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SHORT ARTICLES

BODY WEIGHTS OF ADULT FEMALE *ALOUATTA PALLIATA* IN COSTA RICA INCREASE WITH AGE

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Introduction

Body weights are often used as correlates of general health, as well as being predictive, perhaps, of future reproductive success (Trivers and Willard, 1973; Bercovitch *et al.*, 1998). For female nonhuman primates, the long-term monitoring of body weights constitutes an integral part of the study of life histories (Harvey *et al.*, 1987). With respect to female mantled howling monkeys (*Alouatta palliata*), they emigrate from their natal groups as juveniles (Glander, 1980, 1992; Scott *et al.*, 1978), as do males, later immigrating into other social groups after a period of living alone. In order to stay in these new social groups, immigrating females must become dominant to all resident females, a process that can take up to a year (Jones, 1980; Glander, 1992; Zucker and Clarke, 1998). As group membership is a competitive process, the sizes (weights) of immigrant females might contribute to their competitive abilities and eventual successful immigrations. Newly immigrant females weigh less than resident females; but after two years, this difference disappears (Zucker *et al.*, submitted).

This process of juvenile emigration from natal groups, with subsequent immigration into other groups as young adults, results in reversed, age-graded hierarchies for each sex (Clarke and Glander, 1984; Jones, 1980; Zucker and Clarke, 1998). The most dominant individual of each sex is typically the youngest, while the least dominant is the oldest, usually having the longest tenure in the group (Clarke and Glander, 1984; Jones, 1980; Zucker and Clarke, 1998). Thus, age and status are inversely (negatively) related, unlike the positive relationship common in Old World genera, such as *Macaca* and *Papio*, that have been more extensively studied with respect to physical growth and development (Altmann *et al.*, 1977; Bercovitch, 1987; Bercovitch *et al.,* 1998; Rawlins *et al.*, 1984; Small, 1981).

In this report, we present body weight data for adult females, which have successfully immigrated and resided in one social group at Hacienda La Pacifica, Guanacaste Province, Costa Rica. These females were residents between 1985 and 1993, during which time various age and sex classes were the subjects of behavioral and physiological studies.

Methods

Study Site and Subjects
Hacienda La Pacifica, located 5 km northwest of Cañas, in Guanacaste Province, Costa Rica, is a 1,980-ha ranch (Glander, 1992) in the lowland tropical dry forest zone (Holdridge, 1967). The majority of adult mantled howlers on the ranch have been captured and marked for reliable identification (Scott *et al.*, 1976; Glander *et al.*, 1991; Glander, 1992). Upon capture, all monkeys were weighed, measured, and tattooed, and adult females were palpated to detect pregnancies (Glander, 1980, 1992). Adults are marked with unique, color-coded leg chains (males) or collars and tags (females). Individuals captured for the first time are aged, based on dental characteristics (Pope, 1966). Monkeys have usually been captured during the months of February and July.

Study of Group 2 at La Pacifica began in 1985, after census work in 1984 provided the group's demography (Clarke *et al.*, 1986). During the 9-year period covered in this report (1985–1993), mean group size was 17.3 monkeys (sd = 3.8), including an average of 8.4 adult females (sd = 1.6). This group inhabits an L-shaped home range of upland forest (see Fig. 1 in Glander, 1992, for a map of the ranch showing the location of this group). Home range size was estimated to be 24 ha (Zucker *et al.*, 1996), although this was decreased by approximately 10% in 1991 following deforestation related to the construction of a major canal system through La Pacifica and other parts of Guanacaste Province (Clarke *et al.*, 2002).

Data Set

Six adult females were captured and marked in 1985. In 1986, four more adult females were captured and marked, including two females believed to be recent immigrants. Two marked adult females from 1985 were not present in 1986. Thus, beginning in 1986, all adult female residents in this group were marked and identifiable. In calculating the mean weight of adult females in this group, the first weights obtained for these 10 females (1985–1986) were used, in addition to the first weights obtained for the subsequent six immigrants. Only the body weights of nonpregnant females are included.

Longitudinal assessment of body weights became possible after all of the adult females in Group 2 were marked. Weights for 12 females which were in the group for a minimum of two years are presented here, with multiple weights available for eight of them. As we have minimized the number of times animals in this group are captured, weights are not available for all individuals in all years of study. After the initial two years, weights of some females were obtained in 1989, 1991, 1992, and 1993. Animals new to the group were captured for permanent marking, as were residents which needed damaged or lost collars, tags, or chains to be replaced.

The affiliative and agonistic interactions of the adult females in Group 2 were studied systematically between 1988 and 1992 during portions of June, July, and/or August (Zucker and Clarke, 1998). Thus, dominance relationships of the 7–9 females in the group during this period are also known,

and results generally fit the expected reversed, age-graded hierarchy, although the hierarchies were variable over time. Yearly dominance ranks are given in Zucker and Clarke (1998, Table III).

Results

Taking into account only the first weights, the mean body weight for the 16 females, which were residents in Group 2 at some time between 1985 and 1993, was 4.09 kg (sd = 0.49; range 3.18–5.10 kg). Using all body weights obtained during the study period for these 16 females (n = 26), the mean body weight of an adult female was 4.30 kg (sd = 0.53; range 3.18–5.70 kg). Yearly means and standard deviations are presented in Table 1.

Multiple body weight measurements were available for eight Group 2 females. Seven of them increased their weight over time. The last body weights of these females were, on the average, 16.46% greater than their first weights, with increases ranging from 4.65% to 40.67% (sd = 14.98%). The female who lost weight experienced a decrease of 3.92% over two years. Weights over time for the older females in the group are shown in Figure 1a, while weights for the younger females are shown in Figure 1b. It is evident that the females' weights increased over the years, regardless of length of tenure in the group. Taking into account the number of years in the group, the mean increase per year was 3.64% (sd = 2.72%) for the seven females that showed increases. For mantled howlers, status decreases with increased tenure in the group (Clarke and Glander, 1984; Glander, 1980; Jones, 1 80; Zucker and Clarke, 1998), so there would be an inverse relationship between status and body weight.

Discussion

Adult female mantled howling monkeys increased their body weights throughout their lives, although the proximate causes of these changes have not yet been assessed in this sample (or population). Increases could be due to increased bone growth and overall size, decreased lean body mass, increased amounts of fat, or changes in bone densities (see Schwartz and Kemnitz, 1992).

During the latter portion of the study period, construction-related deforestation produced some major changes in the group's home range (Clarke *et al.*, in press) and, despite the loss of a major *Spondias* tree and a number of other fruit trees, body weights of the adult females continued to increase, regardless of their specific age or social status. Mean daily path length increased following deforestation (Clarke *et al.*, 2002), so these weight increases occurred even with increased activity, and were not due to decreased activity that might accompany increased age.

The weight increases with age described for this one group of howlers might not be found in groups consuming different diets or living in different microhabitats, such as those inhabiting the riverine forests at La Pacifica. Howlers in the drier, upland forests spend more time feeding than do the howlers living near the rivers (Teaford and Glander, 1996), which could be compounded further by increased feeding time per day during the dry season by the upland groups. The volume of food consumed, which would contribute to body weight, might not reflect the nutritional value of the food, or alternatively, the relationship between volume and nutritional value could vary seasonally. Intergroup differences

Table 1. Adult female *Alouatta palliata* at Hacienda La Pacifica, Guanacaste Province, Costa Rica. Ages, years weighed, yearly means, and standard deviations.

Female	1985	1986	1989	1991	1992	1993
Burgundy	9-R[*]					
Cherry	15-R					
Goldenrod	12-R					
Indigo	6-R	7-R				14-R
Marigold	9-R					
Violet	18-R		22-R			
Oregano		4-I				
Pansy		12-R	15-R			
RC		9-I	12-R			16-R
Tulip		19-R				25-R
Chicory			11-I	13-R		
JQ			4-I			
Sage				4-I		6-R
Wisteria				5-I		7-R
Azalea					4-I	
Bamboo					20-I	
Mean (kg)	3.85	4.08	4.70	4.47	4.35	4.56
Sd	0.55	0.21	0.70	0.38	0.64	0.11
N	6	5	5	3	2	5

[*]Numbers indicate estimated age, in years; "R" = resident in group, "I" = recent immigrant.
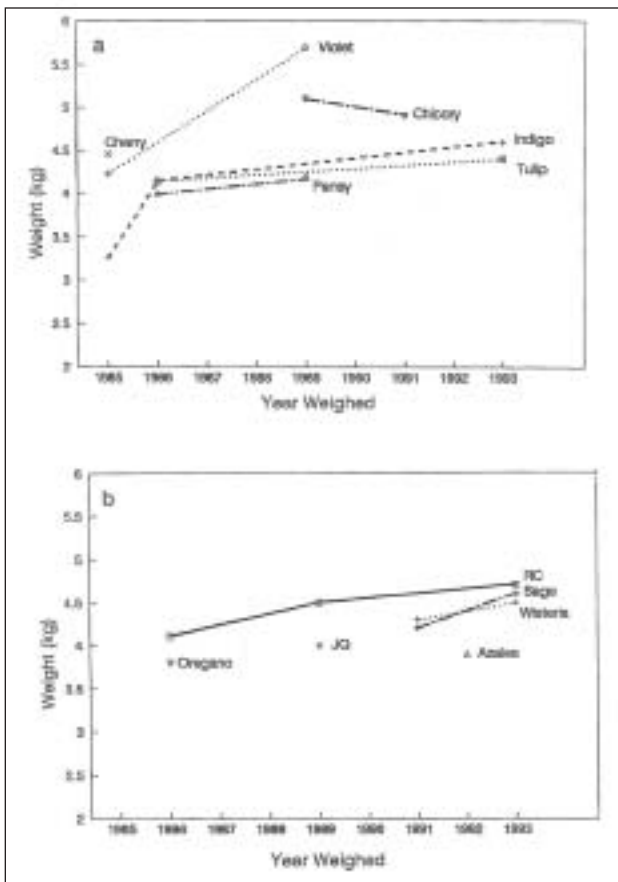
Figure 1. Weights over time of adult female howling monkeys in Group 2 at Hacienda La Pacifica. Weights of older females are shown in (a) and younger females in (b).

in the consumption of different food types were found even within microhabitats (Teaford and Glander, 1996).

Studies of rhesus monkeys (*Macaca mulatta*) provide some comparable data relating body weight to status, although differences in the life histories and social systems of these two species produce different patterns. For rhesus females living in an outdoor field cage, Small (1981) found a significant positive correlation between rank and fat index (composite fat score from skinfold measurements/body weight). Higher fat indexes for high ranking females were attributed to preferential access to food, resulting in them being more healthy. For mantled howlers, immigration patterns produce an inverse relationship between status and weight, although this is clearly confounded by age. In Small's (1981) study, the ages of the higher ranking females were not given, nor was the upper age limit of the adult females studied, although no significant relationship was found between fat index and age (Small, 1981).

Cross-sectional data for provisioned rhesus monkeys on Cayo Santiago, in Puerto Rico, indicated that age and weight were positively related for adult females until they were approximately 13 years old, then weight declined gradually (Rawlins *et al.*, 1984, Table II). In this study by Rawlins *et al.*, sample sizes were quite small for females over six years

old. With larger sample sizes, Schwartz and Kemnitz (1992) corroborated this curvilinear pattern, finding that weight increased over the first 14 years, then decreased. Females over 20 years old were significantly lighter than other adult females (Schwartz and Kemnitz, 1992). Thus, howlers and rhesus differ during the latter portion of adulthood in this relationship between age and weight. Rhesus females decrease in weight as they approach their twenties, whereas the weights of howler females continue to increase. The sample of La Pacifica howlers included two females (Violet and Tulip) over 20 years old (Table I), which continued to increase in weight during their twenties. Testable hypotheses about these species' differences during latter adulthood might center on differences in activity levels, quality and types of foods eaten, psychosocial stresses, and/or physical forces associated with arboreal (howler) versus more terrestrial (rhesus) ways of life.

Acknowledgments

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Variations in Group Size in White-Faced Sakis (*Pithecia pithecia*): Evidence For Monogamy or Seasonal Congregations?

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Introduction

There are few longitudinal data on the social structure and behavior of white-faced sakis (*Pithecia pithecia pithecia*). Synecological studies have found that they tend to live in small groups of 2–4 animals (Buchanan *et al.*, 1981; Mittermeier, 1977; also Oliveira *et al.*, 1985, who studied the golden-faced subspecies, *P. p. chrysocephala*), which have led some researchers to suggest that white-faced sakis are monogamous (e.g., Napier and Napier, 1986; Robinson *et al.*, 1986; Dunbar, 1988). Besides group size, support for monogamy in white-faced sakis comes from field studies in which males and females responded in a territorial manner to loud calls during vocal playback experiments (Rosenberger *et al.*, 1997).

Data from historic accounts and recent surveys indicate that some groups of white-faced sakis contain more than four individuals. There have been reports as early as the mid-19th century of groups with 6–10 members (Schomburgk, 1848; Schomburgk, 1876). More recent field accounts confirm that some groups have more than one adult member of each sex (Buchanan, 1978; Oliveira *et al.*, 1985; Kinzey and Norconk, 1993; Gleason and Norconk, 1995; Ryan, 1995; Norconk *et al.*, 1997; Norconk *et al.*, 1998), leading to suppositions that this species may not be monogamous. It has been suggested that groups with more than four animals may represent seasonal congregations of smaller groups (Buchanan, 1978; Fleagle and Meldrum, 1988). Therefore, it is not surprising that Rosenberger and coworkers (1997) recommended that

we reevaluate the white-faced saki as a "typical" monogamous primate.

Although preliminary surveys have provided invaluable data on the size and composition of white-faced saki groups (e.g., Mittermeier, 1977; Oliveira *et al.*, 1985; Kessler, 1998), they are difficult to interpret because the studies were typically conducted during only one season, and few sightings were made due to the shy and cryptic nature of the animals. Moreover, there are few recent data for populations of white-faced sakis in Guyana (Muckenhirn *et al.*, 1975; Sussman and Phillips-Conroy, 1995), where there are, surprisingly, some of the earliest descriptions of large group sizes (Schomburgk, 1848; Schomburgk, 1876).

If there is a seasonal effect influencing group congregations in white-faced sakis, then surveys conducted throughout the year may provide important preliminary data on their social structure. In this report we present longitudinal survey data on group size for white-faced sakis in Guyana and summarize results from previous surveys. We then suggest directions for future studies.

Methods

The data analyzed in this paper are from a literature review and 1,725 km of surveys we conducted at sixteen sites in Guyana (Fig. 1). Guyana is a small country of 215,000 km² situated on the northeastern coast of South America, between 56°20' and 61°23'W and 1°10' and 8°35'N. Mean annual precipitation is between 2,000 and 3,400 mm (ter Steege, 1993). There are generally two wet seasons (May to August and December to January) and two dry seasons (September to November and February to April).

Data were collected during three periods: (1) November 1994 to June 1995; (2) September 1995 to June 1996; and (3) June to August, 1997. When surveying forests, we used randomly selected and predetermined transect lines. Although most studies of the distribution of animals use only random selection of transects (e.g., Anderson *et al.*, 1979; Burnham *et al.*, 1980; Krebs, 1989; Peres, 1997), we also used predetermined transect lines to ensure that biogeographic features, such as rivers that may be barriers to dispersal, were included in the data set. Predetermined transect lines often ran along paths in the forest to maximize survey time in remote areas. Two types of surveys were conducted: (1) unique and (2) repeat. Unique surveys were made along transects, such as trails or riverbanks, where one to two transits were made during a census. During repeat surveys we conducted more than two transits of a transect line. Repeat surveys were conducted along paths at five locations: (1) Timehri; (2) Dubulay Ranch; (3) Kaieteur Falls National Park; (4) Mabura Hill Ecological Reserve and (5) Sebai River. We walked slowly along unique and repeat transects lines at a rate of 1.0 km/h, stopping every ten minutes to listen for the sounds of movement in the forest.
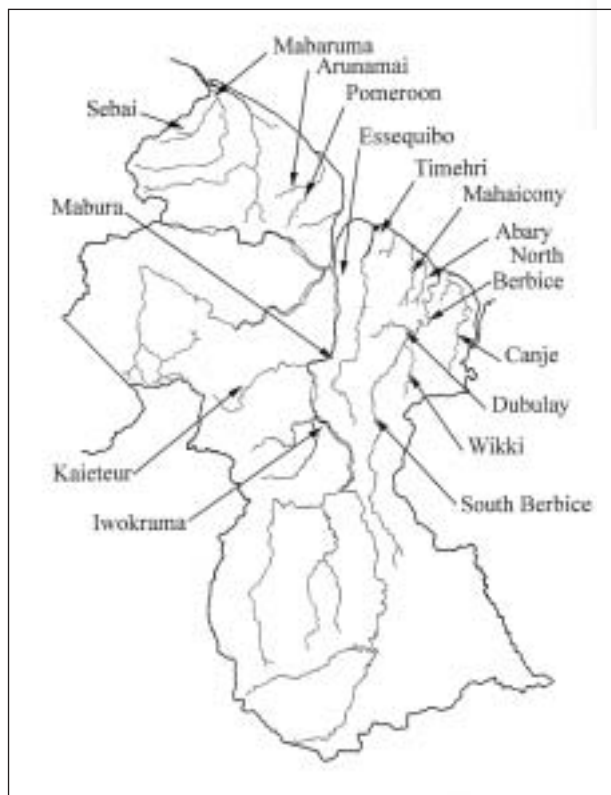
Figure 1. Locations of study sites.

We surveyed rivers by paddling slowly (1.5–2.0 km/h) along riverbanks. During river surveys, randomly selected areas were chosen on each bank for land surveys. Non-linear transect lines in the forest were used because travel costs are very high in Guyana. Thus, it was cost-prohibitive to cut and mark trails when only 2–4 weeks were available for data collection. Furthermore, in protected areas such as Kaieteur Falls National Park, Mabura Hill Forest Reserve, and Iwokrama Forest Reserve, it is illegal to cut trails. Hence, established trails were used in these protected areas.

During surveys, data were recorded on: (1) primate species; (2) time of day; (3) weather; (4) vegetation height; (5) general height of group; (6) number of animals in group; (7) cue by which animals were detected; (8) activity; (9) perpendicular distance from the transect [meters]; (10) sighting angle; and (11) habitat type. When a primate group was seen, a standardized time of 10 minutes was spent observing the behavior of individuals in the group (NRC, 1981). *Ad libitum* notes on behavior, obvious individual physical characteristics, and vocalizations were also collected. The location of primate groups seen during surveys was determined using LANDSAT-5 satellite photographs, 1:50,000 topographic maps of the region, and a Magellan NAV 5000D GPS. If monkeys were observed feeding, then fruit and/or voucher specimens were collected. Specimens were placed in plastic zip-lock bags and preserved with 80% ethanol. They were deposited for identification at the Center for the Study of Biological Diversity at the University of Guyana. Habitat descriptions were made using soil features, a vegetation map (Huber *et al.*, 1995), various monographs on Guyanese flora

(Van Roosmalen, 1985; de Granville, 1988; Mennega *et al.*, 1988; ter Steege, 1990, 1993), and LANDSAT-5 satellite imagery of survey areas.

Group sizes are given as the mean ± one standard deviation. Nonparametric statistics were used because survey data violate assumptions of normality (Ludwig and Reynolds, 1988). Spearman correlation coefficients (r_s) were computed for monthly data on mean group size (dependent variable) versus rainfall and fruiting records (independent variables) in Guyana. Rainfall and fruiting records are based on 100 years of data collected in Guyana (ter Steege, 1993). Data on group sizes from the three groups seen by Kinzey (1988) and Norconk (1997) in Venezuela were combined to facilitate comparisons. A Kruskal-Wallis (*H*) test was used to determine variations in group sizes between studies. Mann-Whitney U (*U*) tests were run to document pair-wise differences in group sizes for each of the published studies. Statistics were computed using SPSS 8.0 statistical software. All statistical tests were two-tailed and the alpha level was set at p<0.05.

Results

Table 1 shows the group size and composition of white-faced sakis we sighted in Guyana. We observed a total of 21 groups. Group size ranged from 2–12, with a mean of 4.8 ± 2.4 animals. The total average sex ratio was 1.1:1. Of the

Table 1. Size and composition of *Pithecia pithecia pithecia* groups censused in Guyana.

Group Number	Number of Animals					
	Adult males	Adult females	Juvenile males	Juvenile females	Infants	Total
1	1	1				2
2	2	2	1			5
3	2	2				4
4	3	3	1			7
5	1	1			1	3
6	2	2				4
7	2	1				3
8	2	2			1	5
9	1	2		1	1	5
10	5	5	1		1	12
11	3	3				6
12	2	2	1		1	6
13	2	0				2
14	1	0	1	1		3
15	1	2				3
16	3	2	1	2	1	9
17	1	1	1		1	4
18	2	2			1	5
19	1	1	1		1	4
20	3	2	1			6
21	1	1				2
Total	41	37	9	4	9	100
Range	1-5	0-5	0-1	0-2	0-1	2-12
Mean	2.0	1.8	1.0	1.3	1.0	4.8
1 SD	1.0	1.1	0.0	0.6	0.0	2.4

21 groups censused, 52.3% (N = 11) contained more than one adult of each sex. A total of 71.4% (N = 15) groups contained more than one adult male or adult female. Mean monthly group size was not correlated with either rainfall (r_s = -0.145, p = 0.78) or fruiting records (r_s = 0.464, p = 0.35).

On April 17, 1996, a group of twelve white-faced sakis were sighted by SML in riparian forest near the Madewini River in northern Guyana (6°29'N, 58°13'W). The animals were not shy and were followed easily for one hour. The group was composed of five adult males, five adult females, a juvenile male, and a juvenile female. The animals were traveling slowly as a cohesive group in the understorey at a height of 15 m. Two adult males foraged for ripe fruits in a *kokerite* palm (*Attalea maripa*) within 1 m of each other. Each male bit into and dropped fruits over a 45-second period before moving off to join the rest of the group. No social interactions were observed among any of the group members.

Average group size for all records of white-faced sakis was 3.8 ± 2.1 animals (Table 2). There is significant variation in group size for white-faced sakis across the study sites in NE South America (Kruskal-Wallis $H_{(5)}$ = 12.650, p = 0.027). This variation is driven by significantly larger group sizes in Guyana compared to those reported by Mittermeier (1977) in Suriname (Table 3).

Discussion

Some groups we surveyed in Guyana contained only one adult of each sex, whereas others contained more than one adult of each sex. We found no evidence of a seasonal effect on group size. Our data on group size are comparable to those collected by Kinzey *et al.* (1988) in eastern Venezuela and Muckenhirn *et al.* (1975) in Guyana. This continuity in grouping patterns for white-faced sakis in the western Guiana shield (eastern Venezuela and Guyana) indicates that the observations we made are not a phenomenon unique to only our study sites and time period. Surprisingly, average group size for white-faced sakis in Suriname, which is also part of the Guiana Shield (Norconk *et al.*, 1997), was significantly smaller than that seen for conspecific groups in Guyana. The reasons for these regional differences in social structure are poorly documented, but may be due to variations in plant species composition and diversity (Terborgh and Andresen, 1998). Therefore, our data support white-faced sakis as not being representative of a "typical" monogamous primate (Rosenberger *et al.*, 1997). However, it must be noted that only limited interpretations of social behavior can be made based on survey data. Detailed data on the feeding ecology and behavior of habituated groups are needed to determine the causal factors affecting intraspecific variation in group structure.

It should not be assumed that white-faced sakis are alone in challenging our views on primate monogamy. Fuentes (1999) conducted a review of primate monogamy and found that many supposed monogamous species exhibit a variety of grouping types and mating patterns. A notable example

Table 2. Size and composition of *Pithecia pithecia* groups censused in South America.

Country	Group Size			Group Composition					Sources
	Mean ± 1 SD	Range	N	AM	AF	SA	J	I	
Guyana	4.8 ± 2.4	2-12	21	1-5	0-5		0-2	0-2	Present study
Guyana	3.3 ± 1.7	1-5	10						Muckenhirn *et al.* (1975)
Venezuela	9.0		1	3	1	1-2	0-1		Norconk (1997)
Venezuela	5.5 ± 2.5	3-8	2						Kinzey *et al.* (1988)
Suriname	2.7 ± 0.8	2-4	9	1-2	1		0-1		Mittermeier (1977)
French Guiana	2.8 ± 1.0	1-4	4						Kessler (1998)
Brazil	2.6 ± 0.5	2-3	3	0-2	0-2	0-1		0-1	Oliveira *et al.* (1985)
Brazil	6		1	1	1-3	0-2	0-2	0-2	Setz and Gaspar (1997)

AM=adult male, AF=adult female, SA=subadult, J=juvenile, I=Infant

Table 3. Mann-Whitney U scores for intersite differences in group size for *Pithecia pithecia pithecia*. Sites are expressed by country to facilitate comparisons. Numbers above the diagonal refer to the U score. Numbers below the diagonal indicate the corresponding p value for each test.

Country	Venezuela	Guyana[a]	Guyana[b]	Suriname	French Guiana	Brazil
Venezuela		25.5	6.0	48.0	1.5	2.0
Guyana[a]	0.214		60.0	68.5	32.5	11.5
Guyana[b]	0.155	0.053		33.0	15.5	10.0
Suriname	0.042	0.019	0.310		17	12.5
French Guiana	0.105	0.119	0.509	0.865		6.0
Brazil	0.142	0.076	0.370	0.364	0.544	

[a] Present study, [b] Muckenhirn *et al.* (1975)

of this social diversity can be found among hylobatids. Despite gibbons being described as invariably monogamous (Leighton, 1986), recent field studies indicate that some species are not exclusively monogamous and/or pair-bonded (Jiang *et al.*, 1999; Palombit, 1994; Palombit, 1999; Sommer and Reichard, 2000). For example, Jiang and colleagues (1999) report the coexistence of monogamy and polygyny in black-crested gibbons (*Hylobates concolor*). Therefore, contrary to assumptions of obligate monogamy in gibbons, the social system of these primates may be characterized by flexible grouping and mating patterns (Sommer and Reichard, 2000).

