois procedimentos: coleta de fezes e observação direta dos animais, através do método *ad libitum* (Altmann, 1974). Os itens vegetais não identificados como sementes, frutos, flores e caule foram mencionados como indeterminados

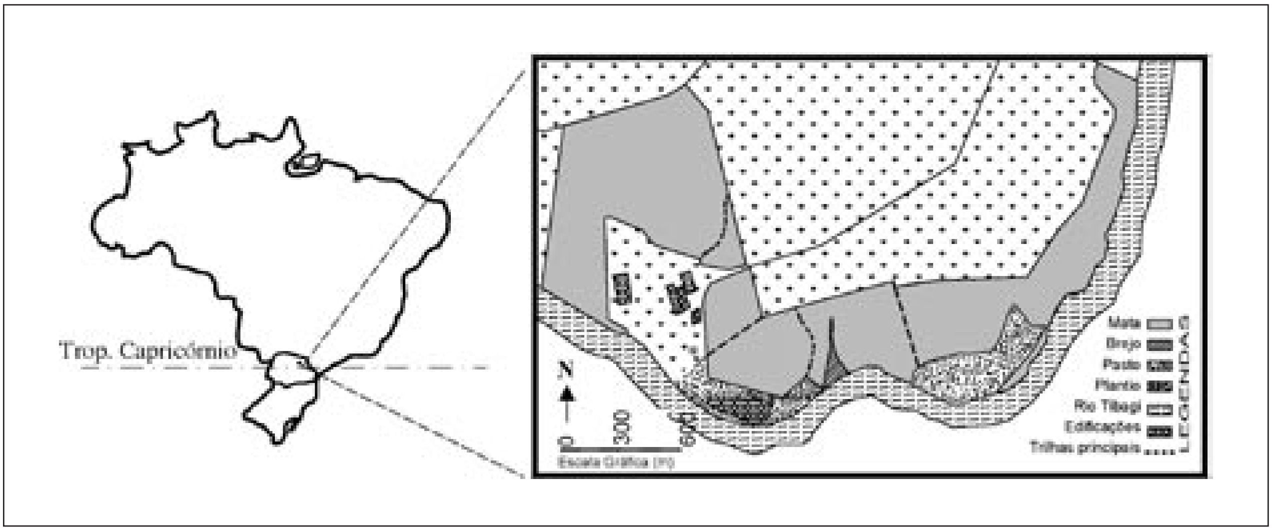

Figura 1. Mapa do Remanescente Florestal Mata Doralice, Ibiporã, PR (170 ha).

(sp. 1, sp. 2, etc.). Foram classificados como "fibras vegetais" os vestígios de folhas indeterminadas encontradas nas fezes. Para padronizar as amostras fecais e as visuais na somatória final, considerou-se como uma ocorrência tanto cada espécie vegetal encontrada nas fezes como quanto cada espécie ingerida pelo animal na observação direta do grupo focal (Rocha, 2001).

Áreas de vida e percursos diários: Foram estudados dois grupos vizinhos, GI e GII, acompanhados por 50 e 100 h, respectivamente. A diferença no número de horas de acompanhamento foi porque em GII mensuraram-se os percursos diários, assim os resultados de GII podem ser mais concisos devido ao maior número de amostras. A quantificação da área de vida de cada grupo foi feita pelo GPS Garmin, modelo eTrex Venture, metodologia adotada também por Izar (1999). Os pontos e rotas foram marcados pelo aparelho conforme a atividade dos animais, mudanças de direções e possibilidade de contato com satélites dentro da mata, sendo plotados diariamente em mapas. As áreas foram calculadas através do programa *AutoCAD 2000*. Os percursos diários foram mensurados no GII pelo GPS durante o verão, outono e inverno.

Vocalizações: Para o estudo sazonal das vocalizações de longo alcance (*loud calls*), do tipo rugido, foram cronometrados e anotados os horários, local, sexo e classe etária do animal, independentemente do grupo emissor. Para a análise contextual, registraram-se somente as emitidas pelos grupos focais da área de vida e de seus vizinhos conhecidos. O método *ad libitum* foi usado para o registro dos comportamentos.

Estimativas populacionais: Foi empregado o método da área de vida (Brockelman e Ali, 1987) levando-se em conta o número médio de indivíduos encontrados por grupo e os resultados das áreas de vida exclusivas e sobrepostas com grupos vizinhos. Chegou-se, assim, a um intervalo de número de grupos, indivíduos e densidade populacional.

Resultados

Dieta

Além de *Ficus* spp., 41 espécies vegetais estiveram presentes na dieta, identificadas em 21 famílias. *Hovenia dulcis* foi a única espécie exótica utilizada. Moraceae foi a família mais representativa e freqüente no número de espécies (36,6%). Além das figueiras (23,0%), a base da dieta constituiu-se de mais 13 espécies vegetais (38,6%), destacando-se *Maclura tinctoria* e *Sorocea bonplandii*, totalizando uma base alimentar de 62,0% (foram consideradas apenas as espécies que obtiveram freqüências acima de 1,0%). O item "fibras vegetais", encontrado constantemente nas fezes dos animais, também se apresentou com uma freqüência bastante elevada durante todo o estudo (24,3%) (Tabela 1). Quanto aos itens da dieta, registraram-se folhas (50,3%), frutos (47,9%), flores (1,4%) e caules (0,3%).

Sazonalmente, as espécies vegetais mais consumidas foram: frutos de *Maclura tinctoria*, *Ficus* spp. e *Miconia tristis* durante a primavera; frutos de *Jacaratia spinosa*, *Phytolacca dioica* e *Maclura tinctoria* no verão; frutos e folhas de *Ficus* spp. durante o outono; e frutos de *Pereskia aculeata*, *Sorocea bonplandii* e folhas de *Ficus* spp. no inverno. Espécies do gênero *Ficus* estavam presentes na dieta durante todas as estações (Tabela 1), pois os animais consumiram tanto seus frutos como suas folhas.

Durante a primavera e o verão, o consumo de frutos foi levemente mais elevado do que o de folhas (62,3% e 61,0%, respectivamente), enquanto que no outono e inverno a freqüência alimentar de folhas foi maior (66,0% e 61,0%, respectivamente) (Fig. 2). Notou-se também que durante o outono, o consumo de flores foi maior que nas outras estações e, durante o inverno, houve o consumo de caule de liana.

Áreas de vida e percursos diários

Ao final do outono, GI não mais ampliou sua área amostrada, e GII utilizou apenas mais um pequeno trecho na última estação, o inverno. Ambos os grupos apresenta-

Tabela 1. Espécies vegetais, parte consumida, número de vezes que o item foi consumido durante as estações e freqüência total com que o item participou na dieta de *Alouatta guariba.* (PC = parte consumida.)

Espécies Vegetais	PC	Primavera			Verãno			Outono			Inverno			Total	%
		O	N	D	J	F	M	A	M	J	J	A	S		
Fibras vegetais	Folhas	6	6	3	10	7	1	1	6	6	11	12	2	71	**24,31**
Ficus spp.	Folhas	2		1	4	3		3	8	2	3	3	6	35	**11,99**
Ficus spp.	Frutos	7		1	2	4		4	4	2	5	3		32	**10,96**
Maclura tinctoria	Frutos	5	7	4	2	3	2							23	**7,88**
Sorocea bonplandii	Frutos	3			1							10	1	15	**5,14**
Pereskia aculeata	Frutos									3	7	5		15	**5,14**
Jacaratia spinosa	Frutos				5	6								11	**3,77**
Phytolacca dioica	Frutos				8									8	**2,74**
Pisonia ambigua	Folhas		1								3	1	1	6	**2,05**
Miconia tristis	Frutos	1	5											6	**2,05**
sp. 5	Frutos				7									7	**2,39**
Lauraceae	Frutos				4									4	**1,37**
Syagrus romanzoffianum	Frutos					3		1						4	**1,37**
Casearia sp.	Folhas					1		1		2				4	**1,37**
Rollinia sericea	Frutos					3								3	**1,03**
Jacaratia spinosa	Folhas				2	1								3	**1,03**
Aspidosperma polyneuron	Folhas									2			1	3	**1,03**
Outros (33 Itens)															**14,28**
Total		24	23	14	52	32	3	12	22	23	33	38	16	292	100%

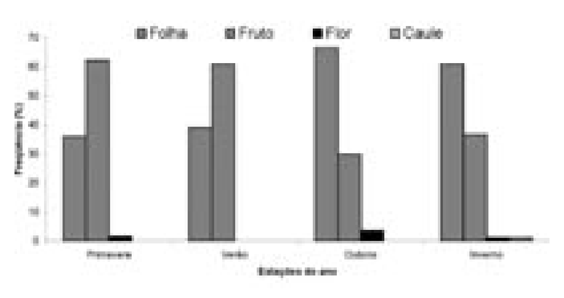

Figura 2. Freqüência dos itens alimentares nas estações: Primavera de 2001 e verão, outono e inverno de 2002.

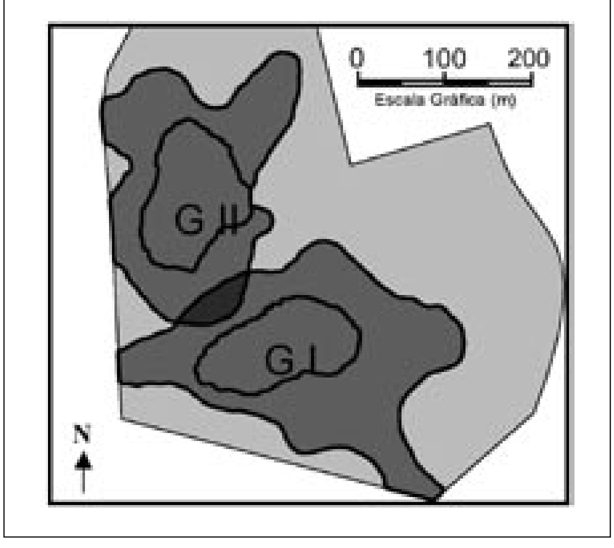

Figura 3. Áreas de vida dos grupos focais: GI, 6 ha com área nuclear de 1,5 ha e GII, 5 ha com área nuclear de 1,6 ha.

ram áreas bem definidas. Ao final das estações, o maior grupo, GI, com cinco indivíduos, explorou a maior área (6 ha), com área nuclear de 1,5 ha, e o menor grupo, GII, com três indivíduos, explorou 5 ha, com área nuclear de 1,6 ha (Fig. 3). A exigência espacial dos grupos resultou em média de 1,45 ha/ind. GII deteve quatro figueiras adultas (*Ficus* spp.) em sua área nuclear e GI deteve apenas duas, as mesmas foram bastante utilizadas como árvores de dormida dos grupos.

Os grupos utilizaram diferentes tamanhos e setores de área ao longo das estações (Fig. 4). As áreas foram usadas de modo homogêneo na primavera e verão e heterogêneo no outono e inverno, sendo que nestas duas últimas estações foi maior a utilização de sub-áreas pelos animais, as quais foram influenciadas principalmente por *Ficus* spp. GI obteve maior área na primavera (3,5 ha) e verão (3,7 ha), reduzindo-a em quase um hectare no outono (2,7 ha) e inverno (2,4 ha). Já GII manteve um tamanho quase constante, em média 2,4 ha ao longo das estações. Os dois grupos restringiram suas atividades a locais próximos às suas áreas nucleares no inverno, e alimentaram-se quase que exclusivamente de frutos de *Sorocea bonplandii* e folhas de *Ficus* spp. No verão, registrou-se a única sobreposição de área entre os grupos focais (0,21 ha) (Fig. 4b).

Os percursos diários, medidos no GII, tiveram média de 280 m/dia (n = 7), variando entre 120 m/dia a 500 m/dia. Os maiores valores foram medidos no verão (média = 367 m/dia) e os menores no inverno (média = 200 m/dia), tendo-se registrado também nesta estação o menor percurso, 120 m/dia.

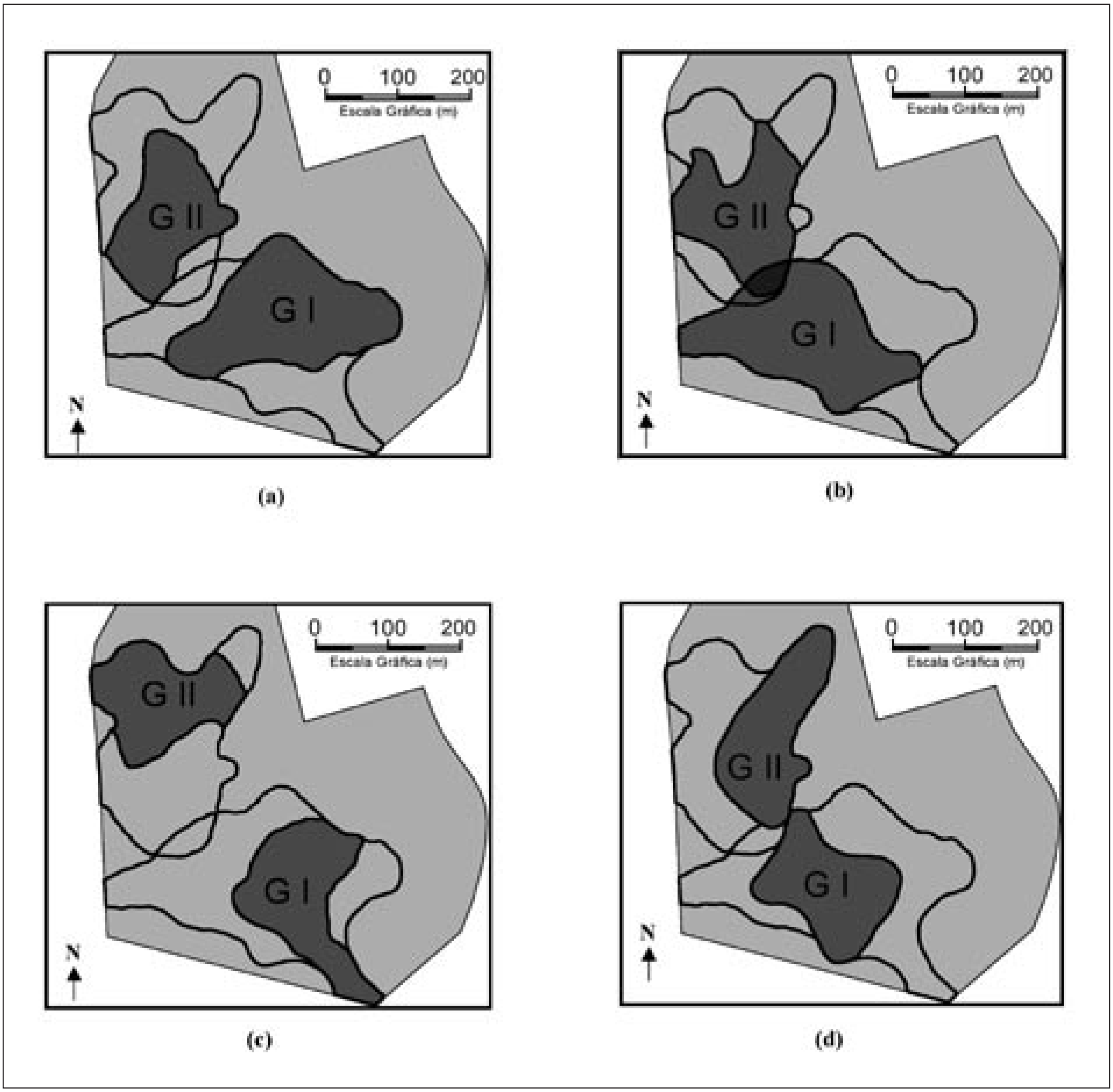

Figura 4. Variação sazonal no uso de diferentes setores da área de vida dos grupos focais: **a**) Primavera, GI: 3,5 ha e GII: 2,2 ha; **b**) Verão, GI: 3,7 ha e GII: 2,6 ha; **c**) Outono, GI: 2,7 ha e GII: 2,5 ha; **d**) Inverno, GI: 2,4 ha e GII: 2,4 ha.

Vocalizações

De todas as vocalizações de longo alcance do tipo rugido registradas (n = 19), 74% foi no período da tarde com um pico das 15 às 17 h. Não houve registro do pico de vocalização no alvorecer (*dawn chorus*). Os rugidos foram contínuos e duravam em média 13 min, sendo na maioria das vezes executados apenas pelo macho adulto dominante (84% dos registros). Em uma ocasião, a fêmea vocalizou junto com o macho dominante do grupo, e em outra, a fêmea vocalizou sozinha ao lado do macho dominante. Um macho de hierarquia inferior vocalizou apenas em um registro. Sazonalmente, 42% das vocalizações foram registradas no verão, seguidas de 26% no outono, 16% na primavera e 16% no inverno. As vocalizações de GI e vizinhos ocorreram próximas aos limites de suas áreas, em regiões periféricas, na direção de outros grupos. Somente uma vocalização foi registrada na área nuclear do GI. Houve apenas um registro de encontro intergrupal, resultando em vocalizações pelos grupos conflitantes. O número de vocalizações dos grupos focais relacionou-se ao número de vizinhos transgressores identificados, bem como a porcentagem de sobreposições de suas áreas: GI – 10 vocalizações / 3 grupos vizinhos e 1 macho adulto solitário transgressor, 30% de área sobreposta; GII – 1 vocalização / 1 grupo vizinho e 1 macho subadulto solitário transgressor, 10% de área sobreposta.

Estimativas populacionais

Distinguiu-se no total pelo menos seis grupos diferentes e três machos solitários. O maior grupo continha seis indivíduos e o menor três. Com exceção de um grupo que possuía mais de um macho adulto (justamente o maior grupo), todos apresentavam-se com um macho adulto dominante, suas fêmeas e indivíduos juvenis. Em média foi constatado 4,5 indivíduos por grupo.

Com os resultados das áreas de vida dos grupos focais e com a média de indivíduos por grupo, foi estimada em média a população de *A. guariba*. Poderia haver de 31 a 39 grupos habitando a mata durante o período de estudo, totalizando de 140 a 175 indivíduos, com uma densidade populacional de 0,82 a 1,02 indivíduos/ha.

Discussão

Dieta

O gênero *Alouatta* é bastante seletivo, parecendo ter fortes preferências por algumas espécies vegetais e até mesmo por certos indivíduos dentro de algumas espécies particulares (Milton, 1977; Sussman, 2000). Estudos com *A. guariba* demonstraram uma marcante seletividade alimentar: Chiarello (1992) verificou que mais da metade da dieta destes animais (54,5%) provém de apenas seis espécies; Limeira (1997) citou apenas duas como base da dieta, representando 55%; e Jardim e Oliveira (2000) relataram a importância de cinco espécies para estes bugios, constituindo 70% de freqüência total. Na Mata Doralice, a base da dieta constituiu-se de um número maior de espécies, *Ficus* spp. e 13 outras (62%), demonstrando uma menor seletividade quando comparada a outros trabalhos.

Moraceae foi a família mais freqüente (36,6%) sendo as espécies de *Ficus* as mais presentes na dieta, consumidas durante todas as estações de estudo. As figueiras são uma fonte alimentar importante para muitas espécies de primatas, inclusive para *Alouatta* (ver Terborgh, 1986; Young, 1983; Sussman, 2000; Rocha, 2001). No outono, quando a disponibilidade dos frutos parece ser menor, as figueiras foram importantes tanto no consumo de frutos como de folhas: Fato também observado por Prates (1990) que considerou o gênero *Ficus* como sendo a base da alimentação deste primata. Figueiras e outras espécies da família também mostraram-se importantes para outras espécies de *Alouatta*: *A. palliata* (Milton, 1977; Solano *et al.*, 1999); *A. pigra* (Schlichte, 1978); *A. caraya* (Marques e Marques, 1995) e *A. seniculus* (Palacios e Rodriguez, 2001).

O freqüente uso de folhas como fonte de proteínas (Braza *et al.*, 1983; Torres de Assumpção, 1986) e frutos como fonte de carboidratos não estruturais (Smith, 1977) de diversas espécies pode ser explicada pela necessidade de uma dieta nutricionalmente balanceada, sendo que Milton (1980) considera comportamentais as adaptações para a folivoria neste gênero.

No total, a porcentagem de folhas e frutos consumidos foi semelhante. Entretanto, notou-se uma diferença sazonal, visto que o consumo de frutos em períodos de abundância (primavera e verão) foi maior em relação aos períodos de escassez (outono e inverno) quando houve aumento no consumo de folhas e flores. Bicca-Marques (1991) atribuiu essas diferenças às ofertas sazonais de determinados itens relacionados diretamente às duas estratégias adaptativas de maximização de energia, uma de alto-custo, alta-recompensa e outra de baixo-custo, baixa-recompensa (Zunino, 1986), conforme as mudanças das fases fenológicas das espécies que compõem a dieta.

A freqüência total com que os frutos foram utilizados está acima das estimativas observadas para o gênero. Entre as espécies de *Alouatta,* somente nos trabalhos com *A. seniculus* e *A. palliata* (ver tabela comparativa em Hirano, 1996) verificaram-se resultados onde ocorre uma equivalência de ambos os itens consumidos ou onde o consumo do item fruto foi superior ao item folha, corroborando com o presente trabalho.

Áreas de vida e percursos diários

O tamanho das áreas de vida aqui mensuradas (6 e 5 ha) estão de acordo com as pequenas áreas citadas para as espécies de *Alouatta*, o que provavelmente ocorra devido ao reflexo do comportamento folívoro alimentar visto em todo gênero. Primatas folívoros têm áreas de vida menores que os frugívoros e onívoros (Milton e May, 1976; Fleagle, 1999). As dimensões aqui verificadas podem estar próximas dos tamanhos reais já que GI não explorou novas áreas no outono e inverno, e GII explorou apenas um pequeno novo setor na última estação de coleta, o inverno. Em comparação aos trabalhos com a espécie *A. guariba*, estas áreas foram menores que as encontradas por Mendes (1989) (7,94 ha), Gaspar (1997) (8,5 ha) e Limeira (2000) (11,6 ha), mas próximas às de Chiarello (1992) (4,1 ha). Tal semelhança ocorreu apesar do número de indivíduos e grau de folivoria serem maiores e o grau de frugivoria ser menor em relação aos verificados neste trabalho, evidenciando diferenças nas estratégias utilizadas pela mesma espécie em diferentes habitats. Spironello (2001) sugeriu que diferenças ecológicas entre as áreas de estudo podem resultar em grandes diferenças no requerimento de área pela mesma espécie ao longo de sua distribuição geográfica. Ainda, Crockett and Eisenberg (1987) sugerem que as diferenças de tamanho nas áreas de vida estão mais associadas às diferenças ambientais. O número de indivíduos por grupo foi outro fator que influenciou o tamanho das áreas de vida, pois GI (5 indivíduos) utilizou 1 ha a mais do que GII (3 indivíduos), concordando com Strier (1987). A maior procura por figueiras adultas por GI também poderia ter aumentado sua área em comparação a GII, já que aquele apresentou menor número destas árvores em sua área nuclear, utilizando sua área de vida de modo mais homogêneo.

Sazonalmente, os grupos utilizaram suas áreas em diferentes setores conforme a distribuição espácio-temporal de frutos e folhas. As estratégias citadas por Zunino (1986) pareceram ser utilizadas pelos animais. GI apresentou maiores áreas na primavera e verão, período de maior frugivoria, que coincidiu com a frutificação de *Maclura tinctoria* e *Jacaratia spinosa*, respectivamente. Di Bitetti (2001) também verificou um aumento da área de vida de *Cebus apella* que coincidiu com a frutificação de quatro árvores de *M. tinctoria*. A procura pelos frutos de *J. spinosa* foi o principal fator responsável pela sobreposição registrada entre GI e GII e também responsável pela maior área sazonal de GI, já que esta espécie arbórea apresentou um baixo Índice de Valor de Importância nos levantamentos florísticos e é uma espécie que ocorre em baixas densidades (Lorenzi, 2000). No outono e inverno, GI diminuiu o tamanho de sua área em 20%, coincidindo com o período de maior índice de folivoria. No inverno, a utilização de *Ficus* spp. e *Sorocea bonplandii* na área nuclear do grupo contribuiu para a redução da área, já que esta espécie arbórea apresenta alta freqüência e Índice de Valor de Importância (Soares-Silva *et al.*, 1992). Apesar do tamanho da área de vida de GII não apresentar variações sazonais, os maiores percursos foram medidos no verão e os menores no inverno, o que poderia ser um reflexo das estratégias citadas por Zunino (1986).

A riqueza de figueiras no fragmento, evidenciada pelos trabalhos de levantamento florístico, poderia sustentar as diferenças no tamanho e no modo de uso da área quando comparados a outros trabalhos, já que foi nítida a influência destas, principalmente em épocas de escassez de alimentos. No outono houve a procura por figueiras em frutificação e no inverno a procura por folhas novas. Neville *et al.* (1988) destacam que o uso de área de *Alouatta* é relatado diretamente para a distribuição de fontes preferidas de comida, particularmente *Ficus.*

Para *Alouatta*, os percursos diários estão relacionados à qualidade do habitat e são também adaptações relacionadas à dieta folívora utilizada (Bicca-Marques e Calegaro-Marques, 1995). Em relação aos percursos de GII, estes estão próximos aos pequenos percursos encontrados para o gênero, porém aqui verificaram-se menores médias. Mais uma vez as diferenças verificadas poderiam mostrar, além de diferentes tamanhos grupais, diferentes estratégias em resposta às disponibilidades de alimento.

Vocalizações

Os rugidos na Mata Doralice apresentaram-se contínuos, diferindo de outras espécies como *A. palliata* e *A. seniculus* (Oliveira, 2002). O número registrado (n = 19) foi inferior aos trabalhos de Mendes (1989), Chiarello (1995) e Oliveira (2002). Isto provavelmente está relacionado a um baixo número de encontros intergrupais presenciados e a uma menor porcentagem de sobreposições de áreas verificadas entre os grupos, resultantes de uma densidade não alta. Gaspar (veja Oliveira, 2002), também verificou um número baixo de vocalizações (n = 17) em uma área de baixa densidade da espécie.

O pico de vocalização encontrado na Mata Doralice (entre 15 e 17 h) está muito próximo ao encontrado por Mendes (1989) e ao pico vespertino encontrado por Chiarello (1995). Muitos autores detectaram a presença do coro matinal em algumas espécies de *Alouatta*, tais como em *A. palliata* (Carpenter, 1934; Whitehead, 1987, 1989) e *A. seniculus* (Sekulic, 1982). Na primeira espécie, os autores apoiaram a idéia de que o contexto das vocalizações de longo alcance atuava basicamente como um mecanismo de espaçamento entre os grupos em uma espécie não-territorial. Na segunda, foi proposto um contexto de competição sexual, onde os rugidos atuariam mais como um meio de evitar o acesso às fêmeas por machos externos ao grupo, mas posteriormente reconheceu-se que esse comportamento pode desempenhar um papel na defesa de outros recursos (Sekulic, 1983). Neste trabalho, não foi detectado um coro matinal, o que constitui uma característica da espécie, como também verificado por Mendes (1989), Chiarello (1995) e Oliveira (2002).

Os grupos de *A. guariba* pareceram ser territoriais, conforme constatado também por Mendes (1989) e Hirano *et al.* (1996). No que diz respeito à defesa de suas áreas bem definidas, suas vocalizações foram emitidas principalmente nas periferias, como assinalou Mendes (1989), e na direção de seus vizinhos. Além disso, verificou-se que o grupo com maior número de vizinhos e maior porcentagem de área sobreposta (GI) vocalizou dez vezes mais do que o grupo com menor número de vizinhos e menor porcentagem de área sobreposta (GII), parecendo ter sofrido maior quantidade de estímulos para a emissão deste comportamento. Mitani e Rodman (1979) ressaltaram que em primatas, a defesa territorial é funcionalmente dependente da procura por fontes de comida dentro de uma pequena área de vida, e que estes animais defenderão uma área somente se seus regimes alimentares permitirem. Assim, as pequenas áreas de vida dos grupos focais e um alto índice de frugivoria visto neste trabalho apontam para o fato de que estes animais, bem como suas vocalizações, possivelmente estão inseridas no contexto de territorialidade, com a função de defesa de espaço.

Sazonalmente, a maior porcentagem de vocalizações foi registrada no verão, período que correspondeu ao maior registro de sobreposições de áreas entre GI e GII, e desse com outros grupos invasores. O outono foi a estação com o segundo maior registro, apresentando uma maior procura por *Ficus* spp. em frutificação. Ambos os casos podem ter colocado os grupos vizinhos em maior probabilidade de encontros entre si, podendo levá-los a situações de disputa. Em contrapartida, registrou-se a menor porcentagem de vocalizações no inverno, período em que os animais restringiram mais suas atividades às áreas nucleares.

Estimativas populacionais

As estimativas registradas para a espécie (0,82 ind/ha a 1,02 ind/ha) partiram da hipótese de a Mata Doralice ser homogênea e chegou-se a resultados inferiores, se comparados aos trabalhos de Mendes (1989) e Chiarello (1992), porém superiores em comparação com as baixas densidades encontradas por Pinto *et al.* (1993). Todavia, é importante salientar que esta densidade pode sofrer alterações se considerar a heterogeneidade da mata, uma vez que os grupos foram estudados numa área de floresta primária e o fragmento também compreende um trecho de floresta secundária. As densidades populacionais encontradas na Mata Doralice podem estar sofrendo pressão de caça, mesmo que baixa, mas que ainda é existente neste fragmento. Vale ressaltar que no Parque Estadual Mata dos Godoy (o fragmento florestal mais representativo da região do Baixo Tibagi, com 680 ha), a espécie *A. guariba* está extinta, provavelmente devido à caça predatória (Peracchi *et al.*, 2002).

Conclusões

Diante de todo o exposto, concluiu-se que há uma grande necessidade da manutenção da Mata Doralice, e outros fragmentos afins, para aplicação de projetos de manejo, enriquecimento ambiental e genético para esta população isolada de bugios, já que este fragmento é um dos poucos relatos da presença da espécie na região baixa da bacia do Rio Tibagi, onde provavelmente estão quase extintos. Não obstante, salienta-se a importância da criação de corredores para o estabelecimento de metapopulações para *A. guariba* na região.

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CALLITHRIX GEOFFROYI (PRIMATES: CALLITRICHIDAE) AND *ALOUATTA CARAYA* (PRIMATES: ATELIDAE) IN THE SERRA DO CIPÓ NATIONAL PARK, MINAS GERAIS, BRAZIL

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Introduction

The Serra do Cipó National Park is 90 km north of Belo Horizonte, Minas Gerais, and part of the southern section of the Serra do Espinhaço (19°12' to 19°34'S, 43°27' to 43°38'W). It is 33,800 ha in size, covering altitudes ranging from 800 to 1600 m. The vegetation is a mix of *cerrado* (bush savanna), *campo rupestre* (rocky moorland), open pasture and gallery forests, with some forest patches on the eastern ridge. Here we report unusual high-altitude sightings, made as part of an ongoing project, of two eastern Brazilian primate species: *Callithrix geoffroyi* and *Alouatta caraya.*

Geoffroy's marmoset, *Callithrix geoffroyi* (É. Geoffroy in Humboldt, 1812), is endemic to the Atlantic forest of Brazil (Rylands *et al.*, 1993; Fonseca *et al.*, 1996). It is found in secondary forests in lowlands, semi-deciduous forests, gallery forest and forest borders, with a preference for disturbed rather than mature areas (Passamani and Rylands, 2000a, 2000b). It is diurnal, and its diet is composed largely of fruits, exudates and small animal prey. Populations of Geoffroy's marmoset are declining over large parts of its relatively restricted range due to habitat loss and fragmentation, hunting and capture for pets. Its distribution appears to be further limited by its restriction, in many parts of its range, to altitudes between sea level and 600-800 m (Mendes, 1997).

The black howler monkey, *Alouatta caraya* (Humboldt, 1812) is typical of the Cerrado biome, but may also be found in forests along the Paraná/Paranaíba rivers, in deciduous forests in Caatinga regions of north-east Brazil, semi-deciduous forests of the Pantanal, the humid Chaco of Argentina, and in "capões" – forest patches – of Rio Grande do Sul and extreme northwestern Uruguay (Hirsch *et al.*, 2002). This species thus has a wide geographic range, from northern Argentina to the northeast of Brazil. *A. caraya* is usually to be found in low altitudes up to approximately 1000 m. It is diurnal and lives in groups of seven to nine individuals, although group sizes of up to 17 have been reported (Bicca-Marques, 1992). Leaves and fruits comprise the majority of its diet. Although not directly threatened, *A. caraya* suffers from the severe and ongoing fragmentation of its habitat in the Cerrado. In this context it is critical to identify new sites where it may occur, each of which will be important to the long-term survival of this species.