How then can we interpret a social system for white-faced sakis that contrasts large group size, at least in some parts of its range, and monogamy? Monogamy in primates has been explained as: (1) an anti-infanticide strategy (Van Schaik and Dunbar, 1990; Palombit, 1999); (2) a strategy to elicit male parental care (Kleiman, 1977); (3) a means of protecting resources that are scarce and uniformly dispersed (Wittenberger and Tilson, 1980); and (4) a response to human predation (Kinzey, 1987). Fuentes (1999) reviewed these models and identified the following six characteristics of monogamy: exclusive one-male/one-female groups; pair bond and reinforcement behavior; sexual monomorphism; exclusive mating; territoriality; and paternal care. White-faced sakis do not meet the criteria for three of the six monogamous characteristics: exclusive one-male/one-female groups (present study; Kinzey *et al.*, 1988; Norconk, 1997; Rosenberger *et al.*, 1997); pair bond/reinforcement behavior (Gleason and Norconk, 1995); and paternal care (Ryan,

1995). Monomorphism is the only one of Fuentes' (1999) criteria that *P. p. pithecia* meets. The lack of longitudinal data on territoriality and the exclusivity of mating between two adults highlight some of the directions to be undertaken in future studies of this species. Social systems in white-faced sakis will be better understood when longitudinal data are also collected on: (1) demography and social behavior, (2) population genetics and paternity, and (3) ecological correlates to social structure.

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Diurnal Activity Budgets of Black Spider Monkeys, *Ateles chamek,* in a Southern Amazonian Tropical Forest

Robert B. Wallace

Introduction

In the last twenty years an increasing number of field studies have demonstrated the potential behavioral flexibility within individual primate species. Until recently few published studies existed for any one primate genus, and thus all populations of a given species were inevitably 'tarred with the same behavioral brush' of just one focal study group. Whilst detailed behavioral studies of some primate genera are still scarce, for example the incredibly wide ranging

Cacajao in the Neotropics (but see Ayres, 1989), today many primate genera have been studied at a number of long-term field sites. In this paper, I present data on diurnal variations in black spider monkey activity budgets from a previously unstudied focal study group in eastern Bolivia, and compare these results with other long-term *Ateles* study sites.

Study Site

The study was conducted in the Noel Kempff Mercado National Park of 15,300 km² in the north-eastern corner of Departmaento Santa Cruz, Bolivia (see Fig. 1). The Río Iteñez defines the park's eastern and northern edges, and represents the border with the neighboring Brazilian states of Rondônia and Mato Grosso. The region is situated on the Brazilian Shield geological formation, which is characterized by poor kaolinitic clay and podsol soils (PLUS-CORDECRUZ, 1994; Peres, 1997). The region has been characterized by a marked dry season in the austral winter, a mean annual temperature of *c.*26°C, and an annual precipitation of *c.*1,600 mm (Wallace, 1998).

Figure 1. Map showing the location of the Noel Kempff Mercado National Park, Bolivia.

Research was based at Lago Caiman (13°36'S, 60°55'W), a large oxbow lake at the base of the northern tip of the Huanchaca escarpment, and approximately 21 km upstream from an international tourist centre "Flor de Oro". A 400 ha study plot (2 x 2 km) with a grid system of trails spaced every 100 m was set up approximately 3.5 km from camp. Subsequently, trails were cut to include a further *c.*100 ha to cover parts of the focal spider monkey community range not encompassed by the 400-ha grid. The Lago Caiman study plot contained a number of structurally and floristically distinct habitats: tall forest, low vine forest, *sartenejal* or swamp forest, piedmont forest and cerrado forest (Wallace, 1998).

Methods

Following habituation, data was collected on the behavioral ecology of a focal spider monkey community for 11 months between June 1996 and April 1997. The focal spider monkey community was made up of approximately 55 individuals at the beginning of data collection (June 1996). Subadults were visibly smaller than adults and, following McFarland Symington (1988a), were considered subadult until they reached 80–90% the size of adults. All other young animals were considered juveniles except infants that were carried ventrally or laterally by their mothers.

Ateles has a fission-fusion social system and subgroup size and composition change frequently throughout the day (Chapman, 1990; McFarland Symington, 1988b; Van Roosmalen, 1985). To control for this aspect of their behavioural ecology I made individual monkeys the focus of all-day follows. Thus, each month I attempted to follow four adult females (F), four adult males (M), and one sub-adult male (SAM) for a total of nine days during two temporally distinct sessions of up to five days. Attempts were made to randomize the data sampling regime; in the pre-dawn one of five radio-collared males was randomly selected as the initial spider monkey contact and a focal follow animal (FFA) was selected from the animals present at the sleeping site. Whenever possible the age/sex class of the FFA corresponded with a randomly ordered list of the nine day standard monthly sample.

FFAs were followed from dawn to dusk (approx. 0515–0615 to 1745–1845). If an FFA was lost I continued with another individual of the same age/sex class from the same subgroup. If this was not possible I made attempts to rapidly locate another subgroup and continue. These two scenarios were considered 'broken' all-day follows. Occasionally it was not possible to continue, either because the subgroup climbed the inaccessible escarpment and/or it was not possible to rapidly locate a second subgroup. The day was then considered a 'half' or 'quarter' day. If necessary AM 'half' or 'quarter' days were made up at a later stage with an afternoon follow on the same age/sex class. Between January–March 1997 I was unable to collect nine days of data due to illness and other research commitments.

Point scan sampling (Altmann, 1974; Dunbar, 1976) at 15-minute intervals was used to gather data on activity budgets, diet and social behavior. Scans lasted five minutes and data were collected on as many animals as possible. The total number of animals included in any one scan depended on subgroup size and ranged between 1–11 animals per scan. At each scan, data on the following parameters were recorded: climate, location and habitat type, subgroup size, spread, and dominant activity, and the presence of other frugivorous species, as well as the activity of each scanned individual (Wallace, 1998).

Monthly activity budgets were calculated for each of the following age/sex classes: adult and subadult females combined, adult males, subadult males, and non-infant juveniles. In order to provide information on diurnal activity budgets each age/sex class sample was divided into hourly intervals and calculated as follows:

$$\frac{(\text{records for activity } i)}{(\text{records for all activities})} \quad x \quad 100$$

where i = feeding, resting, travelling or other behaviours. An average activity budget for the spider monkey community was established by averaging the activity budget of the four age/sex classes, weighted by their proportion within the focal community.

Unless otherwise specified the data presented was analysed using non-parametric statistical tests (Siegal and Castellan, 1988). The standard probability level of $p < 0.05$ was set, although non-significant trends are also discussed.

Results and Discussion

Age/Sex Class Activity Budget Variations

Overall, at Lago Caiman spider monkeys spend on average 18.9% of daylight hours feeding, 29.7% moving, 45.5% resting, and 5.9% engaged in other activities such as social behavior, vocalization, defecation and urination. Thus, approximately half of the day is spent either resting or engaged in other activities, with the other half divided between feeding and moving. The overall activity budget displayed by the focal spider monkey community at Lago Caiman appears to be fairly typical of previous long-term studies of the genus (see Table 1).

Nevertheless, there were variations in activity budgets between age/sex classes (see Fig. 2). Most strikingly, juveniles spent over double the amount of time in 'other' activities than other age/sex classes. Given that juveniles spent the majority of the day in the same subgroup as their mother, I compared juvenile and adult female time budgets. There were no

Table 1. Comparison of activity budgets for five *Ateles* long-term study populations.

Activity	Bolivia[1]	Peru[2]	Colombia[3]	Brazil[4]	Venezuela[5]
% Feeding Time	18.9	29	22.2	18	50.5
% Moving Time	29.7	26	14.8	36	18.1
% Resting Time	45.5	45	63	45	23.7
% Other Time[a]	5.9	no data	no data	no data	7.7

[1]This study (*Ateles chamek*), [2]McFarland Symington (1988b) (*A. chamek*), [3]Klein & Klein (1977) (*A. belzebuth*), [4]Nunes (1995) (*A. belzebuth*), [5]Castellanos (1995) (*A. belzebuth*). [a]Includes social and physiological function behavioral categories.
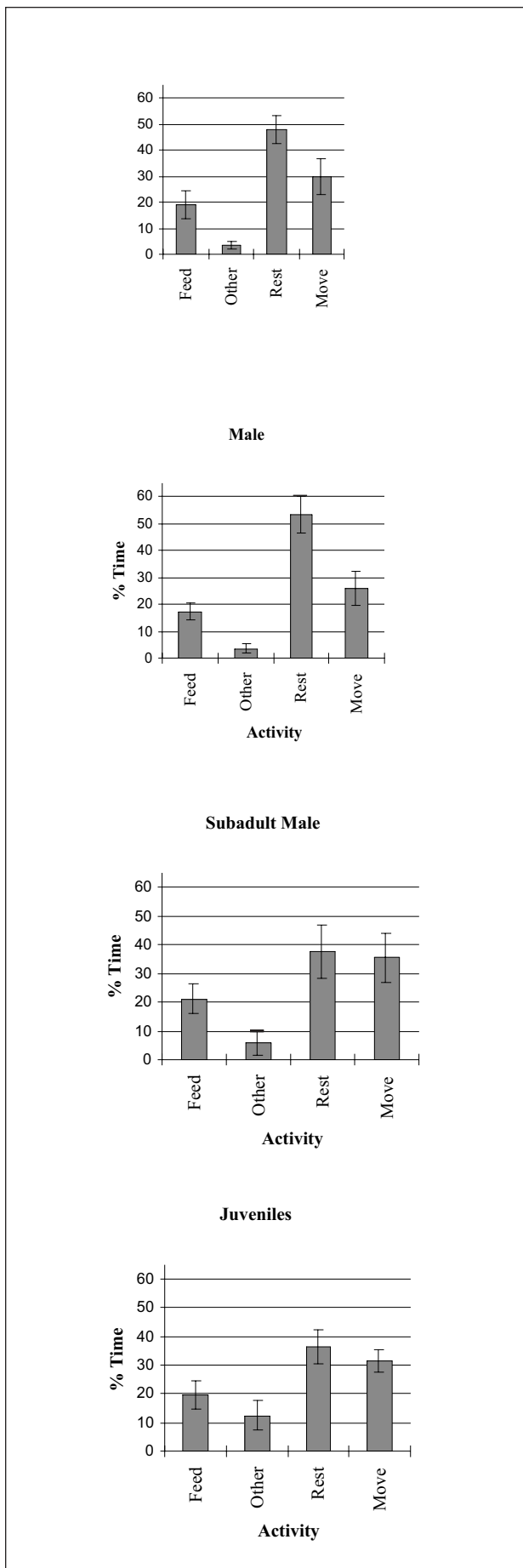
Figure 2. Age/sex class variations in overall activity budgets.

significant differences in monthly activity budget proportions for feeding and moving, but resting and other behaviors were significantly different (Rest - Wilcoxon T = 0, p<0.005, N = 11; Other - Wilcoxon T = 0, p<0.005, N = 11). The majority of juvenile 'other' time was spent in play behavior (77.8 %), which usually consisted of wrestling and chasing involving up to five individuals. Indeed, juveniles were most frequently observed playing together whilst their mothers slept towards the end of prolonged rest periods.

Subadult males were also frequently observed playing (45.9% of 'other' activities) and this accounts for the relatively high 'other' portion of the activity budget. When monthly activity budget proportions were compared with adult males (see Fig. 1), subadult males spent significantly more time moving and feeding and significantly less time resting (Move - Wilcoxon T = 0, p<0.005, N = 11; Feed - Wilcoxon T = 5, p<0.02, N = 11; Rest - Wilcoxon T = 0, p<0.005, N = 11). These results may reflect the subordinate status of subadult individuals (Eisenberg and Kuehn, 1966). Subadult males may have to spend more time feeding because they are restricted to fringe areas of fruiting resources. Alternatively, these increases may be linked to the energetic costs of growth (Dunbar, 1988). The fact that they spend less time resting than adult males is partly explained by the increases in feeding and 'other' activities, but more so by the increase in proportion of time spent moving. Subadult males and to a lesser extent large juvenile males were frequently observed in male-dominated subgroups which often appeared to be patrolling the focal community home range extensively. This feature of spider monkey behavior has been previously reported (Eisenberg, 1976; McFarland Symington, 1990) and may represent a form of sub-adult male recruitment in a male philopatric primate society.

Males spent significantly more time resting than females (Wilcoxon T = 11, p<0.005, N = 11) and significantly less time moving (Wilcoxon T = 7, p<0.05, N = 11), whilst females spent more time feeding, although this was only approaching significance (Wilcoxon T = 12, p = 0.07, N = 11). Males and females showed very similar levels of 'other' behaviors and this similarity extended to the overall breakdown of the miscellaneous activities within this category (Wallace, 1998). The additional costs of lactation and pregnancy offer the best explanation as to why females spend more time feeding than adult males; however, an explanation for the differences in resting and moving is more problematical. One possibility is that females are forced to travel at slower rates than adult males because of the additional costs of carrying non-independent infants and juveniles. Even in the case of females with independent juveniles, the need to slow down and wait for these smaller individuals may increase moving time, thereby cutting into resting time.

Diurnal Activity Patterns

Diurnal variations in the spider monkey activity budget are depicted in Figure 3. Spider monkeys show an initial early morning peak in feeding, which then drops off, remaining

constant until mid-morning. Feeding behavior then falls considerably until mid- to late afternoon when it increases to a smaller peak. During this second period spider monkeys are presumably attempting to maximize food ingestion prior to the prolonged overnight fasting period (Chapman and Chapman, 1991).

In a review of the genus, Van Roosmalen and Klein, 1988, suggested that *Ateles* are selecting for dietary variability, with subgroups consistently eating more than one fruit type per follow day. In fact, patterns of diurnal dietary diversity were apparent at Lago Caiman; spider monkeys appeared to concentrate on one or two resources for most of the day and then feed for brief periods on a greater variety of resources towards the end of the day, especially on their way to the sleeping site. This observation could be seen as a way of opportunistically maintaining a full stomach right up until retiring for the long night. Alternatively, once daily energy intake has been maximized *Ateles* may select for some dietary diversity in order to provide a more varied nutrient and mineral intake.

In Costa Rica, spider monkeys ingested relatively more leaves immediately prior to periods of prolonged rest. This diurnal pattern of folivory has been attributed both to the difficulty and added time involved in digesting folivorous material, and of the need to maintain sufficient stomach space for more energetically profitable fruit during foraging sessions (Chapman and Chapman, 1991). The tendency for spider monkeys to consume folivorous material later in the afternoon was also noted by Van Roosmalen (1985) in Suriname. At Lago Caiman a similar diurnal pattern emerges (see Fig. 4), with spider monkeys clearly consuming more leaves in the afternoon, although a very early morning peak in leaf eating also occurs. Folivory is usually rare and the pattern may be less clear because of the months where leaf eating was more important. Thus, I examined the diurnal distribution of the start times of all observed leaf feeding sessions (see Fig. 5), and this shows a much more dramatic pattern which concurs with the above hypothesis.

An alternative explanation regarding diurnal patterns of leaf consumption by primates was suggested by Ganzhorn and Wright (1994). Their results only partially supported the hypothesis that temporal variations in folivory might be linked to varying diurnal protein concentrations in leaf material. However, species which are maximizing energy intake (in the form of sugars) should apparently eat leaves late in the day (Ganzhorn and Wright, 1994), as spider monkeys seem to do. Most folivorous material consumed was
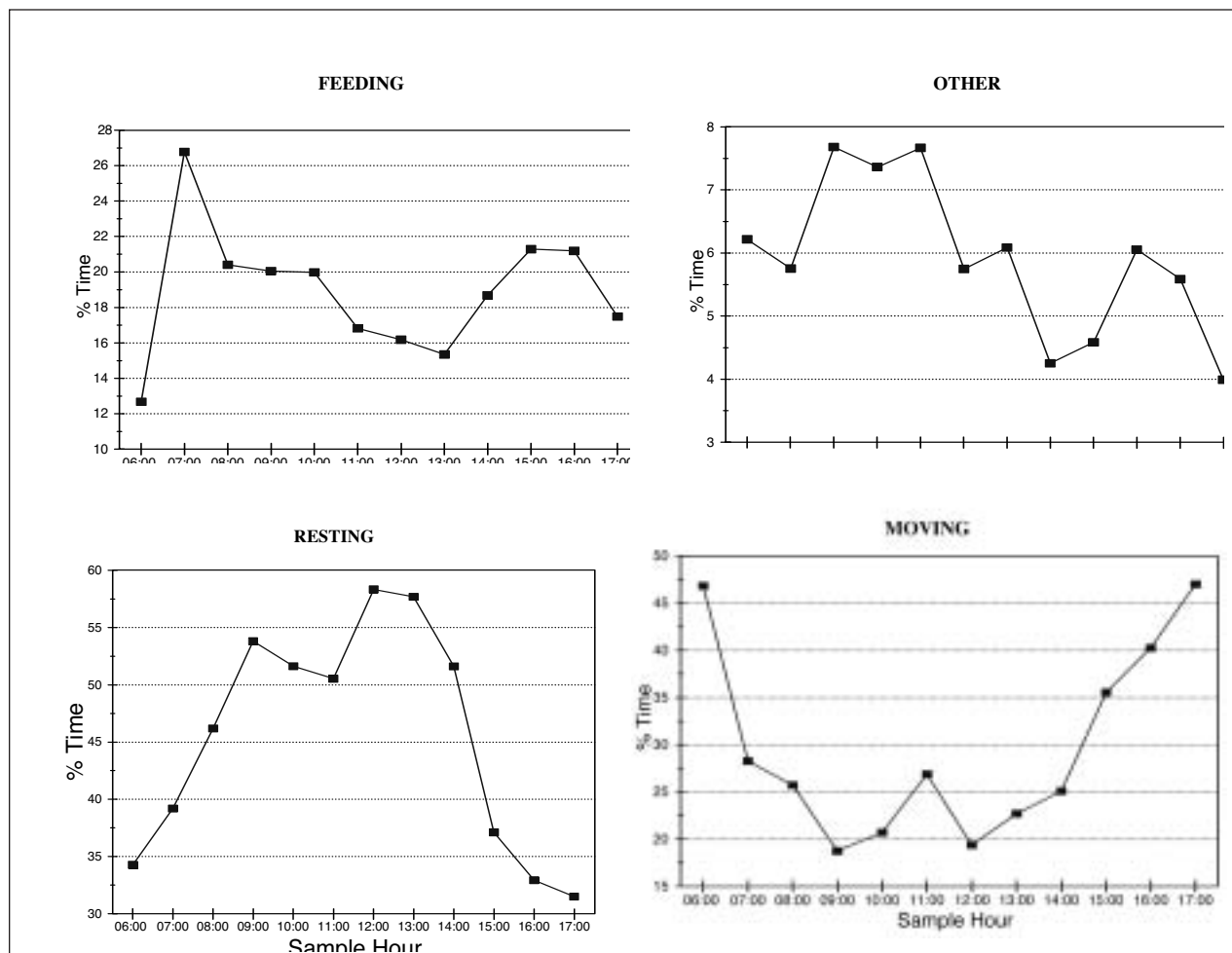

Figure 3. Diurnal variations in spider monkey activity budgets.

the younger leaves of several high canopy liana species, along with young leaves of a few tree species (Wallace, 1998). This pattern of leaf selection is similar to several primate species including *Ateles* (Van Roosmalen, 1985; Chapman, 1987; Castellanos, 1995). Young leaves are known to be easier to digest than those more mature (Hladik, 1978), contain fewer toxins (McKey *et al.*, 1981), higher levels of protein and energy (Milton, 1982), and may also be an important source of minerals and nutrients such as potassium, magnesium, phosphorus and nitrogen (Waterman, 1984).
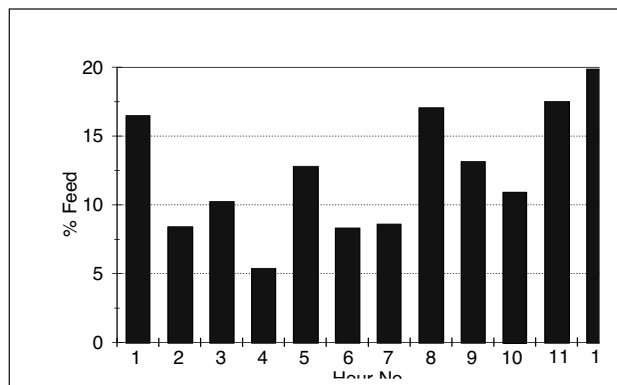
Time spent moving shows two pronounced peaks, one in the very early morning and another in mid to late afternoon as spider monkeys are traveling from and to sleeping sites respectively. From an energy conserving point of view these two periods represent the coolest times of the day and travel costs would thus be significantly reduced. Otherwise time spent traveling remains fairly constant and the overall pattern of moving is inversely related to the diurnal pattern of resting. Resting time increases throughout the day showing a first peak in the mid-morning (0900–1000) by which time monkeys may well have filled their stomachs. A second more pronounced resting peak occurs at midday continuing into early afternoon (1200–1400), before dropping off dramatically later in the day. This second peak dominates the activity budget at this time of day and is best explained by the corresponding peak in ambient temperatures which, along with high humidity levels,

Figure 4. Diurnal variations in degree of folivory in the spider monkey diet.

Figure 5. Distribution of start times for folivory patch feeding sessions.

presumably inhibits thermoregulation, thereby discouraging strenuous activity such as travel. Overall these patterns are fairly typical for diurnal primate species living in tropical conditions (Clutton-Brock, 1977), and extremely similar to those documented for *Ateles paniscus* in Suriname (Van Roosmalen and Klein, 1988).
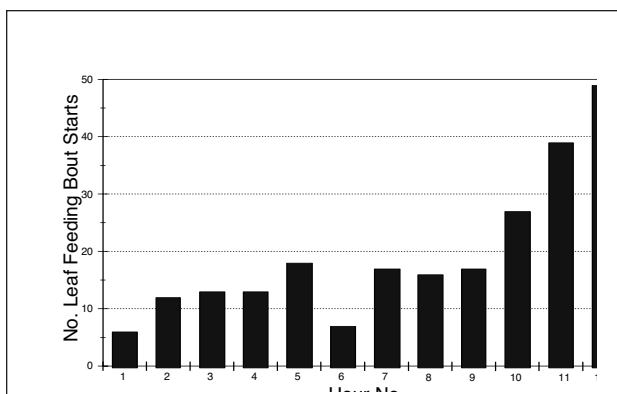
Climatic Effects on Activity Patterns
Extremes in the ambient temperature also affected diurnal activity budgets, for example, during the mid-austral winter cold southerly winds can occasionally lower temperatures to as little as 6°C. In such conditions spider monkeys often remained resting in overnight sleeping sites or high up in large emergents for 3–4 hours after day break, as if waiting for the day to warm up and/or maximizing insolation potential. On one extremely cold and wet morning (28 June 1996) the focal subgroup remained motionless until as late as 13:00 hrs.

As has been demonstrated for other diurnal arboreal primate species (Raemakers, 1980; Barrett, 1995), rainfall also affected spider monkey behavior. Although during light drizzly rain the spider monkeys continue apparently unaffected (unless also particularly cold at the time), more typical heavy tropical downpours result in the monkeys taking shelter and resting motionless until the rain stops. In summary, the focal follow animal's subgroup was dominated by resting individuals in 76% of those scan samples that occurred during rainfall.

Two other behaviors were directly associated with rain, firstly, a 'bathing' form of autogrooming was often witnessed during and immediately following rainfall, especially if the rainfall was the first for several days. This behavior has been previously reported for free-ranging spider monkeys (Eisenberg and Kuehn, 1966) and is particularly notable given the relatively low grooming frequencies displayed by spider monkeys at Lago Caiman (1% of the overall activity budget), and in general (Symington, 1988a; van Roosmalen and Klein, 1988).

The second behavior was rare but extremely dramatic; several pilo-erecting adult and subadult males would repeatedly charge around particularly open and connected emergent and upper canopy trees. This movement included running but was dominated by brachiating and, along with inter-community disputes, was the fastest that spider monkeys were ever seen traveling during the study. On the few occasions this behavior was witnessed it appeared to correlate with the coming of rains, which often also brought heavy winds. The fact that only males were observed in this activity suggests the possibility that this behavior serves as an intra-community male display. Intriguingly, an extremely similar behavioral response to the arrival of rains has been described for adult male chimpanzees (*Pan troglodytes*) at Gombe (Goodall, 1986) and termed a 'rain dance'. Spider monkeys and chimpanzees have been frequently compared in the past due to the fission-fusion nature of their social systems (McFarland Symington, 1990, Chapman *et al.*, 1995).

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Distribución Parcial del Tití Gris (*Saguinus leucopus*, Callitrichidae) en el Departamento de Antioquia, Colombia

Carlos A. Cuartas-Calle

Introducción

Saguinus leucopus fue descripto en la localidad tipo de Medellín (Bella Villa) departamento de Antioquia por Günter (1877), la especie era muy numerosa en dicho poblado. El crecimiento de la población humana y la construcción de vías y sitios de vivienda fueron acabando con los remanentes de bosque y aislando y desplazando a las poblaciones de tití gris amenazando la permanencia del tití en dicho hábitat. Los últimos grupos de *S. leucopus* fueron observados en la ciudad de Medellín en la década del treinta (1930–1940), a partir de dicha fecha no se volvió a saber de la especie, la cual fue diezmada de su localidad tipo.

Saguinus leucopus es un primate endémico de Colombia, tiene como zona de distribución el Norte del país, entre la parte baja del Río Cauca y el Valle Medio del Río Magdalena (Hernández-Camacho y Cooper, 1975, Hernández-Camacho y Defler, 1983). Según Cuervo *et al.,* (1986) la especie se distribuye desde el Oriente de Caldas, Norte del Tolima, Antioquia (en el Bajo Cauca y Nechí, y la Hoya del Magdalena). Eisenberg (1989) la ubica en el Valle del Río Magdalena, centro y norte de Colombia, en la margen izquierda del Río Magdalena en el departamento de Antioquia, y en los departamentos de Bolívar y Tolima. Emmons y Feer (1998) la distribuyen al Oriente de los Andes en el piedemonte de la Cordillera Central, entre la margen Oriental del Río Cauca (Bajo Cauca) y la margen Occidental en la parte media del Río Magdalena. También se distribuye en zonas poco anegadizas al Sur del departamento de Bolívar y sectores del Norte del Departamento de Caldas en el corregimiento de Norcasia, y el corregimiento de Guarinó en la parte media y alta de la Quebrada la Burra entre los municipios de Dorada y Honda (observación personal); como también en el sector "Arizona" municipio

de La Dorada, Departamento de Caldas, y el sector "San Antonio" municipio de Samaná, Departamento de Antioquia (Vargas y Solano, 1996). Esta especie está catalogada por la UICN y US-ESA (1994) CITES como "En Peligro de Extinción", debido a tres variables: Su marcado endemismo, su rango de distribución restringido (uno de los más reducidos entre los primates del mundo), y la severa reducción y destrucción de su hábitat. En el departamento de Antioquia, aún se conservan bosques primarios, primario intervenido y bosques secundarios, con áreas relativamente extensas que albergan poblaciones de esta especie, pero lastimosamente a la fecha no se han creado áreas de reserva para la protección y conservación de *S. leucopus.*

Area de Estudio

Durante el período 1995 – 1998 se realizaron varios inventarios de mamíferos en la margen Oriental del Río Cauca, en las subregiones del Bajo Cauca, Nordeste, Norte, Magdalena Medio y Oriente del departamento de Antioquia, en áreas con jurisdicción de CORNARE (Corporación Autónoma Regional de los Ríos Negro y Nare) y CORANTIOQUIA (Corporación Autónoma Regional del Centro de Antioquia). Se visitaron 40 veredas pertenecientes a 17 municipios, con alturas entre los 30 y 1600 msnm, y zonas de vida de bosque húmedo tropical (bh-T) hasta bosque pluvial premontano (bp-PM) (Figura 1 y Tabla 1).

Resultados y Discusión

En este estudio preliminar de la distribución de *S. leucopus* en el departamento de Antioquia, se observaron 95 grupos con un total de 719 individuos (Tabla, 1). También se detectó la presencia de otros primates como: *Cebus albifrons, Alouatta seniculus, Ateles* sp. y *Aotus lemurinus.*

Basado en las observaciones de campo, la distribución geográfica de *S. leucopus* al Sur de Antioquia, corresponde a la margen derecha del Río Cauca, en los límites con el departamento de Caldas (Río Samaná, municipios de Nariño, Argelia y Sonsón), y a la margen izquierda del Río Magdalena, en los límites con el departamento de Boyacá (municipios de Puerto Triunfo). Al Norte se distribuye en límites de los departamentos de Bolívar (municipios de El Bagre y Nechí), y Sucre (municipio de Caucasia) en la margen derecha de los Ríos Cauca y Porce (Figura 1). Los grupos de Tití, se observaron en bosques primarios, primarios intervenidos, secundarios y rastrojos altos y en bosques ribereños.

Los bosques primarios observados se caracterizan por la presencia de un estrato emergente disperso formado por grandes árboles que superan los 30 m de altura y cobertura total mayor del 90%. Los bosques primarios intervenidos presentan coberturas mayores del 90% y alturas entre 7 y 30 m. Las lianas y trepadoras tienen densidades medias. Los bosques secundarios con estados sucesionales medio y tardío presentan alturas entre 5 y 20 m y una cobertura total del 70%. Los estratos arbustivos muestran coberturas del 50% y

Tabla 1. Grupos y número de individuos de *Saguinus leucopus* observados en los municipios y veredas visitadas en el departamento de Antioquia, Colombia.

Municipio	Vereda	Coordenadas	Altura	Z. V.	Bosque	G	N° Ind.
Nechí	Las Flores	8°6'N; 74°44'O	30	bh-T	Bpi, Bs, Ra	2	15
El Bagre	Amaceri	7°45'N; 74°40'O	50	bh-T	Bpi, Bs, Ra	2	16
Zaragoza	Dos Bocas	7°28'N; 74°50'O	80	bh-T	Bpi, Bs, Ra	3	21
Anorí	Liberia	7°23'N; 75°31'O	200	bh-T	Bp, Bpi	5	40
	Santiago	7°10'N; 75°13'O	1120	bp-MB	Bp, Bpi, Bs	3	17
	Las Juntas	7°12'N; 75°11'O	900	bp-PM	Bp, Bpi	4	40
Amalfi	El Jardín	7°25'N; 74°45'O	850	bh-PM	Bp, Bpi, Bs	3	20
	La Vetilla	7°12'N; 74°53'O	540	bh-T	Bp, Bpi	3	26
	Arenas Blancas	6°52'N; 74°51'O	1060	bh-PM	Bpi, Bs, Ra	2	16
	Los Toros	7°8'N; 75°3'O	400	bh-T	Bpi, Bs, Ra	3	25
Yarumal	El Cedro	7°13'N; 75°18'O	800	bp-T	Bs, Ra	1	8
Sto. Domingo	Los Naranjos	6°40'N; 75°12'O	1450	bp-MB	Bs, Ra	1	5
San Roque	San José del Nús	6°30'N; 74°45'O	400	bh-T	Bpi, Bs, Ra	2	14
	La Trinidad	6°32'N; 74°40'O	450	bh-T	Bs, Ra	2	10
Concepción	La Clara	6°20'N; 75°10'O	1500	bp-MB	Bs, Ra	1	7
	La Sonadora	6°18'N; 75°9'O	1600	bp-MB	Bs, Ra	1	5
San Rafael	Jaguas	6°21'N; 74°48'O	600	bh-T	Bpi, Bs, Ra	3	23
San Carlos	La Florida	6°15'N; 75°0'O	1400	bh-PM	Bpi, Bs, Ra	1	6
	Las Camelias	6°17'N; 75°3'O	1400	bh-PM	Bpi, Bs, Ra	1	5
	Miraflores	6°9'N; 74°40'O	500	bh-T	Bp, Bpi, Bs	5	45
	El Prado	6°10'N; 74°42'O	450	bh-T	Bp, Bpi, Bs	6	50
	La Aguada	6°16'N; 74°55'O	700	bh-T	Bp, Bpi, Bs	2	13
	Cocalito	6°12'N; 74°58'O	1100	bh-PM	Bs, Ra	1	7
	San José	6°11'N; 74°45'O	970	bh-T	Bpi, Bs, Ra	3	24
	Santa Elena	6°12'N; 74°56'O	1100	bh-PM	Bs, Ra	2	16
Granada	La Gaviota	6°4'N; 75°4'O	1400	bh-PM	Bs, Ra	1	5
	San Francisco	6°3'N; 75°4'O	1200	bh-T	Bs, Ra	1	7
	La María	6°5'N; 75°5'O	900	bh-T	Bs, Ra	2	16
	El Tablazo	6°1'N; 75°6'O	700	bh-T	Bpi, Bs, Ra	4	32
San Luis	El Prodigio	6°7'N; 74°45'O	470	bh-T	Bpi, Bs, Ra	1	6
	Las Confusas	6°4'N; 74°42'O	320	bh-T	Bp, Bpi, Bs	4	30
	Playa Rosa	6°2'N; 74°40'O	360	bh-T	Bpi, Bs, Ra	2	13
PuertoTriunfo	Puerto Perales	6°0'N; 74°39'O	200	bh-T	Bs, Ra	4	30
	Las Mercedes	5°56'N; 74°45'O	350	bh-T	Bs, Ra	3	27
	Río Claro	5°58'N; 74°48'O	400	bh-T	Bpi, Bs, Ra	2	15
Sonsón	La Soledad	5°45'N; 75°15'O	1200	bp-PM	Bs, Ra	1	5
	El Arenal	5°43'N; 75°10'O	1000	bh-T	Bpi, Bs, Ra	2	14
	Playa Rica	5°41'N; 75°9'O	950	bh-T	Bp, Bpi, Bs	3	24
Argelia	San Pablo	5°40' N; 75°0'O	800	bh-T	Bpi, Bs, Ra	2	16
Nariño	Samaná	5°32' N; 75°7'O	800	bh-T	Bpi, Bs, Ra	1	5
Total						**95**	**719**

Convenciones: Z.V: Zona de vida; G: Grupos observados; N° ind: individuos observados; bh-T: Bosque húmedo tropical; bp-MB: Bosque pluvial montano bajo; bp-PM: Bosque pluvial premontano; bh-PM: Bosque húmedo premontano; Bp: Bosque primario; Bpi: Bosque primario intervenido; Bs: Bosque secundario; Ra: Rastrojo alto.

José Bernardo Barreiro Luna

Figura 1. *Saguinus leucopus* (tití gris).

alturas entre 3 y 6 m. Finalmente el matorral alto tiene una altura entre 1.5 y 7 m y sus copas se proyectan cubriendo el 60% del sustrato. En el trabajo de campo se pudo observar algunas plantas utilizadas por *S. leucopus* para alimento (Tabla, 2).

Saguinus leucopus se observó utilizando diferentes tipos de hábitats, con preferencia por los bosques primarios, primarios poco intervenidos y secundarios de sucesión tardía. En estos hábitats, de denso follaje y oquedades en los troncos, encuentra alimento, buen refugio de sus predadores naturales y sitios de anidación y descanso. También se lo observó utilizando los bosques secundarios muy intervenidos y rastrojos altos para alimentarse y para desplazarse a otros sitios o parches de bosque más densos donde se establecía o buscaba alimento. Se pudo observar un grupo conformado por siete individuos en un palo de naranjo consumiendo dicho fruto (vereda Cocalito) en un bosque muy intervenido.

En varias ocasiones se observó que para desplazarse de un parche a otro el tití gris tenía que atravesar potreros, poniendo en más riesgo su existencia. En una ocasión se pudo ver un perro cazando y dándole muerte a un ejemplar ya que eran presa fácil en el suelo (El Cedro, quebrada Santa Barbara). Esto hace pensar en la necesidad de recuperación de franjas de potreros y zonas boscosas degradadas para adecuarlas como corredores naturales y sitios de alimento y paso a otros parches más densos.

Los bosques primarios y primarios intervenidos cubren áreas considerables en los municipios de Anorí (sector de Liberia y

Las Juntas por la quebrada La Trinidad) municipio de Amalfi (veredas La Vetilla, Los Toros, rodeando la cuenca del Río Tinitá); municipio de San Carlos sector de Samaná (veredas Miraflores, El Prado y San José); Municipio de San Rafael (vereda Jaguas); Municipio de San Luis (Las Confusas). Las características que presentan estos bosques son el tamaño, la vegetación, la oferta de alimento y refugios y corredores que comunican con otros fragmentos facilitando el intercambio de individuos entre poblaciones.

En las diferentes subregiones donde se detectó la presencia de *S. leucopus* se presentan diferentes actividades de explotación a saber:

Subregión del Bajo Cauca: Hasta el año 1964 la región del Bajo Cauca fue zona de reserva forestal y estaba cubierta casi en su totalidad por bosques primarios, pero por solicitud del INCORA (Instituto Colombiano de Reforma Agraria) y en virtud de la Ley 019 de 1964 el sector desde el Río Nechí hasta el Río Cauca fue declarado área de colonización, dejando áreas pequeñas como reserva en los municipios de Nechí, El Bagre y Zaragoza. En 1973 gran parte de la vegetación fue destruida y adecuadas las tierras para ganadería. La ganadería fue reemplazada por la minería, resultando en la destrucción de los potreros, principalmente por la minería de aluvión mecanizada en tierra y agua. A la fecha, esta subregión solo presenta unos pocos remanentes de bosque.

Subregión del Nordeste: En el municipio de Anorí, sector de Liberia, se practica la minería de aluvión mecanizada; es preocupante el futuro de estos bosques ya que la región es altamente minera y la penetración a esta zona boscosa es inminente. En Santiago, la actividad consiste en cultivos, y ganado, así como la extracción y extracción de madera. Las Juntas presenta un bosque bien conservado, con poca actividad de extracción y pocas áreas para ganadería. En el municipio de Amalfi se practica la minería mecanizada y de veta. En la vereda Arenas Blancas hay gran explotación maderera. En la vereda los Toros se practica minería y ganadería intensiva. En la vereda La Vetilla se presenta explotación minera y en la vereda El Jardín explotación maderera. En los municipios de Santo Domingo y San Roque, se presentan áreas de ganadería y cultivo, los bosques mejor conservados en San Roque están ubicados en las márgenes del río Nús.

Subregión del Norte: En el Municipio de Yarumal, vereda El Cedro, los bosques se encuentran en la margen derecha e izquierda de la quebrada Santa Bárbara; esta zona se caracteriza por la dominancia de potreros para ganadería y agricultura, y en el futuro serán inundados por un proyecto hidroeléctrico.

Subregión del Magdalena Medio: El Municipio de Puerto Triunfo, con la apertura de la autopista Medellín-Bogotá, ha sido muy intervenido, especialmente para extracción de madera. Puerto Perales presenta explotación petrolera, los bosques están conservados y cuidados, pero se consideran

Tabla 2. Plantas visitadas y partes consumidas por *Saguinus leucopus.*

Familia	Especie	N. Vulgar	Consumen
Anacardiaceae	*Anacardium excelsum*	Caracoli	F, Ht, Yf, P
	Spondias mombin	Jobo	H, F(c p)
	Mangifera indica	Mango	F(c p)
	Tapirira guianensis	Fresno	Fruto entero
Apocynaceae	*Aspidosperma dugondi*	Carreto	Frutos tiernos
Bombacaceae	*Bombacopsis aquinata*	Ceiba	Hojas
	Ceiba pentandra	Ceiba	Hojas tiernas
	Ochroma lagopus	Balso	Fruto entero
Burseraceae	*Bursera simaruba*	Almácigo	F, Yf, P
	Protium nodulosum	Anime	F (pulpa)
Caesalpinicidea	*Brownea macrophylla*	Arizal	Hojas, Flores
Esterculiaceae	*Sterculia apetala*	Piñón	Hojas, Flores
Flacourtiaceae	*Laetia procera*	Saino	F, Fl, H
Leguminosae	*Uribea tamarindoides*	Tamarindo de mico	F(arilos)
Mimosoideae	*Inga spectabilis*	Guaimaro	Hojas, Flores
	Inga sp.	Guamo de monte	Fruto(pulpa)
	Inga sp. 1.	Guamo bejuco	Fruto(pulpa)
Melastomataceae	*Bellucia axinanthera*	Guayabo de monte	Fruto entero
Moraceae	*Ficus americana*	Suán	Hojas, Flores
	Ficus insipida	Higuerón	Frutos, Flores
Myrtaceae	*Psidium guajava*	Guayaba	Fruto entero
	Myrcia sp.	Arrayán	Fruto entero
	Eugenia sp.	Arrayán	Fruto entero
Palmae	*Bactris minor*	Corozo de lata	F(c p)
Sapotaceae	*Pouteria multiflora*	Caimito castaño	Fruto (pulpa)

Convenciones: F: fruto entero; Ht: hojas tiernas; Yf: yemas foliares; P: peciolos; H: hojas; F(cp): del fruto consumen la cascara y pulpa; Fl: flor.

islas ya que están bordeados por potreros extensivos para ganadería. En Las Mercedes el bosque lo tienen protegido y lo conservan como protector de la microcuenca El Corozal. En la vereda Río Claro varios de los bosques son protegidos y cuidados por sus propietarios; en áreas aledañas a estos bosques se presenta extracción de madera y explotación de minas karsticas (mármoles y calizas).

Subregión del Oriente: Se caracteriza principalmente por la extracción de madera. En Sonsón, vereda La Soledad, hay destrucción de los bosques y se hacen cultivos de café, caña y extracción de madera para cocina. Las veredas El Arenal y Playa Rica presentan poca ganadería, se queman parches de bosque para cultivo de maíz y caña. El sector de La Danta es protegido y se presenta poca extracción de madera, aunque se observan pequeños áreas para ganado. Municipio de San Carlos, veredas El Prado, Miraflores y San José presentan gran explotación maderera y potreros ganaderos. En el municipio de San Luis se presenta gran explotación maderera.

Es preocupante el futuro de *S. leucopus,* ya que el área de su distribución está siendo alterada y fragmentada a un ritmo acelerado. Estos hábitats naturales han sido fuertemente afectados por la actividad humana, ya que ofrecen condiciones para la explotación maderera, expansión de tierras para cultivos y ganadería, apertura de vías, explotación minera y construcción de embalses. La situación se agrava por no existir un control en el manejo y uso de la

tierra ni áreas de reserva para la protección y conservación de la especie.

La fragmentación de los bosques tendrá consecuencias drásticas sobre la distribución de esta especie ya que puede resultar en extinciones locales. La degradación y fragmentación de los ecosistemas están creando "islas" de áreas naturales en las que las poblaciones se están aislando de sus congéneres de otras partes. En parches de bosque suficientemente grandes se puede mantener poblaciones con una tasa baja de extinción; pero cuando los parches son muy pequeños y aislados, estos mantienen poblaciones pequeñas, decrece la tasa de colonización y de intercambio genético por lo que la extinción puede llegar a ser alta.

Conectar habitats fragmentados sería una de las soluciones a corto plazo, lo cual reduciría las posibilidades de extinción por efecto del aislamiento, por lo que se. Se propondrían corredores de hábitat (Corredor a Escala de Mosaico de Paisaje) que conectarían hábitats aislados y promoverían procesos de movimiento y colonización entre fragmentos, permitiendo un flujo de genes entre diferentes grupos y poblaciones. Estos corredores deben ser amplios y grandes para facilitar el movimiento de manera estacional o cotidiana. Los corredores conectarían parches separados a través de largas franjas de bosque, como bosque ribereño a lo largo de ríos, quebradas y riachuelos o hábitats de montañas. Para establecer los corredores se deben tener en cuenta factores

adicionales como la estructura del hábitat, la existencia de árboles con huecos para resguardo y forrajeo.

Es urgente que las corporaciones y entidades encargadas creen áreas de reserva para la protección y conservación de la especie. Son varios los bosques que pueden ser protegidos para asegurar la supervivencia de esta especie, ya que existen áreas extensas de bosque primario, primario poco intervenido, bosques secundarios de sucesión media y tardía, entre los cuales están los de Anorí, Liberia, Samaná, San Carlos, San Luis, Sonsón y Amalfi.

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Drinking by Howler Monkeys (*Alouatta fusca*) and Its Seasonality at the Intervales State Park, São Paulo, Brazil

Sandra Steinmetz

Introduction

Drinking is only infrequently observed in howler monkeys (Bicca-Marques, 1992; Bonvicino, 1988; Carpenter, 1934; Glander, 1975, 1978; Moynihan, 1976; Terborgh, 1983) and it is argued that their diet provides the majority of fluids they need (Glander, 1978). In this note I report on the occurrence of drinking in a population of southern brown howler monkeys, *Alouatta fusca*, observed during a study of their behaviour and ecology carried out at the Intervales State Park, São Paulo, from November, 1998 to October, 1999 (Steinmetz, 2000).

The Intervales State Park projects 49,888 ha of Atlantic rain forest in the state of São Paulo, Brazil (24°12'–24°25'S, 48°03'–48°30'W). The climate there is temperate, with an annual precipitation above 1.000 mm and no dry season. The average temperature is 18°C in the coldest month and 22°C in the hottest month (Petroni, 2000). During the year of study (November 98 to October 99) the average temperature was 16.2°C and the total precipitation was 1.707,82 mm (data collected in the Intervales State Park) (Fig. 1).
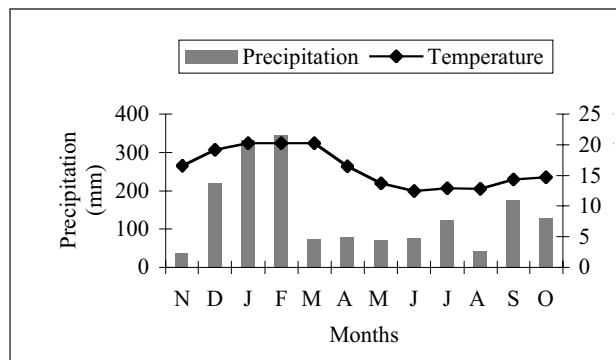
Figure 1. Monthly average temperature and cumulative precipitation registered at Intervales State Park, São Paulo, November and December of 1998 and January to October of 1999.

Methods

The activity budget and diet of a group of six individuals, composed of two adult males, one juvenile male, one female and one infant, were registered by monthly scan sampling from November, 1998 to October, 1999. Direct observations of the group totalled 918:30 hours or 92 days, of which 65 were full days. All observations of the howlers drinking water were noted. To verify differences between the light rainy season (April to August) and the heavy rainy season (September to March), the monthly percentages were compared using the Mann-Whitney "U" test. The Spearman coefficient was used for the correlations and significance was set at the 0.05 level.

Results and Discussion

Drinking was observed 79 times (Table 1). In all instances the howlers drank water accumulated in epiphytic bromeliads. They were seen drinking more often in the lighter rainy season (Mann-Whitney 'U' = 35.000; p = 0.0025) (Table 1). Occurrences of drinking were negatively correlated with precipitation and temperature (r = -0.642; p = 0.0244 and r = -0.6103; p = 0.0351, respectively). Drinking was positively correlated with the consumption of old leaves, and they drank less often when more fruit was eaten (Pearson correlation, r = 0.7231; p = 0.0079, r = -0.6208; p = 0.0312, respectively) (Figs. 2 and 3).

Table 1. Total number of observations, mean of observations per month and standard deviation (SD) of drinking of howler monkeys, *Alouatta fusca*, in two seasons, and throughout the study (November 1998 to October 1999) at the Intervales State Park, São Paulo.

Season	Number of observations	Mean	SD
Less rainy	69	13.80	9.36
Most rainy	10	1.43	1.13
Total	79	6.58	8.55
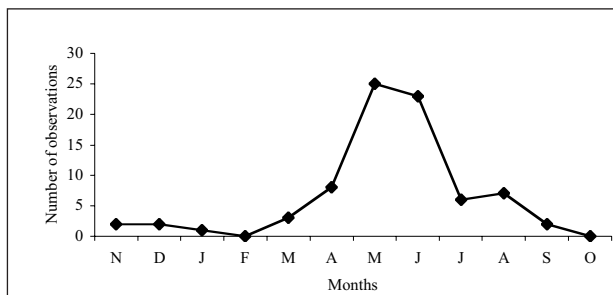
Figure 2. Monthly variation of the number of observations of drinking behaviour in howler monkeys, *Alouatta fusca*, between November 1998 and October 1999, at Intervales State Park, São Paulo.
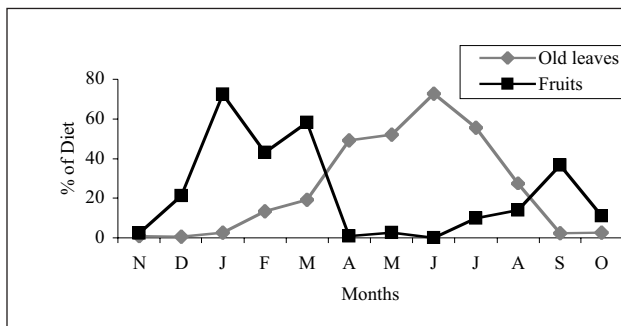
Figure 3. Monthly percentile of old leaves and fruits in the diet of howler monkeys, *Alouatta fusca*, between November 1998 and October 1999, at Intervales State Park, São Paulo.

Glander (1978) also found a seasonal pattern in drinking behaviour correlated with the consumption of old leaves. Besides a reduced availability of water, old leaves have more secondary compounds that, after the detoxification process, produce metabolites that require water for their elimination (Glander, 1978). At Intervales, the howlers have no difficulty in finding water because of the abundance of bromeliads and the absence of a defined dry season. Drinking seems to be related to the kind of food consumed: fruits have more water and less secondary compounds than old leaves. However, in Alegrete, Rio Grande do Sul State, Brazil, a place with drastic dry seasons, Bicca-Marques (1992) noted that howlers consumed more water in the rainy season, and that drinking behaviour was not related to diet.