In this report, we register the occurrence of *Callithrix geoffroyi* and *Alouatta caraya* in a small fragment of Atlantic forest on the eastern border of the Serra do Cipó National Park, Minas Gerais, Brazil. This new locality is at one of the highest elevations (1274 and 1254 m, respectively) yet recorded for these species (Carlos E. V. Grelle, pers. comm.; Maycon G. Belarmino, unpubl. data, respectively), at the westernmost limits of the Rio Doce basin, headwaters of the Rio Santo Antônio (Hirsch *et al.*, 2002; see Fig. 1).

Methods and Results

The study was carried out in a forest fragment with an approximate area of 34.3 ha and a perimeter of approximately 3.22 km, in the municipality of Morro do Pilar, near the neighboring municipality of Santana do Riacho (see Fig. 1). Geographic coordinates and altitude were taken with a GPS device. We used a Landsat 5 TM satellite image (p218/r73, 01/nov/1997; Minas Gerais, DMC/IEF, 2001) to identify the vegetation in the surrounding areas, and ArcGIS 8.2 software (ESRI, 2001) for calculating the forest fragment's contour, area and perimeter. From the examination of the satellite image done by Hirsch (2003), the study site may be characterized as a small semi-isolated fragment, linked on only one side with a gallery forest that follows a small watercourse downstream. The surroundings are occupied with rocky moorland and open pasture (Fig. 1).

Two marmosets, *Callithrix geoffroyi*, were heard and seen in the forest fragment in August 2002. We later observed 10 individuals there during a return visit in March 2003. The GPS coordinates taken in the field were 19°15'28"S and 43°31'01"W, and the altitude was 1274 m. On 15 March 2003, two members of the field team observed one individual of *Alouatta caraya* in the same forest fragment, at approximately the same coordinates and at an altitude of 1254 m. All the records were taken *ad libitum* (Altmann, 1974).

Discussion

Callithrix geoffroyi

Although little studied, the home range of *C. geoffroyi* is believed to vary from 20 to 30 ha (Rylands and Faria, 1993). Passamani and Rylands (2000a, 2000b) estimated a home range of 23.3 ha for a group of 3-5 individuals in a forest fragment of 110 ha in the state of Espírito Santo. The record from this study was made in a fragment of approximately 34 ha, which suggests that its area is insufficient to support more than one group. Considering a circle as the best shape, the ideal perimeter calculated with the formula

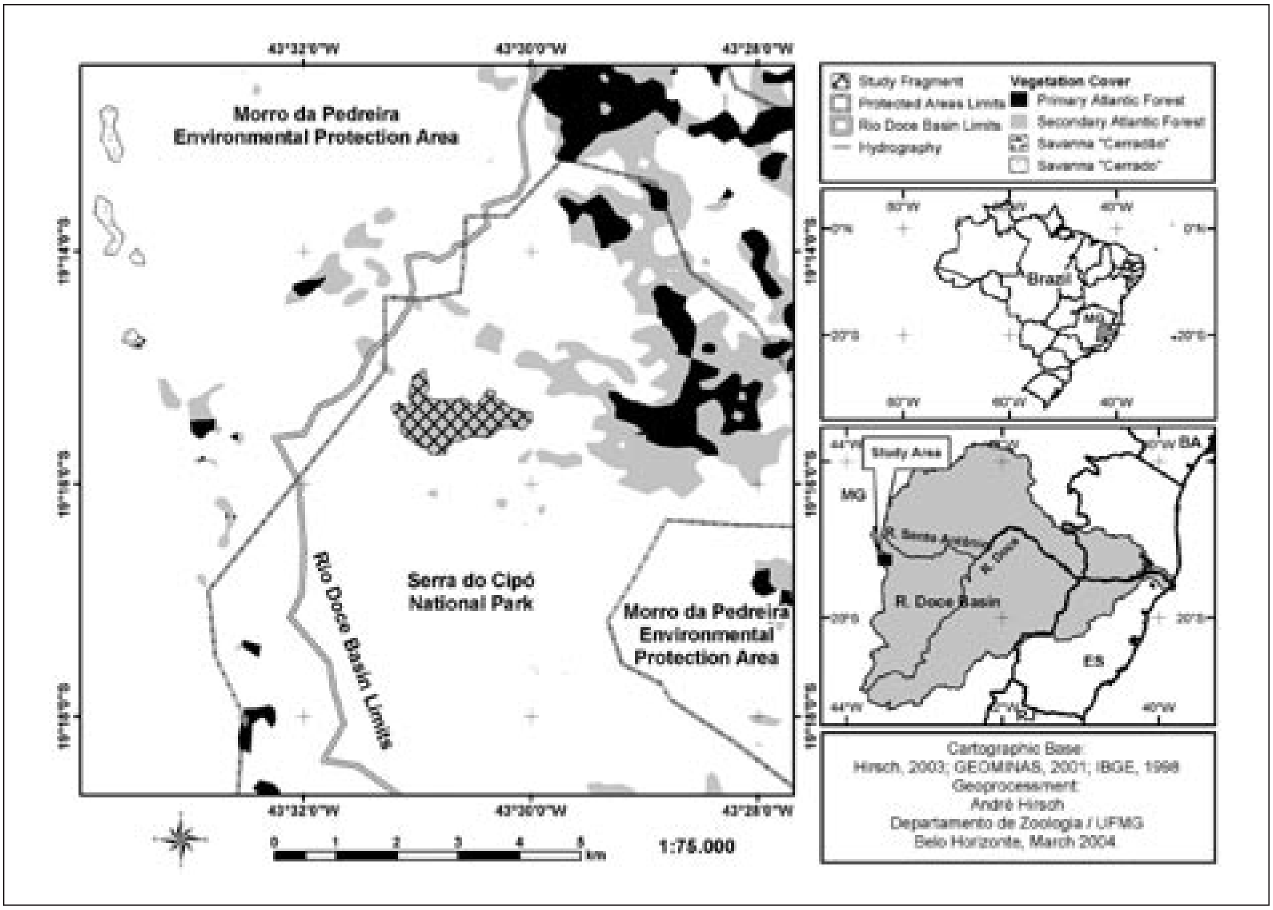

Figure 1. Location of the forest fragment where *Callithrix geoffroyi* and *Alouatta caraya* were recorded at the Serra do Cipó National Park, Minas Gerais, Brazil.

provided by Hirsch (2003) for this forest fragment is only 2.08 km. The actual contour (3.22 km) is larger and somewhat irregular, with a considerable edge effect acting on the interior forest area.

One of the causes of the threatened status of *C. geoffroyi* is its relatively restricted distribution in a highly fragmented environment. Our record of this species at an altitude of 1274 m extends its vertical range by almost 500 m, thereby indicating that it may be more wide-ranging than previously thought. This is also the westernmost record of the species in the Rio Doce basin (Hirsch *et al.*, 2002). The nearest record on the western slopes of the Serra do Cipó National Park is of *Callithrix penicillata*, near the park's administrative headquarters. Thus, the Serra do Cipó may be considered a biogeographic divide between these two marmoset species (Hirsch *et al.*, 2002).

Alouatta caraya

Home range size for the genus *Alouatta* is reported to vary from 4.1 to 182 ha (Chiarello, 1993; Palacios and Rodriguez, 2001). In fragmented landscapes, *A. caraya* has been registered in patches of 2 ha (Bicca-Marques, 1992; Bicca-Marques and Calegaro-Marques, 1995). Their ability to incorporate secondary vegetation in their diet may explain their capacity to survive in small and degraded areas (Chiarello, 1994). This observation is one of the highest altitudes (1254 m) recorded for the species (Maycon G. Belarmino, pers. obs.), which extends its potential geographical distribution and suggests that new proposals for population management might be implemented in areas previously considered unsuitable for the species.

Small and isolated fragments such as this one may not have sufficient core area to support viable populations of many species (Zudeima *et al.*, 1996). They may function, however, as an ultimate refuge for many species (Shafer, 1995). Small populations found in such small refuges may be subject to a series of stochastic processes of demographic, genetic and environmental origin that may lead them to extinction, despite measures taken for their conservation (Gilpin and Soulé, 1986; Brito and Fernandez, 2000). The negative effects of population isolation, especially on small populations, have already been well-demonstrated in the conservation literature (see, for example, Meffe and Carol, 1997).

Although small forest fragments cannot support marmoset or howler populations which are viable in the long-term, they may serve as "stepping stones" between larger forests, thereby facilitating gene flow and recolonization through dispersal and migration. These new records are in a large protected area, the Serra do Cipó National Park, surrounded by the buffer zone of the Morro da Pedreira Environmental Protection Area. This allows for some hope for the long-term persistence of these populations. Future research may reveal the conservation relevance of such small fragments and their apparently isolated populations.

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DISTRIBUIÇÃO DO GUIGÓ (*CALLICEBUS COIMBRAI*) NO ESTADO DE SERGIPE

Marcelo Cardoso de Sousa

Sergipe é o menor estado brasileiro em extensão territorial. Possui cerca de 21.994 km² e localiza-se na região nordeste do Brasil, ao sul do Rio São Francisco. Seu relevo apresenta formas desgastadas, com altitudes pouco elevadas; cerca de 86% do território é abaixo de 300 m sobre o nível do mar. A baixada litorânea constitui uma extensa faixa de tabuleiros sedimentares, com cerca de 150 km de largura do litoral, em direção ao interior, cortada pelas várzeas dos rios (Vaza-Barris, Sergipe, Piauí, Real) que deságuam no Oceano Atlântico. No norte do estado, esses terrenos baixos se unem à planície aluvial do Rio São Francisco, o maior rio de Sergipe, o qual demarca a divisa com o estado de Alagoas. A baixada, por seus aspectos fisiográficos, corresponde em sua maior parte à Zona da Mata, cuja vegetação original era a floresta tropical, hoje em grande parte devastada pela exploração econômica predatória ou substituída por áreas agrícolas.

Em meio às áreas antrópicas, ainda existem remanescentes florestais, pequenas ilhas de vegetação secundária representadas por formações do tipo Floresta Ombrófila Densa e Floresta Estacional Semidecidual. Vários desses remanescentes florestais foram percorridos nos últimos anos com o propósito de se registrar a presença de *Callicebus coimbrai* e ampliar o conhecimento sobre as suas áreas de ocorrência. Apesar de incluída na nova lista da fauna brasileira ameaçada de extinção, *C. coimbrai* dispõe de pouquíssimos registros de campo, e sua distribuição e estado de conservação ainda não estão efetivamente bem definidos. As únicas informações sobre essa espécie foram fornecidas por Kobayashi e Langguth (1999) quando, no trabalho da descrição da espécie, indicaram duas áreas de ocorrência de *C. coimbrai*, além da sua localidade tipo no estado de Sergipe. Sousa (2000) acrescentou mais três localidades, uma delas situada no nordeste do estado da Bahia. Van Roosmalen *et al.* (2002) fizeram uma compilação das informações até então disponíveis e sugeriram os limites de sua distribuição entre o Rio Itapicuru (ao norte) e o Rio São Francisco.

Neste nota, reportamos novos registros da distribuição de *Callicebus coimbrai* baseados em observações realizadas no período de outubro de 2002 a setembro de 2003, durante nossos trabalhos de campo desenvolvidos no estado de Sergipe. Nesse período, tivemos a oportunidade de registrar a vocalização de *Callicebus* em 14 fragmentos florestais e obter imagens de alguns indivíduos em duas localidades.

Figure 1. Ocorrência do guigó *Callicebus coimbrai* no estado do Sergipe, Brasil. Escala 1:3.000.000. Projeção Área Igual Cilíndrica. Mapa gentilmente confeccionado por Mark Denil, GIS and Mapping Laboratory, Center for Applied Biodiversity Science, Conservation International, Washington, DC.

1. *Mata da Santana* (10°32'S, 36°44'W). Localizada entre os municípios de Pacatuba e Japoatã, nos arredores da localidade tipo de *Callicebus coimbrai*, a mata da Santana é um fragmento com cerca de 150 ha, isolada em meio a plantações de cana-de-açúcar. A maior parte da mata é constituída por vegetação secundária, entretanto, algumas árvores altas remanescentes com cerca de 20 m de altura ainda podem ser encontradas, principalmente, nas grotas e encostas de difícil acesso. A retirada seletiva de madeira é uma das principais ameaças à integridade da mata e à sobrevivência dos *Callicebus.* Outro fator de risco é a possibilidade de incêndios na floresta, uma vez que durante a colheita da cana-de-açúcar todo o canavial, inclusive próximo à borda da floresta, é incendiado para facilitar o manejo da safra. Observamos, ouvimos e obtivemos gravações de três indivíduos de *C. coimbrai* no dia 4 de julho de 2003.

2. *Mata do Serigy* (10°33'S, 36°42'W). No município de Pacatuba, próxima à mata da Santana, com aproximadamente 70 ha de área, a mata do Serigy encontra-se hoje bastante alterada. Destaca-se na área uma vegetação secundária, muitas clareiras em processo de sucessão ecológica e muitas espécies heliófitas, inclusive gramíneas e ciperáceas que dificultam o acesso ao seu interior. A fisionomia atual da mata do Serigy é conseqüência de um incêndio ocorrido há aproximadamente oito anos que destruiu boa parte da mata. Apesar do seu estado de perturbação, *Callicebus*

coimbrai ainda pode ser encontrado no local. Registramos sua vocalização no dia 28 de setembro de 2002.

3. *Mata do Oiteiro* (10°39'S, 37°03'W). Situada no município de Rosário do Catete, em meio a uma vegetação de cerrado, a mata do Oiteiro localiza-se num pequeno vale onde a vegetação possui um maior porte. O estrato arbóreo da mata possui entre 10 a 15 m, contudo, algumas árvores emergentes podem ultrapassar os 20 m. O interior da mata encontra-se parcialmente devastado, sendo a caça e a retirada de madeira constantes; contudo, pudemos ouvir a vocalização de *C. coimbrai* no dia 20 de junho de 2003.

4. *Mata do Cadoz* (10°23'S, 36°39'W). Em meio a pastagens, plantações de coqueiros, algumas lagoas e de uma fazenda de criação de peixes e gado, no município de Neópolis, encontra-se a mata da Fazenda Cadoz. A mata, uma capoeira alta, encontra-se relativamente bem conservada e em estágio de recuperação. O registro da vocalização de *Callicebus coimbrai* foi feito no dia 30 de julho de 2003.

5. *Mata da Serra Preta* (10°30'S, 37°37'W). Reduzida às encostas de uma elevação de pouca altitude, denominada Serra Preta, no município de Frei Paulo. A mata encontra-se seriamente ameaçada pela expansão de pequenas lavouras de subsistência que avançam no sentido do sopé até o alto do morro. Fizemos o registro da presença de *Callicebus coimbrai* no dia 5 de julho de 2002.

6. *Mata da Fazenda Sabão* (11°30'S, 37°34'W). Uma das principais características dos remanescentes florestais da Fazenda Sabão, situada no município de Indiaroba, é a grande quantidade de palmeiras do gênero *Attalea* em meio a uma formação arbórea densa e, em maiores proporções, áreas de capoeira alta. Na mata, que possui aproximadamente 300 ha, obtivemos registros da vocalização de *Callicebus coimbrai* no dia 2 de maio de 2003.

7. *Mata da Aiumas* (10°25'S, 36°39'W). A Fazenda Aiumas localiza-se as margens da rodovia estadual SE-204, no município de Pacatuba. A área florestada da Fazenda encontra-se bastante perturbada, reflexo da retirada de madeira para lenha e estacas para cercas. Contudo, existe na área um pequeno trecho de mata ciliar, entremeada com palmeiras dos gêneros *Attalea* e *Elaeis*, em bom estado de conservação. Fizemos o registro de *Callicebus coimbrai* no dia 30 de julho de 2003.

8. *Mata da Aguada* (10°40'S, 36°56'W). Possui cerca de 40 ha e está situada no município de Carmópolis, nos arredores do Povoado Aguada. Registramos a presença de *Callicebus coimbrai* nesse fragmento florestal, relativamente conservado e situado na encosta e no alto de um pequeno morro, no dia 31 de julho de 2003. Segundo informações colhidas através de depoimentos de moradores do local, a retirada de madeira não é permitida, embora ocorra às escondidas, mas, a caça ainda persiste no local.

9. *Mata do Junco* (10°32'S, 37°03'W). Às margens de uma pequena estrada e cercada por pequenos povoados do município de Capela, a mata do Junco possui cerca de 400 ha. Mescla trechos de mata devastada, encraves de cerrado e áreas relativamente conservadas, principalmente nos baixios e ao longo de pequenos riachos. Registramos a vocalização de *Callicebus coimbrai* no dia 14 de junho de 2003.

10. *Mata da Nova Descoberta* (11°06'S, 37°19'W). Ouvimos a vocalização de *Callicebus coimbrai* no dia 29 de março de 2003, num trecho de mata parcialmente devastada do município de Itaporanga d'Ajuda. A mata localiza-se às margens da rodovia estadual SE-270, ao lado do povoado Nova Descoberta. As pressões sofridas pela mata são geradas pela expansão desse pequeno núcleo urbano cujos habitantes utilizam a madeira, caçam e desmatam para expandir suas lavouras.

11. *Mata da Fazenda Trapsa* (11°12'S, 37°14'W). No município de Itaporanga, numa área de Cerrado bastante deteriorado (devido a construção de uma represa e a exploração de uma jazida de cascalho laterítico) situado no antigo terraço marinho de formação geológica do grupo barreiras, alguns trechos de mata encontram-se nos vales e nos terrenos baixos. Nesses locais, a vegetação apresenta-se mais densa, e possui um estrato arbóreo entre 5 e 15 m, cujas árvores apresentam geralmente um pequeno diâmetro. A exploração de madeira já foi intensa no local, e a presença de árvores mortas com cerca de 20 m evidenciam incêndios ocorridos num passado não muito distante. A mata hoje encontra-se em recuperação, embora a extração de madeira continue. A caça, embora proibida pelo proprietário da fazenda, persiste no local. Registramos a vocalização de *Callicebus coimbrai* no dia 28 de abril de 2002.

12. *Mata do Crasto* (11°22'S, 37°25'W). Localizada no município de Santa Luzia do Itanhy, possui uma área de aproximadamente 900 ha. É um dos remanescentes florestais mais significativos e conservados do estado. Só subsiste graças à proteção dos proprietários que vêm tentando garantir a integridade da floresta. A mata do Crasto foi decretada Reserva Particular de Patrimônio Natural (RPPN) no dia 10 de agosto de 1989 pela Portaria No. 442/89 do Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA). As principais ameaças à mata do Crasto são os projetos de expansão turística propostos a partir da pavimentação asfáltica de estradas de terra já existentes no entorno e até mesmo dentro de alguns pontos da mata, além da retirada de madeira e da caça que ainda ocorrem clandestinamente e de forma sistemática na área. No dia 4 de maio de 2003 ouvimos a vocalização de *Callicebus coimbrai* e conseguimos visualizar um indivíduo cruzando por sobre as árvores uma das trilhas existentes no interior da mata.

13. *Mata do Dira* (10°53'S, 37°21'W). Os remanescentes florestais da Fazenda Dira somam hoje pouco mais de 100 ha. A mata depauperada ainda existente está sob a proteção dos proprietários e é um testemunho do que foi um dos

mais importantes remanescentes de Mata Atlântica daquela região do estado, destruída pela expansão de pastagens para a criação de gado, pela caça e pelos assentamentos para a reforma agrária. Registramos a vocalização de *Callicebus coimbrai* no dia 23 de agosto de 2003.

14. *Mata da Arauari* (10°45'S, 36°59'W). Localizada no município de Santo Amaro, a mata da Arauari foi visitada por Langguth e Kobayashi em 1995 quando, na ocasião, eles coletaram uma série de dois parátipos para a descrição da espécie. No dia 14 de maio de 2003, percorremos um trecho da mata na qual ouvimos e observamos dois indivíduos. Constatamos a retirada recente de madeira da área e a destruição das bordas da floresta para a formação de pastos e de pequenas lavouras.

Com base nas observações realizadas em vários fragmentos florestais do estado, principalmente naqueles nos quais conseguimos registrar a presença de *Callicebus coimbrai,* podemos argumentar o seguinte:

a. Todas as áreas florestadas do estado de Sergipe encontram-se sob forte processo de degradação, inclusive aquelas que são redutos das diminutas populações de *C. coimbrai.*

b. Apesar de persistirem em alguns fragmentos e terem suportado ao longo dos anos a deterioração de seus ambientes, as populações de *C. coimbrai* acham-se em franco declínio, principalmente devido à caça, redução e conseqüente perda de habitat.

c. A soma de todos os fragmentos onde a espécie ainda ocorre totaliza pouco mais de 5000 ha distribuídos em pequenas áreas, nenhuma delas legalmente protegida (a exceção da RPPN Mata do Crasto). Essa falta de proteção e fragilidade do ponto de vista de conservação, além do tamanho reduzido de sua área de distribuição até o momento conhecida, faz de *C. coimbrai* uma das espécies de primatas mais ameaçadas do mundo. A ampliação do conhecimento sobre essa espécie, a busca de novas áreas de ocorrência, a criação de áreas protegidas e o estabelecimento de programas de proteção são medidas que se fazem urgentes e imprescindíveis para a garantir a sobrevivência da espécie.

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ESTIMATIVA DE DENSIDADE E TAMANHO POPULACIONAL DE SAUÁ (*CALLICEBUS NIGRIFRONS*) EM UM FRAGMENTO DE MATA EM REGENERAÇÃO, VIÇOSA, MINAS GERAIS, BRASIL

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Introdução

Primatas são importantes indicadores para as florestas tropicais como componente fundamental de estratégias para a conservação da biodiversidade, tanto em nível regional quanto de bioma (Rylands *et al.*, 1997). A Floresta Atlântica, que retém atualmente 7,5% de sua vegetação primária (Myers *et al.*, 2000), abriga 23 espécies e subespécies reconhecidas de primatas, onde 74% delas são endêmicas. Esta região também apresenta o segundo maior número de taxa ameaçados, 18, sendo endêmicos e compreendendo 78% dos primatas ocorrentes na Floresta Atlântica (Rylands *et al.*, 1997).

O sauá, *Callicebus nigrifrons,* ocorre na região sudeste (Kinzey, 1982). Encontra-se listada como "vulnerável" no estado de Minas Gerais (Machado *et al.*, 1998) mas informações a cerca da sua biologia e ecologia permanecem ainda escassos. Dados de densidade podem ser de grande utilidade para o estudo das conseqüências da fragmentação do habitat, como por exemplo para avaliar o "status" de uma população que se encontra ameaçada (Laurance, 1990). Este trabalho teve como objetivo fornecer uma estimativa da densidade e do tamanho populacional de *Callicebus nigrifrons* sobreviventes em um pequeno fragmento de mata em processo de regeneração.

Área de Estudo e Métodos

Os censos foram conduzidos numa área de aproximadamente 75 ha no município de Viçosa, Minas Gerais, Brasil (20°45'S e 42°51'W), em terreno de relevo montanhoso e topografia acidentada, dentro dos limites da Universidade Federal de Viçosa (Fig. 1). Trata-se de um fragmento florestal que, no início do século, foi uma plantação de café (Valverde, 1958; Golfari, 1975), e hoje é resultado de uma sucessão secundária em regeneração que, apesar de situar-se em área urbana, é bastante representativa da flora regional (Camargo, 1993).

A coleta dos dados foi feita usando o método dos transectos lineares (Buckland *et al.*, 1993), no período de fevereiro a junho de 2000, a partir de quatro trilhas (Trilha 1 = 930 m, 4 = 950 m, A = 520 m e D = 400 m) feitas de maneira a cobrir os diferentes tipos florestais do fragmento. Um total de 60,24 km de trilhas foi percorrida (comprimento total do transecto) durante 76:56 horas de observação. As 94 amostras de censo realizadas nesse período foram feitas predominantemente pela manhã (63%) entre 08:00 h e 12:00 h, horário de maior atividade dos primatas. Esforços foram feitos para manter a velocidade de caminhada sempre constante e próxima de 1,5 km/h. A análise dos dados se deu através do programa Distance versão 2.1 (Laake *et al.*, 1994), que se baseia nas distâncias perpendiculares registradas durante o censo. As densidades foram calculadas em grupos/km², fazendo a multiplicação da densidade de grupo pelo seu tamanho médio.

Resultados e Discussão

Um total de 11 encontros visuais foram registrados durante o estudo. O tamanho médio dos grupos foi de 3,09 indivíduos. Em trabalho realizado com *C. personatus* por Pinto *et al.* (1993) na Reserva Biológica Augusto Ruschi, o tamanho médio dos grupos foi de 3,9 indivíduos, enquanto que 6 indivíduos/grupo foram encontrados na Reserva Biológica de Sooretama por Kinzey e Becker (1983). A altura média de detecção dos grupos foi de 18 m, indicando uma certa preferência da espécie por estratos superiores da mata. Foi registrado uma taxa de encontros de 1,83 grupos/10 km de censo, enquanto Chiarello e Melo (2001) obtiveram, para diferentes fragmentos florestais no Espírito Santo, uma variação de 0,22 a 1,66 grupos/10 km de censo. Pinto *et al.* (1993) registraram um valor de 0,54 grupos/10 km de censo para a Reserva Biológica Augusto Ruschi (Tabela 1).

A partir das distâncias perpendiculares, o programa Distance determinou a ESW ou largura efetiva da trilha, que foi de 18,98 m, e uma densidade de 14,86 indivíduos/km². Esta se encontra dentro da variação registrada para outras regiões de Mata Atlântica (Chiarello e Melo, 2001; Pinto *et al.*, 1993) e se mostra relativamente alta, indicando uma elevada densidade de sauás no fragmento, se comparado às densidades de fragmentos maiores (Tabela 1). Podemos inferir que pela falta de grandes predadores, os fragmentos pequenos suportam uma densidade maior de sauás que os fragmentos maiores. Um outro fator de extrema importância que pode afetar o sucesso de espécies frugívoras, como o sauá, é a falta de recursos, especialmente frutos. A sobrevivência desses animais num fragmento pequeno como a Mata da Biologia é provavelmente devida, em parte, à ocorrência de várias espécies de árvores que oferecem frutos carnudos e também à forma como se encontram distribuídas. Como sabemos, em fragmentos pequenos as árvores frutíferas se distribuem melhor no

Figura 1. A localização da Mata da Biologia, um fragmento de floresta de 75 ha no campus da Universidade Federal de Viçosa, Viçosa, Minas Gerais.

Tabela 1. Densidades estimadas para as espécies de *Callicebus* registradas para as várias localidades de floresta Atlântica.

Espécie	Localidade/Estado	Densidade (indiv./km²)	Taxa de avistamento (grupos/10 km)	Área (km²)	Fonte
C. personatus	M7/317, Espírito Santo	1,4	0,22	2,6	1
C. personatus	Reserva Biológica Augusto Ruschi, Espírito Santo	5,4	0,54	40,0	2
C. personatus	Putiri, Espírito Santo	6,4	1,02	2,1	1
C. personatus	Reserva Florestal Linhares (CVRD), Espírito Santo	7,7	1,23	218,0	1
C. nigrifrons	Fazenda Barreiro Rico, São Paulo	7-10	-	32,6	2
C. personatus	Reserva Biológica de Sooretama, Espírito Santo	9,5	1,66	242,5	1
C. melanochir	Una, Bahia	3,4-16,7	-	1,0	2
C. nigrifrons	Serra do Brigadeiro, Minas Gerais	10,3	-	132,1	3
C. melanochir	Estação Experimental Lemos Maia (CEPLAC), Bahia	17,0	-	10,0	4
C. melanochir	Fazenda Teimoso, Bahia	17,7	-	2,4	2
C. nigrifrons	Viçosa, Minas Gerais	14,86	1,83	0,75	Neste estudo

Fonte: 1: Chiarello e Melo (2001); 2: Pinto *et al.* (1993, compilado); 3: Cosenza e Melo (1998); 4: Müller (1996).

espaço e no tempo, levando espécies frugívoras a ampliar a sua área de uso (Milton e May, 1976).

Em relação ao método dos transectos lineares, embora ele seja amplamente difundido no estudo de densidade de primatas, observamos algumas dificuldades e limitações em sua aplicação. Melo e Mendes (2000) comprovaram a ineficiência do método para os fragmentos menores, onde a observação direta dos grupos num processo de exaustão da área mostrou ser mais eficiente.

Pôde ser estimado ainda, um valor hipotético para o tamanho da população de sauás para a área em estudo (considerando a área de 75 ha ou 0,75 km²) de 11,14 indivíduos. O que se observa no fragmento da Mata da Biologia, assim como em outros remanescentes de Mata Atlântica, é que a grande maioria das populações de primatas sobreviventes é muito pequena e por isso, muito susceptível à extinção, tanto por fatores exógenos quanto endógenos. Daí a necessidade de se entender como tais populações sobrevivem e se adaptam às mudanças ambientais, especialmente à crescente fragmentação e conseqüente perda de seu habitat natural.

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PRIMATES OF BROWNSBERG NATUURPARK, SURINAME, WITH PARTICULAR ATTENTION TO THE PITHECIINS

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Introduction

Brownsberg Natuurpark (5°01'N, 55°34'W) is Suriname's only wildlife park that is open and accessible to both Suriname citizens and researchers. The park lies 130 km south of the capital, Paramaribo, and consists of a lateritic plateau, which at 530 m forms the top of the Brownsberg range. The plateau lies 473 m above the surrounding lowlands and is relatively humid with low cloud cover, particularly on the eastern perimeter. The Brownsberg range has at least one additional lateritic plateau at some 100-150 m above sea level, which is much drier than the upper one. In between the two plateaus are slopes with exceptionally high forest, but also occasional broad ridges or narrow semi-plateau areas with lateritic soil (e.g., at 200-350 m elevation) and medium to low forest. The areas with thick laterite crusts (perhaps 10% of the park), especially where the forest is low, are dominated by the Myrtaceae in all storeys (B. P. E. De Dijn, unpubl. data). Forests range from seasonally dry to seasonally flooded, consisting of both secondary and primary forest, steep forested slopes, and creek-side forest in the valleys – a total area of *c.* 8,000 ha (Reichart, 1997). The eastern edge of the plateau is bounded by Lake Afobaka, also referred to as the Brokopondo Reservoir of the Suriname River, and the northern edge of the park is approximately 3.0 km from the village of Brownsweg.

The origin of the village and the lake corresponds to the damming of the Suriname River in 1964 for construction of one of the first hydroelectric plants in South America. Half the territory of the Saramaccan people was flooded as a result of the construction of the dam. Approximately 4,500 people from three autonomous villages were relocated to Brownsweg, although De Dijn now estimates the population to be about 3,500 residents. The Brownsberg is valuable for its floristic and faunal diversity (as yet undiscovered for most taxonomic groups), and also for the educational opportunity it provides to the citizens of Suriname, most especially in the highly populous Brownsweg.

The Brownsberg has long been a destination for tourists, particularly from Holland, but the proximity of the park to Paramaribo also attracts day-trippers and over-night tourism from Surinamers. This has resulted in a recent increase in the number of dwellings in the park to accommodate a few dozen permanent staff, tourists, and researchers on the top of the berg, besides considerable forest clearing on the eastern slope of the plateau for picturesque "outlooks" over the forest and lake below. The berg itself rises 473 m above the relatively flat surrounding terrain (50 m above sea level) (Reichart, 1997). The flora is extremely diverse, supporting not only low-elevation species, but also a flora indicative of cloud forest on the top of the berg and intermediate climatic conditions on the slopes. Huber (1995) characterized Guayana Shield elevations of 500 m or more as cool and wet (submesothermic [mean annual temperature 18-24 °C], ombrophilous [rainfall >2000 mm]), with fewer than two dry months a year. An informal census by P.-M. Forget (pers. comm.), consisting of a single transect from the lake in the east, up to and across the plateau and down the northern side of the berg, suggested that the Brownsberg is more floristically diverse in flowering plant species than either Nouragues in French Guiana (see Bongers *et al.*, 2001) or the Central Suriname Nature Reserve (previously Raleighvallen-Voltzberg). All three sites are on the Guiana Shield, where 6.6% of plant genera and 40% of plant species are endemic (Berry *et al.*, 1995, p.165). Fitzgerald (2003) conducted a year-long wildlife survey on the Brownsberg from November 2000 to May 2002. Her census included primates, though not as a focus, but the work she initiated has been incorporated into a long-term monitoring program projected to extend until 2006.