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Uso de Plantas Como Alimento por Monos Aulladores, *Alouatta palliata*, en el Parque Yumká, Tabasco, México

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Introducción

El estado de Tabasco en el sur de México resguarda poblaciones representantes de las tres especies de primates que existen en México: *Alouatta palliata, A. pigra* y *Ateles geoffroyi* (Smith; 1970, Horwich and Johnson 1986; Rylands *et al.*, 1995). Tabasco es el único estado de México,

y la única zona de la región Mesoamericana, en donde podemos encontrar representantes de las tres especies de primates y resguarda la zona de transición entre *A. palliata* y *A. pigra* y en algunas localidades las dos especies son simpátricas (Smith, 1970). Cerca del 60% de la superficie del estado estaba originalmente cubierta por selvas, pero como resultado de la actividad humana en Tabasco, cerca del 80% de esta vegetación ha desaparecido a una tasa de 600 km² ó más al año, siendo las tierras bajas en donde ha ocurrido la mayor transformación de la selva a pastizales y otros agrosistemas (Masera, 1996 México, SEMARNAP, 1999, INEGI, 1996).

Aunado a la desaparición de las selvas en Tabasco, hay una falta de información acerca de la distribución geográfica actual y tamaño de las poblaciones de las tres especies de primates. Igualmente faltante son datos sobre su historia natural, ecología, conducta y estado de conservación. Entre estos estudios, aquellos relacionados a la ecología alimentaria de los aulladores aportan información fundamental para determinar los recursos que son capaces de utilizar estos primates como fuente de alimento. Tales datos son importantes no sólo como aspectos de la historia natural de las especies, pero también como indicadores de los conjuntos de plantas presentes en las selvas que son aprovechables por los primates. La ausencia de datos básicos acerca de las preferencias alimentarias de *A. palliata* en Tabasco y como varían estas en el tiempo dificulta el llevar a cabo proyectos de conservación y manejo de las poblaciones remanentes en el estado.

Con el objeto de contribuir a este vacío de información, en este trabajo reportamos los resultados de un estudio parcial sobre el uso de plantas como alimento por una tropa de monos aulladores (*Alouatta palliata*) en el Parque Yumká localizado en la parte central de Tabasco. Un trabajo anterior reporta datos sobre el tamaño y aspectos demográficos de la población de monos aulladores en este sitio (Estrada *et al.*, 2001).

Métodos

Sitio de estudio

El Parque Yumká se localiza a 17°45" y 18°00"N, 92°45" y 93°00"W y a 15 km de la ciudad de Villahermosa, la capital del estado. Yumká es un parque público que comprende una superficie de 101 ha, de las cuales, 33 ha presentan selva alta perennifolia, 47 ha son sabanas y el resto lo conforma un lago (Fig. 1). La altura sobre el nivel del mar es de 15 m. El clima es cálido-húmedo con una precipitación media anual de 2159 mm y una temperatura media anual de 29.4°C.

Sujetos de estudio

Nuestro estudio se basó en observaciones del comportamiento alimentario de una de las cuatro tropas de monos aulladores que existen en el Parque (Estrada *et al* 2001). Esta tropa estaba formada por 28 individuos: cinco macho adultos, once hembras adultas, cinco juveniles, cuatro infantes y tres individuos cuyo sexo no pudo ser determinado.
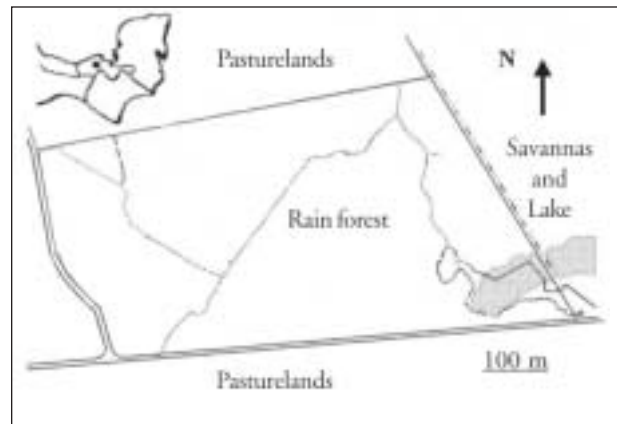
Fig. 1. Localización del Parque Yumká en la parte central del estado de Tabasco (punto negro en el mapa del sur de México). Las líneas paralelas y solida son una carretera pavimentada y otra de terracería. Las líneas delgadas son veredas en el área de selva del Parque. El área sombreada en la parte infeior de la figura es parte de un lago.

Observaciones de los monos aulladores

Las observaciones del comportamiento de alimentación de los aulladores se llevaron a cabo durante siete días de cada mes entre Noviembre 2000 y Abril 2001. El método de muestreo empleado en las observaciones fue el de animal focal (Altmann, 1974). El tiempo de duración de la muestra focal para cada sujeto fue de una hora, registrando el tiempo dedicado al consumo de hojas (jóvenes y maduras), de frutos (jóvenes y maduros), de flores, de pecíolos, de epifitas, de hemiparásitas y de bejucos. Los árboles utilizados por los aulladores fueron marcados, medidos (altura máxima y diámetro a la altura del pecho) y identificados a nivel de especie. Debido a que los datos para los meses de Diciembre y Enero fueron escasos, ambos meses se combinaron como un solo periodo.

La diversidad dietética mensual se expresó con el índice de diversidad de Shannon (H´) y el índice de Sorencen fue calculado para expresar la similitud intermensual en el uso de especies en la dieta de los aulladores. La dispersión en el espacio de los árboles que fueron fuentes de alimento para los aulladores se determino por medio de la ubicación de estos en un mapa a escala. En este mapa, el área de selva se dividió en sectores de 1.0 ha en tamaño cada uno, resultando en un total de 33 sectores más 14 sectores adicionales, ya que en algunos casos los aulladores salieron del área de selva y utilizaron arboles fuera de la propiedad del Parque. El patrón de dispersión espacial de los árboles usados por los aulladores como fuente de alimento se determinó por medio del calculo del índice de dispersión de Morisita (Franco, *et al.* 1995). Este permitió discernir si la distribución espacial de los árboles utilizados por la tropa era al azar, uniforme o agregada.

Resultados

Esfuerzo de muestreo

Durante el periodo de muestreo (Noviembre 2000–Abril 2001) se completaron mensualmente un promedio de 7.0 $\pm$ 2.1 días de observación de la conducta de los aulladores y

acumulamos 727 muestras focales en 302 hrs de registro. El promedio mensual fue de 43 hrs de observación.

Recursos utilizados

Los aulladores utilizaron 21 especies de plantas (13 familias botánicas) como fuente de alimento. De estas, 19 especies estuvieron representadas por 113 árboles, una especie más estuvo representada por una planta epifita y otra más por un bejuco (Tabla 1). Los árboles utilizados por los aulladores presentaron una altura promedio de 18 m (rango = 5 - 24 m) y un d.a.p. promedio de 0.50 $\pm$ 0.40 m (rango 0.1 - 1.8 m) y se encontró una correlación positiva entre el d.a.p. y la altura de los árboles utilizados por los aulladores (r_s = 0.82, p <0.001).

Tres especies de árboles, (*Brosimun alicastrum, Cynometra retusa y B. terrabanum*) contribuyeron al 51% del tiempo de alimentación y al 49 % de los árboles utilizados como fuente de alimento (Tabla 1). Tres especies arbóreas adicionales (*Gliricidia sepium, Sabal mauritiformis y Lysiloma bahamensis*) contribuyeron a un 25% más del tiempo de alimentación y contribuyeron al 29% de los árboles utilizados. El resto de las especies registradas contribuyeron al 24% restante del tiempo de alimentación y al 22% de los árboles usados (Tabla 1). El tiempo de alimentación se encontró asociado positivamente con el número de especies usadas como fuente

de alimento (r_s = 0.76, P < 0.002) y una correlación positiva se encontró entre el tiempo de alimentación y el número de árboles usados por especie (r_s = 0.78, P < 0.005).

Tres familias botánicas contribuyeron al 75% del tiempo de alimentación registrado. La familia Moraceae con dos especies de plantas contribuyó al 32% del tiempo alimenticio. Mientras que la Fabaceae con seis especies de plantas aportó un 24% del tiempo de alimentación (Tabla 1). El 19% de tiempo alimenticio fue aportado por dos especies de la familia Caesalpiniaceae. Una sola especies de la Araceae contribuyó al 8% del tiempo de alimentación. El restante 25% lo aportaron especies en las otras 11 familias botánicas (Tabla 1).

Selectividad de las partes de las plantas utilizadas como alimento

El 72% del tiempo de alimentación registrado fue utilizado por los aulladores en el consumo de hojas. De este, el 38% y 34% fue invertido en el consumo de hojas jóvenes y hojas maduras respectivamente y los frutos maduros aportaron el 10% y los jóvenes el 4%. El consumo de flores contribuyó al 13% del tiempo de alimentación. La mayor diversidad de especies se encontró en el consumo de hojas maduras (17 especies) y de hojas jóvenes (12 especies), mientras que

Tabla 1. Especies de plantas utilizadas por los monos aulladores del Parque Yumká, Tabasco, México, como fuente de alimento (Nov 2000 – Abril 2001). Se muestra el porciento de tiempo de alimentación que los aulladores pasaron alimentándose de cada parte de la planta. Las especies están listadas de acuerdo al número de individuos utilizados por los aulladores. Las letras entre paréntesis indican la familia botánica: M *Moraceae*, C *Caesalpiniaceae*, F *Fabaceae*, A *Araceae*, R *Rutaceae*, B *Boraginaceae*, S *Sapindaceae*, M *Meliaceae*, Si *Simarubaceae*, Bo *Bombacaceae*, Bu *Burseraceae*, U *Ulmaceae* y Fl *Flacourtiaceae*. Be bejuco, E epifita.

Especie	Hojas jóvenes	Hojas maduras	Frutos jóvenes	Frutos maduros	Flores	Número de individuos
Brosimum alicastrum (M)	23	20.9	53.0		5	20
Brosimum terrabanum (M)	15	9.3	46.0			18
Cynometra retusa (C)	31	14.6		15.0		18
Gliricidia sepium (F)	1	5.9			59	17
Sabal mauritiformis (A)				85.0		9
Lysiloma bahamensis (F)	1				27	7
Zanthoxylum microcarpum (R)	6	0.4				5
Cordia stellifera (B)	1	2.9				3
Piscidia communis (F)	5	3.9			7	3
Enterolobium cyclocarpum (F)		4.7				2
Gliricidia sp. (F)		5.3				2
Paullinia pinnata (S) Be	8	14.7				2
Ampelocera hottlei (U)		1.1	1.0			1
Bursera simaruba (Bu)		1.5				1
Casearia bartlettii ((Fl)		0.2				1
Ceiba pentandra (Bo)		1.0			2	1
Dialium guianense (C)	2					1
Guarea chichon (M)	4	11.0				1
Picramnia antidesma (Si)	3					1
Platymiscium yucatanensis (F)		2.5				1
Syngonium podophyllum (A) E		0.1				1

el número de especies utilizadas por los aulladores para consumo de frutos y flores varió de 2 a 5 especies (Tabla 1).

Los aulladores utilizaron 12 especies de plantas como fuentes de hojas jóvenes, pero dos de ellas, *B. alicastrum* y *B. terrabanum,* contribuyeron al 38% del tiempo registrado para alimentación en hojas jóvenes, otro 31% fue aportado por *C. retusa* (Tabla 1). El tiempo empleado por los aulladores en el consumo de hojas jóvenes se encontró asociado positivamente con el número de árboles usados por especie, (r_s = 0.82, P < 0.008). En el caso de las hojas maduras los aulladores utilizaron 17 especies. De estas *B. alicastrum* y *B. terrabanum* contribuyeron con un 30% del tiempo de alimentación. Las especies *C. retusa* y *Paullinia pinnata* contribuyeron, cada con una, con un 15% del tiempo de alimentación y la especie *Guarea chichon* contribuyó con un 11% del tiempo alimenticio (Tabla 1). El 29% restante del tiempo registrado en alimentación de hojas maduras se distribuyó en nueve especies. El tiempo empleado por los aulladores en el consumo de hojas maduras se encontró asociado positivamente con el número de árboles usados por especie (r_s = 0.50, P < 0.02).

Dos especies de plantas fueron utilizadas por los aulladores como fuente de frutos jóvenes. De estas, *B. alicastrum* contribuyó al 54% del tiempo de alimentación y *B. terrabanum* al 46% (Tabla 1). En el caso de frutos maduros los aulladores usaron dos especies: *S. mauritiformis* y *C. retusa*, pertenecientes a las familias Araceae y Caesalpiniaceae. Estas especies aportaron el 85% y 14% del tiempo de alimentación, respectivamente (Tabla 1). Cinco especies de árboles fueron usadas como fuentes de flores, *G. sepium, L. bahamensis, Piscidia communis, B. alicastrum y Ceiba pentandra.* De estas, *G. sepium* fue la más importante, aportando el 60% del tiempo total registrado en el consumo de flores (Tabla 1). El aporte de otras cuatro especies fue 27% *L. bahamensis*, 7% *P. communis*, 5% *B. alicatrum* y 2% *C. pentandra.*

Variación mensual en la dieta de los aulladores

El 19% de las especies de plantas usadas como fuente de alimento se registró en Noviembre, primer mes de observaciones. La aparición de especies nuevas en la dieta de los aulladores en los meses posteriores, presentó dos incrementos significativos en Dic/Ene con el 33% de las especies (n = 7) y otro en Febrero con el 38% (n = 8). Después de Febrero, los aulladores sólo añadieron una nueva especie de planta a su dieta en el mes de Marzo y otra en Abril. El índice promedio mensual de diversidad dietética fue de H´= 1.59 ± 0.53, pero este varió de mes a mes, presentando sus valores más altos en el mes de Febrero y los más bajos en el mes de Noviembre (Fig. 2). El índice promedio de similitud intermensual (índice de Sorensen IS) a nivel de especie fue de IS = 0.49 ± 0.07. Este varió de 0.42 entre Noviembre y Diciembre-Enero a 0.59 entre Diciembre-Enero y Febrero (Fig. 2).

El consumo de hojas y frutos fue variable durante los meses que duró el estudio, presentándose una marcada estacionalidad en el consumo de flores, frutos y también de
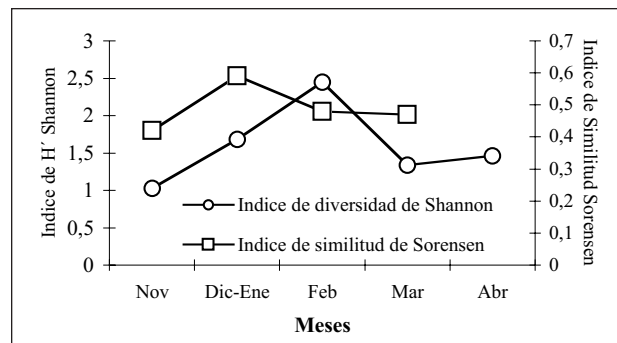

Fig. 2. Diversidad mensual (índice de Shannon H´) y el índice de similitud intermensual (Índice de Sorensen) en el uso de especies de plantas usadas por los aulladores como fuente de alimento en el Parque Yumká (Noviembre 2000–Abril 2001).

hojas jóvenes y maduras (Fig. 3). El consumo de flores fue importante en los meses de Noviembre a Febrero, mientras que el consumo de frutos maduros se presentó en todos los meses del periodo de estudio. El consumo de hojas jóvenes se concentró entre los meses de Febrero y Abril y este fue precedido por una concentración en el consumo de hojas maduras (Fig. 3).

Dispersión espacial de los recursos

Los aulladores usaron 19 de los 47 sectores de 1.0 ha en tamaño cada uno en que fue dividido el área selvática del Parque Yumká ó un 40% del espacio disponible. En estos sectores se encontraron dispersos los árboles que los aulladores usaron como fuente de alimento. Las especies *B. terrabanum, B. alicastrum, C. retusa y S. mauritiformis* contribuyeron al 64% de los árboles usados. Especies como *L. bahamensis, G. sepium, Dialium guianensis, P. comunis, Zantoxilum microcarpus, Gliricidia sp., Ampelocera hottlei y Picramia antidesma* aportaron el 28% de los árboles usados. El 8% restante estuvo representado por especies como *Bursera simaruba, Casearia bartleti, C. pentandra, Cordia stellifera, Enterolobium microcarpus, G. chichon y Platymicium yucatenensis.*
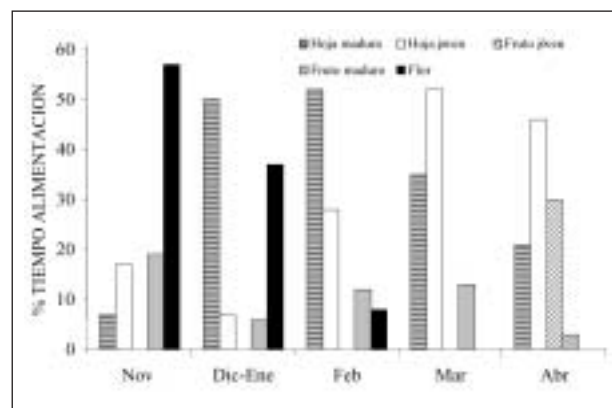
Fig. 3. Variación mensual en el porcentaje del tiempo de alimentación dedicado por los aulladores al consumo de diferentes partes de la planta en el Parque Yumká (Noviembre 2000-Abril 2001). Note la estacionalidad en el consumo de flores, mientras el consumo de hojas jóvenes estuvo concentrado entre Febrero y Abril.

Los valores del índice de Morisita derivados del calculo del patrón de dispersión espacial de los árboles usados por los aulladores como fuente de alimento fueron > 1.0 en cuatro calculos cubriendo sectores diferentes dentro de su área de suministro (Id_A = 1.35, Id_B = 1.59, Id_C = 1.02, Id_D = 1.13), lo que indica que los recursos utilizados por los aulladores presentaron un patrón agregado en el espacio (Muñoz, 2001). La distancia promedio recorrida por día por los aulladores en la búsqueda del alimento fue de 125.8 $\pm$ 95.0 m y la distancia promedio recorrida por mes fue de 652 $\pm$ 429 m, pero esta varió de 229 m en Enero a 1243 m en Febrero.

Discusión

Nuestros resultados indicaron que el uso de árboles en el entorno en el que existen los aulladores del Parque Yumká estuvo directamente asociado a la utilización de estos como fuente de alimento. Estos árboles que tienden a ser relativamente grandes en tamaño y les sirven también como substrato físico, representaron a cerca de 21 especies que les sirvieron como fuente de alimento. Entre estas predominó la utilización de especies pertenecientes a las familias Moraceae, Fabaceae y Caesalpiniceae. Especies en estas familias han sido reportadas como parte importante en la dieta de monos aulladores en otras localidades en México como en Los Tuxtlas en Veracruz (Estrada, 1984; Estrada *et al.,* 1999; Juan *et al.*, 1999) y en Centro y Sud América, como en Belice (Silver *et al.*, 1998), Finca la Pacifica, Costa Rica (Glander, 1975), Isla de Barro Colorado, Panamá (Milton, 1980) y Finca Meremberg, Colombia (Gaulin y Gaulin, 1982).

Como un dato sobresaliente fue la importancia de la palma *Sabal mauritiformis* (Araceae) que sirvió de suministro de frutos maduros a los aulladores durante cuatro de los cinco meses de duración del estudio. Esta palma es la segunda especie arbórea mas importante en el sitio presentándose en densidades de 26 ind/ha (Jiménez, 1987). Es probable que debido a la predominancia de esta especie y de aquellas del genero *Brosimum*, los aulladores cuentan con una fuente adecuada y más ó menos constante de alimento en forma de hojas y de frutos a través del año. La asociación existente entre el porciento de tiempo de alimentación y el número de árboles usados por especie sugiere que los aulladores persistentemente están buscando árboles de estas especies en su área de suministro.

Se ha sugerido que debido a la consistencia con que son usadas las especies de la familia Moraceae como fuente de hojas y frutos por monos aulladores, existe una tendencia en él genero *Alouatta* hacia la especialización en el uso de especies de esta familia (Milton, 1980; Estrada y Coates Estrada, 1995). La predominancia y consistencia en el uso (árboles y tiempo de alimentación) de las especies *B. alicastrum* y *B. terrabanum* de la Moraceae por el grupo de aulladores en el Parque Yumká es consistente con esta observación. El uso predominante de las Moráceas también ha sido asociado a la alta densidad que caracteriza a las especies de esta familia en hábitats con elementos de vegetación primaria y secundaria (Julliot y Sabatier, 1993). Por ejemplo, en el Parque Yumká

la densidad estimada de *B. alicastrum* es de 15 ind/ha, lo que acoplado al aporte de su área basal, la coloca entre las cuatro especies arbóreas más dominantes en este sitio (Jiménez, 1987).

El género *Alouatta* ha sido clasificado como folívoro-frugívoro (Crockett y Einsenberg 1987), dependiendo del hábitat que ocupen. En el Parque Yumká, durante el periodo de estudio los aulladores fueron más folívoros que frugívoros ya que pasaron el 76% del tiempo de alimentación consumiendo hojas. Las altas tasas de consumo de hojas observadas en el Yumká son consistentes con aquellas reportadas para él genero *Alouatta* en otras localidades (Glander, 1975; Milton, 1980; Gaulin y Gaulin, 1982; Estrada, 1984, 1988; Julio y Sabatier, 1993; Galetti *et al.*, 1994; Bicca-Marques *et al.*, 1994; Silver *et al.*, 1998, Juan *et al.*, 1999).

Se ha reportado que en la dieta de los monos aulladores predomina el consumo de hojas jóvenes (Braza *et al.*, 1983; Estrada, 1984; Glander, 1975; Julliot y Sabatier, 1993; Milton, 1980; Silver *et al.*, 1998; Juan *et al.*, 1999), preferencia atribuida a una alta concentración de proteína (33% más que las hojas maduras), altos contenidos de nutrientes digeribles y menor contenido (36% menos que las hojas maduras) de fibra que en las hojas maduras (Estrada, 1984; Glander, 1975; Milton, 1978, 1980). Las hojas maduras, en contraste, contienen niveles altos de compuestos secundarios (taninos, alcaloides, fenoles, etc.) y de fibra (celulosa, hemicelulosa y lignina) (Glander, 1982; Hladik, 1978; Milton, 1978, 1979).

En general, estas observaciones son consistentes con los datos obtenidos en el Parque Yumká, en donde los aulladores mostraron una marcada preferencia por las hojas jóvenes cuando estas estuvieron disponibles (Marzo-Abril). En los otros meses, predominó el uso de hojas maduras, lo que indica una cierta estacionalidad en la disponibilidad de hojas jóvenes. Debido a la estacionalidad en la disponibilidad de hoja jóvenes, los aulladores consumieron hojas maduras en una mayor proporción en esos meses en que las hojas jóvenes fueron escasas, pero el número de especies utilizadas fue mayor, invirtiendo más tiempo y recorriendo más distancias en su búsqueda (Muñoz, 2001). Los comportamientos arriba indicados se dieron a pesar de la mayor predecibilidad de las hojas maduras en la selva, lo que sugiere la necesidad que tienen los aulladores de balancear su dieta y minimizar la ingestión de fibra y compuestos tóxicos (Glander, 1975; Milton, 1977, 1979, 1980; Gaulin y Gaulin, 1982; Braza *et al.*, 1983: Estrada, 1984, Estrada *et al.*, 1999).

A pesar de la estacionalidad en la producción de frutos en el sitio, el comportamiento asincrónico y el largo periodo de frutación en la población de *Sabal mauritiformis*, permitió que los aulladores consumieran frutos en todos los meses que duró el periodo de estudio. Especies como *B alicastrum, B. terrabanum, Cynometra retusa* y *Ampelocera hotleii* presentaron frutos durante dos de los cinco meses, pero la dependencia de los aulladores de los frutos de *S. mauritiformis* es enfatizada por el dato de que el 63% del tiempo registrado

en el consumo de frutos por los aulladores, se registró en esta especie. Es probable que la fuerte dominancia de esta especie en la comunidad vegetal selvática del Yumká ha sido un aspecto favorable para el sostenimiento de la población de aulladores en este sitio. Otras especies importante en la dieta de los aulladores fueron aquellas que les sirvieron como fuente de flores, reforzando así la ingestión de proteína. Estas especies, *G. sepium, L. bahamensis, P. comunis, B. alicastrum* y *C. pentandra,* fueron utilizadas brevemente (1–2 meses) enfatizando la marcada estacionalidad en la disponibilidad de las flores consumidas por los aulladores.

Las variaciones mensuales observadas en la diversidad dietética (indicado por H´) de los aulladores, atestigua a las variaciones estaciónales en la disponibilidad de hojas, frutos y flores discutidas arriba, pero resalta el hecho de que el mes en que fue mayor el consumo de hojas maduras tiene el índice de diversidad más alto (H´ 2.45 versus el promedio mensual H´ 1.59). Esto sugiere que cuando escasea el alimento de mayor calidad (hojas jóvenes, frutos maduros y flores) los aulladores están forzados a alimentarse de hojas maduras, incrementando el número de especies y individuos de los cuales cosechan estas partes de las plantas. Esto último debido, posiblemente, al mayor contenido de fibra y compuestos secundarios en estas partes de las plantas (Estrada, 1984). Así, los monos aulladores logran adaptarse a las limitaciones de su flexibilidad digestiva por medio de respuestas conductuales en el tiempo y espacio que les permiten enfrentarse a variaciones en el comportamiento fenológico y propiedades químicas del alimento, logrando optimizar la ingestión de nutrientes y minimizando la ingestión de fibra y compuestos tóxicos (Milton, 1980; Estrada, 1984).

Se ha descrito que las distancias que recorren los aulladores a través de su área de suministro puede ser un buen indicador de la dispersión espacial y temporal de los recursos alimenticios (Estrada, 1984, Estrada, 1999). Los árboles de las especies usadas por los aulladores del Parque Yumká como fuente de alimento presentaron un patrón de dispersión espacial agregado, indicando una alta dispersión en el espacio de los recursos preferidos. Los aulladores respondieron a estos aspectos de sus recursos viajando distancias variables cada día, que fueron de 190 m a 380 m. Estos recorridos los llevaron a distintas secciones dentro de su área de suministro. Durante el periodo de estudio la tropa estudiada utilizó un 40% de la superficie selvática disponible o 19 ha, pero este uso varió mensualmente de 6 a 18 ha. Es claro que los monos aulladores no utilizaron de modo uniforme el área selvática disponible, algo que estuvo fuertemente condicionado por el patrón agregado de las fuentes de alimento, especialmente de aquellas especies arbóreas que tuvieron una marcada presencia en su dieta, como fue el caso de *S. mauritiformis, C. retusa, B. alicastrum* y *B. terrabanum.*

Aun cuando la presencia de otras tropas puede influir también en las variaciones observadas en el uso del espacio, nuestros datos sugieren que es muy probable que los comportamientos observados fueron respuestas a aspectos de los recursos alimenticios como su dispersión en el espacio y tiempo y su densidad y dominancia relativa. Estas respuestas están dadas por la necesidad de los aulladores de balancear y diversificar su dieta con la meta de optimizar su estrategia de forrajeo.

La importancia del estudio de la pequeña población de monos aulladores en el Parque Yumká radica en la necesidad de documentar, por un lado, aspectos de la ecología y historia natural para las especies primates del estado de Tabasco. Por otro lado, estos estudios son importantes para comprender la flexibilidad adaptativa de miembros del género *Alouatta* a la fragmentación, aislamiento y reducción en área de sus hábitats. Los monos aulladores del Parque Yumká han tenido éxito en esta dirección y una buena prueba de ellos es la persistencia y crecimiento de la población en una pequeña área de selva por ya cerca de cinco décadas (Estrada *et al.*, 2001). Por consiguiente, el estudio del comportamiento de los aulladores y la caracterización de los rasgos del entorno ecológico en el que existen nos permitirá comprender la manera en que se adaptan a la disponibilidad de los recursos, al espacio disponible y al crecimiento demográfico. Esta información nos puede dar las herramientas metodológicas, teóricas y empíricas para crear modelos de manejo que promuevan la conservación de poblaciones aisladas de estos primates en otras localid del estado de Tabasco y en el Neotrópico.

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ALOUATTA GUARIBA CLAMITANS CABRERA, 1940: A NEW SOUTHERN LIMIT FOR THE SPECIES AND FOR NEOTROPICAL PRIMATES

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Introduction

The state of Rio Grande do Sul in Brazil has a rich biodiversity due to its geographic location and landscape. Thirty-five percent of the Brazilian mammals, 141 species in 34 families, have been recorded for the state (Silva, 1994). Most of them occur in the Atlantic forest which extends from Rio Grande do Norte in the northeast of Brazil. In Rio Grande do Sul, this forest extends from the municipality of Torres to the Rio Maquiné in the northeast of the state, and marks the southern limit for most tropical plants (Reitz *et al.*, 1988). Few tropical forest plant species reach the region of

Porto Alegre or the Rio Jacuí. Forest fragments are found on the quaternary wet plains, and on the foothills of mountains (up to 900 m, in the region called Serra Geral).

The genus *Alouatta* Lacèpéde, 1799 is the most widely distributed of Neotropical primates (Neville *et al.*, 1988). Their northern limit is in the Yucatán Peninsula, Mexico (20°N) (Smith, 1970) and their southern limit, as defined until now, was the Rio Jacuí (30°S), Rio Grande do Sul, Brazil (Hirsch *et al.*, 1991). It was Cabrera (1940) who suspected that the southern brown howler, *Alouatta guariba clamitans*, may occur south of the Rio Jacuí, but no concrete evidence was available. Here we report on five expeditions to the region in order to define more exactly the southernmost limits to its range.

Methods

Five expeditions were carried out between December 1998 and September 2000. Our fieldwork began in the forests along the Rios Camaquã and Piratini; along the middle and southern portions of the south-eastern mountain ranges, respectively, 30–31°S, where the forests and original natural vegetation are relatively well conserved. Further south the forests give way to the grassland and bushy savannas of the Rio Grande do Sul Shield (Rambo, 1956; Fernandes, 1998). Geographic co-ordinates were taken using a GPS (Garmin® models 1 and 2).

Police stations and local people (mainly hunters and fishermen) were contacted in the different localities to obtain information on the possible occurrence of howlers. To avoid false positive identifications of howlers, we asked questions about the mammal fauna in general. Photographs were also used to confirm howler monkey identification.

Positive information was selected for field verification according to the location of the area indicated (latitude, if near to forest, rivers or mountains), when the animals were seen, the number of animals reported for each area, and a general feeling for the veracity of the information from the behaviour patterns of the primates described by the observer.

Once an area was sufficiently explored and there were no new indications of the occurrence of howler monkeys, the expedition moved north.

In the localities where the occurrence of *A. guariba clamitans* was verified, we carried out a quick survey of the vegetation using a 50 m transect with one sample point every 2 m. Trees closest to the transect, in any direction, with a 7 cm or greater circumference at breast height were identified. Tree heights and their distance from the transect were also recorded (Filgueiras *et al.*, 1994).

Results

The 11 localities surveyed are shown in Table 1 and Figure 1. There was no evidence of *A. guariba clamitans* in the Rio Piratini basin, but they were found at two sites along the Rio Camaquã, south of the Rio Jacuí.

1) Cristal, municipality of Cristal, Rio Camaquã (31°00'S, 52°04'W), locality 1 (Fig. 1 and Table 1). All reports on the occurrence of *A. guariba clamitans* in upstream sites given by the local population were confirmed. The forests become progressively more fragmented inland, due to agriculture (beans and corn). Along the Rio Camaquã, however, there were good stretches of relatively continuous forest. We visited a farm (5 km from the town of Cristal), where farmers had reported the presence of at least three howler groups. This was confirmed by new and old faeces collected on 31 December 1998, and we eventually saw the monkeys on 5 March 1999.

The forest was between 16 and 18 m tall. "Angico-vermelho" (*Parapiptadenia rigida* - Mimosaceae) was the predominant tree. Other common species found under the canopy were: "camboatá" (*Cupania vernalis* and *Matayba elaegnoides* - Sapindaceae), "açoita-cavalo" (*Luehea divaricata* - Tiliaceae), and "batinga" (*Eugenia rostrifolia* - Myrtaceae). *Eugenia hiemalis* and *Eugenia uniflora* were common in the understorey. Considering the size of the *Parapiptadenia rigida* and *Luehea divaricata* trees, and judging from information obtained from local people, the forest is

Table 1. Localities visited during the "Southern Limit Expedition", their respective co-ordinates, survey results (occurrence or otherwise) and time spent in each site. See Figure 1.

Locality		River Basin	Coordinates	Occurrence	Time (days)
1.	Cristal	Camaquã	31°00'S; 52°04'W	Yes	4*
2.	Cascavel	Camaquã	31°05'S; 52°17'W	No	1
3.	Canta Galo	Camaquã	31°10'S; 52°19'W	Yes	6*
4.	Turuçu	Turuçu	31°21'S; 52°28'W	No	1
5.	Torrinhas	Jaguarão	31°22'S; 53°33'W	No	1
6.	Hulha Negra	Jaguarão	31°24'S; 53°21'W	No	1
7.	Canguçu	Pelotas	31°24'S; 52°40'W	No	4*
8.	7º Distrito de Pelotas	Pelotas	31°26'S; 52°27'W	No	1
9.	Candiota	Jaguarão	31°38'S; 53°44'W	No	1
10.	Pedro Osório	Piratini	31°52'S; 52°46'W	No	1
11.	F. Capão Redondo	Piratini	31°57'S; 52°33'W	No	2

* non consecutive days
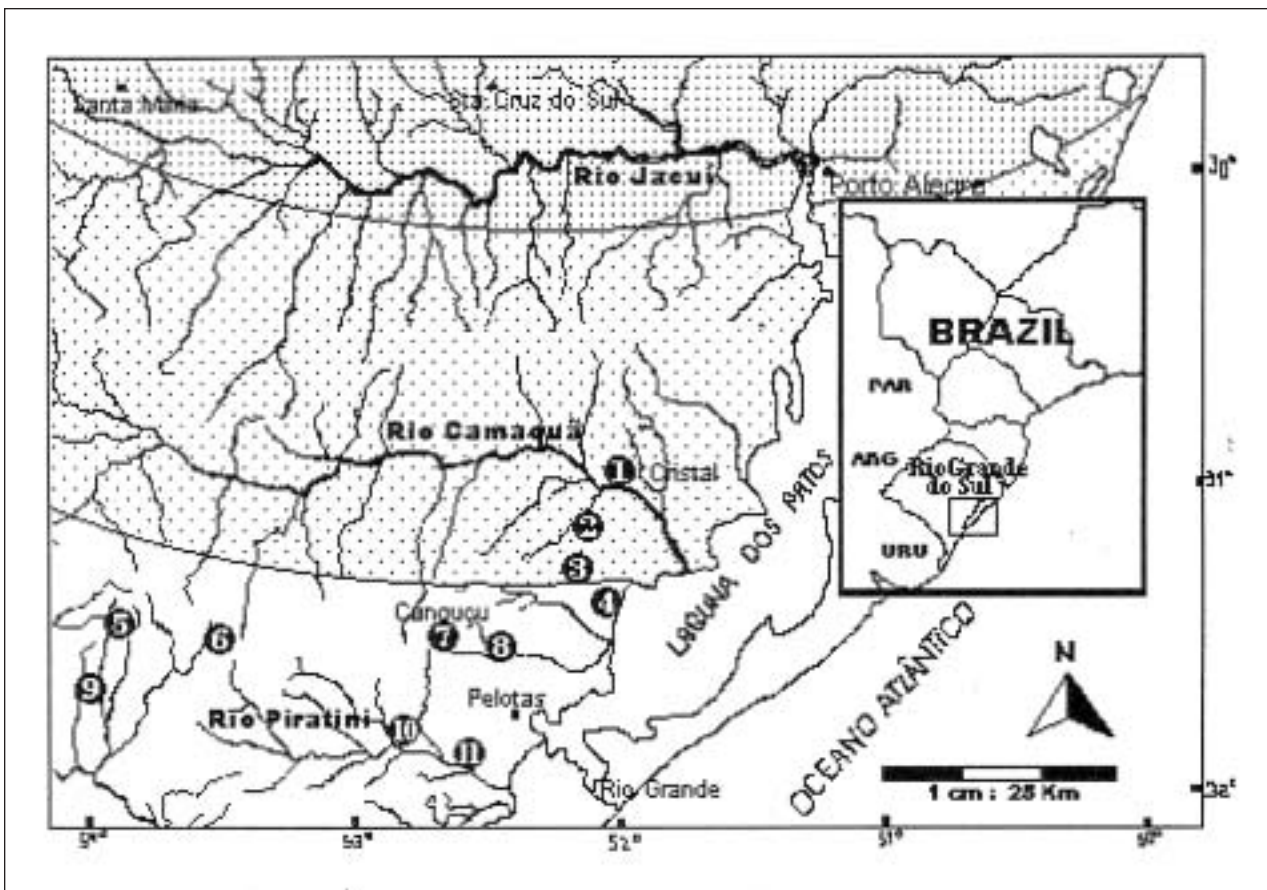
Figure 1. Localities visited during the "Southern Limit Expedition" (the old limit for *A. guariba clamitans is* shaded dark; the new limit is lighter): (1) Cristal, 31°00'S; 52°04'W; (2) Cascavel, 31°05'S; 52°17'W; (3) Canta Galo, 31°10'S; 52°19'W; (4) Turuçu, 31°21'S; 52°28'W; (5) Torrinhas, 31°22'S; 53°33'W; (6) Hulha Negra, 31°24'S; 53°21'W; (7) Canguçu, 31°24'S; 52°40'W; (8) 7º Distrito de Pelotas, 31°26'S; 52°27'W; (9) Candiota, 31°38'S; 53°44'W; (10) Pedro Osório, 31°52'S; 52°46'W; (11) Faz. Capão Redondo, 31°57'S; 52°33'W.

relatively undisturbed and well conserved. The entire area is occasionally inundated, and forests along the banks of the Rio Camaquã are seasonally covered by water. Other mammals recorded for this site were: paca (*Agouti paca*), raccoon *(Procyon cancrivorus)*, deer (*Mazama* sp.), nine-banded armadillo (*Dasypus novemcinctus*), and jaguarundi (*Herpailurus jagouaroundi*).

2) Canta Galo, municipality of São Lourenço, Rio Camaquã basin (31°10'S, 52°19'W), Locality 3 (Fig. 1 and Table 1). Local people reported the occurrence of *A. guariba clamitans* on the opposite bank of the Rio Camaquã to Cristal. According to the reports, the howlers could be seen there only during the summer, when the grapes are ripening, which the howlers feed on. Old howler excrement was found in a forest patch on a farm 8 km away from Canta Galo, on 2 February 2000.

The forest was humid, 40 ha in size, and surrounded by corn crops. "Batinga" (*Eugenia rostrifolia*) was the most common tree in the canopy, and its fruits, probably eaten by the howlers, also mature during the summer (usually in February). Some of the trees reach 16 m in height. The understorey was well shaded, and the most common species

found were *Sorocea bonplandii* (Moraceae) and *Trichilia claussenii* (Meliaceae).

Discussion

Being sub-tropical, the extreme south of Brazil is marked by distinct seasonal patterns of spring, summer, autumn and winter, and forests are semi-deciduous. This seasonality, and even the occasional occurrence of snow, probably limits the occurrence of primates to only the larger monkeys, *Cebus* and *Alouatta*. The Rio Camaquã basin marks the transition between the Atlantic Forest and the Pampas (Rambo, 1956) with a gradual loss of forest and a reduced tree diversity, which makes even folivory a difficult diet to maintain.

The Rio Jacuí was considered to be the southern limit for *Alouatta guariba clamitans* until 1991 (Hirsch *et al.*, 1991). However, the results presented here show that this species occurs on both margins of the Rios Jacuí and Camaquã (200 km south of the Rio Jacuí). It is probable that the howlers of the Rio Camaquã have to move long distances during times of flooding, and to exploit perhaps relatively few key resources, such as cultivated grapes and the fruits of *Eugenia rostrifolia*.

Villalba *et al.* (1995) indicated the possible natural occurrence of *Alouatta caraya* in northern Uruguay (31°00'S, 56°00'W) which, although not yet confirmed, is just a little north of the localities we have identified on the Rio Camaquã. The most southerly record for this species is the town of Canta Galo (31°10'S, 52°19'W), in the municipality of São Lourenço do Sul, Rio Grande do Sul, Brazil. This locality is also the new southern limit for all Neotropical primates.

We conclude that the key factors determining the distributional limits of primates in the south of South America are: 1) The seasonal inundation of rivers in the Camaquã basin; 2) the reduction in tree species diversity; 3) the gradual predominance of deciduous trees; and 4) the low temperatures during winter.

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Two Taxonomies of the New World Primates – A Comparison of Rylands *et al.* (2000) and Groves (2001)

Anthony B. Rylands

Two listings of the New World Primates were published recently. The first by Rylands *et al.* (2000) arose from a review of the species and subspecies during the workshop "Primate Taxonomy for the New Millennium", organized by the IUCN/SSC Primate Specialist Group (PSG) at the Disney Institute, Orlando, Florida, in February 2000. The second was published by Colin P. Groves of the Australian National University, Canberra, in his book *Primate Taxonomy*, published in April 2001 by the Smithsonian Institution Press, Washington, DC. Rylands *et al.* listed 110 species and 205 species and subspecies of New World primates. Groves also listed 110 species, but only 177 species and subspecies.

In this note, I point out and comment on the (minor) differences between these listings, the most significant of which is in the names used for the families and subfamilies. Rylands *et al.* opted for five families, using the traditional names, as follows: Callitrichidae (the marmosets and tamarins), Cebidae (capuchin monkeys and squirrel monkeys), Aotidae (night monkeys), Pitheciidae (sakis, uakaris and titi monkeys) and Atelidae (howling monkeys, spider monkeys, muriquis, and woolly monkeys). Groves followed a very similar arrangement, but defined the Cebidae differently, with three subfamilies: the marmosets and tamarins, the squirrel monkeys, and the capuchin monkeys (as proposed by Rosenberger in 1981). However, regarding the correct names of the family-groups, Groves, with the *International Code of Zoological Nomenclature* (2000) in hand, winkled out some synonyms and has suggested changes in some of the family and subfamily names (Table 1).

The first is his argument that the correct family-group name for the marmosets and tamarins is not Callitrichidae Thomas, 1903, but Hapalidae Gray 1821 (Hapalinae as a subfamily of the Cebidae). I quote his reasoning here verbatim (pp.126–127):

Table 1. Families and subfamilies of Platyrrhini according to Groves (2001).

Family/Subfamily	Genera
Cebidae Bonaparte, 1831	
Hapalinae Gray, 1825	*Cebuella, Mico, Callithrix, Callimico, Leontopithecus, Saguinus*
Chrysotrichinae Cabrera, 1900	*Saimiri*
Cebinae Bonaparte, 1831	*Cebus*
Nyctipithecidae Gray, 1870	*Aotus*
Pitheciidae Mivart, 1865	
Pitheciinae Mivart, 1865	*Pithecia, Cacajao, Chiropotes*
Callicebinae Pocock, 1925	*Callicebus*
Atelidae Gray, 1825	
Atelinae Gray, 1825	*Ateles, Lagothrix, Oreonax, Brachyteles*
Mycetinae Gray, 1825	*Alouatta*

"Callitrichinae Thomas, 1903, is a synonym. There are two reasons why the name Callitrichinae (and its coordinate Callitrichidae for those wishing to retain family-level status for the marmosets and tamarins) cannot be used.

First: Priority in the family-group is accorded not to the type genus but to the family-group name itself. The earliest family-group name given to marmosets is Harpalidae [sic] by Gray (1821), who misread *Hapale* Illiger, 1811, as *Harpale*. The current (fourth) edition of the *International Code of Zoological Nomenclature* (2000) states in Article 40:

(a) **After 1960**. When, after 1960, the generic name on which a valid family-group is based on is rejected as a junior synonym, that family-group name is to be replaced unless the conditions of Subsection (i) apply.

> (i) If the senior generic synonymy is itself the basis of a family-group name, or if a reclassification also involves other family group names, the Principle of Priority applies to all the family group names concerned.

(b) **Before 1961**. If a family group name has been replaced before 1961 because of such synonymy, and the replacement name has one general acceptance, it is to be maintained.

In this case Thomas (1903) discovered that the generic name *Callithrix* Erxleben, 1777, referred to marmosets, not to titis as had been previously assumed, and took three actions: 1) he replaced the commonly used name *Hapale* Illiger, 1811, with *Callithrix*, 2) he replaced the family name Hapalidae with Callithricidae (recte Callitrichidae), and 3) he gave the titis a new generic name *Callicebus*. The first and third of these actions were justified; the second, admittedly retroactively, was not. But the Code must be followed. The provisions of article 40(b) apply: the family-group name was replaced before 1961, but the replacement name cannot be said to have "won general acceptance," by virtue especially of the continued use of Hapalidae in W. C. O. Hill's influential monograph series *Primate: Comparative Anatomy and Taxonomy*.

Second: Because the name *Callithrix* was long used, incorrectly, for the titis (as just discussed) family group names for the marmoset/tamarin group were understandably based on what was thought to be the correct name. Gray (1821) misread the name as *Callitrix* and based the family name Callitricidae on it. This might, at a pinch, be taken as effectively a different name, but the same cannot be said of Callitrichina Gray, 1825 (during the intervening four years, he had corrected his misspelling). This means that Callitrichinae/-idae Thomas 1903, for the marmosets and tamarins is preoccupied by the same name of Gray, 1825, for the titis.

The first point is difficult, but arguable. The second point is fundamental, not arguable. The correct name for the subfamily containing marmosets is therefore not Callitrichinae Thomas, 1903, as listed by Simpson (1945, as Callithricidae) or Napier and Napier (1967), or Hershkovitz (1977)."

Groves also argued that: the subfamily name of the squirrel monkeys, Saimiriinae Miller, 1924 (used by Hershkovitz, 1977) is a synonym of Chrysotrichinae Cabrera, 1900 (p.156); the family-group name Aotidae/Aotinae Poche, 1908 (used by Hershkovitz, 1977 and Hill, 1960) is a synonym of Nyctipithecidae Gray, 1870; and that the subfamily name Alouattinae Elliot, 1904 (used by Hershkovitz, 1977 and Hill, 1960) is a synonym of Mycetinae Gray, 1825. Groves attributes the authorship of the family-group name Cebidae to Bonaparte, 1831. The name was assigned to Swainson, 1835, by Hill (1960), but Groves argued that Bonaparte clearly intended the name Cebina to be a family-group suffix and is therefore the original author. Table 1 shows the families/subfamily arrangement according to Groves (2001).

Regarding the list of species, those in the Callitrichidae/Hapalinae, are identical except for the addition of three marmosets by Rylands *et al.*: *Mico saterei* (Silva, Jr. and Noronha, 1998), and *Mico manicorensis* and *Mico acariensis*, both described (under the genus *Callithrix*) by Van Roosmalen *et al.* (2000), the descriptions of which had not been published when Groves' book was in press. Groves gave subgeneric classifications to the marmosets, subgenus *Mico* Lesson, 1840, for the Amazonian marmosets, and *Callithrix* Erxleben, 1777, for the "Jacchus" group marmosets of eastern and south-eastern Brazil. Rylands *et al.* went the whole hog in assigning all the Amazonian marmosets to the genus *Mico*.

The genus *Cebus* presents some discrepancies in the continued listing of numerous, often poorly defined, subspecies by Rylands *et al.* In his research, however, Groves whittled them down considerably. *C. capucinus limitaneus* Hollister, 1914, *C. capucinus imitator* Thomas, 1903, and *C. capucinus curtus* Bangs, 1905, listed by Rylands *et al.*, are considered synonyms by Groves. They were listed by Hershkovitz (1949) who, as pointed out by Groves, even then doubted their validity, and Hernández-Camacho and Cooper (1976) also found that the pelage characters

used to distinguish them were too variable to allow for the recognition of distinct subspecific forms.

Rylands *et al.* continued to follow Hershkovitz (1949) in listing 11 poorly defined subspecies of *Cebus albifrons*, while Groves reduced the number to six: *C. albifrons albifrons* (Humboldt, 1812); *C. albifrons unicolor* Spix, 1823; *C.*

albifrons cuscinus Thomas, 1901, *C. albifrons trinitatis* Von Pusch, 1941, *C. albifrons aequatorialis* Allen, 1914, and *C. albifrons versicolor* Pucheran, 1845 (see Table 2). Rylands *et al.* did not list *C. albifrons unicolor* on the advice of Thomas Defler, whose investigations had led him to argue cogently that it is a synonym of *C. albifrons albifrons* (see Defler and Hernández-Camacho, in press). Rylands *et al.* also maintained

Table 2. A summary of the taxonomic differences between the listings of the Platyrrhini by Rylands *et al.* (2000) and Groves (2001).