The plateau and surrounding area of the Brownsberg have long been known to miners for their gold and bauxite reserves. In 1908, weekly trains transported gold from the Brownsberg area to Paramaribo, and gold has been mined in the area since 1718 (Reichart, 1997). In 1916, the Surinam Bauxite Company (SURALCO, a subsidiary of ALCOA-US) purchased the mountain and continues to hold mineral rights to the Brownsberg. Suriname's Foundation for Nature Conservation (STINASU) received a

75-year lease to the plateau and middle portion of the mountain in 1970. In 2001, the park was expanded to 12,200 ha from its original 8,400 ha by the addition of pristine high forest in the southern portion of the Brownsberg range. At the same time, 1,000 ha in the northwestern part of the park was relinquished to local inhabitants (Fitzgerald *et al.*, 2002).

Currently, gold mining provides a much-diminished return compared to the value-to-effort return of the early 20th century, but mining practices involving heavy equipment, water-powered extraction and the perfusion of stream beds with mercury are causing more damage than previous methods. Fitzgerald *et al.* (2002, p.2) characterized Brownsweg as "a large village with a busy small-scale gold mining industry." Our recent observations suggest that the level of production and speed of processing has destroyed hundreds of meters of pristine streambeds draining the Brownsberg since March 2003. Gold mining is also more actively pursued today than bauxite mining, but the threat of destruction on the plateau itself is not without devastating consequences. SURALCO has recently brought crews with survey equipment to the plateau in order to reassess the mineral content of the berg. We estimated that 4.8 ha of forest along the main plateau road was destroyed by SURALCO for the construction of test pits in May 2003. Both forms of mining put the forests and their wildlife at risk, and the bauxite mining and reclamation of the plateau threatens the very existence of the park as an ecotourism resource uniquely accessible to all Surinamers.

The purpose of this census was to gather data specific to primate populations, conduct a feasibility study to prepare for a long-term study of pitheciin primates, and to contribute to the database being created by STINASU to ensure long-term protection of the site.

Methods

The census was conducted for 28 consecutive days, from 21 May to 17 June 2003, during the early rainy season. Two research teams, of two to three people each, censused all trails and roads on the plateau of the Brownsberg every other day (Table 1). The censused area included slopes leading east to Lake Afobaka and north toward the village of Brownsweg. We began transect walks at 06:15 hrs and

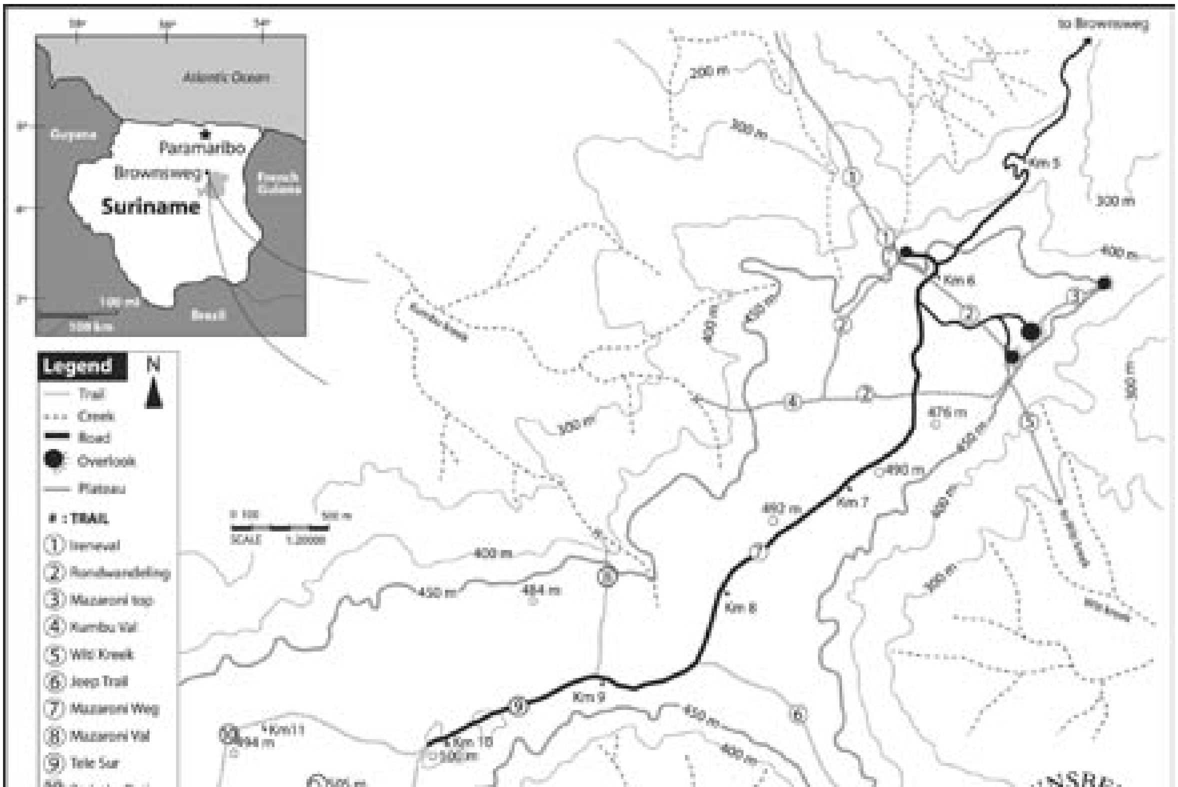

Figure 1. The Mazaroni plateau, encompassed within the 450 m topographical line, of Brownsberg Natuurpark, Suriname. Positions of the main road (dark line) and approximate position of trails (dotted lines) both on the plateau and descending the slopes of the mountain are indicated.

Table 1. Characteristics and length of trails that were used as transects for the census, and the total distance walked on each trail. The length of transect was not the entire length of the trail for AKP, Witi Kreek, and Jeep Trail. The elevation change is taken from the top of the plateau at 473 m. Elevation changes are estimates.

Trail Name	Trail characteristics	Length of trail (km)	Total distance walked (km)	Elevation change from the plateau[1]
AKP	Plateau & slope	3.6	62.2	- 250 m
Jeep Trail	Plateau & slope	3.1	58.6	- 300 m
Mazaroni Val	Plateau & slope	1.0	16.9	- 150 m
Irene Val	Plateau & slope	2.0	10.3	- 300 m
Kumbu Val	Plateau & slope	1.5	6.0	- 150 m
Witi Kreek	Slope & creek side	3.5	63.4	- 450 m
Mazaroni Weg	Plateau	3.0	70.7	0
Rondwandeling	Plateau	2.3	37.4	0
Tele Sur	Plateau	1.3	21.9	0
Mazaroni Top	Plateau	0.7	8.4	+ 10 m

([1]From Appendix C: Fitzgerald *et al.*, 2002.)

ended at approximately 14:30 hrs. Walking speed was approximately 1.3 km/hr. We collected the following data each time a primate group or individual was detected: time of day and weather, location (trail mark), observation of primate species (height, distance, and direction from the trail), group size and age/sex composition data, and activity at the time of the sighting. Species encountered informally, i.e., not part of transect walks, were not treated in the analysis.

Data were recorded in both directions of our travel route ("transect" and "return transect") since all but one of the trails (Rondwandeling) were linear. Visibility on either side of the trail varied, ranging from approximately 5 m to 25 m. We discarded any data that could have represented repeated sampling of a species or group and, for the analysis below, also eliminated all data collected on primate vocalizations. None of the primates were habituated to observers, but there were several cases in which we were able to accumulate sufficient data to calculate group size and composition with confidence. Nevertheless, the summary statistics that we report are considered to be minimum estimates.

Positional data on trail locations were collected prior to the onset of our study by K. Fitzgerald, S. Mitro, and B. P. E. De Dijn, using a Garmin GPS 12 XL. Satellite readings were taken every 100 m. We measured the road to Brownsweg (AKP) that was also used as a census transect using a Garmin eTrex Venture, again taking readings every 100 m. GPS data were entered into ArcView 3.2. Maps do not reflect elevational differences.

Individual encounter rates (ER) for each species (except *Saimiri* and *Ateles*, for which data were insufficient) were calculated by dividing the total number of individuals encountered by 26.2 km (total survey distance). Group encounter rates were calculated in the same manner, and both individual and group ER were expressed as groups encountered per 10 km. We censused a total linear distance of 364.2 km (see Table 1), an average of 12.26 ± 1.27 km/day. Thus each trail was censused approximately every two days. We estimated Primate Biomass Encounter Rate (PBER) per 10 km using body weight data from Ford and Davis (1992) multiplied by individual ER.

We also compared primate sightings on plateau vs. slope trails to assess variations in local abundance using non-parametric statistics (α-values were set at 0.05). Relative trail abundance is reported as the number of times a species was encountered divided by the number of times the trail was walked. Species abundance was calculated as the relative frequency of encountering a particular species on any trail.

Results

All eight primate species found in Suriname were seen at the Brownsberg. *Alouatta seniculus* was very abundant at the site, with an estimated 20 groups encountered, the highest biomass (PBER), and the second highest individual encounter rate (ER) (Table 2). Howlers were encountered on all trails save one, but were seen on that trail during informal observations. Group sizes were relatively small, ranging from 2 to 7 individuals, but the groups were well distributed both on the plateau and slopes of the Brownsberg (Table 3).

Chiropotes satanas had the highest estimated individual ER due to their large group sizes (average = 32.7 individuals, n = 3 groups) and relatively frequent encounters. We observed three groups that were encountered mainly on trails that transected the forested slopes of the berg, although they were also seen on the plateau during informal observations. They had the second highest PBER (see Table 2).

The tamarins (*Saguinus midas*) had the third highest encounter rates. We estimated that we encountered 16 groups of *S. midas* with an average group size of 5.7 individuals (see Table 2). Like the howlers, the tamarins were common and seen on almost all trails during the survey.

White-faced sakis (*Pithecia pithecia*) were relatively common, having the third highest group ER (n = 10).

Estimated group sizes ranged from 2 to 6 individuals (average = 3.7 individuals), although small groups with 2 to 3 individuals may very well have been underestimated in our counts. No groups were fully habituated and some were very skittish. Nevertheless, of those seen repeatedly, only one had more than one adult male (easily recognized by the males' white faces).

Cebus olivaceus were encountered quite frequently, but group sizes were difficult to estimate. An average group size of 12 is an underestimate, since a group of > 32 was encountered during informal (non-census) observations. *C. olivaceus* individuals were well-dispersed when encountered (unlike *Chiropotes* that were also found in large, but more cohesive groups) and accurate group counts were not possible. Nevertheless, capuchins appeared to be rare and very wide-ranging at the Brownsberg. We were more confident with the count of a single group of *Cebus apella* which was seen on multiple occasions, both while collecting transect data and during informal observations. We encountered *C. apella* most often on the plateau (Table 3), but suspected that they too are wide-ranging in an area that includes at least the eastern slope of the berg.

Ateles paniscus were more often heard than seen. Subgroup size ranged from 2 to 4 (see Table 2). When encountered, they first displayed by breaking off branches and hurling them down on observers, and then fled. We have little confidence in our population measures for *Ateles*. A single squirrel monkey group (*Saimiri sciureus*) was seen once; their preference for stream-side terrain at the base of the berg may make them rare, or at least only seasonal visitors, on the plateau.

We compared the trails that ran exclusively on the plateau with those that began on the plateau and then descended along the slopes of the berg (see Table 3). We found a non-significant trend for higher encounter rates on the slopes as opposed to the flat plateau on the top of the berg (Wilcoxon signed ranks test Z = 1.83, p = 0.07).

Table 2. Group size (minimum and range of group sizes) and number of groups observed during the census. Individual and group encounter rates (ER) were calculated from the group size data (see Methods). Primate biomass encounter rate (PBER) was calculated by multiplying body mass data (taken from Ford and Davis, 1992) by total number of individuals encountered / 10 km linear distance censused (after Wallace *et al*., 2000).

Species	Average observed group size (range)	Observed no. of groups	Individual ER/10 km	Group ER/10 km	PBER kg/10 km
Saguinus midas	5.69 (3-8)	16	34.73	6.1	1.85
Pithecia pithecia	3.70 (2-6)	10	14.12	6.1	2.29
Saimiri sciureus	–	–	–	–	–
Cebus apella	14	1	5.30	0.4	1.45
Cebus olivaceus	12.0 (9-14)	3	13.70	1.1	3.68
Chiropotes satanas	32.67 (22-44)	3	37.40	1.1	10.66
Alouatta seniculus	4.65 (2-7)	20	35.50	7.6	22.72
*Ateles paniscus**	2 (2-4)	–	–	–	–
Total PBER					**42.65**

– Insufficient data, * Subgroup size.

Table 3. Relative primate encounter rate (ER) per trail, which equals the total number of primate encounters per trail per number of census walks (n). The column totals are the total number of sightings per species. With the exception of Rondwandeling, all the trails were linear and n represents the number of round-trips. Shaded rows are trails that traversed both plateau and slope; unshaded rows are trails that are found only on the plateau. Total encounters are the sum of plateau and slope and plateau only.

Trail (n walks)	*S. midas*	*S. sciureus*	*P. pithecia*	*C. apella*	*C. olivaceus*	*C. satanas*	*A. seniculus*	*A. paniscus*	Relative ER/trail
AKP (10)	7		2		2	5	5	4	0.417
Jeep (9)	3		3	1	2	3	5		0.315
Mazaroni Val (9)					1	3	1		0.185
Irene Val (4)	2					1	1		0.333
Kumbu Val (4)	1		1				1		0.250
Witi Kreek (9)	5	1	5		2	1	5	3	0.349
Mazaroni Weg (17)	10		4	1			3	1	0.224
Rondwandeling (18)	9		10	4	1		9		0.367
Tele Sur (9)	1		1			3	2		0.194
Mazaroni Top (7)			1	1	1				0.143
Total enounters/spp.	**18/20**	**1/0**	**11/16**	**1/6**	**7/2**	**13/3**	**18/14**	**7/1**	

Discussion

Average group size for *A. seniculus* at the Brownsberg was small compared with a number of group size estimates from other *seniculus* populations (range 4.25 to 10.5). However, our estimated group size was similar to that found by Mittermeier (1977) at the Central Suriname Nature Reserve (where there was no hunting), and also similar to the sizes observed by Bennett *et al.* (2001) on the Río Tapiche in Peru (where hunting was reported as severe). We have no evidence that *Alouatta* is being hunted within the area that was censused at the Brownsberg, although there are reports of hunting primates inside the reserve near the margin of Lake Afobaka. If the larger group size reported from the llanos of Venezuela is excluded, there is relatively little variation in red howler group sizes (mean 5.23 ± 0.21, n = 6 studies) (Fig. 2).

With regard to pitheciins, we documented the largest reported groups of *Chiropotes satanas,* ranging from 22 to 44 individuals, larger than maximum estimates by Mittermeier (1977: 27 individuals) in Suriname or Muckenhirn *et al.* (1975: 20 individuals) in Guyana. Lehman *et al.* (2001) recently examined variation in group size and number of adult males and females in *Pithecia pithecia* groups. The largest body of data on *Pithecia* group size comes from 21 groups censused in Guyana, in which one group of 12 was seen (Lehman *et al.*, 2001). If that outlier is removed, the average from the remaining 20 groups is 4.4 ± 1.82 individuals (range 2-9). Groups ranging from 6 to 9 have been documented from island habitats (Setz and Gaspar, 1997; Norconk, 1996), but the body of evidence from Guyana and from our census (average 4.65 ± 1.66) suggests that small group size is typical for white-faced sakis (see Fig. 2). Lehman *et al.* (2001) found significant differences between the sizes of groups in Venezuela and Suriname, and between groups in Guyana and Suriname. The Venezuela-Suriname comparison should be excluded based on the lack of dispersal ability on the island habitat in Venezuela, and the Guyana and Suriname data now seem quite comparable.

The more frequent encounter rates of *Alouatta* at the Brownsberg probably reflect both the relatively small home ranges used by howlers and a ban on hunting primates in the immediate vicinity of the plateau. *Alouatta* sightings are much reduced at sites where hunting is relatively severe (e.g., the *terra firma* forest in Amazonia censused by Peres, 1997; and the Río Tapiche sites suveyed by Bennett *et al.*, 2001) and more common where hunting is prohibited (e.g., Nouragues, in Simmen *et al.*, 2001). Hunting at the Brownsberg does occur in active mining areas, and may be the cause of the relatively rare encounters of *Ateles paniscus* during our census, besides their threatening/evasive behavior when encountered. Encounter rates of *Ateles* in un-hunted sites such as Nouragues, French Guiana, were much higher than our Brownsberg estimates (Simmen *et al.*, 2001). Alternatively, our low encounter rates may have been due to a seasonal shortage of fruit in the census area.

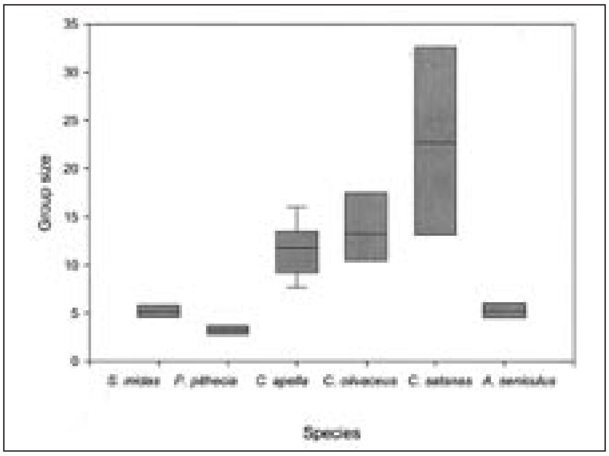

Figure 2. Comparison of group size estimates for the eight species of primates found at the Brownsberg. Data are from: Defler (1982, 2003), Janson (1985 in Sussman, 2000), Kessler (1998), Mittermeier (1977), Muckenhirn (1975), Simmen *et al.* (2001), Terborgh (1983), and this census.

Low species encounter rates for *Saimiri sciureus* may also have been an artifact of the season, but the habitats preferred by *Saimiri* only occurred on one trail, the streamside Witi Kreek trail. The heterogeneous habitats of the Brownsberg may limit the distribution of a habitat specialist such as *Saimiri.* For example, Peres (1997) reported high sighting rates of *Saimiri* in three *várzea* forests in Amazonia, and their absence or relative rarity in 12 *terra firma* forests. *Saimiri* had the highest sighting rates of the eight species at 16 sites in Guyana surveyed by Lehman (2000).

Saguinus midas and *Pithecia pithecia* had the second highest encounter rates at the Brownsberg. While *Saguinus* appears to be well-dispersed on both slopes and plateau, *Pithecia* was encountered more frequently on plateau trails (see Table 3).

The Brownsberg primate population may be summarized as follows:

1) *Alouatta seniculus* and *Saguinus midas* were well-dispersed in relatively small home ranges both on the plateau and on the slopes of the berg.

2) The two pitheciins were encountered frequently. The home ranges of *Pithecia* appear to be small (one was calculated as 10.3 ha, on the basis of repeated sightings and territorial behavior associated with intertroop encounters). *Chiropotes* occurred in larger groups than have been observed at any other site (including other Suriname sites) and are relatively wide-ranging, but more cohesive when traveling than *Cebus olivaceus. Pithecia* was observed more often on the plateau than the slopes, and *Chiropotes* was seen more often on the slopes. *Chiropotes* fed extensively on *Pouteria melanopoda* (Sapotaceae) during the census period. The distribution of that tree may have influenced its ranging patterns at the time of the census, but the rich diversity of saki resources may help to explain both the large group

sizes of *Chiropotes* and the high density of *Pithecia* groups. For example, Fitzgerald *et al.* (2002: Appendix G) reported 10 species of *Licania* (Chrysobalanaceae), four species of *Lecythis* and five of *Eschweilera* (Lecythidaceae), and 12 species of *Pouteria* (Sapotaceae).

3) The two capuchin species appear to be relatively rare at the site, and both species may have large home ranges. Only one *Cebus apella* group was seen and we estimated three *C. olivaceus* groups within the census area. The data were too few to assess habitat preferences for the capuchins, but they appeared to range widely.

4) *Saimiri* and *Ateles* also appear to be relatively rare. We saw *Saimiri* only once, but our census route covered only a small part of their potential range. *Ateles* were heard often, but rarely seen. Their behavior when they were encountered (almost exclusively in slope terrain) suggests that they are very sensitive to humans and furthermore, there were reliable reports of hunting by miners near Lake Afobaka. It is impossible to assess population size for either species on the basis of these census data.

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Primates in a Forest Fragment in Eastern Amazonia

Oswaldo de Carvalho Jr.

Introduction

Many new towns were established along the Belém-Brasília Highway following its construction in the 1960s. One was Paragominas, in the northeastern region of the state of Pará (Fig. 1). Large areas of forest in this region were cut for cattle pasture during the 1970s; and due to the depletion of timber resources in southern Brazil, in the 1980s Paragominas also became an important logging center, with the highest concentration of sawmills anywhere in Brazilian Amazonia. Today, timber is scarce in the region, and the sawmills have been moved to new frontiers, although Paragominas still remains an important commercial center for the industry.

The landscape around Paragominas today is a mosaic of agricultural land, pastures, logged and burned forest, and small patches of primary forest which cover about 6% of the original area (Nepstad *et al.*, 1999). The region of Paragominas has undergone some of the most intense deforestation and habitat degradation – and today supports the highest human population density – of anywhere in the Brazilian Amazon.

Although the remaining fragments suffer from hunting and selective logging, some still maintain primate populations (Lopes and Ferrari, 2000). In this study I evaluate the effects of this land use model on primates in a forest fragment isolated since the late 1970s and composed of three different habitats (unlogged - UN, logged - LG and secondary forest - SF), and compare my results with other studies in the same region.

Study Area

Data were collected at Fazenda Vitoria (FV) (02°55’S, 47°35’W), 6 km northwest from Paragominas town. Rainfall (1750 mm/yr) varies seasonally, with a pronounced dry season between July and November (< 50 mm/month) (EMBRAPA-CPATU). Hunting pressure is high, and hunters are frequently encountered, especially on weekends.

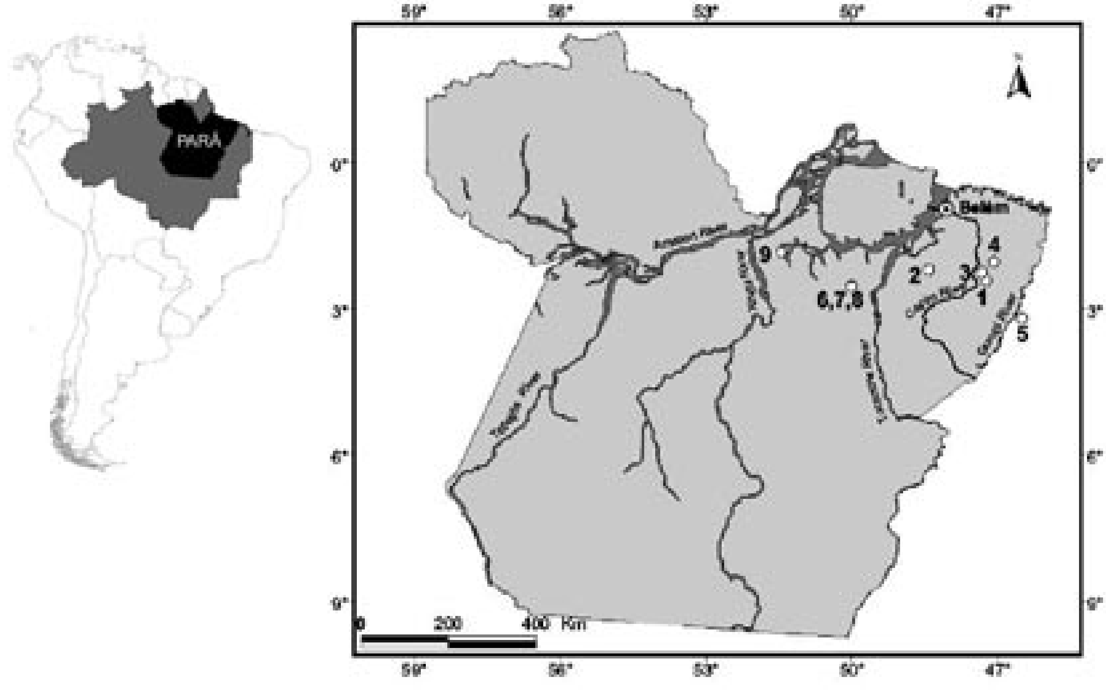

Figure 1. Location of the Fazenda Vitória (1) and the other sites in the state of Pará in eastern Brazilian Amazonia. See Table 1.

At the time of the study, there was a forest fragment on the FV of approximately 400 ha: 210 ha of primary forest (UN), 70 ha of logged forest (LG) and 60 ha of an 18-year-old secondary forest (SF) surrounded by pasture. Since 1984, a combined team from the Amazonia Environmental Research Institute (*Instituto de Pesquisas Ambientais da Amâzonia – IPAM*), the Woods Hole Research Center (WHRC), Woods Hole, MA, the Center for Research in Agro-forestry in the Eastern Amazon (CPATU) of the Brazilian Agricultural and Cattle-Breeding Research Company (EMBRAPA) (*Centro de Pesquisa Agroflorestal da Amazônia Oriental – CPATU/EMBRAPA*) and the Federal University of Pará (UFPA) have conducted research on forest ecology in one area of 260 ha (80 UN, 70 LG, 60 SF and 50 in abandoned pasture).

Methods

I used the Line Transect Method (NRC, 1981; Brockelman and Ali, 1987) to evaluate the composition and abundance of the primate community. When a group was sighted the following data were noted: date, time of day, trail, location on the trail, species identification, number of animals and animal-to-trail perpendicular distance. In order to compare this study area with other sites (Table 1), I calculated the number of individuals sighted per 10 km (sighting rate) as suggested by Lopes and Ferrari (2000).

The transects were walked between 06:00-12:00 and 16:00-18:00 at a mean speed of 1 km/h on a 4-km-long trail (2 km UN, 1 km in LG, and 1 km in SF). A total of 69 km (23 km in each habitat) was surveyed during the late dry season to early wet season of 1994-1995.

Results

Eight mammal species were recorded in 40 sightings, 25 of which were of primates of four species. Sighting rates were 5.88/10 km walked for all mammals and 3.68/10 km for primates. Each primate species was seen in all three habitat types. Table 2 compares the sighting rates at FV with other sites in the same region (Fig. 1). For details on each site see Lopes and Ferrari (2000), Emídio-Silva (1998) and Bobadilla and Ferrari (1998).

The primates observed during the census were *Alouatta belzebul belzebul, Chiropotes satanas satanas, Saguinus niger* and *Saimiri sciureus*. The night monkey (*Aotus infulatus*) and brown capuchin monkey (*Cebus apella apella*) were not recorded, although they are known to inhabit the site. The highest sighting rates for *Alouatta*, *Chiropotes* and *Saguinus* were in the primary (undisturbed) forest. Squirrel monkeys were seen just once in secondary forest (Table 3).

Discussion

Six species inhabit the study area: four were confirmed by actual sightings, and *Cebus apella* and *Aotus infulatus* were reported by local people. The four species observed during the study were seen in each of three forest types (primary, logged and secondary forest). Although the sighting rate in disturbed forest was lower than in primary, it has an important role for some species. For example, during a six-month study nearby, Oliveira and Ferrari (2000) observed *S. niger* using disturbed forest for feeding, while primary forest provided their sleeping sites. Surprisingly, *Cebus apella* – generally one of the commoner primates in Amazonia – occurs in very low densities at FV. The reasons for this are not known, but may reflect local ecological factors, such as forest type, composition and productivity, as well as human interference.

The only species expected but not seen was *Cebus kaapori*. The Ka'apor capuchin has a restricted range, is rare, and occurs at low densities (Ferrari and Lopes, 1996; Carvalho Jr. *et al.*, 1999). Although Carvalho Jr. *et al.* (1999) suggested that the abundance of *C. kaapori* is inversely related to the presence and abundance of *C. apella*, at least at FV, other factors may also be influencing its distribution there, such as intolerance to high levels of habitat degradation (Carvalho Jr. *et al.*, 1999).

In general, it would seem that FV maintains higher population densities of these primates when compared with other sites (Table 2). In a rank of the sighting rates for the 10 sites, the FV has the highest density of *Saguinus niger*, was second in this respect for *Alouatta belzebul* and *Saimiri sciureus*, and third for *Chiropotes satanas*. The high sighting rates at FV might be a result of: 1) rapid deforestation, which packed the primates into this frag-

Table 1. Characteristics of sites in eastern Amazonia used for comparison with the Fazenda Vitória, Paragominas.

	Municipality	Size (ha)	Vegetation disturbance	Hunting pressure	Source
Site 1	Paragominas	20,000	Moderate	None	1
Site 2	Tailândia	18,000	Moderate	High	2
Site 3	São Domingos do Capim	8,000	High	High	2
Site 4	Irituia	5,000	Moderate	Moderate	2
Site 5	Gurupí	340,000	Moderate to Low	Low	2
Site 6	Novo Repartimento	350,000	Moderate to Low	Moderate	3
Site 7	Novo Repartimento	350,000	Moderate to Low	Moderate	3
Site 8	Novo Repartimento	7,000	Moderate to High	Moderate	4
Site 9	Melgaço	300,000	Low	Low	4

Sources: 1. Carvalho Jr. and Pinto, in prep.; 2. Lopes, 1993; 3. Emídio-Silva, 1998; 4. Bobadilla and Ferrari, 1998.

Table 2. Sighting Rate (SR) of primates at FV and other sites in the region. Number of sightings in parentheses.

	A. belzebul	*C. satanas*	*S. midas*	*S. sciureus*	Transect length (km)	Source
FV	1.32 (09)	0.44 (03)	1.76 (12)	0.14 (01)	69	This study
Site 1	0.72 (05)	0.58 (07)	0.58 (03)	–	69	1
Site 2	0.005 (01)	0.28 (06)	1.20 (26)	–	216	2
Site 3	0.20 (04)	0.005 (01)	1.22 (25)	–	205	2
Site 4	0.25 (10)	0.34 (14)	1.47 (60)	–	408	2
Site 5	0.56 (27)	0.37 (18)	1.10 (53)	0.002 (01)	480	2
Site 6	0.31 (03)	0.52 (05)	0.10 (01)	0.10 (01)	96	3
Site 7	0.98 (08)	0.12 (01)	0.25 (02)	–	81	3
Site 8	1.00 (10)	2.07 (21)	0.50 (05)	0.40 (04)	101	4
Site 9	2.08 (111)	0.11 (06)	1.11 (59)	–	533	4

Sources: 1. Carvalho Jr. and Pinto, in prep.; 2. Lopes, 1993; 3. Emídio-Silva, 1998; 4. Bobadilla and Ferrari, 1998.

Table 3. Sighting Rate (SR) of primates at the Fazenda Vitória in the different habitats. Number of sightings in parentheses.

	A. belzebul	*C. satanas*	*S. midas*	*S. sciureus*
Primary Forest	2.61 (06)	0.87 (02)	2.61 (06)	0
Logged Forest	1.30 (03)	0.43 (01)	1.74 (04)	0
Secondary Forest	0	0	0.87 (02)	0.43 (01)

ment (in which case the population densities may decline over the coming years); 2) Low hunting pressure on primates in the region, except for howlers (Cymerys, 1994); 3) Absence of potential predators (J. R. Martins, pers. comm.); and 4) ecological and behavioral flexibility of primate species. Other factors, such as interspecific competition and floristic composition of the forest fragments, are also important influences on the occurrence and local abundance of primate species.

There is only one strictly protected area in eastern Amazonia, the Gurupí Biological Reserve; it is seriously threatened, however, and much of its forest has already been destroyed. Numerous logging companies are active there and causing widespread environmental degradation through pollution and hunting, resulting in threats to many species of the region. East of the Rio Tocantins, *A. belzebul ululata* (coast of Maranhão) and *Cebus kaapori* are now considered Critically Endangered, and *Chiropotes satanas satanas* Endangered (Rylands and Chiarello, 2003). With such threats increasing, these relatively small forest fragments – together with the few large remaining areas of undisturbed forest – could play an important role in conservation strategies in the future.

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SOME OBSERVATIONS ON THE PREDATION OF SMALL MAMMALS BY TUFTED CAPUCHIN MONKEYS (*CEBUS APELLA*)

Briseida D. Resende, Vivian L. G. Greco
Eduardo B. Ottoni, Patrícia Izar

Capuchin monkeys are the most omnivorous of the New World primates and are predators of small vertebrates (Terborgh, 1983). *Cebus capucinus* has been observed hunting coatis (*Nasua narica*) and squirrels (*Sciurus variegatoides*) in Costa Rica (Newcomer and De Farcy, 1985; Rose, 1997). Brown capuchin monkeys (*Cebus apella*) capture and eat lizards, squirrels, frogs and birds (Izawa, 1978; Terborgh, 1983; Galetti, 1990). Ferreira *et al.* (2002) described predation on birds by a group of tufted capuchins at the Tietê Ecological Park, São Paulo. Here we report on our observations of this same, semi-free-ranging group eating small mammals. The group lives in an 18 ha reforested area in the Tietê Ecological Park, São Paulo, Brazil. A detailed description of the area and the group is given by Ottoni and Mannu (2000).

On 6 June, 2001, at around 0930, one of us (BDR) was following the capuchin group and saw the juvenile male Frank eating birdseed near the juvenile male Lobato and juvenile female Vavá. Suddenly he descended to the ground, grabbed a mouse hidden in the bushes and took it to a tree. The mouse was not seen moving prior to capture, so we cannot be sure if he had killed it or if it was already dead. Frank examined its belly and ripped the skin between the hind limbs, but soon abandoned the prey. Lobato approached, took the mouse and, after a brief examination, also abandoned it.

On 15 March, 2003, at around 1050 in the morning, BDR and VG observed the dominant male Bisqüi on a branch, 10 m above the ground, eating the head and intestines of an adult male rat (*Rattus rattus*). The adult female Cisca, carrying her 5-month-old infant, and the adult male Medeiros were watching Bisqüi from very close by. An unidentified immature was also nearby, and watching keenly. Bisqüi showed great tolerance, never threatening or attacking those who were watching. The unidentified immature was able to eat a piece of the viscera. After about three minutes, Bisqüi abandoned the rat, which fell on the ground. Female juvenile Ada went down and took the carcass. We observed her from a close distance (around 4 m). She ate parts of the digestive tract, liver and pancreas, and after about four minutes, also abandoned the carcass. The juvenile male Químico then approached and examined it, but soon went away, following the group and leaving the rat on the ground.

On examination, most of the muscle tissue of the carcass was intact, except for the abdominal layers and the face muscles. The rat's belly was ripped open, and its liver, pancreas, stomach, heart, the entire digestive tract, and the brain were completely eaten. Consumption of the head and brains of small vertebrate prey has also been registered by Heymann *et al.* (2000) in their study of *Saguinus mystax* and *Saguinus fuscicollis*. Biting the head of lizards, frogs and bird nestlings was seen as a killing strategy with a rich energy source, the brain, as a reward. Izawa (1978) described *Cebus apella* in Colombia which killed frogs by squeezing the prey's neck or biting them, and then consuming the thighs, the tips of the hands and feet, and the viscera. We were unable to see the way the prey was killed, but the monkeys certainly showed a preference for eating the intestines and brain. Later that morning, at 1135, VG observed an adult male eating a small young, pink mammal around 5 cm in length. Another adult male had also been observed eating two young mammals similar to this one in July 2002.

On 27 May, 2003, at 0945, VG observed an adult female carrying the carcass of an opossum infant (*Didelphis* sp). The dominant male, Bisqüi, and another adult female were nearby. Almost the entire carcass was consumed; only the head, skin and bones and a small part of the intestines remained. Unlike the rat carcass, in this case the muscle tissue was broadly consumed and the brain was intact.

Although the capuchin monkeys are provisioned daily, they forage continuously, eating fruits, leaves, birds and invertebrates such as spiders and worms (Ferreira *et al.*, 2002). As opportunists, they probably capture vertebrate prey whenever possible, even though food scarcity is not a problem for this group; varied protein sources are always welcome, and hunting behaviors may be rewarding *per se*. In contrast to what was observed with Izawa's group in

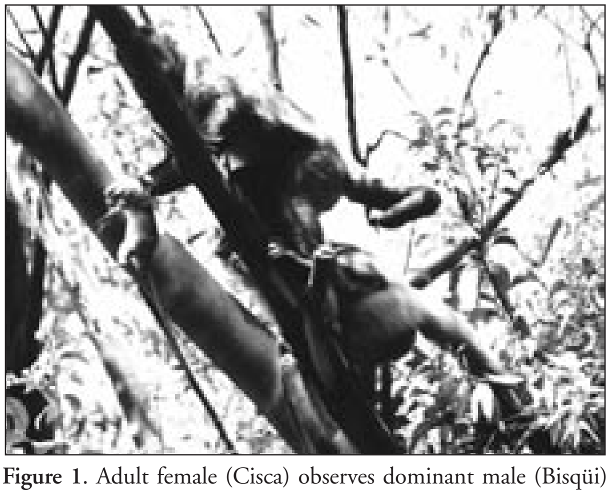

Figure 1. Adult female (Cisca) observes dominant male (Bisqüi) eating a rat.

Colombia, in all predation events described here the possessor tolerated the proximity of conspecifics; this created opportunities for food transfer, either direct and tolerated or, more often, through scrounging. Food transfer in this group was also registered in bird predation events, and scrounging was also the most common type of transfer (Ferreira *et al.*, 2002).

In a review of the genus by Freese and Oppenheimer (1981), vertebrate prey listed included only lizards, birds and rodents in the diet of *C. capucinus*, and frogs in the diet of *C. apella*. While John Oppenheimer was the pioneer in studies of this genus in the wild (*C. capucinus* in particular), this diet list reflected the paucity of information available at the time. As new field studies are conducted, our understanding of the diversity of prey taken by tufted capuchins, and the dynamics of food transfer among them, will continue to improve.

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INSECT-EATING BY SPIDER MONKEYS

Andres Link

Introduction

Studies on the diet and feeding behavior of spider monkeys (*Ateles* spp.) have revealed they are primarily frugivorous, with fruits representing between 72% and 90% of their diet (Carpenter, 1935; Hladik and Hladik, 1969; Klein and Klein, 1977; Van Roosmalen, 1985; Chapman, 1987; Symington, 1988; Dew, 2001). Flowers and young leaves are also eaten frequently, especially when fruit is scarce (Van Roosmalen and Klein, 1988; Castellanos, 1995; Nunes, 1998; Stevenson *et al.*, 2000). Bark, decaying wood, fungus, seeds, soil from salt-licks and termite nests, insects and other items are seldom consumed and represent only a small part of their diet (see Van Roosmalen and Klein, 1988).

Insect-eating in spider monkeys has been reported in several studies and, except for passive consumption (for example, fig wasps in fig fruits), it represents a minor part of their feeding activities. Wagner (1956) reported that spider monkeys eat insects and insect larvae. Termites are eaten selectively (Klein and Klein, 1977; Van Roosmalen, 1985), but this behavior has been difficult to separate from decaying wood or termite-nest eating (Castellanos, 1995) and has not been observed in several studies (Dew, 2001; Link, pers. obs.). They have been incidentally observed eating meliponid bees in Costa Rica (C. A. Chapman, pers. comm.) and Colombia (P. Stevenson, pers. comm.), and caterpillars are eaten intensively by spider monkeys during short periods of the year in a number of different sites (Van Roosmalen, 1985; Chapman, 1987; Symington, 1988; Cant, 1990).

White-bellied spider monkeys (*Ateles belzebuth*) have been studied in the Tinigua National Natural Park in Colombia for several years and, until this study, no insect-eating behavior had been observed except by Pablo Stevenson (pers. comm.), who reported it as a minor part of the diet of one of his study groups (MB-1); no individuals in his other groups had ever been seen actively consuming insects. During the study reported here, I observed white-bellied spider monkeys eating insects on a number of occasions and, although it represents a small part of their total diet in the study year, it was an important food item at certain times.

Study Site

This research was carried out at the Centro de Investigaciones Ecológicas de La Macarena (CIEM), part of Tinigua National Natural Park in the northwestern Amazon, located between the eastern Andes and the Serranía de La Macarena, Departamento de Meta, Colombia (2°40'N, 74°10'W; 350-400 m a.s.l.). Annual temperature is relatively constant at approximately 26°C and rainfall is highly seasonal, with a dry season between December and March and the rainy season between April and November. Peak rainfall is in June and July, and the region averages 2700 mm annually (Kimura *et al.*, 1994; Stevenson, 2002).

Field Methods

Observations of insect-eating by white-bellied spider monkeys were recorded during 13 months of fieldwork, from January 2001 to January 2002. Focal animal sampling (Altmann, 1974) was used to study their basic ecology and diet. Instantaneous sampling (every five minutes) was used to quantify activity budgets and habitat use. Continuous sampling was used every time the focal animal began to feed. Total feeding time per bout, the species and item eaten, and DBH (diameter at breast height) in trees and lianas were recorded, in addition to the number of individuals feeding on the same item and, when possible, consumption rates (measured in number of ingested items per minute).

Results

Sixteen insect-eating bouts were observed during the study, during which the spider monkeys ate orthopterans (n = 2), meliponid bees (n = 8) and lepidopteran larvae (n = 6). Fifteen of these bouts were observed directly, while one event was inferred by insect exoskeletons found in fecal samples. Grasshoppers (Orthoptera) were probably eaten opportunistically. Caterpillars and bees were eaten intensively, and active foraging to obtain these food items was observed in all of these feeding bouts.

Insect-eating constituted 1.5% of the total feeding time during the study year. All age/sex classes were seen eating insects and, although no aggression was seen on these occasions, there were some displacements at the meliponid bee nests. Spider monkeys were observed eating grasshoppers twice: in February, I collected two fecal samples next to each other, each of which contained one-half of the exoskeleton of an orthopteran (*c.* 40 mm long); and in April, one small grasshopper was caught from the top of a leaf and eaten by a female with an infant (J. Cajiao, pers. obs.).

Meliponid bees (*Scaptotrigona* sp.) were also part of the diet of this spider monkey group. Bee-eating was seen repeatedly throughout the year, and although it is an infrequent activity (compared to eating fruits or leaves), large quantities of bees were eaten on each occasion. Six out of eight observations were at the same two bee nests located on the trunk of an emergent *Bombacopsis quinata* (Jacq.) Dugang (Bombacaceae) tree, another nest was in another *B. quinata* tree, and one in an unidentified tree. All were in the canopy, about 20-25 m above the ground. One to three monkeys were seen eating bees simultaneously at the same nest (excluding dependant infants). They usually hung from their tails in front of the bee nest, or sat on the trunk and branches nearby waiting for their turn to gain access. When bees attacked and flew into the monkey's fur, they were easily captured and eaten. Mothers ate simultaneously with their juveniles and infants, capturing bees on their own or another individual's fur. When the bees stopped attacking, the spider monkeys would disturb the nest with their hands, and the bees would start attacking again. The feeding bouts lasted 2, 4, 5, 6, 6, 7, 11 and 13 minutes, and average feeding rates were 18.0 ± 6.2 bees/min (SD), range 12-30 (n = 9). These few observations reveal that spider monkeys could be eating a large quantity of bees per feeding bout, and although data were only collected from focal animals, several spider monkeys fed on these nests after and before the focal animal started its feeding bout.

Caterpillars were eaten intensively during a short period of the year in October, as well as on one occasion in February, when a medium size (*c.* 30-40 mm long) caterpillar was eaten by a female with twins. The other five caterpillar-eating bouts were observed during focal animal sampling; in each case the spider monkeys ate caterpillars of a single species, which were heavily clumped in the leaves of a few individual trees. During October almost 9% of the feeding time of spider monkeys was invested in this item, which was the fourth most commonly eaten item during that month. One to three monkeys were seen eating caterpillars in the same tree. Each individual actively foraged for and captured the caterpillars by directly licking or biting the fresh or dry leaves. These five feeding bouts lasted 1, 17, 27, 11 and 53 min. No feeding rates were obtained due to the difficulty in recording when a single caterpillar had been ingested, but large quantities of caterpillars were consumed at each feeding bout.

Discussion

Insect-eating by spider monkeys is uncommon, but may reveal some important aspects of their feeding ecology and adaptations. The few species of insects eaten are the only animal matter in their otherwise plant-supported diets. In several studies carried out on different species of spider monkeys, caterpillars were the only group of insects observed in the diet of this genus. In all of these studies, this activity occurred in specific short periods (*c.* 15 days) of the year (Van Roosmalen, 1985; Chapman, 1987; Symington, 1988; this study), probably when the caterpillars of some lepidopteran species hatch and aggregate on the leaves of particular trees. These caterpillars were eaten only in a short period of the year, which is similar to the availability of other food items such as some fruits, flowers and leaves of particular plant species (in contrast with meliponid bees, which were available throughout the year). Taxonomic identification of these caterpillars, and those eaten at other sites, would be useful to determine if they are phylogenetically related, and whether they might have been part of the diet of an ancestral spider monkey, or if the exploitation of this food resource has evolved separately in isolated populations.

Meliponid bees were eaten at different times of the year, and this is the first report on such repeated feeding bouts at bee nests. In these cases, the spatial and temporal availability of bees is predictable and somewhat constant throughout the year. Nevertheless, the spider monkeys ate them on only a few occasions, and this feeding source was totally ignored at other times, even though they rested or passed very close to the nests, and bees were seen flying around them. It would seem that fruit availability is not an important determinant of this behavior, as bees were eaten during periods of fruit abundance and scarcity alike (Link, unpubl. data).

Insect-eating by spider monkeys, and its selectivity and possible consequences, are still not well understood. There are few data available, and practically no information on the taxonomic groups eaten or on their nutritional components. Most studies of primate diets focus on quantitative and qualitative analysis of the major food items. Considerable information of this sort is now available for several species of spider monkeys at different localities (Carpenter, 1935; Hladik and Hladik, 1969; Klein and Klein, 1977; Van Roosmalen, 1985; Chapman, 1987; Symington, 1987; Van Roosmalen and Klein, 1988; Cant, 1990; Castellanos, 1995; Nunes, 1998; Wallace, 1998; Dew, 2001). It is possible that food items such as insects, which are only a small part of their diet, contribute essential or complementary nutrients, besides the soil eaten by both howler and spider monkeys at salt-licks (see Izawa, 1993).

One important aspect of the feeding ecology of spider monkeys that has not been studied in detail is the set of physical constraints they experience while capturing, manipulating and exploring objects with their hands. Their thumbless hands make them less agile at such foraging when compared with other genera such as *Saimiri, Cebus* or *Lagothrix.* This is supported by the fact that other primate groups which have vestigial or absent thumbs (i.e., *Colobus* spp.) rarely include insects in their diets (see Davies and Oates, 1994). Thumbless hands and long fingers are adaptations that are probably associated with their locomotive patterns and a diet based on fruits and leaves, which certainly constrains their ability to capture fast-moving animal prey.

Given the “precision-grip” constraints on the spider monkey hand, the caterpillars and meliponid bees which were eaten in Tinigua Park might represent a food resource which does not require high energetic costs in foraging and capturing. Meliponid bees are found in their nests and easily captured when they entangle in a monkey’s fur. The caterpillars are densely clumped in individual trees, and move slowly enough that they may be captured with the hands or directly with the mouth. The abundance and predictable location of these food resources, as well as the ease with which the spider monkeys capture them, may explain why they are among the few insects eaten by this primate species.

Many studies have assessed differences in the ecological strategies of the atelines, especially comparing spider monkeys and woolly monkeys (*Lagothrix* spp.); these genera overlap widely in their geographic distribution, and are sympatric at several northwestern Amazonian sites in Ecuador and Colombia (see Strier, 1992; Stevenson *et al.*, 2000; Dew, 2001). Differences in their diets include the higher proportion of lipid-rich fruits eaten by spider monkeys, and the more frequent foraging and insect-eating by woolly monkeys.

Differences in the diets of the atelines are apparent in the proportions of food items they consume, which probably evolved to avoid direct competition. Although all are frugivorous, each species complements its diet with different items. Howler monkeys (*Alouatta* spp.) eat a great variety of mature and young leaves, as well as other vegetative plant parts (Neville *et al.,* 1988; Juliot and Sabatier, 1993) and there is also limited evidence of insect-eating. Woolly monkeys eat young leaves and insects, especially in periods of fruit scarcity (Ramirez, 1988; Defler and Defler, 1996; Stevenson *et al.,* 1994). *Ateles* and muriquis (*Brachyteles* spp.) base their diet on fruits and leaves, but the former relies more on fruits, while the latter feeds more on leaves (Van Roosmalen and Klein, 1988; Nishimura *et al.,* 1988; Strier, 1991; Nunes, 1998). Both spider and howler monkeys include small proportions of selected insects in their diet (Milton, 1980; references above) and more information is needed to understand why they do not rely on other insects, as woolly monkeys do, in order to complement their nutritional requirements, considering the widespread availability of this resource in the forest (Izawa, 1993).

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LAGOTHRIX LAGOTHRICHA OR *LAGOTHRIX LAGOTRICHA*: WHICH IS IT?

Thomas R. Defler

When von Humboldt (1812) wrote the holotypic description of Humboldt's woolly monkey, he spelled the species name both *lagotricha* and *lagothricha.* According to some, *lagothricha* (and its variant *lagothrica*) are incorrect Latinizations of the Greek words *λάγο(ς) - lago(s)* (hare) + *θρίχο(ς) - thrico(s)* (hair)[1] because of the preceding vowel, *ο*, which would require the form "trichos" rather than "thrichos". The use of the two versions was certainly a *lapsus* on von Humboldt's part. However, when revising the genus, Fooden (1963), under Article 24 (24.2) of the *International Code of Zoological Nomenclature*, chose the variation *lagothricha* as the "correct legal spelling" for *Lagothrix lagothricha.*

"Article 24: Precedence between simultaneously published names, spellings or acts.

> **24.1. Automatic determination of precedence of names.** When homonyms or synonyms are established

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[1] No pun intended, as von Humboldt was writing in French, not English.

> simultaneously, but proposed at different ranks, in the family group, genus group or species group the name proposed at higher rank takes precedence [Arts. 55.5, 56.3, 57.7]. See Article 61.2.1 for the precedence of simultaneous but different type fixations for taxa and their nominotypical subordinate taxa.
>
> **24.2. Determination by the First Reviser**.
>
> **24.2.1. Statement of the Principle of the First Reviser.** When the precedence between names of nomenclatural acts cannot be objectively determined, the precedence is fixed by the action of the first author citing in a published work those names or acts and selecting from them; this author is termed the "First Reviser".
>
> **24.2.2. Determination of precedence of names or acts by the First Reviser.** If two or more names, different or identical, and based on the same or different types, or two or more nomenclatural acts, are published on the same date in the same or different works, the precedence of the names or acts is fixed by the First Reviser unless Article 24.1 applies." (International Commission on Zoological Nomenclature, 1999.)

Thus has the binomial *Lagothrix lagothricha* been spelled by Hershkovitz (1977), Napier and Napier (1967), Napier (1976), Eisenberg (1989), Emmons (1990, 1997), Eisenberg and Redford (1999) and many others, although Mittermeier and Coimbra-Filho's (1981:95) inclusion of a brief comment by R. Thorington Jr. on von Humboldt's original spelling has influenced many primatologists to use the *lagotricha* variant. (Thorington's published comment on p.95 itself is incorrect, since von Humboldt used both spellings.)

Some years ago I asked Philip Hershkovitz what he thought about the legality of all of this. He consulted with Jack Fooden (Field Museum of Natural History, Chicago) and wrote to me that Fooden (1963) had "unfortunately" legalized *lagothricha* under the Code when he chose that variant of the spelling. Thus, they opined, *lagothricha* is legal under the Code, *lagotricha* is not (P. Hershkovitz and J. Fooden, pers. comm. to T. R. Defler). The dilemma is whether to use a legal but perhaps incorrect Latinization, or to use the correctly Latinized (I suppose) but illegal form. Each person makes his own choice whether to respect the Code or not; but by the Code, *lagothricha* is correct.

We all understand there are two (or three) spelling variations for this taxon. Despite my own constant misspelling of the binomial, what is to me far more important is to determine what we shall mean in the future when we refer to *Lagothrix lagothricha*. Should *Lagothrix lagothricha* include *lugens, poeppigii* and *cana* as subspecies, or are these truly distinct, separate species, as suggested by Groves (2001:190-192)? Urgent chromosomal, molecular and morphological research is needed to resolve these questions. Ruiz and Alvarez (2003) have made a start by identifying separate haplotypes of mtDNA from individuals of the two taxa *lagothricha* and *lugens*, but in the same study they found different haplotypes of mtDNA in *Saimiri sciureus albigena* and *Saimiri sciureus macrodon*, suggesting that we need yet more molecular information to be able to truly solve the species problem in *Lagothrix*. A difference in haplotypes alone is insufficient for the establishment of a new species name.

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Births of *Alouatta caraya* and *A. belzebul* (Atelidae, Alouattinae) in Captivity in Brazil

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Júlio César Bicca-Marques

The genus *Alouatta* (howler monkeys) has the largest geographic distribution of all Neotropical primate genera, occurring from Mexico to Argentina and Brazil (Neville *et al.*, 1988). Its ecology and behavior have been a recurrent topic of field research, but very few studies have been conducted in captivity due to the difficulty of keeping these primates outside of their natural environment (Kinzey, 1997). The species *A. caraya* and especially *A. belzebul* are still poorly known.

Alouatta caraya and *A. belzebul* live in social groups composed of two to 19 individuals. Generally, there are more adult females than adult males in the group (see Crockett and Eisenberg, 1987; Rowe, 1996). In *A. caraya*, sexual maturity is reached around 35-42 months in females and 24-37 months in males (Shoemaker, 1982). The menstrual cycle in this species lasts on average 20 days (Colillas and Coppo, 1978). Estimates of the gestation period range from 152 to 195 days (see Calegaro-Marques and Bicca-Marques, 1993), whereas the interbirth interval varies from seven to 27 months (Calegaro-Marques and Bicca-Marques, 1993; Lindbergh, 1978; Shoemaker, 1982; Zunino, 1996).

Howler monkeys rarely breed in captivity, but some success has been achieved with *Alouatta caraya* (see Crockett, 1998; Kinzey, 1997). Studies of *A. caraya* suggest the absence of reproductive seasonality in captivity (Colillas and Coppo, 1978; LaHue, 2000; Lindbergh, 1978; Shoemaker, 1979, 1982), although conflicting results have been obtained in the wild (Zunino, 1996; see also Calegaro-Marques and Bicca-Marques, 1993; evidence of birth seasonality in wild *A. palliata*, *A. pigra* and *A. seniculus* is presented by Brockett *et al.*, 2000; Crockett and Rudran, 1987; Fedigan *et al.*, 1998; and Jones, 1980). According to Di Bitetti and Janson (2000), folivorous and large-sized Neotropical primates such as *Alouatta* tend to be non-seasonal breeders. In Argentina, however, Zunino (1996) observed a greater frequency of births during the dry season, a time of higher availability of new leaves and fruits. He related this birth seasonality to three environmental variables: Temperature, rainfall, and especially food availability (Zunino, 1996).

Here we examine whether *A. caraya* and *A. belzebul* breed seasonally in captivity in Brazil based on an analysis of the monthly distribution of birth records. Data were obtained through a questionnaire sent to Brazilian zoos. The following information was requested: Species (scientific name), date of birth, litter size, sex of offspring, and characteristics of the cage (indoor/outdoor).

A total of 48 births of *A. caraya* and nine of *A. belzebul* were recorded from 1960 to 2003 in outdoor cages at 12 Brazilian zoos (see "Acknowledgements"). It was not possible to test the data on *A. belzebul* for seasonality because of the small sample. (Data on the reproduction of this species at the National Primate Center [Kingston, 1987] were not available for this research.) Although *A. belzebul* birth records were scattered throughout the year, most of them (78%) occurred between September and February (Fig. 1).

Data on *A. caraya* were grouped (January-February, March-April, and so on) for statistical analysis because of the low frequency of birth records per month. There was no evidence of seasonality, since birth records were well distributed across the year (χ^2 = 4.75, df = 5, NS; Fig. 1). The analysis of birth records of *A. caraya* at 25 zoos in the USA (compiled by LaHue, 2000) corroborates the absence of seasonal reproduction of this species in captivity (χ^2 = 11.02, df = 11, NS; Fig. 2). This research confirms results from other studies that suggest that *A. caraya* may give birth throughout the year under the conditions of regular food availability observed in captivity (Shoemaker, 1979, 1982).

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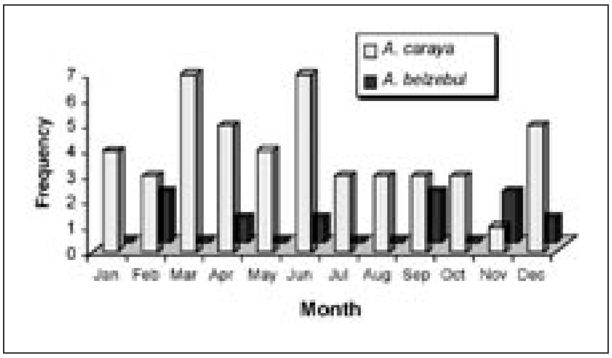

Figure 1. Monthly distribution of birth records of *A. caraya* (N = 48) and *A. belzebul* (N = 9) at Brazilian zoos.

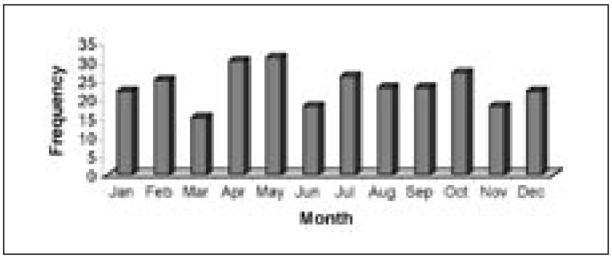

Figure 2. Monthly distribution of birth records of *A. caraya* in captivity in the U.S.A. (N = 280) (data compiled by LaHue, 2000).

Parque Zoológico de Goiânia/GO, Parque Zoobotânico de Carajás/PA and Museu Paraense Emílio Goeldi/PA.

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WEIGHT DEVELOPMENT OF HAND-REARED CALLITRICHIDS

Michael Schröpel

Birth weights of various callitrichid species in the Magdeburg Zoo were reported by Schröpel (1989) and were compared to data from research journals. Usually, the birth weights of callitrichids may only be taken from stillborn animals, or from neonates that have been neglected by their mothers and are available to be raised by hand. Hand-rearing enables firsthand observation and measurement of the weight development of the subject during ontogenesis, and allows for comparison of the subject to members of its own and other species. For parent-reared infant callitrichids that cannot be weighed, it is possible to observe their weight development through physical and behavioural development.

In general, we observed no differences between the development of parent-reared and hand-reared infant callitrichids at the Magdeburg Zoo. Even the twins of golden-handed tamarins (*Saguinus midas*) that were separated at birth – the male raised by hand, the female by her parents – did not demonstrate any differences in their morphological and behavioural development.

The infants for which weight development is reported here grew up free of disease or other complications. This report covers the cases of three (2.1) cotton-top tamarins (*Saguinus oedipus*) from two separate births in 1987, two (2.0) golden-handed tamarins (*Saguinus midas*) born at the end of 1999 and in September 2001, one (1.0) golden lion tamarin (*Leontopithecus rosalia*) born in March 2001, and seven (2.5) common marmosets (*Callithrix jacchus*) from three separate births in 2000 and 2001.

Two of the common marmosets came from a quadruple birth; the remaining two quadruplets were reared by their parents, and all four young survived. The neonate hand-reared common marmosets weighed 20 grams after their births. These weights are considered at the low end for this species. The other five hand-reared common marmosets included one set of twins and one set of triplets. The sole golden lion tamarin came from a triplet birth. One of the triplets was stillborn; a second survived only one day with its parents. We found the third neonate with low body temperature, an uncut umbilical cord, and shallow respiration. The newborn cotton-top tamarins were slightly injured, as immediately after birth their mother dropped and bit them.

Schröpel (1988a) wrote in detail about methods for hand-rearing cotton-top tamarins. From the first day of life, all of the hand-reared callitrichids are carried close to the body of the "human parent" – usually on a piece of fur that has been wrapped around the human parent's arm. (At one time, the newborn cotton-top tamarins were put in a heating box during the first days of their life.) While clinging to the "fur" of the human parent, the infant callitrichid experiences movements of the keeper similar to the natural movement of its parents. This supports the development of their sensory perception, communication and social behaviour. However, if the subject is placed in a rearing-box when removed from its parents, this support is unavailable, and there is the danger that "Kaspar Hauser Syndrome" may develop. In my opinion, the rearing method we implemented is important, even essential to achieve a normal social ontogenesis in young primates, because infant primates are carried all the time by their mother or father (Schröpel, 1982). There is a difference in the rearing of nesting mammals. Indeed, some keepers are also using the method of "parking" in the hand-rearing of primates. In most cases, we reintegrate the young hand-reared callitrichids into the family group after three months, with a high rate of success. In the meantime, some of the hand-reared subjects have become parents themselves and have successfully reared their own infants.

Initially, the newborn callitrichids are bottle-fed every two hours with a human infant milk formula; the quantity is dependent upon the newborn's need. In the first days of life the quantity consumed is hardly measurable. From the first day, there is a four-hour break in feeding during the night, and with normal development, the interval increases to six hours after one week of life. After approximately 10 days, the intervals between the feedings are extended to three hours during the day. After 15 to 20 days, depending upon the individual, the infant gradually receives solid food. Normally, the infants determine when they will begin to eat solid food by showing interest in the human parent's mouth and the chewing motion. In a natural rearing, infants regularly steal food from their father's mouth. In hand-rearing, the infant callitrichids receive banana pulp, apple pulp, and biscuit as the first solid foods with other foods introduced gradually. By approximately 10 weeks there are longer intervals between formula feedings.

During hand-rearing the infants are weighed daily. Usually the daily weighing ends when the subjects reach between 80 and 100 days, because the young callitrichids become too agile, and the measurements are not exact. The birth weights of the cotton-top tamarins were 47 g and 48 g (both males from a twin birth) and 40 g (female from a triplet birth). The two male golden-handed tamarins (from separate twin births) weighed 41 g and 53 g. The male golden lion tamarin (from a triplet birth) weighed 65 g, and the newborn common marmosets weighed between 20 g and 28 g.

The development of the total body weights for these four species of hand-reared callitrichids is shown in Figure 1a. The weight curves on the diagram increase in a gradually linear fashion until the subjects reach 90 days of age. The increase in the curves is shallower, however, in the first two weeks of life. The hand-reared *Saguinus midas* and *Leontopithecus rosalia* demonstrate a sine-like progress (less pronounced in *Leontopithecus*) with slow growth at the beginning, more rapid growth between three and 10 weeks, and finally slow growth again.

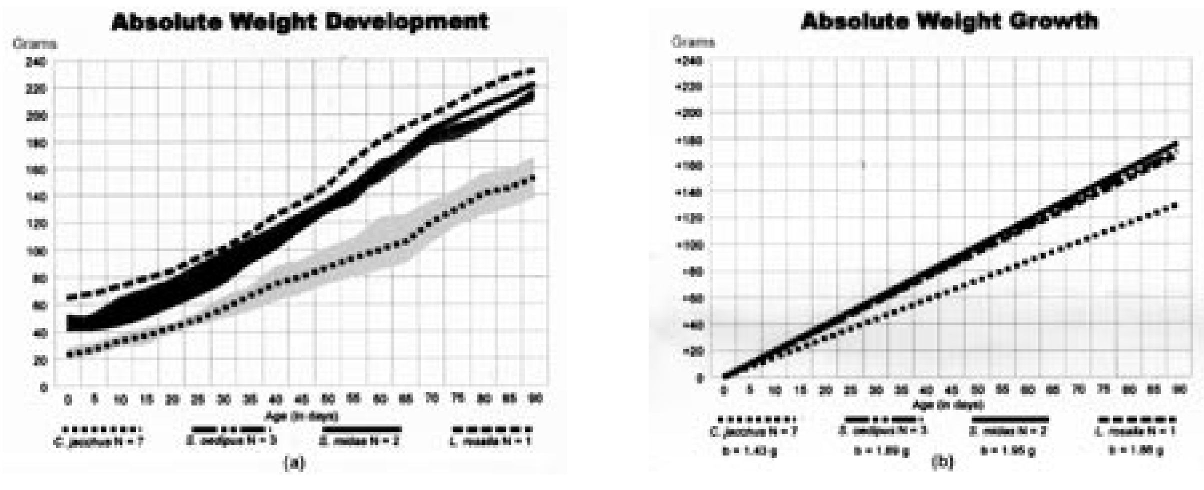

Figure 1. (a) Absolute weight development of *Callithrix jacchus, Saguinus oedipus, Saguinus midas*, and *Leontopithecus rosalia.* (b) Absolute weight gain of the callitrichids studied, presented as a regression line. *S. oedipus*, *S. midas*, and *L. rosalia* gain weight in the same scale, *C. jacchus* slightly less.