Rylands *et al.* (2000)	Groves (2001)
Mico saterei (Silva, Jr. & Noronha, 1998)	Mentioned (p.131), but description not published when Groves (2001) was in press.
Mico manicorensis (Van Roosmalen, Van Roosmalen, Mittermeier & Rylands, 2000)	Description not published when Groves (2001) was in press.
Mico acariensis (Van Roosmalen, Van Roosmalen, Mittermeier & Rylands, 2000)	Description not published when Groves (2001) was in press.
Cebus capucinus capucinus (Linnaeus, 1758)	*Cebus capucinus* monotypic
Cebus capucinus limitaneus Hollister, 1914	Synonym of *Cebus capucinus*
Cebus capucinus imitator Thomas, 1903	Synonym of *Cebus capucinus*
Cebus capucinus curtus Bangs, 1905	Synonym of *Cebus capucinus*
Synonym of *C. albifrons albifrons* (Humboldt, 1812) (see Defler *et al.*, in press)	*Cebus albifrons unicolor* Spix, 1823
Cebus albifrons cesarae Hershkovitz, 1949	Synonym of *Cebus albifrons versicolor* Pucheran, 1845
Cebus albifrons leucocephalus Gray, 1865	Synonym of *Cebus albifrons versicolor* Pucheran, 1845
Cebus albifrons yuracus Hershkovitz, 1949	Synonym of *Cebus albifrons cuscinus* Thomas, 1901
Cebus albifrons adustus Hershkovitz, 1949	Synonym of *Cebus albifrons versicolor* Pucheran, 1845
Cebus albifrons malitiosus Elliot, 1909	Synonym of *Cebus albifrons versicolor* Pucheran, 1845
Cebus olivaceus olivaceus Schomburgk, 1848	*Cebus olivaceus* monotypic
Cebus olivaceus apiculatus Hershkovitz, 1949	Synonym of *Cebus olivaceus*
Cebus olivaceus brunneus Allen, 1914	Synonym of *Cebus olivaceus*
Cebus olivaceus castaneus I. Geoffroy, 1851	Synonym of *Cebus olivaceus*
Cebus olivaceus kaapori Queiroz, 1992	Listed as *Cebus kaapori*
Saimiri boliviensis pluvialis Lönnberg, 1940	Synonym of *Saimiri boliviensis boliviensis* (I. Geoffroy & de Blainville, 1834)
Saimiri boliviensis jaburuensis Lönnberg, 1940	Synonym of *Saimiri boliviensis boliviensis* (I. Geoffroy & de Blainville, 1834)
Pithecia monachus napensis Lönnberg, 1938	Not listed
Callicebus personatus (É. Geoffroy, 1812)	*Callicebus personatus* with four subspecies
Callicebus nigrifrons (Spix, 1823)	Subspecies of *Callicebus personatus*
Callicebus melanochir (Wied-Neuwied, 1820)	Subspecies of *Callicebus personatus*
Callicebus barbarabrownae Hershkovitz, 1990	Subspecies of *Callicebus personatus*
Alouatta palliata palliata (Gray, 1849)	*Alouatta palliata* monotypic
Alouatta palliata mexicana (Merriam 1902)	Synonym of *Alouatta palliata*
Alouatta palliata aequatorialis (Festa, 1903)	Synonym of *Alouatta palliata*
Alouatta coibensis coibensis Thomas, 1902	*Alouatta coibensis* monotypic
Alouatta coibensis trabeata Lawrence, 1933	Synonym of *Alouatta coibensis*
Alouatta seniculus ssp. (formerly *straminea*; see Rylands and Brandon-Jones, 1998)	*Alouatta macconnelli* Elliot, 1910
Alouatta seniculus amazonica Lönnberg, 1941	Synonym of *Alouatta seniculus juara* Elliot 1910
Alouatta seniculus puruensis Lönnberg, 1941	Synonym of *Alouatta seniculus juara* Elliot 1910
Alouatta seniculus insulanus Elliot, 1910	Synonym of *Alouatta macconnelli*
Alouatta belzebul belzebul (Linnaeus, 1766)	*Alouatta belzebul* monotypic
Alouatta belzebul discolor (Spix, 1823)	Synonym of *Alouatta belzebul*
Alouatta belzebul ululata Elliot, 1912	Synonym of *Alouatta belzebul*
Ateles hybridus hybridus (I. Geoffroy, 1829)	*Ateles hybridus* monotypic
Ateles hybridus brunneus Gray, 1872	Synonym of *Ateles hybridus*
Ateles geoffroyi fusciceps Gray, 1866	Listed as *Ateles fusciceps fusciceps* Gray, 1866
Ateles geoffroyi rufiventris Allen, 1914	Listed as *Ateles fusciceps rufiventris* Allen, 1914
Ateles geoffroyi panamensis Kellogg & Goldman, 1944	Synonym of *Ateles geoffroyi ornatus* Gray, 1870
Ateles geoffroyi azuerensis (Bole, 1937)	Synonym of *Ateles geoffroyi ornatus* Gray, 1870
Ateles geoffroyi frontatus (Gray, 1842)	Synonym of *Ateles geoffroyi geoffroyi* Kuhl, 1820

the subspecies of *Cebus olivaceus* recognized by Hershkovitz (1949) under the species name of *nigrivittatus* Wagner, 1848 (see Rylands, 1999). Groves placed them all as synonyms of *C. olivaceus*. Rylands *et al.* listed the form *kaapori* Queiroz, 1992, as a subspecies of *C. olivaceus*, whereas Groves (2001) maintained it as a distinct species as described by the author. Rylands *et al.* adopted Groves' taxonomy for the tufted capuchin monkeys of the *Cebus apella* group.

The taxonomies of *Saimiri* are the same except that Rylands *et al.* listed the two forms, *pluvialis* Lönnberg, 1940 and *jaburuensis* Lönnberg, 1940, mentioned in a footnote by Hershkovitz (1987). Groves listed them both as synonyms of *S. boliviensis boliviensis*.

Rylands *et al.* followed Groves on the taxonomy of the Pitheciidae except in giving all the Atlantic forest titis the status of species, as recommended by Kobayashi and Langguth (1999) in their description of *Callicebus coimbrai*. Rylands *et al.* also listed a third subspecies of *Pithecia monachus*. Based on his examination of specimens in the British Museum (Natural History), Peter Grubb argued that *P. monachus napensis* Lönnberg, 1938, is a distinct and valid subspecies (pers. comm., February, 2000).

The final two genera which present discrepancies are *Alouatta* and *Ateles*. Groves did not recognize the subspecies of *Alouatta palliata*, *A. coibensis* and *A. belzebul* listed by Rylands *et al.* (see Table 2). Whereas Rylands *et al.,* were not prepared to designate a subspecific name to the Guianan red howler (see Rylands and Brandon-Jones, 1998), Groves listed it as *Alouatta macconnelli* Elliot 1910. Groves synonymized *Alouatta seniculus amazonica* Lönnberg, 1941 and *Alouatta seniculus puruensis* Lönnberg, 1941, with *Alouatta seniculus juara* Elliot 1910, and the Trinidad howling monkey, *Alouatta seniculus insulanus* Elliot, 1910 with *A. macconnelli*.

Rylands *et al.* followed Collins and Dubach (2000) in placing the brown-headed spider monkey, and the Colombian black spider monkey, as subspecies of *A. geoffroyi*: *A. geoffroyi fusciceps* Gray, 1866 and *A. geoffroyi rufiventris* Allen, 1914, respectively, whereas Groves maintained them as subspecies of *A. fusciceps*. Groves did not recognize *Ateles hybridus brunneus* Gray, 1872, and also synonymized *Ateles geoffroyi panamensis* Kellogg and Goldman, 1944 and *Ateles geoffroyi azuerensis* (Bole, 1937) with *Ateles geoffroyi ornatus* Gray, 1870. Lastly, he considered *Ateles geoffroyi frontatus* (Gray, 1842) to be a synonym of *Ateles geoffroyi geoffroyi* Kuhl, 1820.

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NEWS

JORGE IGNACIO HERNÁNDEZ-CAMACHO
JANUARY 17, 1935 - SEPTEMBER 15, 2001

Jorge Ignacio Hernández-Camacho, "Mono Hernández," was a remarkable naturalist. His complete dedication and his genius allowed him to maintain an encyclopedic knowledge of many aspects of the paleontology, taxonomy, ecology, and distributions of the Colombian fauna and flora. He was a mentor for an entire generation of Colombian biologists, not to mention the many foreigners who profited from information that he would always most willingly provide.

I first heard of Mono in 1975 when Heliodoro Sánchez, then of Parques Nacionales-INDERENA, suggested that I write to him about a project I was proposing in the Serranía La Macarena to study woolly monkeys. I was still finishing my Ph.D. I knew nothing about woolly monkeys, and even less about Colombia, but I did know what I was going to do with the rest of my life, that is, dedicate myself to the tropical forest and its conservation. Jorge Hernández, evidently understanding the passion I must have put into the letter, answered me in a typewritten three-page missive. I was not disappointed. The letter was a *tour de force* of the status of the woolly monkey in Colombia up to that point, filled with detailed facts of their natural history, and providing such an extraordinary amount of information that I was completely astonished that he should have taken so much time to answer me in such depth. I began planning a move to Colombia, using Mono's advice to get in touch with the local Peace Corps program, through another Colombian biologist, Ernesto Barriga, in charge at the time.

Because Jorge was advisor to so many people, he was not easy to pin down to a meeting in Bogotá, and my first attempts involved days of waiting outside his office. In those days he was head of terrestrial fauna at INDERENA, a government natural resource agency that he had helped to organize and which was the precursor to the present day Ministry of the Environment. His days were always filled with people asking his opinion, his advice, his help, and a young foreigner had to wait. But our first meetings were like his letters, only better as they ranged through many themes with inevitable taxonomic stops along the way. Unfortunately American universities prepare students very poorly in taxonomy, and in my early Colombian days it was wholly alien to my interests. It must have been difficult for him to talk to me about Colombian geography, the basis for grasping the details of primate distributions, since I knew so little then. I found that I was ignorant of much, but Mono's extraordinary patience

and personal diplomacy meant that my understanding of the many taxonomic problems grew painlessly, not only in my area of primatology, but for other groups as well, and I began to grasp the complexity of Colombian geography and species' distributions, and the reasons why Colombia is considered truly a "megadiverse" country. One of his insistent lessons was that the study of Neotropical taxonomy was essential to our understanding of the full extent of Neotropical biodiversity. While helping me to prepare for my first field experience, Jorge Hernández was gently educating this new Ph.D. who knew essentially nothing about Colombia and very little about Colombian monkeys.

Usually a late office meeting with him ended with the invitation "Vamos a tomar un traguito" ("let's go have a little drink") and we would put our coats on and walk up to one of his favorite watering holes to continue a conversation that easily might have begun 2–3 hours before. In those years, Mono's "after hours" spot was just a block up from INDERENA, beside 26th Avenue, but after the place became known to so many, I think he decided to change it a bit to the north to the now (among the Mono's friends and admirers) famous Casa Mendoza, his informal Bogotá office into the night. These meetings inevitably went on until midnight when the place would attempt to close, not easy for the owners, since their best client often ignored their admonitions and continued to hold forth on some biological topic that had been chosen for the night. The extended conversations about the Colombian biota were usually in the form of a monologue from Jorge, which in later years I finally learned to write down, encouraged by him; since normal person that I am, I could not hope to remember the rich detail that he provided. This was the "University of the Mono" and this was where I continued my education, right up until he left us.

In later years he preferred to come to my Bogotá apartment for our meetings, but by then they required many books and references and, at least talking about primates, I possessed many of them. Always the meetings involved the ubiquitous rum and coca-cola and voluminous clouds of cigarette smoke, for Jorge was a chain smoker until the day he died, and a meeting with the Mono would always last 4–6 hours. So you had to have stamina. I usually did. You had to accept the smoke and the late hours, and you had to drink rum and coca-cola, because drinking beer that long just doesn't work! There were times in our relationship when I could not accept these terms, but I always weakened. The truth was, if I wanted to enjoy his company I must also survive the smoke and the booze.

Well, I learned to like the booze. I also got to the point where it was worthwhile for Jorge to collaborate on some primate papers, far too few for the time that we knew each other, but by then I was spending most of my time in remote corners of eastern Colombia and could not stay extended periods in the city. A few years back, however, I realized that I must concentrate on producing a few papers which we had discussed, for his health was not so good, with so many

years of smoky meetings with Colombians and foreigners and friends and I realized that he would probably not be with us for too much longer. I am particularly relieved that we both insisted on these projects, as they came to fruition just before he left us and will form part of his legacy.

But research and writing papers were only a small part of this great gentleman's repertoire. The present form and content of Colombian National Parks is especially due to his efforts. The complexity and comprehensiveness of Colombian environmental legislation is in great part due to him. The university degrees of many, many Colombians have been successfully completed due to his often profound intellectual support. The acceptance of the CITES treaty and Colombia's international contribution during the early years is mostly due to his efforts.

His inspiration touched many others besides myself. He was one of the small circle of Colombian friends that I knew I would lose touch with if I were to accept a tempting offer in 1983 from Russell Mittermeier to work on *Brachyteles* in Brazil. Even then, a consideration of what his professional influence had meant to me was enough to make me realize that I would continue to invest my future in this tragic yet biologically fantastic country, Colombia. I owe him much, both professionally and personally. I shall miss him dearly.

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JORGE IGNACIO HERNÁNDEZ-CAMACHO
ENERO 17 DE 1935 - SEPTIEMBRE 15 DE 2001

In memoriam

Jorge Ignacio Hernández-Camacho, affectionately known as "el Mono", was the true "Father of Colombian Primatology", since it was under his leadership and advice that the first studies were begun, and under his supervision and inspiration that so many were carried out in subsequent years. His first publication concerning this group of mammals was the discovery of Goeldi's monkey, *Callimico*, in Colombia in 1966, but his most important and basic contribution was his classic review of the status and distribution of Colombian primates: J. Hernández Camacho and R. W. Cooper 1976. The nonhuman primates of Colombia, in *Neotropical Primates: Field Studies and Conservation*, R. W. Thorington, Jr. and P. G. Heltne (eds.), pp.35–69, National Academy of Sciences, Washington, DC. During his life he was always interested in all aspects relating to primatology, as much in terms of taxonomy and systematics as from the viewpoint of the conservation and sustainable-use of the rich Colombian primate fauna. A theme of particular interest to him was biomedical research. I had the opportunity to share his passion and co-author several papers in various projects which we advanced together, especially

concerning the cotton-top tamarin, *Saguinus oedipus*, endemic to the country.

Characterizing his contributions to primatology would be incomplete without mentioning his role as maestro and guide for innumerable Colombians and foreigners dedicated to primates. His enormous knowledge and his holistic vision of conservation problems were part of the justification for pre-selection of the geographic areas which make up what is today the national system of natural parks in Colombia.

It has been frequently recognized that his awesome capacity to accumulate information and to comparatively analyze it, helped to form the pillars of Colombian environmental institutions. Also, it is important to recognize that the origins of the legal structures and laws which are in force today and the solidity of the National Code for Natural and Renewable Resources and the Environment, including its various legal decrees, are due to his genius and to his broad vision and knowledge of national and international environmental problems.

But more than all this, Jorge Ignacio Hernández-Camacho leaves us a legacy of professional honesty, personal decency and love for nature which few people have left in this world. It is certain that we have undoubtedly lost the "last Neotropical naturalist" as he was once called by Phillip Hershkovitz, but his recommendations, formed in the context of his cultural heritage, his goodness and great selflessness, should be examples to follow in order to secure a future for our natural heritage.

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CONSERVATION INTERNATIONAL'S PRESIDENT AWARDED BRAZIL'S HIGHEST HONOR

In recognition of his years of conservation work in Brazil, CI President Russell Mittermeier was awarded the National Order of the Southern Cross by the Brazilian government. Dr. Mittermeier received the award on August 29 at the Brazilian Ambassador's residence in Washington, DC. The National Order of the Southern Cross was created in 1922 to recognize the merits of individuals who have helped to strengthen Brazil's relations with the international community. The award is the highest given to a foreign national for service in Brazil.

For the past three decades, Mittermeier has been a leader in promoting biodiversity conservation in Brazil and has conducted numerous studies on primates and other fauna in

the country. During his time with the World Wildlife Fund (1978–1989), he played a key role in putting Brazil's Atlantic Forest, one of the planet's highest-priority hotspots, on the international conservation agenda. He became well-known throughout the country after, with Adelmar Coimbra-Filho (then of the Rio de Janeiro Primate Center), successfully mobilizing international support for the endangered lion tamarins, and with Célio Valle (then Professor of Zoology at the Federal University of Minas Gerais), creating similar national and international attention for the muriquis; campaigns that sparked a newfound pride in the country's native animals. Mittermeier was also instrumental in the creation of Conservation International-Brazil, which has since become one of the country's leading conservation advocates.

Patrick Johnston, Conservation International, 1919 M St. NW, Suite 600, Washington, DC 20036, USA. E-mail: <p.johnston@conservation.org>.

Prêmio Von Martius 2001 Concedido ao Instituto Florestal de São Paulo

O Instituto Florestal de São Paulo teve o trabalho "Geoprocessamento no Levantamento da Vegetação e no Suporte às Unidades de Conservação" premiado pela Câmara de Comércio e Indústria Brasil-Alemanha, na categoria Tecnologia do Prêmio Ambiental von Martius-2001, patrocinado pelas empresas Henkel S/A, Deutsche Bank e TetraPak S/A. Concorreram ao referido prêmio 191 trabalhos, sendo que foram premiados nove; três para cada uma das categorias (humanidade, natureza e tecnologia). O trabalho conduzido pelo Instituto Florestal relata as ações referentes ao Levantamento da Vegetação Natural, com abrangência estadual e aquelas referentes à estruturação de base digital das Unidades de Conservação. São parceiros deste trabalho a Universidade de Campinas (UNICAMP) e a Escola Superior de Agricultura "Luiz de Queiróz" da Universidade de São Paulo (USP), Piracicaba. Na parte referente ao reflorestamento, houve envolvimento das empresas do setor de celulose, papel e chapas, com participação direta da Sociedade Brasileira de Silvicultura (SBS). *Fonte*: Instituto Florestal, 10 August 2001.

Ecología Austral

Ecología Austral is the scientific journal of the Argentine Ecological Society. It publishes original scientific articles on any area of the environmental sciences. Articles may be (1) Original research: results of field, experimental or theoretical research, (2) Reviews: papers reviewing the present knowledge of a topic, and (3) Short communications: short papers reporting on a minor work representing an improvement in general knowledge or a methodological development. Articles are peer reviewed by at least two referees. Manuscripts are accepted in Spanish, English or Portuguese. The Editor-in-Chief is seeking the help of reviewers in any of the three languages of the journal. To this end, a data base is being developed (about 120 reviewers already entered), in order to have a wide range of expertise available, and also to avoid requesting reviews from the same expert too frequently.

For those interested in volunteering for the peer review process please send a message to: Dr. Jorge Rabinovich, Editor, *Ecología Austral,* e-mail: <ecol_aus@netverk.com.ar>. From: NeoCons, 1(2), April 2001, Neotropical Conservation Biology Bulletin: http://www.conservationbiology.org/SCB/Publications/NeoCons/>.

Quatorze Reservas Particulares (RPPNs) Novas no Brasil

O presidente do Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Ibama), Hamilton Casara, assinou portarias no dia 16 de outubro de 2001, reconhecendo mais 14 propriedades privadas como Reservas Particulares do Patrimônio Natural (RPPNs), em nove estados: São Paulo, Rio de Janeiro, Ceará, Rondônia, Bahia, Maranhão, Santa Catarina, Minas Gerais, e Mato Grosso do Sul. Ao transformar suas terras em RPPNs os proprietários terão vários benefícios: incentivos fiscais e assessoria técnica do Ibama, podendo utilizá-las apenas para projetos ambientais, como ecoturismo e educação ambiental, desde que não alterem sua biodiversidade original.

Com estas, são 353 RPPNs no Brasil, protegendo 380.660,327 ha dos principais biomas. A maior, protege 87 mil hectares do Pantanal em Mato Grosso; e, a menor, apenas 1 ha de cerrado, no Distrito Federal. As savanas da região Centro-Oeste são as mais bem protegidas por RPPNs: são 64, cobrindo 215,385 ha; 33 protegem 120,274 ha de Floresta Amazônica, na região Norte; 82 estão no nordeste protegendo 88,657 ha de Caatinga; 117 ficam no Sudeste protegendo 39,280 ha de Mata Atlântica e da Zona Costeira; e, 44 estão no sul protegendo 15,614 ha de Mata Atlântica, de Campos Sulinos, e, de Costa.

A maior das novas RPPNs é em Rondônia: O Parque Natural Leonildo Ferreira, com 981 ha de Floresta Amazônica no município de Pimenta Bueno. A menor é o Parque Arqueológico da Serra do Santo Antonio, com apenas 9 ha de Mata Atlântica no município de Andrelândia. A segunda maior, é em Mato Grosso do Sul. A Fazenda Floresta Negra protegerá 971 ha de Floresta Amazônica no município de Sete Quedas. As cinco novas RPPNs reconhecidas em São Paulo protegerão 803,63 ha de Mata Atlântica. Incluem: Palmira, com 242 ha no município de Serra Azul; Meambros II, com 145,20 ha, e Meambros III, com 72,60 ha, no município de Ibiúna; Fazenda Serrinha, com 117,30 ha, no município de Bragança Paulista; e, Meambros, com 11,30 ha no município de Ibiúna. Por ordem de abrangência, o Ibama reconheceu como RRPNs: no Ceará (duas) totalizando

704,17 ha de Caatinga: Monte Alegre, com 263,17 ha no município de Quixeramobim, com 441 ha; em Santa Catarina, a Chácar Edith, com 415,79 ha de Mata Atlântica, no município de Brusque; no Rio de Janeiro, a Reserva Ecológica Floresta Alta, com 380,90 ha de Mata Atlântica no município de Silva Jardim; no Maranhão, no município de Rosário, protegerá 349 ha de Floresta Amazônica; na Bahia, Pedra do Sabiá, com 22 ha de Mata Atlântica no município de Itacaré; e, em Minas Gerais, a Reserva tem apenas 9 ha de Mata Atlântica e de Cerrado no município de Andrelândia.

Para obter o reconhecimento do Ibama como RPPN o proprietário precisa provar que o imóvel é importante para a conservação da biodiversidade de determinado bioma (flora e fauna), e/ou possui belezas cênicas. Criado em 1990, o programa RPPN é importante para a conservação da natureza porque: contribui para uma rápida ampliação das áreas protegidas do país; atua como zonas tampão no entorno dos parque e reservas, formando corredores ecológicos; apresenta índices altamente positivos na relação custo/benefício; é facilmente regulamentada; permite a participação da iniciativa privada no esforço nacional de conservação; e, contribui para a conservação da biodiversidade dos biomas brasileiros.

Como benefícios, os proprietários de RPPNs asseguram: preservação do direito de propriedade; isenção do Imposto sobre a Propriedade Territorial Rural (ITR) transformada em RRPN; prioridades nas análises dos projetos pelo Fundo Nacional do Meio Ambiente e na concessão de crédito agrícola junto às instituições oficiais; permissão para implantar atividades de recreação, lazer, educação ambiental, pesquisa, cultura, e ecoturismo na área reconhecida pelo Ibama; e, cooperação com entidades privadas e públicas na proteção da RPPN.

DEVELOPMENTS IN PRIMATOLOGY: PROGRESS AND PROSPECTS

Kluwer Academic/Plenum Publishers is pleased to introduce *Developments in Primatology: Progress and Prospects* (formerly *Advances in Primatology*), a new series under the direction of the Editor-in-Chief of the *International Journal of Primatology*, Dr. Russell H. Tuttle, University of Chicago, Chicago, Illinois.

This peer-reviewed book series will meld the facts of organic diversity with the continuity of the evolutionary process. The volumes in this series will exemplify the diversity of theoretical perspectives and methodological approaches currently employed by primatologists and physical anthropologists. Specific coverage includes: primate behavior in natural habitats and captive settings; primate ecology and conservation; functional morphology and developmental biology of primates; primate systematics; genetic and phenotypic differences among living primates; and paleoprimatology.

Volume authors will be invited to participate based on their expertise in a given area and overall approval by the series editor. Volume authors and editors will receive generous royalties, complimentary copies and full marketing and editorial support. Contributors will receive complimentary copies as opposed to royalties. All manuscripts will be "typeset from disk" for the convenience of the author/editor. Volumes will be approximately 300 printed pages (all page lengths are negotiable) in a 6 1/2 x 9 7/8 format. For further information on how to contribute an authored or edited volume to this series please contact Andrea Macaluso at (212) 620-8007 or via e-mail at <amacaluso@wkap.com>.

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RPPN FELICIANO MIGUEL ABDALA - A PROTECTED AREA FOR THE NORTHERN MURIQUI

The Atlantic Forest region of Brazil is one of the richest and most diverse forest systems in the world; it is also one of the most threatened, ranking among the five top biodiversity hotspots on Earth. Although it once covered some 1.2 million km², it has been reduced to about 7% of its original extent. Needless to say, many of the animals and plants living in this region are severely threatened, and a large number are now at risk of extinction.

Primates have long been the most important symbols for the Atlantic Forest, and their situation is indicative of what is happening to the region as a whole. Some 24 species and subspecies are found in the Atlantic Forest, many of them are now considered endangered or critically endangered. One, the northern muriqui, *Brachyteles hypoxanthus*, the largest mammal endemic to Brazil and a species of great charm and appeal, ranks high on the list of most endangered primates, and has become a flagship species of enormous importance to Brazil. Only about 300 individuals remain in the wild, and half of those occur in a single forest, in the region of Caratinga, in the state of Minas Gerais.

Like the northern muriquis, Caratinga is very special. The area had been effectively protected by its owner, the late Senhor Feliciano Miguel Abdala, since the 1950's. A successful coffee farmer, Sr. Feliciano set aside about 2200 acres of relatively untouched Atlantic rainforest at the Montes Claros farm in the mountainous reaches of the state of Minas Gerais in southeastern Brazil to provide a sanctuary for the fauna and flora - for no other reason than that he thought it was a good idea and the right thing to do. Abdala was especially fond of the muriqui. For more than five decades, he protected the forest at Caratinga, while his neighbors dismissed him as a quack for "squandering" good farmland.

When Abdala reluctantly allowed researchers to study his farm, Brazilian conservation pioneer, Alvaro Aguirre, visited

the site during a region-wide survey in the late 1960's, introducing Caratinga's forest to the scientific community. However, it received little attention, buried as it was in a list of several areas still believed to harbor muriquis at the time. By the mid-1970's, the situation of the Atlantic Forest had deteriorated to such an extent that the muriqui was thought to be extinct in the state.

In 1976, the Caratinga population was rediscovered by Professor Célio Valle of the Federal University of Minas Gerais. The first ever field study of *Brachyteles* in the wild, was carried out there in 1977, by the Japanese primatologist Akisato Nishimura. In late 1979, Russell Mittermeier, Célio Valle and Adelmar F. Coimbra Filho, the pioneer of Brazilian primatology, visited Caratinga while surveying for primates in the protected areas of the Atlantic Forest. There, they found muriquis, as well as healthy populations of three other primate species: the brown howler monkey (*Alouatta guariba*), the tufted capuchin (*Cebus nigritus*), and the buff-headed marmoset (*Callithrix flaviceps*) never recorded in Minas Gerais prior to this visit. Indeed, after a decade of primate survey work that ended in the late 1980's, Caratinga was seen as one of the single most important sites for primate conservation in the entire Atlantic Forest and was made the focus of an education campaign for Atlantic Forest primates, using the muriqui as the obvious flagship species. Brazilian and foreign researchers were enlisted to come and work at Caratinga, in an attempt to stimulate further research on its unique primate community.