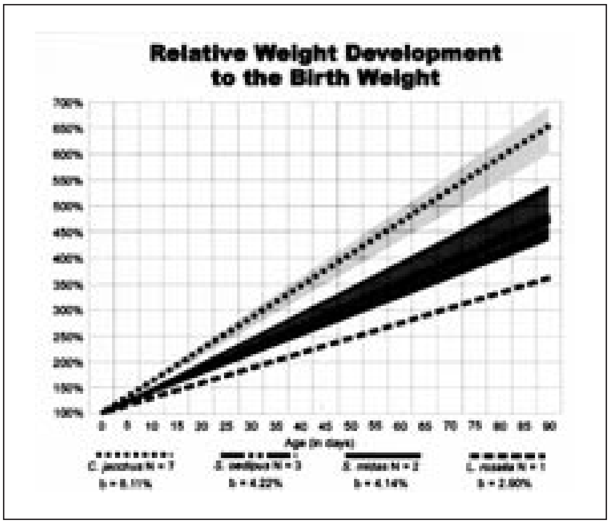

Figure 2. Regression lines of the weight development on a percentage basis to the birth weight.

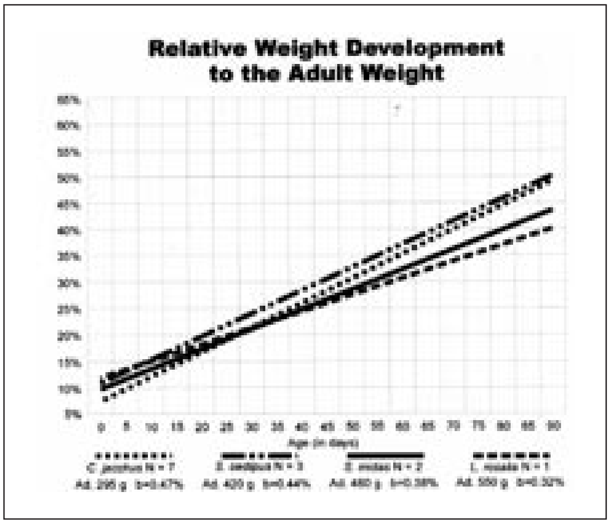

Figure 3. Relative weight development of the studied callitrichids to the adult weight of the different species, shown as regression lines.

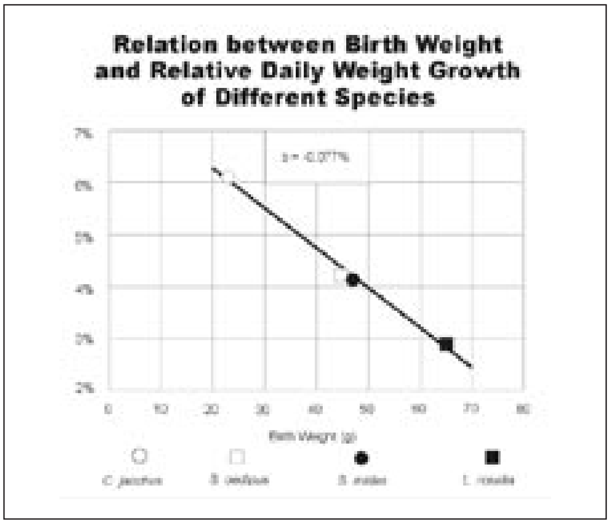

Figure 4. Possible dependence of the weight development of callitrichids to the birth weight of the respective species.

Kirkwood (1985) reported the weight development of callitrichids as a simple exponential curve with a flattening gradient. In our current results we will proceed on the assumption that a gradual linear increase is generally typical in the first three months of life. If the weight gain of the individuals from each species is averaged over the first three months, then the common marmosets gain their body weight by 1.43 g daily; the golden-handed tamarins and the cotton-top tamarins by 1.95 g and 1.89 g per day, respectively; and the golden lion tamarin by 1.86 g daily. The tamarins and the lion tamarin are not notably different in their absolute weight increase (Fig. 1b).

It was noticeable while recording the weight measurements that the various species doubled their birth weight at different times while undergoing the same regimen of artificial rearing. In *C. jacchus* the birth weight doubled between days 18 and 26, in *S. oedipus* between days 27 and 28, in *S. midas* at days 32 and 35, and in *L. rosalia* at day 42. To compare the weight development among the species we computed the daily weight increase on a percentage basis of the birth weight (Fig. 2). There is a significant negative correlation between birth weight and weight development on a percentage basis ($p < 0.05$ to $p < 0.001$). Only between *S. midas* and *S. oedipus* is the difference not significant; however, the birth weight of both these species differs only minimally. The birth weight of *C. jacchus* increased by 6.11% daily, in *S. oedipus* by 4.22%, in *S. midas* 4.14%, and in *L. rosalia* only 2.90%.

Tardif *et al.* (1993) compared the weight development of infants to their adult weight in *S. oedipus* and *C. jacchus.* The absolute weight development of the two species was different, but the relative curves of the adult weights were nearly identical. The absolute weight development of the infants in Tardif *et al.* (1993) is clearly different from our results in this study, in which the curves increase in a shallower line, as depicted in Figure 1a. Furthermore, the authors did not report the adult weights as the basis for their computation. If we consult the data on body weights of these species as reported in the literature (e.g., in summary Hershkovitz, 1977, and other sources), then the reports concerning the adult weights in *C. jacchus*, for instance, range from 240 g to nearly 400 g. When using different adult weights from the same species as base values, the computed relationships of weight development will be correspondingly different as well. Therefore, we compared the weight development of the individuals reported in the present study with the adult weights of these species found at Magdeburg Zoo. The average adult weights of specimens in the Magdeburg Zoo are: *C. jacchus* – 295 g; *S. oedipus* – 420 g; *S. midas* – 480 g; and *L. rosalia* – 550 g. In this comparison of the weight development in relation to the adult weight, there are no significant differences among the species (Fig. 3).

Present interpretations suggest that the greater the species-specific birth weight, the smaller the weight growth over time on a percentage basis, and the longer the time for full weight development (Fig. 4). This correlation is almost linear, and is adequately significant with a correlation coefficient of -0.997. The relationship between the adult weight of a species and the weight development of the infants also demonstrates a trend of slower weight development with greater adult weight, but this tendency is not definitely linear. This trend is considerably less correlated, with a correlation coefficient of -0.951.

Yamamoto (1993) compared data drawn from several studies on the behavioural development of the different callitrichid genera. The infants of *Callithrix* start weaning from their parents at the age of eight weeks, *Saguinus* at 10 weeks, and *Leontopithecus* at 14 weeks. These observations coincide with the weight development curves we recorded. Yamamoto (1993) also found a correlation between weight and the time when the young are no longer carried on their parent's back or by another group member. She indicated eight weeks for *Callithrix*, nine weeks for *Saguinus*, and 12 weeks for *Leontopithecus*. Tardif *et al.* (1993), on the other hand, concluded that the duration of the carrying phase is not connected with weight development, but rather with the average species-specific daily path length through their home range. *Saguinus* groups usually travel daily path distances which are clearly longer than those of *Callithrix*. The carrying phase in the ontogenesis of callitrichids is not determined by one single factor (e.g., body weight or daily path length), but may have multiple causes. There are also differences in the length of the carrying phase between wild and captive individuals. In the zoo setting, for example, some young common marmosets are carried up to the age of 18 weeks. In pygmy marmosets (*Cebuella pygmaea*) this age was 14 weeks (Schröpel, 1988b).

Hershkovitz (1977) summarized reports concerning the age of complete adulthood in callitrichids. He indicated 18 months for *Callithrix* and 24 months for both *Saguinus* and *Leontopithecus*. These observations are confirmed to some extent by our results concerning weight development, although we registered and interpreted the weights only up to the 90th day of life.

Of course, hand-rearing is seldom necessary and it will therefore require some time to demonstrate or negate our results with additional data. Some comparisons of published weight curves from other individuals of the species studied here, or of related species, may only be used indirectly, because the methods of rearing are unknown. Different methods of rearing, and especially the nutrition

Figure 5. Common marmoset, *Callithrix jacchus*. 16 days old.

Figure 6. Cotton-top tamarin, *Saguinus oedipus*. 19 days old.

Figure 7. Golden-handed tamarin, *Saguinus midas*. 4 days old.

Figure 8. Golden lion tamarin, *Leontopithecus rosalia*. 22 days old.

of the infants – milk formula, whether the amount of milk is determined by the keeper or by the infant, starting time of solid food, and so on – may cause different patterns of weight development. For example, the curves of weight development published by Pook (1978) and Tardif *et al.* (1993) for *Saguinus oedipus* increase more slowly than ours, but the values found by Rohrhuber (1987) agree with our data. In addition, Tardif *et al.* (1993) presented weights for *Callithrix jacchus* which are lower than those we found. The values published by Kingston (1975) coincide with our findings.

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INTERACCIONES SOCIALES EN UN GRUPO DE MONOS AULLADORES *ALOUATTA PALLIATA MEXICANA* EN CAUTIVERIO

Cristina Domingo-Balcells, Ernesto Rodríguez-Luna
Mateo Escobar-Aliaga, Jorge Morales-Mávil

Introducción

Son escasos los estudios que abordan las interacciones sociales intragrupales y la jerarquía de dominancia en los monos aulladores de manto *Alouatta palliata* (Jones, 1980; Domínguez-Domínguez, 1994; Zucker y Clarke, 1998). Una posible razón es la dificultad de registrar eventos puntuales tales como las agresiones directas o la direccionalidad de las interacciones sociales entre los miembros del grupo, particularmente en libertad. No obstante, el agonismo entre machos puede ser severo, siendo a menudo estimado a partir de heridas, cicatrices o mutilaciones (Crockett y Pope, 1988). Las invasiones de machos, las muertes por ataques recibidos durante la lucha con otros machos y los infanticidios asociados, han sido reportados para *A. palliata* (Clarke, 1983). El factor de competición en estos casos está relacionado con el aspecto reproductivo, aunque a un nivel intragrupal es el acceso al alimento el principal factor de competición en los grupos de primates (Van Schaik, 1989).

Como primates básicamente folívoros, los monos aulladores consumen recursos no monopolizables de los que obtienen energía limitada (Milton, 1980). Debido a ello los modelos sociales de Wrangham (1980) y Van Schaik (1989) predicen que el principal tipo de competición esperada sería indirecta (*scramble competition*), ya que los individuos no pueden excluir agresivamente a otros de los recursos. La obtención de recursos tendería a ser igualitaria y todos los sujetos serían afectados igualmente por la escasez de recursos, por lo que las jerarquías se preveen débiles y la tasa agonística muy baja. Por el contrario, la competición directa (*contest competition*) es aquella en la que la distribución de recursos permite que algunos animales accedan a ellos excluyendo a otros. Los individuos dominantes obtienen más recursos. En la mayoría de situaciones naturales se produce una combinación de ambos tipos de competición, pudiéndose estimar separadamente (Van Hooff y Van Schaik, 1992).

Wrangham (1980) postuló que a menudo son los parientes los aliados más fiables a largo plazo en el seno de los grupos sociales de primates, de manera que habría una tendencia a permanecer en la sociedad natal o al menos migrar en conjunto con los parientes. Por ello, estos modelos sociales se basaron en especies de primates con grupos formados por hembras emparentadas. La excepcionalidad de los monos aulladores de manto radica en el hecho de que no sólo los machos que alcanzan la madurez sexual emigran de los grupos originales, sino que también las hembras abandonan el grupo individualmente y se incorporan a otros grupos sólo cuando pueden convertirse en dominantes de los integrantes de su misma clase de sexo y edad (Zucker y Clarke, 1998). En consecuencia, las predicciones de los modelos de competición intragrupal se han de tomar con precaución para *A. palliata* y el estudio social ha de ser convenientemente contextualizado.

En este trabajo se controló la disponibilidad de los recursos para un grupo de monos aulladores, potenciando el componente de competición directa por la acumulación de fruta en comederos. Las condiciones de cautiverio permitieron la observación directa de las interacciones afiliativas y agonísticas y su direccionalidad en cada díada. Se determinó la jerarquía de dominancia del grupo y se analizaron las interacciones sociales entre sus miembros. Se evaluó también la relación de asociación entre los individuos del grupo y el método para su determinación.

Metodología

Sujetos, lugar de estudio y colecta de datos

El grupo de estudio constó de un macho adulto (MA), un macho subadulto (MSA), una hembra adulta (HA), una hembra adulta-vieja (HA+), una hembra juvenil de más edad (HJ+) y una hembra juvenil de menos edad (HJ). La edad aproximada de los individuos se determinó en función de la dentición. Todos los individuos formaban parte de un grupo socialmente establecido en libertad, aunque se desconocía su historia de formación y parentesco entre sus miembros. El grupo se capturó el 25 de marzo de 2002 en Cascajal del Río (Acayucan, Veracruz, México), dentro del marco de un programa de translocación de esta especie realizado por el Parque de Flora y Fauna Silvestre Tropical (PAFFASIT) y auspiciado por la Universidad Veracruzana (Xalapa, Veracruz, México).

El estudio se realizó en instalaciones del PAFFASIT, localizadas en la Reserva de la Biosfera de Los Tuxtlas, en el municipio de Catemaco, Veracruz. El encierro consta de una base de hormigón de forma rectangular con diez jaulas de 2x3 m, paredes de malla metálica y techo de lámina de zinc. Para permitir la exposición de los animales al sol, se anexó una jaula de igual tamaño, pero sin cubierta de lámina. Todas las jaulas están interconectadas por puertas y troncos lisos para facilitar la locomoción de los animales. Los troncos conforman un entramado permanente en el interior de todo el habitáculo a una altura aproximada de un metro y medio desde el suelo, para que los animales puedan desplazarse y descansar. El aprovisionamiento de alimento constaba de fruta cultivada (melón, papaya, piña y plátano) y de alimento silvestre colectado diariamente (ramas frescas con y sin frutos) de distintas especies reportadas dentro de la dieta del mono aullador (Rodríguez-Luna *et al.*, 2003). El alimento se suministraba diariamente a las 09:00 h, antes de lo cual se retiraba el alimento sobrante del día anterior. La fruta cultivada se situaba en cuatro comederos equidistantes y las ramas frescas de árboles silvestres se situaron en una posición central, formando una cama de follaje, por donde podían desplazarse los animales y realizar el forrajeo.

Inmediatamente después de la captura los animales fueron sometidos a las condiciones de cautiverio del estudio. El grupo demoró ocho días en empezar a consumir el alimento novedoso (fruta cultivada). Tras este periodo todos los individuos se alimentaron de la fruta situada en los comederos y aceptaron la presencia del observador en el interior del encierro sin alterar aparentemente su conducta. El muestreo sistemático inició el ocho de abril de 2002 y se registraron un total de 180 horas de observación repartidas en 36 días de muestreo, en sesiones de mañana y tarde, de cinco horas cada una. El horario de muestreo abarcaba de 09:00 a 14:00 h para las sesiones de mañana y de 14:00 a 19:00 h para las de tarde. Se utilizó el método de muestreo focal-animal (Altmann, 1974; Martin y Bateson, 1991), muestreando cada individuo durante media hora. Se registró cada individuo en orden rotatorio en cada sesión, para balancear los efectos de horario. Se registraron todos los eventos de agonismo (mordida, empujón, desplazamiento, amenaza) y afiliación (juego, caricia, acicalamiento, abrazo), según la definición dada en el etograma de la especie de Carrera-Sánchez (1993), en los cuales estaba involucrado el animal-focal.

Complementariamente al registro focal-animal, cada cinco minutos se realizó un muestreo instantáneo (Altmann, 1974; Martin y Bateson, 1991), en el que se anotaron los individuos que se encontraban en las cercanías del animal-focal. Se registraba el nombre del individuo, la actividad que realizaba y la distancia al animal-focal medida como: *contacto* (contacto corporal entre el animal-focal y otro individuo), *1 brazo* (distancia no superior a un brazo de mono aullador de longitud) y *2 brazos* (distancia entre uno y dos brazos de longitud). Los individuos que se hallaban a mayor distancia no se registraban como animales cercanos, ya que en esa situación la interacción directa entre los individuos es difícil. El empleo de indicadores de distancia basados en la longitud del brazo de los monos aulladores permite medir mediante una extrapolación sencilla la distancia, incluso cuando el observador está lejos de los animales. Se prefirió este método a la medición de proximidad en metros usada en otros estudios (por ejemplo, < 1 m para *Alouatta palliata* en libertad [Zucker y Clarke, 1998]; < 5 m para *Cercocebus torquatus* [Range y Noë, 2002]).

Tabla 1. Número de agresiones emitidas por cada individuo y su tasa (número de agresiones por hora observación del individuo). Se presenta el total del grupo y la media junto a la desviación estándar. MA = macho adulto, MSA = macho subadulto, HA = hembra adulta, HJ+ = hembra juvenil de más edad, HA+ = hembra adulta-vieja, HJ = hembra juvenil de menos edad.

	MA	MSA	HA	HJ+	HA+	HJ	Total	Media	SD
N° agresiones	17	34	7	25	9	0	92	15.33	12.56
Tasa agresión	0.64	1.23	0.26	0.91	0.34	0	0.564	0.563	0.45

Análisis de datos

Se calculó la tasa de agonismo como el número de eventos agonísticos emitidos por hora de observación del individuo y del grupo. Se realizaron sociogramas en función del número y dirección de las interacciones sociales ocurridas durante el estudio para cada díada (pareja de individuos).

La jerarquía de dominancia del grupo se determinó en función de la dirección de los eventos agonísticos entre los individuos siguiendo el método de Landau (Landau, 1951). A partir del número de eventos emitidos y recibidos por cada individuo, se realizó una matriz de dominancia, donde las filas corresponden al emisor de la agresión y las columnas al receptor. La dominancia se establece en función de la direccionalidad de la agresión bastando un solo evento de agresión en la dirección A-B para determinar que A domina a B. A esta dominancia se le da un valor de 1. Si A nunca domina a B se da el valor de 0 y si entre A y B hay bidireccionalidad se le da valor de 0.5 (Appleby, 1983). Siguiendo esto se genera una matriz de direccionalidad. La suma de los valores de dominancia de cada individuo da el rango jerárquico, cuanto mayor es el valor mayor rango de dominancia presenta el individuo en el grupo.

Para calcular la linealidad de la jerarquía se aplicó el índice de Landau *h* (Landau, 1951) y el coeficiente de Kendall *K* (Kendall, 1962). El índice de Landau se obtiene con la siguiente ecuación: $h = 12/(n^3 - n) \sum [S_i - 1/2\ (n - 1)]^2$, donde *n* es el número de individuos y S_i la suma de los valores de la fila correspondiente a cada individuo en la tabla de dominancia (Tabla 3). El coeficiente de Kendall se calcula: $K = 1 - d / \max d$, donde *d* es el número de tríadas circulares: $d = n(n - 1)(2n - 1)/12 - 1/2 \sum (S_i)^2$, y donde max *d* es el número de tríadas circulares máximo para un tamaño de grupo determinado. En nuestro estudio, con un número par de individuos (n = 6), la fórmula es: $\max d = 1/24\ (n^3 - 4n)$. Presentamos ambos índices pese a que se prefiere *h* para un número par de individuos, debido a que hay subestimación del número de posibles tríadas circulares y resulta en $K < h$.

Tabla 2. Matriz de interacciones agonísticas entre díadas. En las filas el individuo emisor, en las columnas el individuo receptor. MA = macho adulto, MSA = macho subadulto, HA = hembra adulta, HJ+ = hembra juvenil de más edad, HA+ = hembra adulta-vieja, HJ = hembra juvenil de menos edad.

	MA	MSA	HA	HJ+	HA+	HJ
MA		2	7	1	5	2
MSA	0		8	3	16	7
HA	0	0		3	2	2
HJ+	0	0	8		1	16
HA+	0	0	0	5		4
HJ	0	0	0	0	0	

Tabla 3. Matriz de direccionalidad de las interacciones agonísticas. Ver texto para mayor explicación. Rango = rango de dominancia en función de la suma, en este caso no existen empates en el rango. La matriz se ha ordenado de manera que bajo la diagonal queden el mayor número de ceros. MA = macho adulto, MSA = macho subadulto, HA = hembra adulta, HJ+ = hembra juvenil de más edad, HA+ = hembra adulta-vieja, HJ = hembra juvenil de menos edad.

	MA	MSA	HA	HJ+	HA+	HJ	Suma	Rango
MA		1	1	1	1	1	5	1
MSA	0		1	1	1	1	4	2
HA	0	0		0.5	1	1	2.5	3
HJ+	0	0	0.5		0.5	1	2	4
HA+	0	0	0	0.5		1	1.5	5
HJ	0	0	0	0	0		0	6

Además, calculamos los índices de linealidad mejorados por De Vries (1995), que evitan sesgos cuando hay díadas bidireccionales (nuestro caso). El índice mejorado *h'* se calcula: $h' = h + 6/n^3 - n * u$, donde *u* es el número de relaciones desconocidas. El coeficiente de Kendall mejorado se obtiene substituyendo *d* por *d'*, siendo $d' = d - 0.25$.

La asociación entre los miembros del grupo suele inferirse a partir de datos de proximidad relativa, usada como indicador (Crockett y Eisenberg, 1987). En nuestro estudio valoramos la proximidad en función de tres parámetros: contacto corporal, distancia de un brazo de longitud y distancia de dos brazos de longitud. Para decidir cual de ellos era el mejor indicador de asociación se calculó el índice de diversidad de Shannon-Wiener (H), que determinó la selectividad en cuanto a las parejas potenciales con las que un individuo podía hallarse en proximidad. El índice se presenta en función de la diversidad máxima, que depende del número de individuos del grupo y estandariza los resultados para poder compararlos con otros estudios (Range y Noë, 2002). Una vez decidido el indicador de proximidad más selectivo se calcularon los índices de asociación diádicos (Lehner, 1979; Martin y Bateson, 1991) con la fórmula $T_{AB} / (T_A + T_B + T_{AB})$, donde T_{AB} es el tiempo en que los individuos A y B se encontraron en proximidad selectiva del tiempo de observación de A sin B, de B sin A y de A con B. Se representó un sociograma de asociación y se calculó la correlación de Spearman entre el número de afiliaciones entre los miembros de cada díada (en ambas direcciones) y su índice de asociación basado en proximidad.

Resultados

Las tasas individuales de agonismo fueron bajas (intervalo 0 - 1.23), con una tasa media para el grupo de 0.56 (Tabla 1). La mayor parte de interacciones agonísticas entre los individuos del grupo ocurrieron en un contexto de alimentación, particularmente relacionadas con los comederos donde se presentaba la fruta cultivada. Durante la alimentación se produjeron el 75% de los eventos agonísticos (53.26% durante la alimentación de fruta y 22.83% durante la alimentación de hojas silvestres), el 17% durante periodos de descanso y el 7% en relación con episodios de juego. El tipo de interacción afiliativa más común fue el juego (73.03%); el abrazo representó el 6.96% de las interacciones afiliativas, así como la caricia (6.96%) y el acicalamiento sólo se presentó el 2.61% de las ocasiones. No hubo diferencias significativas entre mañana y tarde en cuanto a interacciones afiliativas o agonísticas.

La Tabla 2 presenta la matriz de agonismo y la Tabla 3 la matriz de direccionalidad asociada, a partir de la cual se calculó la linealidad de la jerarquía de dominancia. Los resultados fueron los siguientes: $h = 0.914$, $p = 0.044$ y $h' = 0.971$, $p' = 0.032$ (índice de linealidad de Landau y mejorado de De Vries) y $K = 0.906$, $p < 0.05$, $K' = 0.937$, $p' < 0.05$ (coeficiente de Kendall y mejorado de De Vries). Según Martin y Bateson (1991) y Lehner (1979), se considera lineal una jerarquía con índice de Landau superior a 0.9, por lo que encontramos que la jerarquía de dominancia en nuestro grupo de estudio es lineal: MA > MSA > HA > HJ+ > HA+ > HJ (Tabla 3).

Se suele considerar separadamente el rango para hembras y machos, ya que las hembras compiten básicamente por el alimento, mientras que los machos compiten además por el derecho de apareamiento (Van Hooff y Van Schaik, 1992). Por este motivo calculamos también los índices de linealidad sólo para las hembras. El resultado fue poco lineal: $h = 0.70$, $p > 0.05$ y $h' = 0.90$, $p' > 0.05$, $K = 0.625$, $p > 0.05$ y $K' = 0.75$, $p' > 0.05$. La hembra más joven y pequeña se halla al final de la jerarquía, pero las otras tres hembras forman una tríada circular con reversiones agonísticas (Figura 1). Los machos al dominar a todas las hembras son los que interaccionaron agresivamente con más individuos. El macho subadulto es el que emitió más conductas agonísticas, seguido por la hembra joven de más edad. La hembra más joven HJ es la que recibió mayor número de agresiones, principalmente de HJ+, y nunca emitió agresión hacia ningún otro individuo (Figura 1). El macho dominante interaccionó preferentemente con la hembra alpha, que fue objeto del mayor número de sus acciones agonísticas y afiliativas (exceptuando el juego) (Figuras 1 y 3).

El análisis de las distancias interindividuales demostró que cuando dos individuos se hallaban en descanso toleraban mayor contacto corporal (21.07% del tiempo), mientras que cuando ambos se alimentaban estaban en contacto únicamente el 0.94%. El 47.86% del tiempo en que los individuos se hallaban descansando se encontraban a una distancia de un brazo y el 30.73% a dos brazos. La distancia durante la alimentación fue de uno y dos brazos de longitud (45.79% en cada caso).

El índice de diversidad para los parámetros de proximidad registrados arrojó que el contacto corporal era el mejor índice de asociación por la elevada selectividad que los individuos mostraban en su permanencia en contacto con otros individuos (Tabla 4). El macho alpha y la hembra alpha estaban altamente asociados. La hembra alpha, además, se hallaba asociada a la hembra vieja HA+ y la hembra joven de más edad HJ+, de forma que los miembros de la tríada circular presentan altos índices de asociación entre ellas. El macho subadulto pasó más tiempo en contacto con la hembra más joven HJ, existiendo elevada asociación entre los tres miembros más jóvenes del grupo (Figura 2).

El sociograma de interacciones afiliativas (excluyendo el juego), muestra que MSA fue el más activo, emitiendo

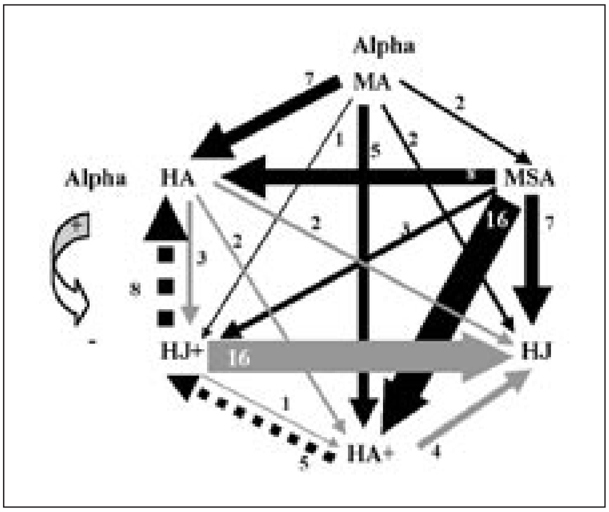

Figura 1. Sociograma de interacciones agonísticas en el grupo. El macho dominante y la hembra de más alto rango se han representado como alpha. En dirección contraria a las agujas del reloj, comenzando por la hembra alpha se han ordenado las hembras por rango jerárquico. Las flechas parten del individuo emisor de la agresión y la punta llega al receptor de la misma. El grosor de la flecha es proporcional al número de eventos agonísticos entre los miembros de la díada y el número indica el número total de eventos. En negro se presentan las interacciones agonísticas emitidas por los machos y en gris las de hembras. En línea discontínua se presentan las reversiones en las agresiones, en contra del rango jerárquico obtenido. La tríada circular HA, HJ+, HA+, se presenta en la esquina inferior izquierda. Ver texto para mayor explicación.

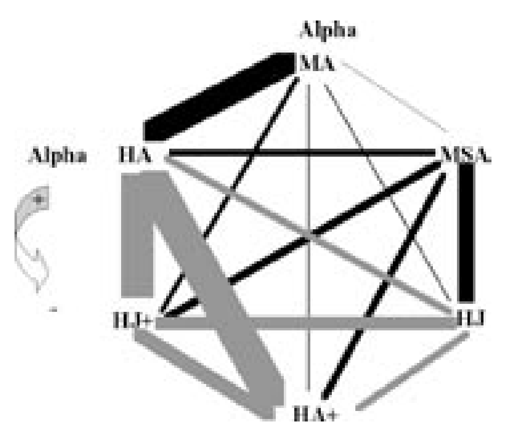

Figura 2. Sociograma de asociación entre individuos. El macho dominante y la hembra de más alto rango se han representado como alpha. En dirección contraria a las agujas del reloj, comenzando por la hembra alpha se han ordenado las hembras por rango jerárquico. El grosor de las líneas es proporcional al valor del índice de asociación en las díadas (ver texto). El macho alpha sólo se halla altamente asociado con la hembra alpha. Existe elevada asociación entre la tríada circular. Las asociaciones entre hembras se han marcado en gris.

afiliación hacia todos los demás individuos, incluso hacia el macho alpha, siendo la afiliación muy recíproca entre ellos. El macho alpha emitió afiliación preferentemente hacia la hembra alpha, la cual emitió y recibió afiliación recíprocamente con la HA+, y recibió el máximo de afiliación de HJ+ y MSA (Figura 3).

El cálculo de la correlación de Spearman entre el índice de asociación y el número de afiliaciones de cada díada (en ambas direcciones), indicó que ambos parámetros estaban correlacionados positivamente ($r_s = 0.602$, $p < 0.02$, $n = 15$). Es decir, que los individuos que permanecían más tiempo en contacto eran los que interaccionaban más afiliativamente. La correlación es negativa, pero no significativa, entre emisión y recepción de afiliación ($r_s = 0.48$, $p > 0.05$). Tampoco hubo correlación significativa entre el rango del individuo y la cantidad de afiliación emitida o recibida, ni con la emisión o recepción de agresión.

Discusión

La tasa de agonismo media del grupo de estudio (0.56) fue mayor a la reportada por Zucker y Clarke (1998) para *Alouatta palliata* en un estudio durante cuatro años en Costa Rica (tasa media 0.38, intervalo anual 0.24 - 0.51). Esto puede ser debido a que: a) el estudio de Costa Rica sólo consideraba a las hembras del grupo y, como muestra este estudio, son los machos los que interaccionan más agonísticamente (Figura 1), b) las condiciones de cautiverio aumentan la tasa agonística por constricción espacial, c) registrar en condiciones de libertad subestima la tasa real por la dificultad de registrar todos los eventos, d) el componente de competición directa (*contest competition*) fue superior en nuestro estudio debido a la forma de administrar el alimento de forma agregada (fruta cultivada en comederos). Adicionalmente, en Costa Rica se manejaron tasas anuales sin diferenciar estacionalidad en la agregación y disponibilidad de los recursos.

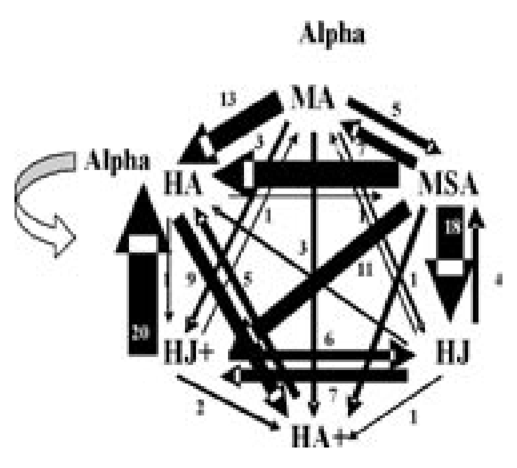

Figura 3. Sociograma de afiliación entre individuos. El macho dominante y la hembra de más alto rango se han representado como alpha. En dirección contraria a las agujas del reloj, comenzando por la hembra alpha se han ordenado las hembras por rango jerárquico. El grosor de las líneas es proporcional al número de interacciones afiliativas.

Probablemente, la plasticidad conductual de esta especie también incluye variaciones estacionales en los componentes de competición intragrupal relacionados con la disponibilidad de alimento en el entorno. La competición directa mediante agresión debe variar con la dinámica fenológica de las especies vegetales presentes en el ámbito hogareño del grupo, al igual que varían los patrones de actividad, forrajeo y distribución espacial en relación con el alimento, especialmente los frutos (Rodríguez-Luna, 2000; Rodríguez-Luna *et al.,* 2003; Serio-Silva, 1992), ya que, a pesar de ser ampliamente generalistas y folívoros, los monos aulladores son selectivos en su elección del alimento (Milton, 1980). Apoyando este razonamiento, observamos que el mayor número de eventos agonísticos tuvieron lugar durante la alimentación, principalmente en relación con los comederos donde se concentraba la fruta.

Wrangham (1980) y Van Schaik (1989) predijeron jerarquías de dominancia para hembras de primates según el tipo de competición intragrupal. Para los monos aulladores las jerarquías serían poco lineales, aunque consideraron a *A. palliata* como un caso particular. Zucker y Clarke (1998) reportaron una jerarquía dinámica a lo largo de cuatro años para las hembras, sin correlación rango-edad, pero con una tendencia a que las hembras dominantes sean las jóvenes recién inmigradas. Sus datos apoyan parcialmente las predicciones de los modelos sociales de Wrangham (1980) y Van Schaik (1989), ya que en ciertos momentos la jerarquía es poco lineal, pero existen periodos donde existe estabilidad y linealidad en la jerarquía de dominancia de las hembras.

Tabla 4. Índice de diversidad de Shannon-Wiener para la proximidad con otros individuos medida como contacto, distancia de uno o dos brazos. Se presenta el valor estandarizado como la proporción entre el índice H y la diversidad máxima para un grupo de tamaño seis. También se muestra la media y su desviación estándar. El índice varía entre 0 = máxima selección de pareja y 1 = máxima diversidad. * = Valores inferiores a 0.4, que fueron considerados selectivos. MA = macho adulto, MSA = macho subadulto, HA = hembra adulta, HJ+ = hembra juvenil de más edad, HA+ = hembra adulta-vieja, HJ = hembra juvenil de menos edad.

	H/Hmax							
	MA	MSA	HA	HJ+	HA+	HJ	Media	SD
Contacto	0.23*	0.38*	0.33*	0.37*	0.39*	0.26*	0.33*	0.656
1 Brazo	0.47	0.38*	0.48	0.46	0.46	0.48	0.45	0.039
2 Brazos	0.48	0.48	0.47	0.47	0.45	0.48	0.47	0.013

Para nuestro grupo de estudio, considerando machos y hembras, la jerarquía fue altamente lineal, situando a los machos dominando sobre las hembras y básicamente los individuos adultos sobre los no-adultos. La jerarquía entre hembras fue poco lineal debido a una tríada circular formada por las dos hembras adultas y la juvenil de más edad, próxima a la madurez sexual. Las reversiones en la dominancia entre las hembras podrían ser consecuencia de las características de los miembros del grupo, principalmente edad, madurez sexual e historia de formación del grupo en cuanto a migraciones y parentesco. Por tanto, la conducta social intragrupal debe ser convenientemente contextualizada para poder interpretar las interacciones entre los individuos de los grupos y sus relaciones de asociación y dominio.

El patrón de migración de los aulladores resultaría en grupos con adultos no emparentados. La jerarquía de dominancia reportada muestra una tendencia a que los inmigrantes recientes dominen sobre los más viejos residentes (Jones, 1980; Zucker y Clarke, 1998). La jerarquía de dominancia de nuestro grupo de estudio posiblemente variaría en un estudio a más largo plazo, debido a que en cautiverio no sería posible la migración de los individuos jóvenes MSA y HJ+. Es posible que se establecieran nuevos individuos alpha con un aumento de agonismo durante el periodo intermedio, consecuencia del balance de fuerzas entre los individuos alpha y los jóvenes adultos. De hecho, durante el estudio estos individuos ya estaban presentando las mayores tasas de agonismo.

En cuanto a la afiliación, la conducta afiliativa de acicalamiento, tan importante entre monos del Viejo Mundo (Jones, 1980; Neville *et al.*, 1988), fue un evento poco común entre aulladores (2.61% de las afiliaciones en el grupo). Incluso en una especie del mismo género como *A. seniculus*, el acicalamiento es más común que en *A. palliata*, lo cual puede tener que ver con las diferencias entre ambas especies en cuanto a patrones de competición entre hembras, ya que las de *A. palliata* no forman alianzas por parentesco en los grupos (Sánchez-Villagra *et al.,* 1998).

El juego fue la conducta afiliativa más importante, con más del 70% del tiempo dedicado a interacciones afiliativas en el grupo. En nuestro estudio el individuo socialmente más activo fue el macho subadulto, emitiendo afiliación y agresión hacia el resto de individuos en la mayor proporción. Nunca se registró agresión de este macho hacia el macho alpha, pero sí un elevado porcentaje de afiliaciones, incluyendo el juego. Todos los individuos del grupo participaron activamente en los episodios de juego, a veces colectivamente. Durante el desarrollo de los aulladores, la cantidad de tiempo invertido, la intensidad y la complejidad del juego varía, pero se considera que tiene un lugar predominante en su historia vital (Carpenter, 1965). Junto con el macho joven, las dos hembras jóvenes participaron en el juego en la mayor proporción, lo que demuestra la importancia social de este tipo de afiliación durante el desarrollo y vida social de los monos aulladores. Jugando no sólo practican activamente las capacidades perceptivas-motoras, que son necesarias para su futuro ajuste y sobrevivencia en el entorno del bosque tropical, sino que también aprenden el comportamiento social complejo que caracteriza su vida en grupos compactos (Crockett y Eisenberg, 1987).

La hembra joven de mayor edad (HJ+) fue también muy activa socialmente, pero interactuando de distinta forma que el macho subadulto. HJ+ presentó la segunda mayor tasa de agonismo (tras MSA), siendo el principal recipiente de sus agresiones la hembra más joven de menor rango. La presencia de reversiones en la jerarquía donde estaba involucrada HJ+ indica la inconsistencia de la dominancia entre las hembras de mono aullador predicha en los modelos sociales de Wrangham (1980) y Van Schaik (1989), y a su vez apoyan la hipótesis de que HJ+ se hallaba en el proceso de aumentar de rango en su grupo natal, lo que se vería favorecido posiblemente por la avanzada edad de las dos hembras adultas. Ambos factores no son contradictorios, pero sin más datos no es posible dar una explicación totalmente satisfactoria para la tríada circular del grupo de estudio.

La mejor medida de asociación en función de distancias interindividuales para monos aulladores en condiciones de cautiverio, se debe calcular con base en el tiempo en que dos individuos permanecen en contacto corporal, por ser el indicador de proximidad más selectivo. Es necesario establecer previamente el mejor indicador de asociación por proximidad en cada caso particular y no usar distancias arbitrarias que quizás no aporten la información requerida. El índice de asociación tuvo una correlación positiva con el número de interacciones afiliativas en las díadas, esto último además aporta direccionalidad, por lo que se sugiere una combinación de ambos parámetros para el establecimiento de relaciones entre los miembros de los grupos.

En nuestro estudio, los individuos que permanecían más tiempo en contacto eran los que interaccionaban más afiliativamente. Esto no fue consecuencia de la mayor proximidad entre ellos, como muestra el caso de HJ+ y HA+, donde la elevada cercanía entre ellas no se correspondía con un gran número de interacciones afiliativas (Figuras 2 y 3). El registro de proximidad no fue direccional por la imposibilidad de registrar el responsable de la misma en todos los casos. Inferimos que el responsable de la proximidad en las díadas correspondería al emisor del mayor número de afiliaciones en cada díada. Por ejemplo, la responsable de la proximidad entre HA y HJ+ podría ser HJ+, ya que es ésta la que emite el grueso de las interacciones afiliativas en esa díada. La responsabilidad entre HA y HA+ sería más recíproca (Figuras 2 y 3). La elevada asociación entre HJ+ y HA+ no sería debida a una asociación real entre ellas, sino sería una consecuencia indirecta de la asociación de ambas con la tercera hembra (con la hembra alpha HA). En otras palabras HJ+ y HA+ se hallan en contacto corporal a menudo no porque exista un vínculo intenso entre ellas sino porque ambas “quieren estar con la HA”. En cuanto a los machos, el macho alpha sólo presenta elevado número de afiliación con la hembra alpha y esto coincide con el mayor tiempo que pasan en contacto, pero no presenta elevada asociación con las hembras HJ+ y HA+, por lo que se deduce que cuando se acerca el macho a la hembra alpha las otras se alejan.

La composición del grupo de estudio en cuanto a clases de sexo-edad y el análisis de las interacciones sociales y distancias interindividuales, nos hacen plantearnos los siguientes puntos: 1) el grupo no presentaba adultos jóvenes, por lo que no existe la posibilidad de inmigraciones recientes en el grupo y los individuos dominantes son los adultos MA y HA; 2) por tanto, es probable que los individuos jóvenes del grupo fueran parientes de los individuos adultos; 3) la elevada afiliación y/o asociación entre individuos jóvenes y adultos, quizás tengan que ver con relaciones de parentesco materno o paterno-filiales; 4) los individuos jóvenes que están cercanos a la madurez sexual son los más activos socialmente, tanto afiliativa como agonísticamente, lo que puede estar indicando el establecimiento de su estatus social en el seno del grupo; 5) la jerarquía de dominancia entre las hembras del grupo no es lineal a consecuencia de bidireccionalidad en el agonismo entre HA, HJ+ y HA+, lo que puede indicar inconsistencia en la jerarquía de las hembras o un proceso de cambio en ésta; 6) existen efectos de asociación ficticios debido al análisis diádico de las distancias interindividuales, entre HA+ y HJ+, que podrían deberse a parentesco desconocido por los autores (por ejemplo, que HJ+ es hija de HA y HA de HA+), o bien a una asociación con la hembra alpha por parte de ambas hembras por otras razones desconocidas; y 7) existe una relación especial entre el macho alpha y la hembra alpha.

En conclusión, la elevada plasticidad conductual reportada para la especie *A. palliata* (Chapman, 1988; Neville *et al.*, 1988; Milton, 1998; Crockett y Eisenberg, 1987) incluiría los aspectos de competición intragrupal por el alimento, en función de la disponibilidad de los recursos y su agregación en el ámbito hogareño de los grupos. La jerarquía de dominancia sería, por tanto, dinámica, en relación con la composición de sexo y edad y la historia de los individuos del grupo en cuanto a origen y migraciones. Para determinar asociaciones entre los miembros del grupo se recomienda el uso de distancias interindividuales conjuntamente con interacciones sociales, que aportan direccionalidad entre las relaciones diádicas y permiten interpretar la distribución espacial de los individuos unos respecto a otros. La proximidad por sí sola puede dar efectos de asociación entre individuos no realmente asociados. En cada caso, se recomienda evaluar previamente el mejor indicador de asociación en función de la proximidad realizando una prueba de diversidad.

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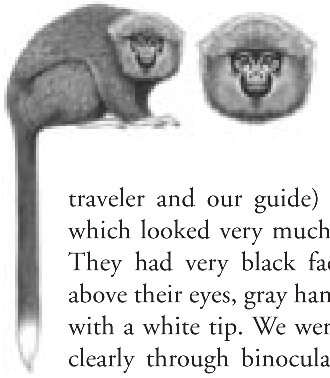
NEWS

A POSSIBLE FIELD SIGHTING OF *CALLICEBUS BERNHARDI* IN NORTHERN MATO GROSSO



During a birdwatching trip to the Alta Floresta area of Mato Grosso, Brazil, in October 2003, our small group (myself, a fellow traveler and our guide) sighted two titi monkeys which looked very much like *Callicebus bernhardi*. They had very black faces with red beards, gray above their eyes, gray hands and feet, and a gray tail with a white tip. We were able to see the monkeys clearly through binoculars, but none of us had a camera along.

We made the sighting in a 50 ha reserve adjoining the Floresta Amazonica Hotel in Alta Floresta, about five minutes from the airport. We were birding along a dirt road which runs parallel to the property, and sighted the monkeys at the edge of the reserve forest. The area around the reserve is developed with housing.

Doug Trent, our guide, has worked in Brazil for over 20 years, and had the chart of titi monkeys from Van Roosmalen *et al.* (2002). We compared the monkeys that we had seen to the chart, and *Callicebus bernhardi* was the only one which looked like them. Doug Trent knew that *C. bernhardi* had not been reported from the Alta Floresta area. The owner of the hotel, Vitoria da Riva Carvalho – who is also the director of the reserve – told us that she knew there were titis in the reserve, but not which species. Further surveys of the fauna there are needed.

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THE BLACK LION TAMARIN ECOLOGICAL STATION

An Ecological Station of 5,500 ha was created by Presidential Decree on 16 July, 2002, for, and with the name of, the Black Lion Tamarin, *Leontopithecus chrysopygus*. Located in the far west of the state of São Paulo, the Pontal do Paranapanema – just west and north of the Morro do

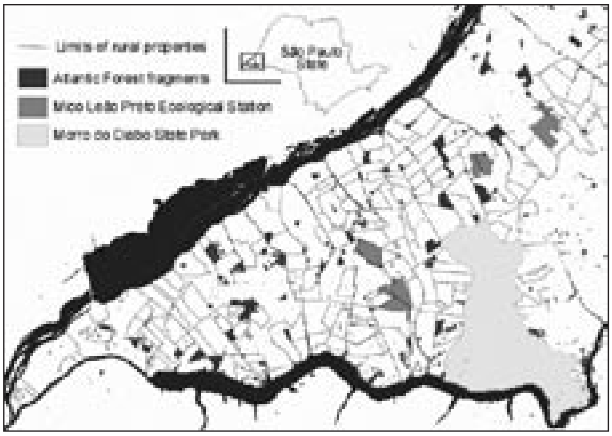

Figure 1. The Black Lion Tamarin Ecological Station, Pontal do Paranapanema, São Paulo, Brazil.

Diabo State Park – the Ecological Station provides permanent protection for four important populations of the species: in the Fazendas Tucano and Rosanella, Fazenda Santa Mônica, Fazenda Ponte Branca, and Fazenda Santa Maria. The estimated total population is over thirty animals. IPÊ – Instituto de Pesquisas Ecológicas drew up the original proposal and supported the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) and the Ministry of the Environment in its creation. The challenge now is to implement the reserve, and plans are underway for reforestation to join the forest patches and extend a corridor to the main population of *L. chrysopygus* in the Morro do Diabo State Park.

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TRES NUEVAS ÁREAS NATURALES PROTEGIDAS EN PERÚ

Tres nuevas Áreas Naturales Protegidas en la cordillera de Vilcabamba, para el SINANPE, es el resultado de la categorización de la Zona Reservada Apurimac: Reserva Comunal Ashaninka, Parque Nacional Otishi y Reserva Comunal Matziguenka, de acuerdo al Decreto Supremo 003-2003-AG publicado el 15 de enero, 2003 en el *Diario Oficial El Peruano*. Esta región tiene particular importancia por la presencia de varias especies de primates, y el esfuerzo que se hizo para declarar las áreas protegidas fue apoyada por grupos de investigadores de Conservation International.

Del total de 1,669,200 ha que tenía la Zona Reservada Apurimac, 709,347.06 ha se destinan a la creación de tres áreas naturales protegidas: Parque Nacional Otishi con 305,973.05 ha, Reserva Comunal Ashaninka con 184,468.38 ha y Reserva Comunal Matziguenka con 218,905.63 ha. La diferencia del total de lo que era la Zona Reservada del Apurímac se constituye en comunidades nativas tituladas, Ashaninkas y Matziguenkas, cuyos territorios pasarían a ser parte de la Zona de Amortiguamiento de las tres áreas naturales protegidas. Dichas etnias tendrán una participación decisiva a través de los comités de gestión de cada una de las áreas naturales protegidas mencionadas. Estas tres áreas se localizan en medio de un macizo aislado de la cordillera de los Andes, en medio de los ríos Apurímac, Ene, Tambo y Urubamba.

Cabe destacar que la acción del gobierno y de las comunidades indígenas, así como de organizaciones conservacionistas nacionales e internacionales, ha sido un proceso muy antiguo, que viene desde la década de los 60 y que hoy día se plasma con la formalización de estas áreas. Por otro lado, asegurar la conservación de esta importante área significa una continua planificación del territorio con un enfoque de *Corredor de Conservación*, que combina los mecanismos de conservación de las propias comunidades y la participación de las diferentes instituciones en el desarrollo sostenible, combinando las actividades económicas sostenibles con la conservación de la biodiversidad.

La Zona Reservada Apurimac está ubicada en una cordillera escabrosa e inaccesible con varias montañas que superan los 4000 msnm y todavía contiene restos de los grandes bosques de montaña que antiguamente cubrían gran parte de los Andes tropicales orientales, de Venezuela a Bolivia (Boyle, 2001). Los bosques supervivientes del Apurimac contienen una notable biodiversidad que incluye varias especies raras y endémicas, pero esta región aislada ha permanecido casi inexplorada por biólogos. Esta área es especialmente interesante en lo que respecta a la biogeografía de primates, ya que la cresta de Vilcabamba está ubicada en cercanías de la zona de contacto de las áreas de distribución de distintos géneros de primates, incluyendo a *Pithecia monachus* y *P. irrorata*, *Saguinus fuscicollis weddelli* y *S. f. leucogenys* y dos taxa de *Lagothrix*.

Tres expediciones han realizado observaciones en esta área en los años 1997 y 1998, dos del Programa de Evaluación Rápida (Rapid Assessment Program, RAP) de Conservation International y uno del Programa el Hombre y la Biosfera (Man and the Biosphere Program, MAB) de la Smithsonian Institution. Estas expediciones han cooperado para documentar la excepcional riqueza biológica de la región, y su informe final realizado en conjunto incluyó una propuesta para crear un Parque Nacional y Reservas Comunales (Alonso *et al.*, 2001). Entre muchos otros hallazgos que resultaron de estas expediciones, se descubrió a *Cuscomys ashaninka*, un nuevo género y una nueva especie de roedor perteneciente a la familia de los Abrocomidae (Emmons, 1999). Adicionalmente, los equipos del RAP confirmaron la presencia de varios grandes primates en el área, los cuales están sufriendo una seria presión cinegética en altitudes más bajas. Observaciones en el sitio más alto evaluado en el RAP, a 3500 msnm, no produjeron evidencias de primates; pero en el segundo sitio más alto se hallaron varias especies que ocupaban una franja de bosque inusual en la base de una pared alta, aproximadamente a 2500 msnm. Aquí, el equipo observó *Cebus apella* y posiblemente

C. albifrons, y registró vocalizaciones de *Ateles chamek* y de monos nocturnos (probablemente *Aotus nigriceps*).

En el tercer sitio, sólo 1000 m más alto que el Río Urubamba, los equipos hallaron *Aotus, Lagothrix lagothricha*, *Cebus apella* y *C. albifrons* y oyeron vocalizaciones de *Alouatta seniculus* y *Ateles chamek*. Algunas de estas especies (*Alouatta*, *Ateles*, *Lagothrix* y *C. albifrons*) fueron halladas por Edmund Heller en el año 1915, junto con *Saimiri boliviensis* y *Saguinus fuscicollis weddelli*. Aunque su distribución sugeriría su presencia en la región, no se registró ningún ejemplar de *Pithecia* por ninguno de los equipos de biodiversidad y los pobladores locales no incluyeron a este género en una lista de primates conocidos (Rodríguez y Amanzo, 2001). No se espera que *Callicebus, Callimico* y *Cebuella* estén presentes en esta área.

Estas y otras expediciones científicas más recientes han documentado otras especies importantes de vertebrados, entre ellas el "hormiguero gigante" (*Myrmecophaga tridactyla*), el "oso de anteojos" (*Tremarctos ornatus*), el "gallito de las rocas" (*Rupicola peruviana*) y el "caimán blanco"(*Caiman crocodylus*). Además, se encuentra una rica diversidad de flora como el "ulcumano o romerillo" (*Podocarpus* sp.), el "quinual" (*Polylepis* sp.) y el "cedro de altura" (*Cedrela* sp.), entre otras.

Para acceso a imágenes y entrevistas por favor contacte a Nina Pardo, <n.pardo@conservation.org>.

THREE NEW NATURAL PROTECTED AREAS IN PERU

Three new Natural Protected Areas were created in the Vilcabamba mountains of southern Peru, in accordance with Supreme Decree 003-2003-AG, published on 16 January, 2003 in the *Diario Oficial El Peruano*. This region is of particular importance for a number of primate species, and the effort to declare the protected areas was supported in part by research teams from Conservation International.

The former Zona Reservada Apurimac covered a total of 1,669,200 ha, of which 709,347.06 ha were allocated to the creation of the three new protected areas: the Otishi National Park, with an area of 305,973.05 ha; the Ashaninka Communal Reserve, covering 184,468.38 ha; and the Matziguenka Communal Reserve, covering 218,905.63 ha. The difference in area from the total of the former Zona Reservada Apurimac is incorporated into the lands of the indigenous communities, the Ashaninkas and Matziguenkas, whose territories will become part of the buffer zone of the three protected areas. These tribes will be able to participate in decision-making through the administrative committees of each of the protected areas. The three areas are located within an isolated massif of the Andean mountain range, between the Ríos Apurímac, Ene, Tambo, and Urubamba.

It is worth emphasizing that the action of the government and the indigenous communities, as well as of national and international conservation organizations, has been an ongoing process which was begun in the 1960s, and which has culminated in the legal protection of these areas. Ensuring the conservation of this important region, however, will require a continuing planning process for the territory with a focus on implementing a conservation corridor, which combines the conservation mechanisms of the communities and the participation of different institutions in sustainable development, which combines sustainable economic activities with the conservation of biodiversity.

The new protected areas cover the highest portions of a rugged and inaccessible mountain range, often rising above 4000 m, which still harbors remnants of the great montane forests which once covered much of the eastern tropical Andes from Venezuela to Bolivia (Boyle, 2001). The surviving forests of the Apurimac hold remarkable biodiversity, including many rare and endemic species, but this isolated region has been largely unexplored by biologists. It is especially interesting in terms of primate biogeography, as the Vilcabamba ridge lies near the meeting of species boundaries for several primate genera, including *Pithecia monachus* and *P. irrorata*, *Saguinus fuscicollis weddelli* and *S. f. leucogenys*, and two taxa of *Lagothrix*.

Three expeditions surveyed this area in 1997 and 1998, two from the Rapid Assessment Program (RAP) of Conservation International and one from the Man and the Biosphere (MAB) program of the Smithsonian Institution. These expeditions cooperated to document the exceptional biological wealth of the region, and their combined final report included a proposal for the creation of the National Park and Communal Reserves (Alonso *et al.*, 2001). Among many other finds from these expeditions was the discovery of *Cuscomys ashaninka*, a new genus and species of abrocomid rodent (Emmons, 1999). In addition, the RAP teams confirmed the presence of several of the larger primates in the area, which suffer severe hunting pressure in the lower altitudes. Surveys at the highest-elevation RAP site, at 3500 m, yielded no evidence of primates; but at their second site they found several species occupying an unusual band of forest at the base of a high cliff, at approximately 2500 m. Here the team observed *Cebus apella*, and possibly *C. albifrons*, and recorded the calls of night monkeys (probably *Aotus nigriceps*) as well as those of *Ateles chamek*.

At the third site, only 1000 m above the Río Urubamba, the survey teams saw *Aotus, Lagothrix lagothricha*, and both *Cebus apella* and *C. albifrons*, and they also heard *Alouatta seniculus* and *Ateles chamek*. A number of these species (*Alouatta*, *Ateles*, *Lagothrix* and *C. albifrons*) were collected by Edmund Heller in 1915, along with *Saimiri boliviensis* and *Saguinus fuscicollis weddelli*. Although their distribution would suggest their presence in the region, no *Pithecia* were noted by any of the biodiversity teams, and local residents did not include the genus in a list of known primates (Rodríguez and Amanzo, 2001). *Callicebus*, *Callimico* and *Cebuella* are not expected to occur in this area.

These and other recent scientific expeditions have also documented many other vertebrate species in the new protected areas, including giant anteater (*Myrmecophaga tridactyla*), spectacled bear (*Tremarctos ornatus*), Andean cock-of-the-rock (*Rupicola peruviana*), and white cayman (*Caiman crocodylus*). This area is also diverse in its flora, which includes the "romerillo" (*Podocarpus* sp.), quinual trees (*Polylepis* sp.) and cedar trees (*Cedrela* sp.).

For more information and images of the protected areas, please contact Nina Pardo at <n.pardo@conservation.org>.

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GUIDELINES FOR APPLICATION OF IUCN RED LIST CRITERIA AT REGIONAL LEVELS

During the First World Conservation Congress held in Montreal in 1996, IUCN adopted a resolution requesting the Species Survival Commission (SSC) to develop guidelines for using the IUCN Red List Categories and Criteria at the regional level. Development of the guidelines has involved a broad consultation with people with technical experience in the development of IUCN Red List Criteria and those with practical experience in producing Red Lists at regional levels. During this process, draft versions of the guidelines were published in *Species* (Gärdenfors *et al.*, 1999) and in *Conservation Biology* (Gärdenfors *et al.*, 2001; see also Gärdenfors, 2001), and comments received on these drafts were used to improve and refine the guidelines.

The *Guidelines for Application of IUCN Red List Criteria at Regional Levels*: *Version 3.0* have been published as a booklet in three languages: English, French and Spanish. They are recommended for anyone who wishes to use the IUCN Red List Categories and Criteria to undertake Red List assessments at the regional level. They are now available on the SSC website as PDF files, in the three languages, at: <http://www.iucn.org/themes/ssc/redlists/regionalguidelines.htm>.

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III LION TAMARIN SYMPOSIUM, *LEONTOPITHECUS*

The first symposium on lion tamarins was organized by the Associação Mico-Leão-Dourado (AMLD) at the Poço das Antas Biological Reserve, Rio de Janeiro, in 1992 (see *Neotropical Primates* 2[Suppl.], December 1994), and the second was in 1997, organized by the Fundação Biodiversitas in Belo Horizonte, at the time of a Population and Habitat Viability Assessment Workshop (PHVA) carried out in collaboration with the IUCN/SSC Conservation Breeding Specialist Group (CBSG). The III Lion Tamarin Symposium, a three-day meeting, was hosted by the management of the Serra dos Órgãos National Park, Teresópolis, in the state of Rio de Janeiro, 26-28 May, 2003, preceding the annual meeting of the International Committee for the Conservation and Management of the Lion Tamarins (ICCM-LT). It was organized by Denise Rambaldi, Executive Secretary, and the staff of the Associação Mico-Leão-Dourado (AMLD), based in Casimiro de Abreu, Rio de Janeiro, and Marcelo Marcelino de Oliveira and Elaine C. Costa Eloy of the Centro de Proteção de Primatas Brasileiros – IBAMA, Cabedelo, Paraíba. The event was supported by the Margot Marsh Biodiversity Foundation, Conservation International, and the Fundação O Boticário de Proteção à Natureza.

Concerns and efforts for the conservation of lion tamarins, which began more than 40 years ago with the initial surveys and alarms raised by Adelmar F. Coimbra-Filho, have resulted in an extraordinary and diversified combination of research, management and education programmes – many of them pioneer – and accompanying, and often leading in, the developing science of conservation biology. This meeting was attended by 127 people – a good sample of the researchers and students (47), conservationists, and managers and staff of protected areas, both foreign and Brazilian, who are involved directly, and sometimes indirectly, with such aspects of conservation as: behavioural, ecological and demographic studies; population genetics and management (including translocation and reintroduction programmes); habitat and landscape protection and restoration; captive breeding, management and husbandry; and environmental education and rural extension, as well as public policy, institutional development and capacity-building, and professional training – all elements of the conservation programmes established for the lion tamarin species, *Leontopithecus rosalia*, *L. chrysomelas*, *L. chrysopygus* and *L. caissara*. The aim, succesfully achieved, was to discuss, renew and broaden partnerships amongst the numerous students, professionals and professional institutions involved in lion tamarin conservation – reporting on their work, exchanging views on their experiences, integrating and planning scientific studies and, most especially, engaging a younger generation of primatologists who will be responsible for the programmes over the coming years.

The opening of the meeting was marked by a presentation of the book *Lion Tamarins: Biology and Conservation*, edited by Devra G. Kleiman and Anthony B. Rylands, and published in 2002 by the Smithsonian Institution Press. Afterwards, in a moment of reflection, Cláudio Valladares-Pádua then read an homage to José Márcio Ayres, "The primatologist who liked to create reserves", who had died at a young age just two months previously, in March, 2003 (see *Neotropical Primates* 11(1): 39-41, 2003). Over the following two days there were talks and roundtables on the following themes: "*Leontopithecus* as a model for primate conservation", "Current status of the genus *Leontopithecus*", "Processes and tools for the conservation of *Leontopithecus*", "Conservation of fragmented habitats", and "Institutional cooperation and its importance in the conservation of the genus *Leontopithecus*", besides three general sessions with a further 18 talks. The abstracts, published in the *Livro de Resumos*, are listed on page 138 of this issue.

Special thanks are extended to the Director and staff of the Serra dos Órgãos National Park, Teresópolis, for their hospitality and generosity in hosting the meeting.

Denise Marçal Rambaldi, Associação Mico-Leão-Dourado, Rodovia BR-101, Km 214, Caixa Postal 109.968, Casimiro de Abreu, 28860-970 Rio de Janeiro, Brazil, e-mail: <rambaldi@micoleao.org.br>, **Marcelo Marcelino de Oliveira** and **Elaine C. Costa Eloy**, Centro de Proteção de Primatas Brasileiros, BR-230, Km 10, Mata da AMEM, 2º Andar, Cabedelo, 58310-000 Paraíba, Brazil, e-mail: <primatas@ibama.gov.br>.

THE ROLE OF PRIMATES AS SEED DISPERSERS IN THE VEGETATION STRUCTURE OF TROPICAL FORESTS

Introduction

Seed dispersal is an important process affecting the density and distribution of plants and the floristic composition of plant communities. Frugivorous species play a key role in the natural regeneration mechanism of tropical forests, as 45-95% of tropical plant species depend on animals to disperse their seeds (McKey, 1975; Terborgh, 1983). Primates represent 25-40% of frugivore biomass in tropical forests, and therefore as a group they play a very important role in seed dispersal in tropical forests (Eisenberg and Thorington, 1973).

At the 10th Brazilian Congress of Primatology, held in November, 2002, at the Federal University of Pará, Belém, Brazil, a roundtable entitled "Seed Dispersal" discussed the role of primates as seed dispersers in structuring the vegetation of Brazilian tropical forests. Participants presented their data for different species of primates, covering a number of key aspects of seed dispersal.

Seed dispersal by *Saguinus niger*, *Cebus apella* and *Brachyteles arachnoides*

Ana Cristina Oliveira monitored the feeding behavior of a group of *Saguinus niger* for six months in eastern Amazonia. The diet of the group was predominantly frugivorous: 87.5% of recorded feeding behavior was of fruits. Of 16 species of plants providing fruits, *Saguinus* ingested and defecated whole seeds from at least six. Seeds with diameter >1 cm and/or length >2 cm were discarded. Seeds that were ingested took from two to four hours to pass through the digestive tract. In association with the movement patterns of the group, 19.3% of the seeds taken from mature forest were dropped in secondary forest, demonstrating clearly that *Saguinus niger* plays an important role in the dispersal of seeds from primary forest trees, and contributes to succession in the secondary forest (Oliveira, 2002).