Karen Strier began her groundbreaking muriqui research in 1982, and her 20-year study has now become one of the classics of primatology. Many other researchers have also worked there, including leaders in Brazilian conservation, such as Gustavo Fonseca and Sérgio Mendes. These studies convinced Abdala of the scientific importance of Caratinga, and his mistrust gave way to enthusiastic support. He responded by creating a field laboratory which, in 1983, became the Biological Research Station at Caratinga. Since then the Caratinga Biological Station has proven to be one of the most productive sites for primate research in all South America, resulting in more than 50 scientific publications by national and international researchers. In addition, a small-scale visitor program has been introduced, encouraging ecotourism, and a small tree nursery has been established for the purposes of reforestation and habitat enrichment. An environmental education and awareness program has also been started.

For the past 18 years, Eduardo Marcelino Veado, current director of tha Caratinga Biological Station and Vice-President of the local NGO, Associação Pró-Estação Biológica de Caratinga, has managed these activities at the Station. He has been working closely with the Abdala family to ensure permanent protection of the Montes Claros Farm. After Sr. Abdala's death last year (June 1, 2000), his family decided to follow his wishes for continued protection of the forest, and agreed to the creation of an official private reserve under Brazilian law, to help preserve the muriquis, together

with the black-capped capuchin, brown howler monkey and buffy-headed marmoset, the latter two currently listed by the IUCN as Vulnerable and Endangered, respectively. Caratinga is also home to a diverse fauna, including approximately 217 species of birds, 45 species of mammals and 16 species of amphibians.

On the 3rd September, 2001, the President of the Brazilian Institute for the Environment (*Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - IBAMA*) of the Ministry of the Environment, signed Decree 116/2001 declaring the Fazenda Montes Claros forests a Private Natural Heritage Reserve (*Reserva Particular de Patrimônio Natural - RPPN*). The private reserve, with 957 ha (or 2,365 acres - equivalent to three times the size of New York's Central Park), has been named "RPPN Feliciano Miguel Abdala", in tribute to the man who, nearly 60 years ago, decided to save this valuable legacy of our forest heritage.

On September 24, 2001, during a party in the town of Caratinga to celebrate the creation of the Reserve, Federal authorities presented the town with the Zero issue of a Federal Lottery ticket bearing the Muriqui as its symbol. The lottery ticket illustrated with the muriqui reached all corners of Brazil.

Maria Inês Castro, Brazil Regional Program, Conservation International, 1919 M Street NW, Suite 600, Washington, DC 20036, USA. E-mail: <i.castro@conservation.org>.

VERSION 2.0 OF RAMAS RED LIST SOFTWARE AVAILABLE

Version 2.0 of the RAMAS® software used for assessing the conservation status of species for possible inclusion in the IUCN Red List of Threatened Species, is now available. The software incorporates the revised Red List Categories (2000) (see below). To purchase a copy, please contact Isabelle Weber, IUCN/SSC, Rue Mauverney 28 CH-1196 Gland, Switzerland, Fax: +41-22-9990015; e-mail: <isc@iucn.org> or Applied Biomathematics, 100 North Country Road, Setauket, NY 11733, USA, Fax: +1 516-751-3435. Single-user and site-licensed copies of the software are priced US$295 and US$445 respectively. From: *IUCN Species Survival Commission (SSC) E-Bulletin - May 2001. Anna Knee, Communications Officer SSC/IUCN.*

REVISED RED LIST CRITERIA

The new improved categories and criteria used for listing plants and animals on the IUCN Red List of Threatened Species are now available after a four-year review which was called for by IUCN members. The review, coordinated by SSC, involving broad consultation with users and organizations from around the world, has produced a clearer,

more open, and easy-to-use system for assessing species. With particular attention paid to marine species, harvested species, and population fluctuations, the review has refined the effectiveness of the Red List categories and criteria as indicators of extinction risk. See <http://www.iucn.org/themes/ssc/redlists/RLcategories2000.html> for more details. From: *IUCN Species Survival Commission (SSC) E-Bulletin - March 2001. Anna Knee, Communications Officer SSC/ IUCN.*

A CD-Rom of Wildlife Sounds in the Atlantic Forest

With support from the Margot Marsh Biodiversity Foundation and Conservation International, the Caratinga Biological Station produced 3,000 CDs (from EarthEar) with the soundscapes of the Fazenda Montes Claros forest, now the "RPPN Feliciano Miguel Abdala" in Minas Gerais, Brazil. The "Caratinga" CD, produced pro-bono by Douglas Quin, presents a day in Brazil's disappearing Atlantic rainforest, starting with a stream and birds in the early morning, followed by the sounds of howler (*Alouatta guariba*) and capuchin monkeys (*Cebus nigritus*). Marmosets, *Callithrix flaviceps*, call after their midday rest, and muriquis, *Brachyteles hypoxanthus* - stars of this CD - are recorded calling, moving and feeding in trees near the biological station. The day proceeds with an afternoon storm and closes with the sound of frogs in the forest. The CD includes a 20-page booklet, beautifully illustrated by Stephen Nash (State University of New York – Stony Brook). with detailed track notes and essays in English and Portuguese. It will be used to promote the conservation of Caratinga's forest at various levels, from raising awareness in Caratinga schools and other local community organizations, to introducing these remarkable soundscapes to the general public in Brazil and worldwide. Proceeds from the sale of the CD go to support the conservation efforts of the Biological Station at Caratinga. See http://www.dqmedia.com/caratinga/booklet .pdf; <http://www.dqmedia.com/caratinga/traycard.pdf>; <http://www.dqmedia.com/caratinga/cd.pdf>.

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PrimateLit Now Available for Searching

The Wisconsin Regional Primate Research Center is pleased to announce that PrimateLit, the primary database for searching the literature of primatology, is now available in a new web format. The database includes over 170,000 citations and covers the literature from 1940 to date. Indexed by the Primate Information Center in Seattle and managed by the Wisconsin Regional Primate Research Center in Madison, PrimateLit is being released in "test" mode. We

would very much appreciate feedback from members of Primate-Science - comments and suggestions on how it can be modified and improved to meet your needs. *Current Primate References*, formerly a print only publication, has been recreated in the web environment to afford access to the most recent literature. In this release the default is set at six months. We will be gradually phasing in 1, 2 and 3 month options.

The National Center for Research Resources is supporting this service - without fees or passwords - for everyone in the international scientific community who needs access to the nonhuman primate research literature. Future enhancements in development include: tailored display and print options; enhanced navigational features and search functions; and access to the PrimateLit Thesaurus of index terms.

Special thanks go to Nolan Pope, Sue Dentinger, Mark Foster and Rose Smith of the University of Wisconsin-Madison Libraries who have worked with Jackie Pritchard and Chico Otsuka-Gooding of the Primate Information Center to oversee the migration of PrimateLit to Madison and to deal with the countless details that attend remounting a large database. Please take a critical look - we need your feedback. Send your comments to me or Jackie Pritchard, PIC Manager, e-mail: <plj@u.washington.edu>. Supported through NCRR Grant RR15311, Coordinated Information Services to Support Primate Research. URL: <http://primatelit.library.wisc.edu/>.

Larry Jacobsen, Director, WRPRC Library and Information Service, Wisconsin Regional Primate Research Center, University of Wisconsin-Madison, 1220 Capitol Court, Madison, WI 53715-1299, USA. E-mail:<jacobsen@ primate.wisc.edu>.

Presidente da SPVS Ganha Prêmio Internacional

O presidente da SPVS - Sociedade de Pesquisa em Vida Selvagem, Clóvis Ricardo Schrappe Borges, recebeu o prêmio 2001 World Climate Technology and Leadership Award, que é concedido anualmente pela AIE - Agência Internacional de Energia através do programa ITC - Iniciativa pela Tecnologia Climática, para indivíduos e organizações que alcançaram avanços no uso de tecnologias que não sejam nocivas ao clima. A SPVS tem sede em Curitiba, Paraná, e atua na proteção de florestas brasileiras. A organização é pioneira em projetos de seqüestro de carbono no país, através do programa de Ação Contra o Aquecimento Global, que pretende retirar da atmosfera, em 40 anos, 2,5 milhões de toneladas de carbono, através de reflorestamento e desenvolvimento sustentado no litoral do Paraná. Muito importante, também têm sido as ações da SPVS em favor da preservação das florestas e manguezais da região de Guaraqueçaba, cubrindo a área onde ocorre o mico-leão-de-cara-preta, *Leontopithecus caissara*. A

cerimônia ocorreu no dia 6 de novembro no Marrocos, durante a VII Conferência das Partes da Convenção-Quadro da Nações Unidas sobre Mudança do Clima (COP-7), principal fórum da ONU sobre mudança climática.

PRIMATE BEHAVIOR AND ECOLOGY FIELD COURSE POSITION AVAILABLE

El Zota Biological Field Station is offering a field course in primate behavior and ecology taught at a new field site in northeastern Costa Rica. The Field Station is home to howler monkeys, capuchins, and spider monkeys, as well as endangered fauna such as jaguars and tapir. Students attend nightly lectures, learn various methods of field techniques used for the study of primate behavior and ecology, and conduct their own research project on one of the three primate species at El Zota.

This course is included in the curriculum at Iowa State University and is listed as Anthropology 445/545. Students receive 4 credits for the course, but arrangements can be made to receive 6 credits with the addition of 2 credits of independent study. This would entail the inclusion of additional library research and writing as well as other requirements. Students are not required to enroll at Iowa State University in order to take the course. Students should have had a college-level course in basic Biology, Ecology, or Anthropology and require a health check-up and medical insurance before they are accepted into the course.

The cost of the course is approximately $1350. Support provided for internship/volunteer positions (travel, meals, lodging): A limited number of internships are available, but students are required to be enrolled at an El Zota course in order to be eligible. The Course will be taught from July 15 through August 11, 2002. Application Deadline: April 2002.

Other courses, such as Tropical Herpetology are also taught at El Zota and students are also given the option of traveling to other areas of Costa Rica during a short mid-course trip. El Zota is sponsored by the non-profit organization DANTA: Association for Conservation of the Tropics, which organizes and accounts for course fees students pay to the station.

For further information contact: Jill D. Pruetz, Department of Anthropology, Iowa State University, Ames, IA 50011, USA, Tel: (515) 294-5150, e-mail: <pruetz@iastate.edu>.

FUNDACIÓN ECOLOMBIA

Colombia is rich in plant and animal species, a number of which are smuggled illegally out of the country every day. Some zoos in Colombia serve as quarantine and holding stations for wildlife confiscated by the environmental authorities but, due to the high number of seizures,

programs and centers for rehabilitation, reproduction and reintroduction are needed. Fundación Ecolombia is a private non-profit institution created in 1999 to promote sustainable economic alternatives to illegal wildlife traffic of fauna and flora, specifically for the communities that live off this activity. Its goals also include, promoting and managing rehabilitation and reproduction centers for native wildlife particularly for those species at risk of extinction and promoting educational programs that prevent the hunting, capture and trade of wildlife.

Fundación Ecolombia has recently leased 83 ha from the government to establish a Rehabilitation Center. Dry forest covers 46 ha, and the rest is cattle pasture which is currently being restored with native species, permitting the natural regeneration of the area. Eventually a further 100 ha adjacent to the land will be integrated into the program. The project is located in the town of La Pintada, an area heavily hunted in the past. Current projects include: The rehabilitation and reintroduction of confiscated primates presently caged in the Santa Fé Zoo, 25 red howlers (*Alouatta seniculus*), 12 black spider monkeys (*Ateles fusciceps*) and 18 cotton-top tamarins (*Saguinus oedipus*); development of captive breeding programs for the blue-billed curassow (*Crax alberti*) and the green macaw (*Ara militaris*), for later reintroduction in their original habitats; development of conservation and population studies for the white-footed tamarin (*Saguinus leucopus*); and implementation of handicraft and environmental education programs in communities neighboring the conservation area.

For more information contact: Fundación Ecolombia, A.A. 75972, Medellin, Colombia, Tel: 57 4 281 40 97, e-mail: <contacto@fundacionecolombia.org>. Website: <www.fundacionecolombia.org>.

MASTERS COURSE IN PRIMATE CONSERVATION

The Oxford Brookes University in Oxford, United Kingdom, is offering a masters course in primate conservation aimed at providing a high quality research qualification relevant to the careers of anthropologists, conservation biologists and educators. The course term is from October 2002–September 2003. Each student will be encouraged to build on their own strengths and interests through a choice of a practical assignment and co-authorship of a relevant chapter of the house journal. Eight major themes are covered in the course: primate diversity and biogeography, socio-political aspects of conservation, environmental education, molecular and population genetics, fieldwork training and methods, captive management, museum studies, habitat protection and the future of rainforests. Qualifications include: Honors degree in anthropology, biology or acceptable related discipline. Undergraduate students will be considered if they can demonstrate ability to work at an advanced level. Costs for the course: £7350 for full time overseas students, £2988 for full time EU students and £1494 for part time

EU students. The application deadline is May 31, 2002. Applications are available at: <www.brooks.ac.uk/courses/pgcourses/application/down.html>. For further information contact: Simon Bearder, School of Social Sciences and Law, Gypsy Lane Campus, Oxford, United Kingdom OX3 0BP, Tel: 01865 483 760, Fax: 01865 483 937, e-mail: <skbearder@brooks.ac.uk>.

PRIMATE SOCIETIES

AMERICAN SOCIETY OF PRIMATOLOGISTS 25TH ANNUAL MEETING

The ASP will host its 25th annual meeting, 1–4 June, 2002, in Oklahoma City, OK. The meeting will be co-hosted by the University of Oklahoma and the Oklahoma City Zoo. Prior to the ASP meeting, the zoo will host meetings of several of the American Zoological Association's Primate Taxon Advisory Groups (TAGs), and the Bushmeat Crisis Task Force will conduct a special primate bushmeat awareness session. A schedule of events includes: 28–31 May, Prosimian, New World Monkey and Old World Monkey TAG meetings; 1 June (am), Bushmeat Crisis Task Force Presentation; 1 June (pm), ASP welcome reception; 2–4 June, American Society of Primatologists' general sessions and poster presentations; 4 June (pm), ASP closing banquet; 5–6 June, ASP Education Committee's teachers workshop.

For program committee contact: Tammie Bettinger, Chair, ASP Program Committee, Zoo Atlanta, 800 Cherokee Avenue SE, Atlanta, Georgia 30315, USA, e-mail: <tbettinger@zooatlanta.org>. For local arrangements contact: Janette Wallis, Department of Psychiatry and Behavioral Sciences, University of Oklahoma, HSC, P.O. Box 26901, Oklahoma City, OK, 73190, USA, e-mail: <janette-wallis@ouhsc.edu>.

2002 ASP CALL FOR AWARD NOMINATIONS AND GRANT APPLICATIONS

The American Society of Primatologists is now seeking nominations for Conservation Awards and Grants to recognize colleagues and students working on conservation related issues. The awards and grants include: *Subscription Award*, *Conservation Award* and *Conservation Small Grants*. All nominations must be submitted by 19 April, 2002 to: the ASP Conservation Committee Chair: Randall C. Kyes, Regional Primate Research Center, University of Washington, Box 357330, Seattle, WA 98195, USA.

The Subscription Award gives the *American Journal of Primatology* to individuals in habitat countries, usually for a five-year period. Preference is given to those who will make the journal available for other students or colleagues to use. Recipients are requested to submit a brief report every two years summarizing their use of the journal. A nominating letter should describe the nominee's credentials, his/her primate related activities, and should explain why the nominee deserves to receive priority consideration.

The Conservation Award provides $750 of financial support to students from habitat countries that demonstrate potential for making significant and continuing contributions to primate conservation. Eligible candidates include students, researchers and educators from habitat countries who have not been out of university for more than five years. Nominators should provide the name, title and full mailing address of the nominee, along with a statement about the nominee's qualifications and a copy of the nominee's curriculum vitae. Supporting letters from other colleagues may be included.

Conservation Small Grants are solicited for conservation research or related projects, including conservation education. Small grants are given in amounts up to $1500. Grant applications can be obtained from the ASP Conservation Committee Chair Randall C. Kyes, Regional Primate Research Center, University of Washington, Box 357330, Seattle, WA 98195, USA, or from the ASP web site at: <www.asp.org>. Recipients of grants must submit a brief single-spaced 1-page report for publication in the *ASP Bulletin* within six months of completion of the project.

AMERICAN SOCIETY OF PRIMATOLOGISTS' BOOK SERIES, *SPECIAL TOPICS IN PRIMATOLOGY*

Volume 2 in the American Society of Primatologists' book series, *Special Topics in Primatology*, Editor Janette Wallis, has been published. *The Care and Management of Captive Chimpanzees* was edited by Linda Brent, 2001. ISBN 0-9658301-1-X (paperback). Price: $25.00 + shipping (US$4.00, outside of US - $9.00, priority mail). The publication is a valuable resource for zoos, laboratories and sanctuaries. It covers topics such as health care, contraceptives, regulations, training, and forming and managing social groups. Chapters include: Foreword - F. B. M. de Waal; Preface - L. Brent; A brief history of captive chimpanzees in the United States - L. Brent; What does a chimpanzee need? Using behavior to guide the care and management of captive populations – J. D. E. Pruetz & W. C. McGrew; Chimpanzee facility design – J. C. Coe, R. Fulk & L. Brent; Chimpanzee medicine and health care program - D. R. Lee & F. A. Guhad; Reproductive management of captive chimpanzees: Contraceptive decisions – T. L. Bettinger & K. E. DeMatteo; Behavior and environmental enrichment of individually housed chimpanzees – L. Brent; Captive chimpanzee social group formation - J. Fritz & S. Howell; Social management of captive chimpanzees – M. A. Bloomsmith & K. C. Baker; Training and cooperative behaviors and enrichment - G. Laule & M. Whittaker;

How much will it cost to keep our chimpanzees?- B. Dyke; Laws, policies, and guidelines on the care and use of captive chimpanzees in the United States – S. W. Blangero & J. L. Vandeberg. *Available from*: Steve Schapiro, ASP Treasurer, American Society of Primatologists, UTMD Anderson Science Park, Rt 2, Box 151-B1 Bastrop, TX 78602, USA, Tel: (512)-321-3991, Fax: (512)-332-5208, e-mail: <schapir@mdanderson.org>. Payment must be in US funds and checks should be made payable to "American Society of Primatologists". All profits from the sale of the book will go to the American Society of Primatologists' Conservation Fund.

ASP Call for Award Nominations

The awards and recognition committee of the American Society of Primatologists encourages members to nominate fellow primatologists for The Distinguished Service Award and The Senior Research Award. Nominations must be received by 15 March, 2002. For further information please see the ASP web site: <http://www.asp.org/awards> or contact: Gabriele R. Lubach, Chair, Awards and Recognition Committee, Harlow Primate Laboratory, University of Wisconsin, 22 North Charter St., Madison, WI 52715, USA, Tel: (608) 263-3533, Fax: (608) 262-6020, e-mail: <lubach@primate.wisc.edu>.

ASP Education Committee Honors Students

Corina Ross

Sarah Brosnan

At the 2001 American Society of Primatologists meeting held in Savannah, Georgia, the Education Committee honored three student presentations. This year a team of judges including, Siân Evans, Sue Howell, Nancy Klepper-Kilgore, Lynne Miller, Leanne Nash, Jaine Perlman and Coleen Schaffner, reviewed 22 papers and 17 posters. The three winning presentations were: Outstanding Paper Presentation: A concept of value in brown capuchin monkeys (*Cebus apella*), by Sarah Brosan and Frans de Waal; Outstanding Poster Presentation: Genetic mosaics across tissues in callitrichids (*Callithrix kuhlii*, black-tufted ear marmosets), by Corina Ross, G. Orti and J. A. French; and Honorable Mention for an Outstanding Presentation: Immigration patterns and group stability in wild golden-headed lion tamarins in southern Bahia, Brazil, by Becky Raboy and James Dietz. Congratulations to the winners!

Recent Publications

Nova Revista Científica da Universidade Federal de Minas Gerais, Belo Horizonte, Brasil

A *Lundiana* está sendo relançada, não como uma revista de zoologia, mas como uma revista de Biodiversidade, propondo-se a publicar artigos nas áreas de Biogeografia, Conservação, Ecologia, Evolução e Taxonomia, com ênfase na biota neotropical. O Comitê para Coleções Taxonômicas (CCT) do Instituto de Ciências Biológicas (ICB) da Universidade Federal de Minas Gerais (UFMG) está resgatando a revista, originalmente uma publicação do Departamento de Zoologia do ICB-UFMG, e que teve apenas dois números editados, no início da década de 1980. A revista deverá ser publicada semestralmente (janeiro e julho). O primeiro número dessa nova fâse da revista será publicado em janeiro de 2002, e o proximo em julho de 2002. Instruções para os autores podem ser encontradas no sítio <www.icb.ufmg.br/~lundiana>. A revista tem como editores os professores Alan L. de Melo (Departamento de Parasitologia - Editor-chefe), Jaime A. Bertoluci (Departamento de Zoologia - editor de área, Zoologia), Julio A. Lombardi (Departamento de Botânica, editor de área, Botânica) e Carlos A. Rosa (Departamento de Microbiologia - editor de área, Microbiologia). O CCT está empenhado em produzir uma revista de alta qualidade científica e gráfica, e pede a colaboração de toda a comunidade científica através da submissão de manuscritos e divulgação da revista junto aos pares de outras instituições. Os artigos deverão ser preferencialmente em inglês, mas, no primeiro momento, serão aceitos, também, artigos em português e espanhol.

Eneida Eskinazi Sant´Anna, Assessora para Projetos, Comitê para Coleções Taxonômicas (CCT), Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais Avenida Antônio Carlos 6627, Caixa Postal 486, 31270-901 Belo Horizonte, Minas Gerais, Brazil. E-mail: <cct@mono.icb.ufmg.br>.

The Future of Evolution

Volume 98 of 8 May 2001 of the *Proceedings of the National Academy of Sciences* includes a series of papers presented at a National Academy of Sciences Colloquium - "The Future of Evolution" held 16–20 March, 2000 at the Arnold and Mabel Beckman Center in Irvine California. It was organized by Norman Myers, of Green College, Oxford University, who with Andrew Knoll (Harvard University) wrote the first, overview paper on the effect of the extinction crisis on the future of the evolution of the planet's biota. Myers and Knoll give an eloquent and dramatic summary of the biotic crisis that they, and the other authors, argue cogently will disrupt and deplete certain basic processes

of evolution, with consequences likely to persist for millions of years. The "first order effects" include 1) a major extinction of species estimated to remove one-third to two-thirds of all species; 2) a mega-mass extinction of populations; 3) alien invasions and mixings of biota; 4) progressive depletion and homogenization with potential threshold effects on ecosystems; 5) general biotic impoverishment and a decline in global biomass; and 6) gross reduction and virtual elimination of entire sectors of some biomes, notably tropical forests, coral reefs and wetlands which have served as centers for diversification in the past. Further evolutionary effects they discuss include: 1) fragmentation of species ranges with disruption of gene flow; 2) decline in effective population sizes with depletion in gene reservoirs; and 3) biotic interchanges introducing species and even entire biotas into new areas, with multiple founder effects and novel competitive and other ecological interactions. The consequences they consider include an outburst of speciation, proliferation of opportunistic species ("pest and weed" ecology), depletion of evolutionary powerhouses; decline in biodisparity (the biota's manifest morphological and physiological variety), an end to speciation in large vertebrates, and emergent, difficult to predict novelties.

Papers. The biotic crisis and the future of evolution – N. Myers & A. H. Knoll, pp.5389-5392; Lessons from the past: Evolutionary impacts of mass extinction – D. Jablonski, pp.5393-5398; Lessons from the past: Biotic recoveries from mass extinctions – D. H. Erwin, pp.5399–5403; Loss of speciation rate will impoverish future diversity – M. L. Rosenzweig, pp.5404–5410; What was natural in the coastal oceans? – J. B. C. Jackson, pp.5411–5418; The future of coral reefs – N. Knowlton, pp.5419–5425; Disrupting evolutionary processes: The effect of habitat fragmentation on collared lizards in the Missouri Ozarks – A. R. Templeton, R. J. Robertson, J. Brisson, & J. Strasburg, pp.5426–5432; Human-caused environmental change: Impacts on plant diversity and evolution – D. Tilman & C. Lehman, pp.5433–5440; Plant biology in the future - F. A. Bazzaz, pp.5441–5445; The evolutionary impact of invasive species - H. A. Mooney & E. E. Cleland, pp.5446–5451; Rapid plant diversification: Planning for an evolutionary future - R. M. Cowling & R. L. Pressey, pp.5452–5457; Human-modified ecosystems and future evolution – D. Western, pp.5458–5465; The current biodiversity extinction event: Scenarios for mitigation and recovery – M. J. Novacek & E. E. Cleland, pp.5466–5470; Decline of biomes and biotas and the future of evolution – D. S. Woodruff, pp.5471–5476; Intervening in evolution: Ethics and actions – P. R. Ehrlich, pp.5477–5480.

Papers from the National Academy of Sciences Colloquium on The Future of Evolution are available for download at <http://www.pnas.org/content/vol98/issue10/>. For subscription information see: <http://www.pnas.org/subscriptions/> or contact: the PNAS Circulation Office USA phone: 1-202-334-2672, fax 1-202-334-2738 or e-mail: subspnas@nas.edu.