Following a similar line of investigation, the research of Patrícia Izar in the Atlantic Forest of Intervales State Park, São Paulo, analyzed the characteristics of fruiting species exploited by *Cebus apella* and *Brachyteles arachnoides*. Her results showed that the quantity of fruits produced affected the seed dispersal by both primate species – that is, the greater the production, the greater the number of seeds dispersed. Comparing the size of seeds dispersed by *Cebus* and *Brachyteles*, she found that the former was a more efficient disperser of smaller seeds (limited by diameter), whereas *Brachyteles arachnoides* was evidently a more efficient disperser of large seeds (Izar, 2002).

Characteristics and Germination Rates of Seeds Dispersed by *Alouatta guariba clamitans*

Ana Alice Biedzicki de Marques studied a group of *Alouatta guariba clamitans* for 13 months in the Atlantic Forest of

Itapuã State Park, Rio Grande do Sul. Seeds from their feces were separated, identified through a seed bank established from a phenological study of 257 trees, shrubs, and lianas encountered in the study area, and used in germination tests. These tests were conducted in a greenhouse, with forest soil in special trays, protected from birds and ants and under daily monitoring for a period of 12 months. Germination rates of seeds collected from feces (tests) and from ripe fruits (control) were compared using the Chi-square test. Significant differences were found between tests and controls in five of the 10 species tested. For *Syagrus romanzoffiana, Erythroxylum argentinum* and *Lithraea brasiliensis*, the percentage of ingested seeds that germinated successfully was higher than that of the control seeds, while for *Enterolobium contortisiliquum* and *Myrciaria cuspidata*, the control seeds germinated better than those ingested. *S. romanzoffiana* accounted for 24.12% of the total fruit ingested during the 13 months of the study. These fruits are available for almost the whole year, and *Alouatta guariba clamitans* was evidently an efficient disperser for this species in terms of an increase in the number of germinated seeds, their defecation far from the parent tree, and the quantity of seeds ingested (Marques, 2002).

Germination *In Vivo* and *In Vitro* as Tools to Conserve the Plant Species Dispersed by *Callithrix jacchus* in the Atlantic Forest

Carla S. S. de Castro used *in vivo* germination tests to verify the viability of seeds dispersed by *Callithrix jacchus*, and also created a germplasm bank for the species involved. She studied two groups of marmosets for 18 months in an Atlantic Forest remnant in the Dunas State Park, in Natal, Rio Grande do Norte.

The marmosets ingested seeds from *Coccoloba* sp., *Campomanesia dichotoma* and *Hexaclamys itatiaiae*. Average lengths of the seeds were 5.7 mm, 6.0 mm and 5.6 mm, respectively. Seeds were collected from the marmoset feces at average distances of 16.8 m, 60.0 m and 45.3 m, respectively, from the parent tree, reflecting the movement patterns of marmoset groups within their home ranges. Seeds from feces (tests) and seeds taken from ripe fruits (control) were planted with forest soil, and kept in a greenhouse (germination *in vivo*). The percentage of seeds germinating and the time to germination were compared using the Kruskall-Wallis and the Mann-Whitney U-tests. For seeds of *Coccoloba* sp. and *Campomanesia dichotoma*, the proportion germinating was greater, and the time to germination was shorter, in those collected from feces than from ripe fruits – indicating that passage through the marmoset's digestive tract promotes germination, or may even have caused a break in dormancy. There was no significant difference in the germination rate and time to germination for the two sets of *H. itatiaiae* seeds. The seeds were monitored from germination to seedling stage. When they reached 50 cm in height, they were removed from the greenhouse and planted in clearings in the forest, increasing the number of fruiting trees for the marmosets and other frugivores in the study area (Castro, 2002).

In the next stage of her research, Carla Castro will experiment with the seeds found in the marmosets' feces, as well as those collected from trees for *in vitro* germination. This technique has the advantage of reducing seed infestation by fungi or other pathogenic agents, since the seeds are washed in disinfectant agents, inoculated and maintained under controlled temperature and light conditions. The objective of this technique is the creation of germplasm banks to conserve the plant species dispersed by this primate (Castro, 2002).

The Study of Seed Dispersal: Future Perspectives

Post-dispersal represents the longest phase of the plant life cycle, since it involves seed germination, seedling establishment and tree maturation (Howe *et al.*, 1985). Few studies have explored this phase, likely due to the difficulty in tracking the plant's growth over a long period of development. Maria Aparecida Lopes showed that more recent studies have broadened their approach and are examining all aspects of the dispersal process – from fruit removal to seedling recruitment – with new techniques employing stable isotopes and genetic markers, which will allow for the identification of seed and seedling origin (Lopes, 2002). Participants in the roundtable emphasized the importance of preserving primate populations as a means of guaranteeing plant diversity in the Amazon and Atlantic Forests. The use of stable isotopes and genetic markers for the identification of seed and seedling origin, as well as *in vitro* germination, will provide important tools in the study of seed dispersal.

Acknowledgements: We thank the organizing committee and Stephen Ferrari (President) of the Xth Brazilian Congress of Primatology. We are also grateful to the Brazilian Science Council (CNPq) for financing research on *Callithrix jacchus*; the Margot Marsh Biodiversity Foundation and the Brazilian Higher Education Authority (CAPES) for financing research on *Alouatta guariba clamitans*; the São Paulo State Research Support Foundation (FAPESP – Fundação de Amparo à Pesquisa do Estado de São Paulo) for financing research on *Cebus apella* and *Brachyteles arachnoides*; and the CNPq and the Amazon Environmental Research Institute (IPAM – Instituto de Pesquisas Ambientais da Amazônia) for financing research on *Saguinus niger*.

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PRIMATES: EL ESTADO ACTUAL DE SU CONOCIMIENTO

La Reserva Experimental Horco Molle, dependiente de la Facultad de Ciencias Naturales e Instituto Miguel Lillo, Universidad Nacional de Tucumán, está organizando el Curso de grado "Primates: El estado actual de su conocimiento" dictado por docentes e investigadores de la Universidad de Buenos Aires (UBA) y CONICET: Dra. Marta Mudry, Lic. Mariela Nieves y Lic. Luciana Oklander. Contenido: Introducción a la Primatología, Genética, Nutrición y Comportamiento y Manejo en Cautiverio. Reserva Experimental Horco Molle, Yerba Buena, Tucumán, Argentina – 5, 6 y 7 de septiembre de 2004. Pre-inscripción hasta el 30 de abril de 2004. Informes e Inscripciones: Reserva Experimental Horco Molle, Tel: (0381) 425-0396, E-mail: <cursoprimates@hotmail.com>.

Marta Mudry, Grupo de Investigación en Biología Evolutiva (GIBE), Departamento de Ciencias Biológicas, Facultad de Ciencias Exactas y Naturales, Pabellón II, 4o Piso, Ciudad Universitaria, (1428) Buenos Aires, Argentina.

CITOGENÉTICA Y LA IDENTIFICACIÓN DE PRIMATES NEOTROPICALES EN CAUTIVERIO

Mariela Nieves realizó la Licenciatura en Ciencias Biológicas en la Facultad de Ciencias Exactas y Naturales (FCEyN) de la Universidad de Buenos Aires (UBA), Argentina. Concluyó sus estudios en diciembre de 2002 con un trabajo de Tesis titulado "Contribución de la Citogenética para la identificación de especies animales en cautiverio: El ejemplo de los primates Neotropicales". Su director fue Marta Dolores Mudry PhD. (Prof. Asoc. Dpto. de Ecología, Genética y Evolución, FCEyN-UBA). La investigación fue realizada con subsidios otorgados por el Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) y la Universidad de Buenos Aires (UBACyT). A continuación se presenta el resumen de la Tesis:

Los primates del Nuevo Mundo (Primates Neotropicales) muestran una notable diversidad distribuyéndose en las regiones boscosas desde el sur de México hasta el norte de Argentina. Desde el punto de vista taxonómico, se ha considerado que estarían representados por cuatro familias: Pitheciidae, Callithrichidae, Atelidae y Cebidae, agrupados en la Superfamilia Ceboidea. Sin embargo en el marco de la aplicación de medidas de conservación se presentan situaciones complejas ya que la distribución geográfica no es ampliamente conocida, falta de información que dificulta la posible reintroducción de determinadas especies, así como el estudio de sus características ecológicas y comportamentales. En el manejo de poblaciones en cautiverio, tradicionalmente se recurre a parámetros morfométricos para la diagnosis sistemática de los ejemplares al ingresar a los zoológicos ya que la procedencia geográfica, en general, es desconocida. Sumado a esto, la gran variedad fenotípica tanto etaria como intraespecífica en muchas oportunidades genera confusiones al momento de armar los grupos de individuos para su mantenimiento en cautiverio. En este contexto, los análisis genéticos han cobrado gran relevancia permitiendo la corroboración taxonómica tanto por medios citogenéticos como isoenzimáticos o incluso mediante análisis de marcadores moleculares que complementan las diagnosis morfológicas tradicionales.

En este trabajo de Tesis se realizaron dos estudios complementarios: Por un lado, se utilizó la Citogenética como herramienta de diagnóstico taxonómico en la sistemática de primates Neotropicales en cautiverio, tomando como ejemplo el mono araña, *Ateles* sp. (Platyrrhini: Atelidae). Por el otro lado, se realizó un estudio evolutivo de la familia Atelidae utilizando para ello tanto la citogenética comparada con técnicas de bandas G y C, como el análisis de sintenias cromosómicas identificadas por FISH. Se aplicaron métodos de reconstrucción filogenética donde las variantes cromosómicas con bandas G se utilizaron como caracteres morfológicos. El estudio citogenético-taxonómico se realizó con especímenes de *Ateles* adultos de ambos sexos, provenientes de distintos zoológicos. Los hallazgos cariológicos incluyeron medidas cromosómicas, 2N, NF y técnicas de tinción diferencial (bandas G y C) que permitieron reclasificar tres ejemplares de *Ateles chamek* que habían sido asignados a *Ateles paniscus* por diagnosis morfométrica. El estudio por FISH en ejemplares de Ceboidea (*Ateles, Alouatta* y *Cebus*) mostró la conservación de la sintenia 3-21 en las tres especies estudiadas. La filogenia cromosómica de *Ateles* mostró concordancia con otras reconstrucciones realizadas a partir de datos de ADN mitocondrial. Los resultados citogenéticos complementados con la descripción fenotípica realizada al ingreso de cada ejemplar a la institución de cautiverio permitieron el diagnóstico en ciertos casos y la reclasificación en otros, integrando desde distintas fuentes y a nivel de especie, el concepto de "evidencia total".

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Referencia

Nieves, M. 2002. Cytogenetic contribution to the identification of animal species in captivity: The case of Neotropical primates. Licenciature Thesis, University of Buenos Aires (UBA), Buenos Aires, Argentina.

PRIMATE CONSERVATION: CALL FOR GRANT PROPOSALS

Primate Conservation, Incorporated (PCI) is a not-for-profit foundation established to fund field research that supports conservation programs for wild populations of primates. Priority will be given to projects that study, in their natural habitat, the least known and most endangered species. The involvement of citizens from the country in which the primates are found will be a plus. The intent is to provide support for original research that can be used to formulate and to implement conservation plans for the species studied.

Eligibility: Primate Conservation, Inc. will grant seed monies or provide matching grants for graduate students, qualified conservationists and primatologists to study rare and endangered primates and their conservation in their natural habitat. Grants have averaged approximately $2,500, with a maximum grant of $5,000. We do not support conferences, travel to scientific meetings, legal actions, tuitions or salaries at institutions, and overhead costs.

Selection Criteria: Proposals are evaluated on a competitive basis. Applications are screened by outside reviewers and the Board of Directors of PCI. All appropriate projects will be considered, but the regions of current interest are Asia and West Africa.

Closing Dates and Notification: Deadlines for all grant application materials are March 1 and September 20. Awards will be given May 15 and December 15.

For more information, please write to Primate Conservation, Inc., 1411 Shannock Rd., Charlestown, Rhode Island 02813-3726, USA, or visit their website at <http://www.primate.org>.

PRIMATE SOCIETIES

IPS 2004 PRE-CONGRESS WORKSHOP: "CAPUCHINS: THE STATE OF THE ART"

A workshop, "Capuchins: The State of the Art," will be held prior to the XXth Congress of the International Primatological Society, Turin, Italy (23-28 August, 2004). It will take place at the Convento dell'Osservanza, Radicondoli, Siena (Tuscany), Italy, 18-22 August, 2004. The aim of the Pre-Congress is to illustrate the state of the art of scientific studies on the genus *Cebus* and to promote a peer-review of the most challenging findings. Each of the topics listed below will be presented by two discussant leaders. They will highlight the state of the art as well as the possible inconsistencies and controversies about their topic. The presentation of each topic will be followed by a general discussion guided by the discussant leaders, in which everyone may participate.

Topic 1. Social structure and ecology – Leader discussants: Linda Fedigan (University of Calgary, Alberta, Canada) and Patrícia Izar (University of São Paulo, São Paulo, Brazil); *Topic 2.* Cognition – Leader discussants: Patrizia Potì (Istituto di Scienze e Tecnologie della Cognizione, CNR, Rome, Italy) and Katie Leighty (University of Georgia, Athens, USA); *Topic 3.* Capuchin Behavioral Economics – Leader discussants: Frans de Waal (Emory University, Atlanta, USA) and Camillo Padoa Schioppa (Harvard Medical School, Boston, USA); *Topic 4.* Social learning and traditions – Leader discussants: Susan Perry (Department of Anthropology, UCLA, Los Angeles, USA and Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) and Elsa Addessi (Istituto di Scienze e Tecnologie della Cognizione, CNR, Rome, Italy). *General discussion.* Looking into the future. In addition to the above themes, the following topics will be addressed in the general discussion: (a) the new proposed taxonomy for the genus and its implications for captive management; (b) conservation, human-animal interactions. *Fees*: We will charge each participant 160 Euro (and 110 Euro for students), covering all meals (all lunches and dinner from the 18th to the the 22nd, excluding the dinner in Siena), all coffee breaks, a concert, a trip to Siena, transport from Poggibonsi to Radicondoli, and the bus trip from Radicondoli to Grosseto Railway Station (from where the train for Turin departs). The fee does not include the train ticket to Grosseto-Torino, nor lodging and breakfast. In Radicondoli there are both amazingly beautiful lodgings (60-80 Euro per person per night) and more simple rooms (20-50 Euro per person per night). All the accommodations are nice, and close to the meeting hall in the convent. *Deposit for the pre-congress fee*: There is a maximum of 70 participants, so I would urge everybody to confirm their participation by paying the fee as soon as possible. *Accommodation*: see the website at <http://www.radiconventosservanza.it> by January 2004 at the latest. If you need further help or assistance (this might be the case for room reservation at the Convento delle Suore Agostiniane), please do not hesitate to contact: <info@radiconventosservanza.it>.

Elisabetta Visalberghi, Istituto di Psicologia, Consiglio Nazionale delle Ricerche, Via Aldrovandi 16 B, 00197 Roma, Italy. E-mail: <e.visalberghi@istc.cnr.it>.

LAWRENCE JACOBSEN EDUCATION DEVELOPMENT AWARD

In honor of Larry Jacobsen's commitment to providing resources, expertise, and guidance to numerous students and researchers in the field of primatology, the Education Committee of the International Primatological Society is pleased to announce that the education award will now carry his name to recognize his outstanding contributions to the field of education and career development.

The Lawrence Jacobsen Education Development Award supports the initiation and long-term support of primate conservation education programs. This education award supports field conservation programs, work with local communities and/or schools, or provides training in conservation education techniques.

I am pleased to announce that the first recipient of this award is Dr. Gigi Joseph, Extension Education Officer of the Periyar Tiger Reserve in Kerala, India. His program entitled "Education and awareness programs to conserve lion-tailed macaques (*Macaca silenus*) in Periyar Tiger Reserve, Kerala, India" was awarded $1000 to support teacher and student training workshops on the conservation needs of the lion-tailed macaque.

Anne Savage, Vice-President for Education, International Primatological Society, Disney's Animal Kingdom, Conservation Station Administration, P. O. Box 10,000, Lake Buena Vista, FL 32830, USA.

BECOME A MEMBER OF THE INTERNATIONAL PRIMATOLOGICAL SOCIETY

To become a member of the International Primatological Society, please contact Steven J. Schapiro, IPS Treasurer and Vice President for Membership, UTMDACC, 650 Cool Water Drive, Bastrop, TX 78602, USA, Tel: +1 512 321 3991, Fax: 512 332 5208, e-mail: <sschapir@mdanderson.org>. For Regular Members the annual fee is $40.00, for Student Members $20.00, and for Lifetime Membership – a bargain for younger applicants – $520.00. A small voluntary contribution (4%) is requested when paying by credit card. IPS members receive the newsletter, edited by Katie Leighty, VP for Communication, and also a discount for registration at the Congresses, held every two years. The IPS website is: <http://www.primate.wisc.edu/pin/ips.html>.

LINDA M. FEDIGAN – NEW EDITOR OF *AMERICAN JOURNAL OF PRIMATOLOGY*

The ASP Search Committee selected and the Board of Directors approved the nomination of Linda Fedigan as the new AJP editor. Dr. Fedigan will be replacing the interim editors, Melinda Novak and Randy Keyes, in mid-January 2004. She is in the process of selecting Section Editors "to represent as wide a spectrum of expertise in primatology as possible." Dr. Fedigan, an anthropologist, received her Ph.D. from the University of Texas at Austin. She is currently a Professor of Anthropology at the University of Calgary and holds the prestigious Canada Research Chair. Linda has studied many species of primates, both in the field and in captivity – for example, Japanese monkeys, vervets, capuchins, howlers and spider monkeys. She is the author/editor of five books and over 70 journal articles and book chapters. As a widely respected and well-known primatologist, she will bring substantial credibility and strength to the office. For more information about Dr. Fedigan and her extensive research, please visit her finely designed website at <http://www.ucalgary.ca/~fedigan/fedigan.htm>.

NEOTROPICAL PRIMATES ARTICLES ACCESSIBLE THROUGH PRIMATELIT

We are pleased to announce that through the support and cooperation of Anthony Rylands and the staff at Conservation International, the full text of articles published in *Neotropical Primates* will be available through the bibliographic database, PrimateLit. This means that when you search PrimateLit and find an article published in *Neotropical Primates*, you will be provided with a URL that will link you to the issue containing that article. You will be able to read the full text online or print out the relevant publication. Links for volumes 1-8 have been added; links for volumes 9-10 will be available shortly.

With support from NCRR grant RR 15311, Coordinated Information Services for Primate Research, the Wisconsin Primate Center is engaged in a project to scan key primate newsletters so that users of PrimateLit can link directly to the full text of articles indexed by the Primate Information Center, Seattle. We have approximately ten other primate newsletters that we hope to scan and make accessible through the database. PrimateLit already includes links to over 65,000 biomedical articles indexed in the National Library of Medicine's PubMed. Within the limitations of copyright, our goal is to make PrimateLit a window to the literature of primatology and accessible, particularly to those in areas where primates are endemic and where print resources may not be readily available.

If you have suggestions for titles to include in our scanning project, please contact the scanning project coordinator, Ray Hamel, at <hamel@primate.wisc.edu>. PrimateLit is available at: <http://primatelit.library.wisc.edu/>.

E-MAIL LISTS FOR *LABORATORY PRIMATE NEWSLETTER*

The *Laboratory Primate Newsletter*, which has gone (more or less) completely electronic, announces two new e-mail lists in addition to the original LPN-L, which sends out the complete plain-text contents of each issue (no pictures, graphs, bold-face type, etc.).

The first new list is LPN-WARN, which simply announces that a new issue has been put on our website at <http://www.brown.edu/primate>. Starting with volume 42, number 1 (January 2003), a PDF file of each issue is included on the web, so that readers can use an Adobe Acrobat reader to print out their very own LPN, identical to what we used to print (except that it will be stapled on the side, instead of in the center of a double-sized sheet of paper).

The second list is LPN-PDF, which sends out the immense PDF file to subscribers. Frankly, we don't know why anyone would want to get this and clog their mailboxes; but people *do* want it, so we provide it.

To subscribe to any of these options, send a message as follows:

SUBSCRIBE LPN-L your-own-name
SUBSCRIBE LPN-WARN your-own-name
SUBSCRIBE LPN-PDF your-own-name

to LISTSERV@LISTSERV.BROWN.EDU.

All of these lists are used quarterly, since the LPN is a quarterly publication. There may be an occasional announcement besides, but that has been rare in the past.

If you have paid for paper issues of the LPN, you will continue to receive them until your subscription runs out, but we will not accept renewals unless you wish to pay the (exorbitant) price of $60/year in the U.S. or $80/year outside the U.S.

And, if you have paid, but are now willing to print your own copies, please let us know and we will send our blessings and thanks.

Judith E. Schrier, Editor, Laboratory Primate Newsletter, Box 1853, Psychology Department, Brown University, Providence, RI 02912, USA, e-mail <primate@brown.edu> and on the web at <http://www.brown.edu/primate/>.

AMAZON.COM PURCHASES HELP ASP CONSERVATION FUND

Since October 1, 1999, anyone who purchased goods from Amazon.com through the link on the ASP website (http://www.asp.org/links/index.html) has been contributing to the ASP Conservation Fund! Through our associate relationship with Amazon.com, ASP earns 5% on purchases of most of the goods they sell. (Certain items, like some tools, don't generate the 5% return to ASP.) In the past four years the Society has earned over $1000 for conservation. Best of all, you don't have to be an ASP member to purchase this way. So, let your friends and relatives know: purchases at Amazon.com will generate a 5% donation to our conservation fund. The only caveat is that **you must enter Amazon.com through the link on the ASP site**, not through the main Amazon.com homepage. Entering through our link is the only way that Amazon.com knows which purchases are assigned to ASP. Do your online shopping at Amazon.com through our link, and support primate conservation!

Nancy Capitanio, Webmaster, American Society of Primatology at <http://www.asp.org>.

RECENT PUBLICATIONS

A MUST-HAVE BOOK FOR PRIMATE-WATCHERS

Setchell, J. M. and Curtis, D. J. (eds.). 2003. *Field and Laboratory Methods in Primatology: A Practical Guide.* Cambridge University Press, Cambridge, UK. 343 pp. $100.00 (USD). Reviewed by Clara B. Jones.

If this book had been available when I began conducting field studies in 1973, I would have learned fewer lessons by trial and error. Setchell and Curtis, researchers in the early years of their careers, have produced a comprehensive and knowledgeable volume summarizing many of the most important aspects of primate research. In their words, "If this book proves useful to fieldworkers, acts to stimulate research and understanding of primates in their natural state, and through that increased knowledge can make some small contribution to primate conservation, then we will have achieved our aim" (Curtis and Setchell, 2003: 12). *Field and Laboratory Methods in Primatology* (hereafter, *FLMP*) is likely to accomplish the authors' objectives. Since their Introduction includes a detailed overview of the volume, here I will highlight what seem to me its primary strengths and weaknesses.

It is necessary to reveal a bias borne of age and, perhaps, fading memory. Like elders recalled from my own youth, I note a growing tendency to romanticize my early years in the field and, armed with anecdote, to exaggerate my past experiences studying monkeys. But I do think it may be accurate to say that when I began as a fieldworker, research was conducted with fewer ethical constraints – or, rather, with less self-consciousness about these issues. One rarely hesitated to collect animals, to conduct field manipulations, to mark individuals, to place weighty transmitter collars around their necks, and otherwise intervene in the natural course of events, as long as this was considered to serve the ends of Science (with a capital "S"). I fear that, perhaps due to the critical losses of biodiversity, purely scientific ends have been compromised. Surely the issue of primate conservation is a compelling one for all of the contributors to *FLMP*, and it is unlikely that any primatologist today can separate his or her science from a concurrent concern for the fate of prosimians, monkeys, and apes.

Among the numerous strengths of this book are its balanced emphasis upon Neotropical and Paleotropical species, recommendations of websites and products, well-documented reviews, chapters covering poorly known topics not emphasized in most graduate programs (e.g., chronobiology, field endocrinology), and a humorous but practical concluding chapter of "tips" from Adaptors to Zip-lock Bags. There are, however, some disappointments. Certain "litanies" of field work common when I was trained are not included (e.g., safe procedures for tasting fruit, the danger of many extravagant species [e.g., orchids, frogs], and the importance of wearing dull-colored clothing [a lesson learned from Louis Leakey who, to my delight, was a Visiting Scientist at Cornell during my graduate training]). Another significant omission is the failure to provide instruction for the use of rappelling equipment to climb trees or descend rock faces, and I think that a chapter on procedures for studying "recognition mechanisms" (e.g., individual, kin) should have been included in the book. Perhaps most seriously for myself, however, was to see Jeanne Altmann's classic paper on observational study attributed to Stuart Altmann on page xxiii. In the early 1970s, a professor gave me a copy of this paper when it was circulating for commentary in preprint form, creating one of my most pleasurable memories from graduate school.

Throughout my reading of *FLMP*, I was aware in almost every chapter of the distance still remaining between biologists and many social scientists. The contributors, most of whom are anthropologists, appear to be interested in primates primarily in their own right, and especially in relation to humans, rather than as components of communities and ecosystems governed by "first principles." Approaches to the study of animals found in mainstream ecology and natural history journals (e.g., *Ecology*, *Oikos*, *Conservation Biology*, *The American Naturalist*) are, on the whole, not reflected in this volume. If primatologists are to become integrated with the wider community of natural scientists, it will be necessary for us to adopt standard approaches and procedures of population, community and ecosystem ecology, not only the science of the individual and his or her group or population.

Primates are evolved taxa positioned in the dynamic context of abiotic and biotic forces, subject to the same constraints governing other taxa, and the present volume neither provides such a holistic (ecological) perspective nor the insights or procedures required to study the Order with the tools of population, community and ecosystem ecology. The website of the American Society of Mammalogists (see <http://www.mammalsociety.org/pubsociety/index.html>) and those of other professional societies relevant to mammalogists include publications that would be helpful to primatologists, based upon the perspectives and procedures taught in tropical biology field courses (e.g., courses sponsored by the Organization for Tropical Studies) rarely attended by students of primates. My own personal bias is that primatology should be absorbed into mammalogy and ecology; but my quibbles are not intended to detract from a solid text reflecting the current state of methods and procedures in field and laboratory research on primates. Setchell and Curtis are to be congratulated for editing a volume that every aspiring fieldworker should read before committing to a career in primatology, and that primate researchers are advised to carry with them at all times in the field.

Clara B. Jones, Theoretical Primatology Project, 1105 North Jackson Street, Salisbury, NC 28144, USA. E-mail: <theoreticalprimatology@hotmail.com>, website: <http://www.robertwilliams.org/tpp>.

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Altmann, J. 1974. Observational study of behavior: Sampling methods. *Behaviour* 49: 227-267.

Curtis, D. J. and Setchell, J. M. 2003. Introduction. In: *Field and Laboratory Methods in Primatology: A Practical Guide*, J. M. Setchell and D. J. Curtis (eds.), pp. 1-14. Cambridge University Press, Cambridge.

BOOKS

De Apen van Suriname – The Monkeys of Suriname, by Sue Boinski. Stichting Natuurbehoud Suriname (STINASU), Paramaribo, Suriname. 2002. 64pp. ISBN 99914-964-2-4. In Dutch and English. This interesting guide to the eight primate species occurring in Suriname includes a sketch map of the country and its protected areas. The introduction to the guide includes sections on Suriname and its natural vegetation, a short review of the theories regarding the appearance of primates in South America, "Why does Suriname have eight species of monkeys?", what the Suriname monkeys eat, "Why conservation?", "Why do monkeys live in troops?", how to watch monkeys and what to look for, and where they can be found in Suriname. The remainder describes the eight species, their behavior and ecology, and where they can best be seen: *Saguinus midas*, *Saimiri sciureus*, *Cebus apella*, *Cebus olivaceus*, *Chiropotes satanas*, *Pithecia pithecia*, *Ateles paniscus*, and *Alouatta seniculus*. There is a centre spread of color photos of each species, and the booklet is amply and beautifully illustrated by Stephen D. Nash. At the end is a short discussion of some taxonomic aspects. Available from: STINASU – Stichting Natuurbehoud Suriname, P. O. Box 12252, Paramaribo, Suriname. Website: <http://www. stinasu.sr>.

A Biodiversidade nos Grandes Remanescentes Florestais do Estado do Rio de Janeiro e nas Restingas da Mata Atlântica, por Carlos Frederico Duarte da Rocha, Helena de Godoy Bergallo, Maria Alice dos Santos Alves e Monique Van Sluys. 2003. RiMa Editora, Rio de Janeiro. 134pp. ISBN 85-86552-49-6. Parceria: Departamento de Ecologia, Instituto de Biologia, Universidade Estadual do Rio de Janeiro (UERJ), Instituto Biomas e Centro de Conservação da Biodiversidade da Conservation International do Brasil. Apoio Fundação Brasileira para a Conservação da Natureza (FBCN). Roberto Cavalcanti, ex-Presidente da Conservation International do Brasil, escreveu, "Para conservar é preciso saber onde estão as oportunidades e o que tem de ser feito. Este livro apresenta um diagnóstico precioso do patrimônio natural remanescente no Estado do Rio de Janeiro. A obra comprova que o Estado é privilegiado em termos de biodiversidade e que, embora sejam gravíssimas as ameaças à sobrevivência das espécies únicas da região, a situação atual pode ser revertida a fim de melhorar o ambiente natural e garantir a qualidade de vida das pessoas e das espécies com que compartilhamos o planeta. Por meio de linguagem técnica mas acessível, os autores descrevem a geologia, o clima, os solos e a biota dos principais blocos de floresta do Rio de Janeiro, dando destaque às unidades de conservação e à sua biodiversidade. Mostram que os parques e reservas não estão ali por capricho ou acaso; sua função é conservar a biota nativa e permitir que gerações futures possam continuar a coexistir com as espécies que sempre nos fascinaram. Trata-se de obra essencial para todos os envolvidos com conservação, planejamento e educação ambiental." Sumário: Prefácio – L. P. Pinto, pp.ix-x; Apresentação, pp.xi-xiii. Parte I. O estado da Biodiversidade no Estado do Rio de Janeiro. 1. Os grandes blocos de remanescentes florestais no Estado do Rio de Janeiro, pp.3-32; 2. Esforço de conservação nos blocos de grandes remanescentes do Estado do Rio de Janeiro, pp.33-36; 3. Fatores predominantes de pressão de degradação nos grandes blocos de remanescentes florestais, p.37-42; 4. A relevância do estabelecimento de corredores interligando os grandes remanescentes florestais do Estado do Rio de Janeiro, pp.43-46; 5. Estado do conhecimento científico biológico nos grandes blocos de remanescentes florestais do Estado do Rio de Janeiro, pp.47-48; 6. Espécies endêmicas e ameaçadas de vertebrados terrestres nos grandes blocos de remanescentes florestais do Estado do Rio de Janeiro, pp.49-67. Parte II. A Biodiversidade nas Restingas dos Corredores da Serra do Mar e Central da Mata Atlântica. 7. Diagnóstico do estado de conservação da biodiversidade das restingas do Corredor da Serra do Mar e do Corredor Central da Mata Atlântica, pp.71-74; 8. Fatores predominantes de pressão de degradação nas restingas dos corredores e diversidade de vertebrados terrestres, pp.75-80; 9. A fragmentação dos habitats de restinga e a ordenação na extinção das espécies das comunidades de vertebrados terrestres, pp.81-84; 10. Esforço de conservação nas restingas do Corredor da Serra do Mar e do Corredor Central da Mata Atlântica, pp.85-88; 11. Vertebrados terrestres endêmicos e ameaçados, pp.89-100; 12. Indicadores biológicos para monitoramento da biodiversidade, pp.101-108; 13. Ampliação da extensão de áreas protegidas e criação de novas áreas para conservação nos grandes blocos de remanescentes florestais e nas restingas dos Corredores da Serra do Mar e Central da Mata Atlântica, pp.109-112; Recomendações, pp.113-116. *Para maiores informações*: Carlos Frederico Duarte da Rocha, Departamento de Ecologia, Instituto de Biologia Roberto Alcântara Gomes, Universidade Estadual do Rio de Janeiro, Rua São Francisco Xavier 524, Maracanã, 20550-013 Rio de Janeiro, RJ, Brasil, e-mail: <cfdrocha@uerj.br>.

Gerenciamento de Áreas de Proteção Ambiental no Brasil, editado por Sandra Maria dos Santos Guapyassú. Fundação O Boticário de Proteção à Natureza, Curitiba, Paraná, Brasil. 2003. 144pp. ISBN 85-88912-03-1. Resultado de um *Workshop* "Panorama das Áreas de Proteção Ambiental no Brasil", realizado em outubro de 2002 e fruto de parceria entre a Fundação O Boticário de Proteção à Natureza e The Nature Conservancy do Brasil. Esta publicação é dividida em quarto partes. Na Parte I são desenvolvidas seis temas relacionadas com a gestão de APA, através de 31 perguntas e respostas discutidas durante o *Workshop*. Partes II e III correspondem à síntese das palestras e estudos de caso apresentados por gestores ou por profissionais que foram especialmente convidados a fazer apresentações técnicas durante o *Workshop*. Na Parte IV encontra-se um mapa com a localização da maioria das APA formalmente representados no *Workshop*, como também uma síntese das características das APAs, contendo dados como: localização, tamanho, tipos de biomas, existência de Conselho e de instrumentos gerenciadores, entre outros, preenchidos pelos seus responsáveis técnicos. *Escreva para*: Fundação O Boticário de Proteção à Natureza, Rua Gonçalves Dias 225, Batel, 80240-340 Curitiba, Paraná, Brasil. Website: <http://www. fundacaoboticario.org.br>.

Mamíferos del Parque Nacional Madidi, by Teresa Tarifa, Enzo Aliaga Jr., Boris Ríos U. and Daniel Hagaman. Conservación Internacional – Bolivia and Albergue Ecológico Chalalán. 2001. 194pp. ISBN 99905-0-106-8. In Spanish and English. This attractive pocket guide is dedicated to the mammalogist Sydney Anderson. It covers all mammals known to occur in the Madidi National Park which weigh more than 200 g, including eight primates. The treatment for each species includes an illustration and a distribution map, plus notes on identification, body measurements, habitat and habits, and conservation status – and for the terrestrial mammals, a description and illustration of their tracks. *Available from*: Conservacíon Internacional – Bolivia, Caller M. Pinilla No. 291, Esq. Av. 6 de Agosto, Casilla 13593, La Paz, Bolivia, Tel: (591-2) 434058 / 435225, e-mail: <ci-bolivia@conservation.org>.

Métodos de Estudos em Biologia da Conservação e Manejo de Vida Silvestre, editado por Laury Cullen, Jr., Rudy Rudran e Cláudio B. Valladares-Pádua. Editora UFPR e Fundação O Boticário de Proteção à Natureza, Curitiba, Paraná. Série Pesquisa No. 8. 2003. 667pp. ISBN 85-7335-114-4. Preço: R$45,00. Trata-se de um novo aprendizado ligado às questões socioambientais, no qual a teoria e prática são inseparáveis. Um livro didático e no mesmo tempo pioneiro na sua abordagem dos mais importantes princípios e práticas na biologia de conservação. Imprescindível leitura para todos. *Conteudo*: Apresentação – Suzana Machado Padua. Parte 1. Macroinvertebrados, Mamíferos e Aves. Estimativas de riqueza em espécies – A. J. dos Santos, pp.19-41; Macroinvertebrados aquaticos como indicadores ambientais da qualidade de água – D. P. Eaton, pp.43-67; Diversidade de macroinvertebrados em riachos – A. S. Melo, pp.69-90; Captura e marcação de animais silvestres – P. R. Mangini & P. A. Nicola, pp.91-124; Insetos como indicadores ambientais – A. V. L. Freitas, R. B. Francini & K. S. Brown, Jr., pp.125-151; Métodos para estudos com aves – P. F. Devely, pp.153-168; Transectos lineares na estimativa de densidade de mamíferos e aves de médio e grande porte – L. Cullen, Jr. & R. Rudran, pp.169-179; Levantamento rápido de mamíferos terrestres de médio e grande porte – R. Pardini, E. H. Ditt, L. Cullen, Jr., C. Bassi & R. Rudran, pp.181-201; Manejo e controle de danos causados por espécies da fauna – S. M. C. Cavalcanti, pp.203-242; Uso de armadilhas fotográficas em levantamentos populacionais – W. M. Tomas & G. H. B. de Miranda, pp.243-267; Armadilhamento fotográfico de grandes felinos: Algumas considerações importantes – U. Karanth, J. D. Nichols & L. Cullen, Jr., pp.269-284; Radiotelemetria em estudos populacionais – A. A. Jacob & R. Rudran, pp.285-342; Metodologias moleculares utilizadas em genética da conservação – B. M. Perez-Sweeney, F. P. Rodrigues & D. Melnick, pp.343-380. Parte 2. Vegetação e Ecologia de Paisagem. Restauração e conservação de ecossistemas tropicais, P. Kageyama & F. B. Gandara, pp.383-394; Fenologia, frugivoria e dispersão de sementes – M. Galetti, M. A. Pizo & P. C. Morellato, pp.395-422; Estrutura da paisagem: O uso adequado das métricas – J. P. Metzger, pp.423-453; Métodos para análise de vegetação arbórea – G. Durigan, pp.455-479; Conservação em paisagens fragmentadas – E. Rodrígues, R. L. P. Cainzos, J. Queiroga & B. C. Herrmann, pp.481-511. Parte 3. Análises Estatísticas. Estatística e interpretação de dados – P. de Marco Jr. & A. P. Paglia, pp.515-538; Delineamento de experimentos numa perspectiva de ecologia da paisagem – J. P. Metzger, pp.539-553. Parte 4. Educação Ambiental e Conservação. A abordagem participativa na educação para a conservação da natureza – S. M. Padua, M. F. Tabanez & M. das G. de Souza, pp.557-591; Análise da sustentabilidade de caça em florestas tropicais no Peru – Estudo de caso – R. E. Bodmer & J. G. Robinson, pp.593-629; Entrevistas e aplicação de questionários em trabalhos de conservação – E. M. Ditt, W. Mantovani, C. B. Valladares-Pádua & C. Bassi, pp.631-646; Manejo integrado de espécies ameaçadas – C. B. Valladares-Pádua, C. S. Martins & R. Rudran, pp.647-665. O livro poderá ser adquirido na: Editora da Universidade Federal do Paraná, Centro Politécnico, Jardim das Américas, Caixa Postal 19.029, 81531-980 Curitiba, Paraná, Brasil, Tel/Fax: (41) 361-3380. Website: <http://www.editora.ufpr.br>.

Monogamy: Mating Strategies and Partnerships in Birds, Humans, and Other Mammals, edited by Ulrich H. Reichard and Christophe Boesch. Cambridge University Press, Cambridge, UK. 2003. 278pp. ISBN: 0521819733 (cloth), ISBN: 0521525772 (paperback). Price: $100.00 (cloth), $40.00 (paperback). Why do males of some species live with a single mate when they are capable of fertilizing more than one female's eggs? Why do some females pair only with one male, and not with several partners? Why do birds usually live in pairs and feed chicks together, whilst mammals often live in larger groups with females rearing their young without male help? These questions form the central theme of this book. Social monogamy is a complex, multi-faceted phenomenon that does not always correspond with reproductive monogamy, so a paired male may not necessarily be raising his own offspring. Exploring the variables influencing and maintaining the fascinating diversity of social, sexual and reproductive monogamous partnerships in birds, mammals and humans, this book provides clues to the biological roots of monogamy for students and researchers in behavioural ecology, evolutionary anthropology, primatology, zoology and ornithology. *Contents*: 1. Monogamy: Past and present – U. H. Reichard. Part I. Evolution of Social Monogamy. 2. The evolution of monogamy: Mating relationships, parental care and sexual selection – A. P. Moller; 3. Mate guarding and the evolution of social monogamy in mammals – P. N. M. Brotherton & P. E. Komers; 4. The evolution of social monogamy in primates – C. P. van Schaik & P. M. Kappeler; 5. The evolution of social and reproductive monogamy in *Peromyscus*: Evidence from *Peromyscus californicus* (the California mouse) – D. O. Ribble. Part II. Reproductive Strategies of Socially Monogamous Males and Females. 6. Social functions of copulation in the socially monogamous razorbill (*Alca torda*) – R. H. Wagner; 7. Social and reproductive monogamy in rodents: The case of the Malagasy giant jumping rat (*Hypogeomys antimena*) – S. Sommer; 8. Social polyandry and promiscuous mating in a primate-like carnivore, the kinkajou (*Potos flavus*) – R. Kays; 9. Monogamy correlates, socioecological factors, and mating systems in beavers – Lixing Sun; 10. Social monogamy and social polygyny in a solitary ungulate, the Japanese serow (*Capricornis crispus*) – R. Kishimoto. Part III. Reproductive Strategies of Human and Non-human Primates. 11. Ecological and social complexities in human monogamy

– B. S. Low; 12. Social monogamy in a human society: Marriage and reproductive success among the Dogon – B. I. Strassmann; 13. Social monogamy in gibbons: The male perspective – U. H. Reichard; 14. Pair living and mating strategies in the fat-tailed dwarf lemur (*Cheirogaleus medius*) – J. Fietz; 15. Social monogamy and its variations in callitrichids: Do these relate to the costs of infant care? – Anne W. Goldizen; 16. Monogamy in New World primates: What can patterns of olfactory communication tell us? – Eckhard W. Heymann. Available from: Cambridge University Press, 40 West 20th Street, New York, NY 10011-4221, 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>.

Nutrient Requirements of Nonhuman Primates, edited by the National Research Council of The National Academies. Second Revised Edition, 2003. The National Academies Press, Washington, DC. 286pp. ISBN 0-309-06989-0 (paperback). The Second Revised Edition 2003 is an update on the previous 1972 and 1978 First Editions, covering over 250 species of primates. Chapter 1 is new and discusses foraging in the wild, gastrointestinal morphology and physiology of prosimians, marmosets, cebids, colobines, non-colobine cercopithecines, and the apes. Chapter 2 covers energy requirements of adults, growth of young, pregnancy and lactation. Chapter 3 discusses carbohydrates including classification and digestion, incorporating examples of wild sources of fiber and what fiber levels are found in captive primate diets. Chapter 4 covers protein sources and requirements, Chapter 5 fats and fatty acids, Chapter 6 minerals, Chapter 7 vitamins, and Chapter 8 water requirements. Chapter 9 discusses pathophysiologic and life-stage considerations, and Chapter 10 diet formulation and dietary husbandry. Chapter 11 covers nutrient requirements and purified and semipurified diets. Chapter 12 is comprised largely of tables – including, for example, the composition of important feeds, mineral concentrations in macro- and micromineral sources, and the characteristics of various sources of fats and oils. Chapter 13 examines food as a component of environmental enrichment. Mary Ellen Goldberg (Virginia Commonwealth University, Richmond, VA), who reviewed the book for Primate-Science Book Reviews, Primate-Science List Serve (<http://www.primate.wisc.edu/pin/review/goldbergreview.html>) (July 2, 2003), concluded that the book "encompasses everything imaginable under the topic of Nutrient Requirements of Nonhuman Primates. There should be a copy in every facility, whether public or private, to be referred to, most probably weekly. I can highly recommend this text and admit to enjoying it more than any other nutrition text I've read." This book is available from the National Academies Press at <http://www.nap.edu/catalog/9826.html>, where it can be ordered in hardcopy or browsed online.

Primate Life Histories and Socioecology, edited by Peter M. Kappeler and Michael E. Pereira, 2003. 416pp. The University of Chicago Press, Chicago. ISBN 0 226 42463 4 (cloth), 0 226 42464 2 (paperback). Price: Cloth - $75.00, Paper - $30.00. The first systematic attempt to understand relationships among primate life histories, ecology, and social behavior. Topics covered include how primate life histories interact with rates of evolution, predator pressure, and diverse social structures; how the slow maturation of primates affects the behavior of both young and adult caregivers; and reciprocal relationships between large brains and increased social and behavioural complexity. *Contents*: Foreword – R. D. Martin, xi-xx; Primate life histories and socioecology – P. M. Kappeler, M. E. Pereira & C. P. van Schaik, pp.1-23. Part 1. Life History and Socioecology. Primate life histories and phylogeny – A. Purvis, A. J. Webster, P.-M. Agapow, K. E. Jones & N. J. B. Isaac, pp.25-40; Socioecological correlates of phenotypic plasticity of primate life histories – P. C. Lee & P. M. Kappeler, pp.41-65; Matrix models for primate life history analysis – S. C. Alberts & J. Altmann, pp.66-102; Puzzles, predation, and primates: Using life history to understand selection pressures – C. H. Janson, pp.103-131; Adaptations to seasonality: Some primate and nonprimate examples – J. U. Ganzhorn, S. Klaus, S. Ortmann & J. Schmid, pp.132-144. Part 2. Development. Modes of primate development – M. E. Pereira & S. R. Leigh, pp.149-176; Dental development and primate life histories – L. R. Godfrey, K. E. Samonds, W. L. Jungers & M. R. Sutherland, pp.177-203; Human life histories: Primate trade-offs, grandmothering socioecology, and the fossil record – K. Hawkes, J. F. O'Connell & N. G. Blurton-Jones, pp.204-227. Part 3. Evolution of Primate Brains. Primate brains and life histories: Renewing the connection – R. O. Deaner, R. A. Barton & C. P. van Schaik, pp.233-265; Life history, infant care strategies, and brain size in primates – C. Ross, pp.266-284; Why are apes so smart? – R. I. M. Dunbar, pp.285-298. Part 4. Where do we go from here? Primate life histories and future research – S. C. Stearns, M. E. Pereira & P. M. Kappeler, pp.301-311. Appendix – A primate life history database, pp.313-330. *Available from*: The University of Chicago Press, e-mail: <sales@press.uchicago.edu>. Website: <http://www.press.uchicago.edu/cgi-bin/hfs.cgi/00/15344.ctl>.

Primates de la Amazonía del Ecuador / Primates of Amazonian Ecuador, by Stella de la Torre, 2000, 60pp. ISBN 9978-41-577-7. Part of the *Serie Fauna del Ecuador*, published by the Corporación Sociedad para la Investigación y Monitoreo de la Biodiversidad Ecuatoriana (SIMBIOE), Quito. In Spanish and English. An excellent little field guide, with color illustrations of Ecuador's 15 primate species. Following an introduction, treatments of each species include the common name, a distribution map, and sections which describe their appearance and provide information on social structure, habitat, and feeding habits. *Available from*: SIMBIOE, Av. Amazonas 2915 e Inglaterra, Edificio Inglaterra, Piso 2, Apartado 17-11-6025, Quito, Ecuador, Tel: (593-2) 431-097, 452-596, Fax: (593-2) 442-771, e-mail: <mamiferosdelecuador@yahoo.com>.

Primates de Colombia, by Thomas R. Defler, 2003, 543pp. Conservación Internacional, Bogotá, Colombia. ISBN

1-881173-73-9. *Conservación Internacional Serie de Guías Tropicales de Campo*, edited by Jose Vicente Rodríguez-Mahecha. In Spanish. Illustrations by Stephen D. Nash, César Lanadazábal Mendoza and Margarita Nieto Díaz. This is a remarkable and amply and beautifully illustrated guide and compilation of information on 27 species of primates occurring in the country. Following presentations by Peter Seligmann (CEO, Conservation International), Russell A. Mittermeier (President, Conservation International) and Fabio Arjona (Executive Director, Conservación Internacional Colombia) and a Prologue by Jose Vicente Rodríguez-Mahecha, the author reviews Colombian primate diversity, prehistory and zoogeography and the phylogeny of the platyrrhines and their classification, and summarizes the conservation status of the Colombian primates. The species are divided into four families: Cebidae (*Callimico*, *Cebuella*, *Saguinus*, *Cebus* and *Saimiri*), Aotidae (*Aotus*), Atelidae (*Alouatta, Ateles, Lagothrix*), and Pitheciidae (*Callicebus, Cacajao, Pithecia*). Descriptions and treatments of the species and subspecies are comprehensive, with colour illustrations of each, drawings of the skulls of each genus, and line drawings of typical postures and behaviors. Excellent range maps are provided for all species and subspecies. At the end there is an extensive glossary of terms and a comprehensive bibliography for the New World primates and Colombian primates in particular. The book is dedicated (with a wonderfully appropriate photograph of a sleeping "mono", *Alouatta seniculus*) *in memoriam* to Jorge I. Hernández-Camacho, naturalist and mentor of the author. It will serve not only as a guide to identifying Colombia's primate species and subspecies, but is also an excellent compendium and source of information for conservation and research efforts on their behalf. *Available from*: Thomas R. Defler, Instituto Imani, Universidad Nacional de Colombia, Leticia, Colombia, e-mail: <caparu@tutopia.com>, or Jose Vicente Rodríguez-Mahecha, e-mail: <jvrodriguez@conservation.org>.

Primates Face to Face: The Conservation Implications of Human-nonhuman Primate Interconnections, edited by Agustin Fuentes and Linda Wolfe, 2002. 358pp. Cambridge Studies in Biological and Evolutionary Anthropology, 29. Cambridge University Press, Cambridge, UK. ISBN 0 521 79109X. Price: Hardback £60.00. As our closest evolutionary relatives, nonhuman primates are integral elements in our mythologies, diets and scientific paradigms, yet most species now face an uncertain future through exploitation for the pet and bushmeat trades, as well as progressive habitat loss. New information about disease transmission, dietary and economic linkage, and the continuing international focus on conservation and primate research have created a surge of interest in primates, and focus on diverse interaction of human and nonhuman primates has become an important component in primatological and ethnographic studies. By examining the diverse and fascinating range of relationships between humans and other primates, and how this plays a critical role in conservation practice and programs, *Primates Face to Face* disseminates the information gained from the anthropological study of nonhuman primates to the wider academic and nonacademic world. *Available from*: Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211, USA, Tel: (800) 872-7423, Fax: (914) 937-4712, e-mail: <directcustserve@cambridge.org>. Website: <http://www.cambridge.org>.

The Trade in Wildlife: Regulation for Conservation, edited by Sara Oldfield. 2002. Earthscan Publications, London. ISBN 1 85383 954 X (hardback), 1 85383 959 0 (paperback). Price: £48.00 (hardback) and £17.95 (paperback). This book provides a critical assessment of how the trade in wildlife is currently regulated and how the regulations are enforced. Through analysis of case studies and comparisons with the trade in illegal goods, it shows what the weaknesses are and where the system is failing. It points the way to what must be done if conservation efforts are to be supported by trade regulations, and not undermined. *Contents*: Preface – Michael Meacher. Part 1. Background. The nature and extent of legal and illegal trade in wildlife; What is the goal of regulating wildlife trade?; Is regulation a good way to achieve this goal?; Regulatory design; Regulation, conservation and incentives; Control and the holy grail. Part 2. Systems Regulation and Enforcement. Compliance and enforcement mechanisms of CITES; The European Community wildlife trade regulations; Evolution, impact and effectiveness of domestic wildlife trade bans in India. Part 3. Case Studies. Regulation and protection: successes and failures in rhinoceros conservation; Elephant poaching and resource allocation for law enforcement; Crocodiles: legal trade snaps back; Regulation of the timber trade; Bushmeat: traditional regulation of or adaptation to market forces; The impact of the proposal to list the Devil's Claw on Appendix II of CITES; The need for a better understanding of context when applying CITES regulations: the case of the Indonesian parrot – *Tanimar corella*. Part 4. Lessons from Illegal Trade in Other Goods. Lessons from the control of illegal trade in ozone-depleting substances, fisheries and timber; The controlled trade in drugs; Lessons from the trade in illicit antiquities. Conclusion: Looking ahead: international wildlife regulation and enforcement. Contributors: S. Broa, T. Mulliken, D. Roe, N. Sinclair-Brown, B. Moyle, M. Murphree, J. C. Vasquez, D. Morgan, M. Misra, N. Leader-Williams, H. Jachmann, J. Hutton, G. Webb, S. Oldfield, W. Bowen-Jones, C. Lombard, P. du Plessis, P. Jepson, D. Brack, D. Lowe, N. Brodie and R. Cooney.

Other titles from Earthscan Publications include: *Policing International Trade in Endangered Species: The CITES Treaty and Compliance*, by Rosalind Reeve (£19.95 – paperback and £50.00 – hardback), and *Endangered Species, Threatened Convention: The Past, Present and Future of CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora*, edited by J. Hutton & B. Dickson (£14.95 – paperback and £35.00 – hardback). Available from: Earthscan, 120 Pentonville Road, London, N1 9BR, UK, Fax: +44 (0)20 7278 1142, e-mail: <earthinfo@earthscan.co.uk>. Website: <http://www.earthscan.co.uk>.

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MEETINGS

2004

XXV Congresso Brasileiro de Zoologia, 8 a 13 de fevereiro, 2004, Brasília. Promovido pela Sociedade Brasileira de Zoologia. Organização: Departamento de Zoologia, Universidade de Brasília. O tema será "A Conservação da Fauna do Cerrado". Maiores informações: <http://www.unb.br/ib/zoo/CBZ/>.

Catalysts for Conservation: A Direction for Zoos in the 21st Century, 19-20 February, 2004, Zoological Society of London, Regent's Park, London, UK. Chester Zoo is proud to co-organize an international symposium hosted by The Zoological Society of London and the Wildlife Conservation Society. This symposium will challenge the global zoo community to review its conservation missions. It will bring together leading thinkers and practitioners familiar with the *in situ* and *ex situ* conservation roles of zoos. Speakers will aim to define a new conservation vision for zoos and aquariums that increases their contribution to tackling the on-going global biodiversity crisis. Organized by Alexandra Zimmermann (North of England Zoological Society), Chris West (Zoological Society of London), Matthew Hatchwell (Wildlife Conservation Society) and Richard Lattis (Wildlife Conservation Society). For further details contact: Alexandra Zimmermann, NEZS Conservation Coordinator, at <a.zimmermann@chesterzoo.co.uk> or Deborah Body, ZSL Scientific Meetings Coordinator, at <deborah.body@zsl.org> or visit <http://www.zsl.org/publication/meeting.html>.

Student Conference on Conservation Science, 24-26 March, 2004, Department of Zoology, University of Cambridge, UK. Plenary lectures by four leading figures in the field: Prof. Gretchen Daily (Stanford University), Prof. Kathy Homewood (University College, London), Prof. John Reynolds (University of East Anglia) and Dr. Bob Watson (The World Bank and former Chair, IPCC). For more information see the website: <http://www.zoo.cam.ac.uk/sccs>.

73rd Annual Meeting of the American Association of Physical Anthropologists, 14-17 April, 2004, Tampa, Florida. Hosted by the University of South Florida, the meeting will be held at the Hyatt Regency Tampa Hotel. For program information, contact John H. Relethford, Dept. of Anthropology, State Univ. of New York, College at Oneonta, Oneonta, NY 13820, phone: (607) 436-2017, fax: (607) 436-2653, e-mail: <relethjh@oneonta.edu>. For more information visit the AAPA meeting website at <http://www.physanth.org/annmeet>.

27th Meeting of The American Society of Primatologists, 8-11 June, 2004, Madison, Wisconsin. Hosted by the Wisconsin Regional Primate Research Center and the Department of Anthropology at the University of Wisconsin. Meeting sessions will be held in the Memorial Union at the University of Wisconsin. For information on registration and submission guidelines, please see the website at <http://www.asp.org/asp2004/index.htm>.

41st Meeting of the Animal Behavior Society, 12-16 June, 2004, Oaxaca, Mexico. For the first time, the Animal Behavior Society will meet outside English-speaking North America, with the vision of becoming a more geographically diverse society. Scientists from the Universidad Nacional Autónoma de México, Mexico City, the Universidad Autónoma de Tlaxcala, Tlaxcala and the Instituto de Ecología, Xalapa, Veracruz, will host the meeting. For more information contact Shan D. Duncan at <sdduncan@abs.animalbehavior.org>, or visit the websites at: <http://132.248.208.1> and <http://www.ecologia.edu.mx/abs2004>.

International Fund for Animal Welfare – Forum on Wildlife Conservation, 17-20 June, 2004, University of Limerick, Ireland. The theme is "Wildlife Conservation: In

Pursuit of Ecological Sustainability". The aim is to focus attention on, and to advance the understanding of, issues surrounding the pursuit of ecologically sustainable use and the conservation of wildlife (including fisheries). The program consists of approximately 24 invited lectures, and a limited number of contributed papers, which will be presented as posters. It is divided into five sessions: 1) The Global Context; 2) Modern Examples; 3) Factors at Play; 4) The Way Forward; 5) Theory into Practice. The program committee invites submission of abstracts to be considered for inclusion in the program as contributed poster papers. Abstracts will be received until 1 February, 2004. Abstracts should follow the guidelines described in the "Abstract Guidelines" section on the IFAW website. For more information on the Forum, including a list of confirmed speakers, please visit <http://www.ifaw.org/forum> or contact Sheryl Fink at <sfink@ifaw.org>.

Association for Tropical Biology and Conservation 2004 Annual Meeting, 12-15 July, 2004, Miami, Florida, USA. The meeting will be held at the James L. Knight International Center in downtown Miami, with the theme of "Geographic and Conceptual Frontiers of Tropical Biology." The meeting will be co-sponsored by the University of Miami and Florida International University, along with other members of the Center for Excellence in Tropical Biology. The deadline for symposium proposals is 15 October, 2003. For more information as it becomes available, visit the ATBC Meetings webpage at <http://www.atbio.org/meetings.html> or contact the two Program Directors: Theodore H. Fleming, Department of Biology, University of Miami, Coral Gables, FL 33124, USA, Tel.: 305-284-6881, Fax: 305-284-3039, email: <tfleming@fig.cox.miami.edu>, or David Lee, Department of Biological Sciences, Florida International University, University Park, Miami, FL 33199, USA, Tel.: 305-348-3111, Fax: 305-348-1986, email: <leed@fiu.edu>.

18th Annual Meeting of the Society for Conservation Biology, 30 July - 2 August, 2004, New York, New York. The Center for Environmental Research and Conservation (CERC) at the Earth Institute at Columbia University will host the 2004 Society for Conservation Biology Annual Meeting, bringing together conservation biology scientists, practitioners and students from around the world. This year's meeting theme is "Conservation in an Urbanizing World." For the first time in history, more of the world's population lives in urban rather than non-urban settings. The urbanization process poses significant conservation challenges, changing patterns of consumption, trade and ecosystem use. Ecosystem health near urban areas is integral to human welfare, and urban conservation issues involve marine, freshwater and terrestrial ecosystems all over the world. The SCB 2004 Annual Meeting will consider this and other emerging topics through plenary sessions, symposia, workshops, organized discussions, contributed oral presentations, and poster sessions. Field trips to key restoration and conservation sites in and near New York City have been organized to highlight the possibilities that exist. For more information, please visit the meeting website at <http://cerc.columbia.edu/scb2004/>.

Feeding Ecology in Apes and Other Primates: Ecological, Physiological and Behavioral Aspects, 17-20 August, 2004, Leipzig, Germany. This meeting addresses issues of feeding ecology and related questions from different perspectives, bringing together both field and lab scientists from different disciplines including anthropology, evolutionary biology, primatology, physiology, and biochemistry. The goal is to synthesize the latest research on the feeding ecology of apes, and to identify avenues of future research to best understand the evolution of the diversity of feeding strategies observed in the apes. The conference will be held at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, and will host about twenty-five invited speakers for oral presentations. In addition, the conference invites poster presentations on related topics. For more information, please contact Claudia Nebel (<nebel@eva.mpg.de>) or Silke Streiber (<streiber@eva.mpg.de>), Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, 04103 Leipzig, Germany, phone: 49-341-3550-200, fax: 49-341-3550-299, or see the conference website at <http://www.eva.mpg.de/primat/FEC2004/index.htm>.

XXth Congress of the International Primatological Society, 23-28 August, 2004, Torino, Italy. All major topics of primatology will be discussed, with an emphasis on their interactions with other specialized branches of modern biology. Special attention will be paid also to the implementation of recent discoveries on primate welfare and conservation. For comprehensive information on abstracts, schedules, registration and pre-congress workshops, see the website at <http://www.ips2004.unito.it>.

VI International Conference on Wildlife Management in Amazonia and Latin America, 5-10 September, 2004, Iquitos, Peru. Organized by The National University of the Peruvian Amazon (UNAP), the Durrell Institute of Conservation and Ecology (DICE) and the Wildlife Conservation Society (WCS). The organizers cordially welcome and invite the participation of a wide audience including students, professionals, local communities, NGOs, government representatives and the general public. Special emphasis during this conference will be on lessons learned in wildlife conservation and management in Amazonia and Latin America. Discussions and presentations will look at the advances made for conservation, and the lessons learned in the design, development, implementation, methods, and management plans for wildlife in Amazonia and Latin America. For further information, please visit the conference website at <http://www.vicongreso.com.pe/>. For any questions, contact the conference organizers by e-mail at <congresofauna@amauta.rcp.net.pe>. The Organizing Committee includes Dr. Richard Bodmer (DICE), Dr. Lorgio Verdi (UNAP) and Pablo Puertas (WCS).

IV Congresso Brasileiro de Unidades de Conservação, 17 a 21 de outubro de 2004, Curitiba, Paraná, Estação Embratel 21 Convention Center. Realização: Rede Nacional Pró-Unidades de Conservação e Fundação O Boticário de Proteção à Natureza, Rua Gonçalves Dias 225, Curitiba 80240-340, Paraná, Brasil. Website: <http://www.fundacaoboticario.org.br>.

3rd IUCN World Conservation Congress, 17-25 November 2004, Bangkok, Thailand. Theme: "People and Nature – Only One World". IUCN members will gather to set the work priorities of the Union and elect its Council for the intersessional period. The IUCN World Conservation Forum takes place 18-20 November, and the Members' Business Assembly 21-25 November. The Species Survival Commission (SSC) meeting will be held in Bangkok over two days prior to the Congress from 16 to 17 November, 2004. Dr. David Brackett, who has served two terms as Chair of the SSC, will be standing down, and elections will be held for the new Chair during the Business Assembly. See: <http://www.iucn/org/themes/ssc>.

2005

19th Annual Meeting of the Society for Conservation Biology, 15 a 19 de julho de 2005, Universidade de Brasília (UnB), Brasília. A organização geral estará a cargo do Prof. Miguel Ângelo Marini, Departamento de Zoologia da UnB. Informações detalhadas do congresso só estarão disponíveis na Internet em 2004.

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 Committeee, 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>, <http://www.atbio.org>.

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>.

29th International Ethological Conference, 20-27 August, 2005, Budapest, Hungary. The aim for this conference is to encourage interdisciplinary discussion among representatives of all areas of behavioral biology. The conference will be hosted at the Eötvös University Convention Center on the banks of the Danube. Deadline for early registration and abstract acceptance: 1 March, 2005. Final deadline for abstract acceptance: 1 May, 2005. Late registration until 1 June, 2005. 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>.

ERRATUM

In the note cited below, the correct unit of measurement for morphometric characters should be millimeters (mm) not centimeters (cm). The author apologizes for any confusion or inconvenience this error may have caused the reader. None of the results or conclusions is changed due to this oversight.

Jones, C. B. 2003. Chest circumference differs by habitat in Costa Rican mantled howler monkeys: Implications for resource allocation and conservation. *Neotrop. Primates* 11(1): 22-24.

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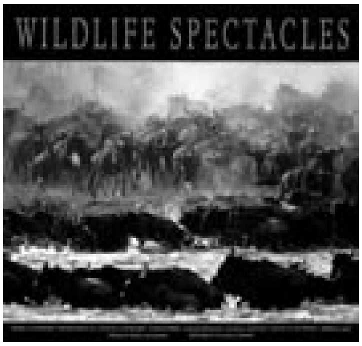

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Notes to Contributors

Scope

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

Submissions

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

Contributions

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

Articles. Each issue of *Neotropical Primates* will include up to three full articles, limited to the following topics: Taxonomy, Systematics, Genetics (when relevant for systematics), Biogeography, Ecology and Conservation. Texts for full articles should not exceed about 20 pages in length (1.5 spaced, and including the references). Please include an abstract in English, and (optional) one in Portuguese or Spanish. Tables and illustrations should be limited to six, excepting only the cases where they are fundamental for the text (as in species descriptions, for example). Full articles will be sent out for peer-review.

Short articles. These are usually reviewed only by the editors. A broader range of topics is encouraged, including such as behavioral research, in the interests of informing on general research activities which contribute to our understanding of platyrrhines. We encourage reports on projects and conservation and research programs (who, what, where, when, why, etc.) and most particularly information on geographical distributions, locality records, and protected areas and the primates which occur in them. Texts should not exceed 10 pages in length (1.5 spaced, including the references).

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

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

References. Examples of house style may be found throughout this journal. Please refer to these examples when listing references:

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

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

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

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

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

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Short Articles

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