Special Issue of *TREE* - Speciation

A special issue of *Trends in Ecology and Evolution*, Vol. 16(7), July 2001, Editor Catriona J. MacCallum, is dedicated to "Speciation". The Guest Editor was Nicholas J. Barton, Institute of Cell, Animal and Population Biology of the University of Edinburgh, UK. The special issue aims to review recent developments and to bring together all aspects of speciation, from genetics through ecology to palaeontology. Of particular interest for conservation is the first article by Jody Hey, Rutgers University, NJ, who discusses the confusion about exactly what a species is, arising from conflict between intuitive classification and the complex and continuous process of evolution. In his Introduction (p.325), Barton rationalizes some of the subsequent series of articles in the form of questions: "Why should there be distinct 'species' at all rather than a continuous intergradation of interbreeding organisms that reflects the continuity of evolution (Turelli *et al.*)? Is the distribution of species' abundance determined primarily by the distribution of ecological niches, or does it also depend on how species form (Godfray & Lawton)? To what extent does genetic exchange impede divergence? In the extreme, can a single population split into two species without any spatial separation at all (Turelli *et al.*, Via, and Riesenberg)? What processes drive divergence - random drift, natural selection, or sexual selection (Panhuis *et al.* and Schluter)? What kinds of genetic differences distinguish species, and what do these tell us about the process of divergence (Turelli *et al.* and Orr)." Further aspects treated include the role of selection as a cause of divergence (Panhuis *et al.* and Schluter), the use of molecular markers (Orr), the use of phylogenies for rigorous comparative tests and inferences about the evolutionary process (Barraclough & Nee), the use of "gene trees" to measure evolutionary processes of selection, migration and drift that are involved in speciation (Nichols), and how palaeontology has allowed clear hypotheses about the relation between speciation and morphological evolution (Benton & Pearson).

Papers. The mind of the species problem - J. Hey, pp.326–329; Theory and Speciation - M. Turelli, N. H. Barton & J. A. Coyne, pp.330–343; The genetics of species differences - H. A. Orr, pp.343–350; Chromosomal rearrangements and speciation - L. H. Riesenberg, pp.351–358; Gene trees and species trees are not the same - R. Nichols, pp.358–364; Sexual selection and speciation - T. M. Panhuis, R. Butlin, M. Zuk & T. Treganza, pp.364–371; Ecology and the origin of species - D. Schluter, pp.372–380; Sympatric speciation in animals: The ugly duckling grows up - S. Via, pp.381–390; Phylogenetics and speciation - T. G. Barraclough & S. Nee, pp.391–399; Scale and species numbers - H. C. J. Godfray & J. H. Lawton, pp.400–404; Speciation in the fossil record - M. J. Benton & P. N. Pearson, pp.405–411. There is also a pertinent review of *Frogs, Flies and Dandelions: The Making of Species* by Menno Schilthuizen, Oxford University Press, Oxford, 2001, along with a glossary of speciation.

THE RED LIST CATEGORIES AND CRITERIA BOOKLET

The Red List Categories and Criteria booklet (in English, French and Spanish) is now available on the SSC website in pdf: <http://www.iucn.org/themes/ssc/redlists/RLcategories 2000.html>. This is the only version that should be used and distributed. The previous version in Word had an error in the citation. The correct citation is: IUCN. (2001). *IUCN Red List Categories and Criteria: Version 3.1.* IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii+30 pp.

BOOKS

A Primatologia no Brasil – 7, edited by Carmen Alonso and Alfredo Langguth, 2000, 360pp. Editora Universitária, Universidade Federal da Paraíba, Sociedade Brasileira de Primatologia, João Pessoa, Paraíba. Anais do VIII Congresso Brasileiro de Primatologia, João Pessoa, 10–15 de agosto de 1997. Proceedings of the VIII Brazilian Primatology Congress. The publication of this book was supported by the Margot Marsh Biodiversity Foundation. It contains 23 articles in Portuguese and English on the behavior, ecology and physiology of Brazilian (and one Colombian) primates. Contents: Comparação do cuidado de uma prole de gêmeos com uma prole de filhote único de *Callithrix jacchus* no ambiente natural - F. S. Albuquerque, E. Otta & M. de F. Arruda, pp.11–21; Social interactions in a *Callithrix kuhlii* family (Primates: Callitrichidae) in captivity - C. Alonso, S. Porfírio & A. Langguth, pp.23–33; Uso do espaço e comportamento social em sagüis do cerrado (*Callithrix penicillata*) selvagens, no Centro de Primatologia da Universidade de Brasília - V. Boere, L. Tillman, M. C. de Resende & C. Tomaz, pp.35–48; Distribuição diária da atividade locomotora e da cataçao em uma fêmea reprodutora de *Callithrix jacchus* durante a gestação e após o parto - C. S. Camillo *et al.*, pp.49–63; Influência da distribuição e disponibilidade dos frutos, na dieta e uso do espaço em sagüi-do-nordeste (*Callithrix jacchus*) - C. S. S. de Castro, A. Araújo, C. Alho & M. M. Dias Filho, pp.65–80; Ecologia alimentar e sazonalidade em primatas neotropicais: Gênero *Saguinus* - S. Egler, pp.81–95; A comparative study of hand preference in three species of the genus *Cebus* - S. F. Ferrari, T. W. R. Lobato & M. S. Andrade, pp.97–105; Mães, filhotes e uma análise dos custos do cuidado parental - R. F. Guerra, pp.107–149; Aspectos ecológicos e do comportamento de *Alouatta fusca* (Geoffroy, 1812) na Estação Ecológica de Aracuri, RS, Brasil - M. M. de A. Jardim & L. F. B. de Oliveira, pp.151–169; Behaviour of free-ranging squirrel monkeys *Saimiri sciureus*, (Platyrrhini: Cebidae) at the fazenda Monte Verde, Peixe-Boi, Pará - E. M. Lima, A. L. C. B. Pina & S. F. Ferrari, pp.171–180; Uso do espaço por um grupo de *Alouatta fusca clamitans* em um fragmento degradado de floresta Atlântica - V. L. A. G. Limeira, pp.181–196; Evolutionary history of the duplicated gamma hemoglobin genes in New World monkeys (Primates: Atelinae) – C. M. Meireles, J. Czelusniak, M. P. C. Schneider & M. Goodman, pp.197–214; Emissão de gritos longos por grupos de *Callicebus nigrifrons* e suas reações a *playbacks* - F. R. de Melo & S. L. Mendes, pp.215–222; Sex and age differences in foraging and vigilance behavior of captive *Saguinus midas midas* (Primates: Callitrichidae) - A. C. de A. Moura & C. Alonso, pp.223–238; Influência de filhotes dependentes no padrão de atividades de um grupo silvestre de *Callithrix jacchus* - M. C. L. Nascimento & M. de F. Arruda, pp.239–246; Percepção de cores em *Cebus apella* (Primates: Cebidae) - V. F. Pessoa *et al.*, pp.247–264; Comunicación vocal y su relación con las actividades, estructura social y contexto comportamental en *Callicebus cupreus ornatus* - M. Porras, pp.265–274; Aspectos de comportamento social de *Saguinus midas midas* (Primates: Callitrichidae) em cativeiro - N. Schiel & A. Souto, pp.275–289; Resultados de uma pequena expedição primatológica à Amazônia Central (Primates: Playtrrhini) - J. de S. e Silva Júnior & M. de A. Noronha, pp.291–304; Consistência no uso das mãos em atividades forçadas e espontâneas no sagüi, *Callithrix jacchus* - M. B. C. de Sousa, N. S. Xavier & H. A. P. Peregrino, pp.305–317; Influência da variação diurna no sangue e do estresse na excreção fecal de esteróides em *Callithrix jacchus* - M. B. C .de Sousa & T. Ziegler, pp.319–331; Memória operacional no macaco-prego (*Cebus apella*) - C. Tomaz, M. C. H. Tavares & A. L. R. Caldas, pp.333–347: A questão do gênero na produção científica em Primatologia no Brasil - M. E. Yamamoto & K. S. da Silva Diniz, pp.349–360. *Available from*: Alfredo Langguth, Departamento de Sistemática e Ecologia CCEN, Universidade Federal da Paraíba, 58059-900 João Pessoa, Paraíba, Brazil. E-mail: <alfredo@dse.ufpb.br>.

Biodiversidade na Amazônia Brasileira: Avaliação e Ações Prioritárias para a Conservação, Uso Sustentável e Repartição de Benefícios, edited by Adalberto Vérissimo, Adriana Moreira, Donald Sawyer, Iza dos Santos, Luis Paulo Pinto and João Paulo Capobianco, 2001, 540pp. In Portuguese. Published by the Instituto Socioambiental and Estação Liberdade, São Paulo, Brazil. ISBN 85 7448 052 5 (Estação Liberdade), 85 85994 13 4 (Instituto Socioambiental). This is a remarkable compilation of articles, facts, figures and maps on diverse aspects of the Brazilian Amazon: its biodiversity, socio-economy, conservation, development, and destruction. The first part provides valuable overviews of its biodiversity. Maria Nazareth F. da Silva *et al.* give an overview of mammals. They listed 311 mammal species as occurring in the Brazilian Amazon – 22 marsupials, 11 edentates, 124 bats, 57 primates, 16 carnivores, two cetaceans, one sirenian, 72 rodents and one rabbit. This book is the result of the priority setting workshop, held in Macapá, Amapá, 20–25 September, 1999 - "Projeto Avaliação e Identificação de Ações Prioritárias para a Conservação, Utilização Sustentável e Repartição dos Benefícios da Biodiversidade da Amazônia Brasileira", part of the activities of the Programa Nacional de Diversidade Biológica - PRONABIO of the Ministry of the Environment. Key organizations involved in coordinating the workshop were: Instituto Socioambiental – ISA (João Paulo Capobianco,

Adriano Ramos & Geraldo Andrello), Instituto do Homem e Meio Ambiente da Amazônia – IMAZON (Adalberto Veríssimo & Eugênio Arima), Instituto de Pesquisa Ambiental da Amazônia – IPAM (Adriana Moreira & Paulo Moutinho), Conservation International do Brasil (Luiz Paulo Pinto & Roberto Cavalcanti) and Instituto Sociedade, População e Natureza – ISPN (Donald Sawyer & Maurício Pontes). *Contents*: Part 1 - Biodiversidade e funções ecológicas dos ecossistemas: O peso dos invertebrados na balança de conservação biológica da Amazonia – W. L. Overal, pp.50–59; Componente biota aquática – R. Barthem, pp.60–78; Relatório técnico sobre a diversidade de anfíbios na Amazônia brasileira – C. Azevedo-Ramos & U. Galatti, pp.79–88; Biodiversidade de répteis do bioma floresta amazônica e ações prioritárias para sua conservação – R. C. Vogt, G. M. Moreira & A. C. de O. C. Duarte, pp.89–96; Biogeografia e conservação de aves na região amazônica – D. C. Oren, pp.97–109; Biogeografia e conservação da mastofauna na floresta amazônica brasileira – M. N. F. da Silva, A. B. Rylands & J. L. Patton, pp. 110–131; Área botânica – B. W. Nelson & A. A. de Oliveira, pp.132–176; As funções ecológicas dos ecossistemas florestais: implicações para a conservação e uso da biodiversidade amazônica – P. Moutinho & D. Nepstad, pp.177–183. Part 2 – Sociodiversidade e etnoconhecimento: Populações tradicionais e conservação ambiental – M. C. da Cunha & M. W. B. Almeida, pp.184–193; A sociodiversidade nativa contemporânea no Brasil e a biodiversidade na Amazônia – B. Ricardo, pp.194–204; "Populações tradicionais" e biodiversidade na Amazônia: levantamento bibliográfico – A. C. Diegues. G. Andrello & M. Nunes, pp.205–224; Elementos de discussão sobre a conservação da agrobiodiversidade: o exemplo da mandioca (*Manihot esculenta* Crant) na Amazônia brasileira – L. Emperaire, pp.225–234; Biodiversidade e conhecimentos tradicionais – J. Santilli, pp.235–245. Part 3 – Unidades de Conservação e terra indígenas: Unidades de Conservaão na Amazônia Legal – F. Ricardo & J. P. R. Capobianco, pp.246–250; Terra indígenas na Amazônia Legal – F. Ricardo, pp.251–258; Sobreposições entre Unidades de Conservação (UCs) federais, estaduais, terra indígenas, terras militares e reservas garimpeiras na Amazônia Legal – F. Ricardo, pp.259–262; Representatividade das Unidades de Conservação e terras indígenas em relação à fitofisionomias da Amazônia Legal – J. P. R. Capobianco, pp.263–267; Identificação de áreas prioritárias para a conservação de biodiversidade por meio de representatividade das Unidades de Conservação e tipos de vegetação nas ecorregiões da Amazônia brasileira – L. V. Ferreira, R. Lemos de Sá, R. Buschbacher, G. Batmanian, J. M. C. da Silva, M. B. Arruda, E. Moretti, L. F. S. N. de Sá, J. Falcomer & M. I. Bampi – pp.268–286; Incidência de requerimentos e titulos minerários nas Unidades de Conservação (UCs) federais e estaduais na Amazônia Legal – F. Ricardo, pp.287–289; Reservas indígenas de recursos naturais – M. Santilli, pp.290–291; Formas de acesso à terra e a preservação da floresta amazônica: uma análise jurídica da regularização fundiária das terras dos quilombolas e seringueiros – J. H. Benatti, pp.292–298; Presenca humana em Unidade de Conservação: um impasse científico,

jurídico ou político? – J. H. Benatti, pp.299–305. Part 4. Socieconomia e pressões antrópicas: Diagnóstico demográfico, socioeconômico e de pressão antrópica na região da Amazônia Legal – M. P. Monteiro & D. Sawyer, pp.308–320; Eixos amazônicos de integração e desenvolvimento – obras e empreendimentos – M. Brito, pp.321–326; O diagnóstico do uso da terra na Amazônia: exploração madeireira, agricultura e agropecuária – A. Veríssimo, E. Arima & E. Lima, pp.327–337; Espécies de árvores potencialmente ameaçadas pela atividade madeireira na Amazônia – A. Martini, N. de A. Rosa & C. Uhl, pp.338–347; Oportunidades de negócios na Amazônia: alternatives sustentáveis – A. Guimarães, pp.348–351. The remaining sections include workshop methodology, texts, maps, tables and details of the base maps used, the numerous priority area maps for the different themes, and the final priority areas selected during the workshop. *Available from*: Instituto Socioambiental, Av. Higienópolis 901, 01238-001 São Paulo, São Paulo, Brasil, Tel: +55 11 3825 5544, Fax: +55 11 3825 7861, e-mail: <isa@socioambiental.org>. Web site: <www.socioambiental. org>.

Biology, Medicine, and Surgery of South American Wild Mammals, edited by Murray E. Fowler and Zalmir S. Cubas, 2001, 536pp. Iowa State University Press, Ames, Iowa. ISBN 0 8138 2846-5. Price US$89.65. A compilation of continent specific coverage of amphibians, birds, reptiles and all South American mammals arranged by order and genus. Topics include conservation efforts, diseases in free-ranging populations, and management of animals in captivity. Special coverage is given to general health topics such as nutrition, ophthalmology and dentistry. Pages 256 to 278 are dedicated to the New World primates, with the following contributions: Biology of the Cebidae - Anthony B. Rylands, pp.256–259; Biology and conservation of the Callitrichidae – Cláudio Valladares-Padua, pp.259–261; Nutrition - Roberto da Rocha e Silva, pp.261–263; Behavior and environmental enrichment - Vanner Boere, pp.263–267; Medicine - José Luiz Catão Dias, pp.267–272; Medicine, selected disorders - Alcides Pissinatti, pp.272–274; Reproduction - Marcelo A. de B. V. Guimarães, pp.274–278. An excellent compendium and difficult to believe that any zoo or breeding institution could do without it. Available from: Iowa State University Press, 212 South State Avenue, Ames, IA 50014, USA, Tel: 800 862 6657, 515 292 0155, Fax: 515-292-3348. Web site:<www.isupress.com>.

Songs, Roars, and Rituals: Communication in Birds, Mammals, and Other Animals, by Lesley J. Rogers and Gisela Kaplan, Harvard University Press 2000. Price: $31.50, ISBN: 0-674-00058-7. The authors have highlighted many of the latest developments in the study of animal communication, offering insights on how animals communicate by sight, sound, smell, touch and electrical signaling. They explore a wide variety of communication patterns and how these patterns evolved, including an account of the science of animal communication and modern concepts, controversies and the evolution of human language and the use of symbolic language by apes. *Available from*: Harvard University Press,

Customer Service Department, 79 Garden Street, Cambridge, Massachusetts 02138 USA, Fax: (800) 962-4983, phone: (800) 448-2242, e-mail: <Contact_HUP@harvard.edu>, web site: <www.hup.harvard.edu>.

Colbert's Evolution of the Vertebrates: A History of the Backboned Animals Through Time, Fifth Edition, by Edwin H. Colbert, Michael Morales and Eli C. Minkoff, WILEY-LISS 2001. Price: $145.00 (hardbound), ISBN: 0-471-38461-5. A valuable reference for professionals in evolutionary biology and paleontology, as well as students in those fields. *From the back cover:* "Vertebrate evolution is studied through comparative anatomy and functional morphology of existing vertebrates as well as fossil records. Since the publication of the previous edition of Colbert's Evolution of the Vertebrates: A History of the Backboned Animals Through Time, there have been significant advances in the knowledge surrounding backboned animals. This latest edition of the classic text is completely revised to offer the most recent discoveries in this continually evolving field of science. Covering the various aspects of vertebrate life, from skeletal system to ecology, behavior, and physiology, the Fifth Edition includes new sections on conodonts, dinosaurs, primates, and the origin of birds, and discusses: Analysis of morphological and molecular data; early diversification of vertebrates; the evolution of dinosaurs; the origin of mammals; early ruling reptiles; and basic adaptation of ungulates". Chapter twenty-three: Primates and Their Kin, covers: The Archonta, Scandentia, The Bats, Dermoptera, The Origin of the Primates, Primate Characters, A Classification of the Primates, Plesiadapiformes, Strepsirhini - The Adapids, Lemurs, and Lorises, Haplorhini, The Tarsioids, Platyrrhini - The New World Monkeys, Catarrhini - The Old World Monkeys, Apes, and Humans and The Family Hominidae. *Available from:* John Wiley & Sons, Inc., Distribution Center, 1 Wiley Drive, Somerset, NJ 08875-1272, phone: (732) 469-4400 or (800) 225-5945, Fax: (732) 302-2300, e-mail: <bookinfo@wiley.com>.

Animal, The Definitive Visual Guide to the World's Wildlife, edited by Don E. Wilson and David Burnie, 2001, 624pp., DK Publishing, ISBN: 0-789-47764-5, over 4000 color photos and color illustrations. Price: £30.00. Researched by over 70 zoologists and naturalists this book covers over 2000 mammals, birds, amphibians, reptiles, fish and invertebrates. Principle consultants include: Juliet Clutton-Brock (Mammals) - Dr Francois Vuilleumier (Birds) - Richard Rosenblatt (Fish) - Chris Mattison (Reptiles) - Tim Halliday (Amphibians) - George McGavin (Arthropods) - Richard Barnes (Non-Arthropod Invertebrates). Available from: NHBS Mailorder bookstore, 2-3 Wills Road, Totnes, Devon, TQ9 5XN, UK, web site: <http://www.nhbs.com>. NHBS Stock Code: *#119919W hardback.*

Economics in Nature: Social Dilemmas, Mate Choice and Biological Markets, edited by Ronald Noe, Jan van Hooff and Peter Hammerstein, 2001. Published by Cambridge University Press, ISBN: 0-521-65014-3 (hardbound). Price: $80.00. *From the back cover:*

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MEETINGS

American Society of Primatologists 25th Annual Meeting, 1–4 June, 2002, Oklahoma City, Oklahoma, USA. For more information contact: Janette Wallis, Department of Psychiatry and Behavioral Sciences, University of Oklahoma Health Sciences Center, P. O. Box 26901, Oklahoma City, OK 73190. Tel: (405) 627-8820, Fax: (405) 271-3808, e-mail: <janette-wallis@ouhsc.edu>.

3rd International Canopy Conference, June, 2002, Cairns, Australia. Sponsored by the Queensland Government of Australia and the Smithsonian Institution, the conference theme is "Science, Policy and Utilisation" and is intended to bring together scientists, environmental managers and policy makers concerned with the discovery and sustainable use of forests around the world. Contact: Eileen Domagala, e-mail <Eileen Domagala@premiers.qld.gov.au> for further information or look on the web site: <http://www.premiers. qld.gov.au/whatsnew.htm>.

XV National Congress of The Italian Primatological Association, 30 May–1 June 2002, Istituto di Psicologia del CNR Rome. Organized by the Associazione Primatologica Italiana. Contact: Annarita Wirz, Istituto di Psicologia del CNR; Via Ulisse Aldovandi 16/B, 00197 Roma, Italy, Tel: 06-3221252, 3221437, Fax: 06-3217090; e-mail: <api2002congresso@yahoo.it>. Web site: <http://www.unipv. it/webbio/api/cong15/15con.htm>.

Encroachment on Wildlife Ecosystems: New and Re-Emerging Viral Epidemics, 9–11, June 2002, Artis Zoological Gardens, Amsterdam, The Netherlands. The meeting focuses on the consequences of altering eco-systems, alterations that affect an established virus-host balance, with new and re-emerging diseases as a consequence. Agents often persist in their natural reservoirs until an ecological imbalance, such as the destruction of forests, results in contact with a new and susceptible species. All too frequently we have witnessed the result as an epidemic with high morbidity and mortality. Several new and re-emerging viral epidemics, like West Nile fever, Rift Valley fever, foot-and-mouth disease, were witnessed during the last decade and illustrate the importance and timeliness of this meeting.

Reservoirs of viruses in exotic species (such as fruit bats for Nipah virus) and in aquatic vertebrates (influenza B virus) were recognized, and their impact on human and animal health was significant. It is the aim of the organizers to have experts on wildlife and zoo animal virology discuss the consequences of trans-species transmission on wildlife, domestic animals and on the human population. The meeting will be an informal opportunity to exchange experience and expertise in the monitoring, diagnosis, prevention (including wildlife vaccination) and control of outbreaks. Contact: Ms. Jeanette Schouw, Department of Virology, Biomedical Primate Research Centre, PO Box 3306, 2280 GH Rijswijk, The Netherlands, e-mail: <wildlife@bprc.nl>, Website: <http://www.wildlife2002.nl>.

16th Annual Meeting of the Society for Conservation Biology, 14–18 July, 2002, Canterbury, England at the University of Kent's campus. The theme of this meeting will be, People and Conservation and will be co-hosted by the Durrell Institute of Conservation and Ecology (DICE), based in the Department of Anthropology at the University and the British Ecological Society. For more information contact: Nigel Leader-Williams, SCB2002 Program Chair, e-mail: <scb2002@ukc.ac.uk> or Andrew Pullin, BES, e-mail: <a.s.pullin@bham.ac.uk>. Web site: <www.ukc.ac.uk/anthropology/dice/scb2002/>.

American Veterinary Society of Animal Behavior, 15 July, 2002, Nashville, Tennessee, USA. This meeting will be held in conjunction with the annual meeting of the American Veterinary Medical Association. The meeting format will include presentations, question and answer sessions and a poster session. Deadline for submitting abstracts is December 1, 2001. Authors will be notified by January 15, 2002. For more information contact: Dr. Margaret Duxbury, 1299 South Shore Drive Amery, WI 54001. Tel: (715) 268-9900, Fax: (715) 268-2691, e-mail: <mduxburyl@yahoo.com>.

Ecological Society of America 87th Annual Meeting joint with the Ecological Society of Mexico, 4–8 August, 2002. Arizona, USA. Details from: ESA, 1707 H St., NW, Suite 400, Washington, DC 20006, USA, Tel: + (202) 833 8773, Fax: +(202)833 8775, e-mail: <esahq@eas.org>.

XIXth Congress of the International Primatological Society, 4–9 August 2002, Beijing, China. Organized by the Mammalogical Society of China and the Institute of Zoology, Chinese Academy of Sciences. The venue will be the Beijing International Convention Center, No. 8 Beichen Dong Road, Beijing 100101, China (website <www.bicc.com.cn>). The theme of the Congress is "Caring for Primates", focusing on the progress and prospects of primatology and the conservation of non-human-primates. Deadline for symposium and workshop titles: 31 August, 2001. Deadline for submitting abstracts is the 31 March, 2002. On-Line registration will be available after 1 December, 2001. *Contact address:* Prof. Fuwen Wei, Secretary General, 19th Congress of the International Primatological Society, c/o Institute of Zoology. Chinese Academy of Sciences, 19 Zhongguancan Lu, Haidian, Beijing 100080, China, Fax: (86-10) 82627388, e-mail: <IPS_Beijing@panda.ioz.ac.cn>. Home page: <http://www.ips.ioz.ac.cn>.

Xº· Congresso Brasileiro de Primatologia, 26–30 August 2002, Universidade Federal do Pará, Belém. Hosted by the Sociedade Brasileira de Primatologia (SBPr). For more information: Stephen Ferrari, Departamento de Genética, Universidade Federal do Pará, Campus do Guamá, Caixa Postal 8607, 66075-150 Belém, Pará, Brazil, e-mail: <ferrari@ufpa.br>.

Annual Meetings of the IUCN/SSC Conservation Breeding Specialist Group (CBSG), 10–13 August, 2002, The World Zoo Organization (WZO), 13–17 August 2002, and The International Association of Zoo Educators (IZE), 17–22 August, 2002, Hofburg Palace, Redoutensäle, Vienna. Hosted by the Schoenbrunn Zoo. For more information: Austropa Interconvention, Conference Office, Friedrichstrasse 7, A-1010 Vienna, Austria, Fax: +43 1 315 56 50, e-mail: <austropa.congress@verkehrsbuero.at>.

The World Zoo Organization, 13–17 August, 2002, Redoutensale, Vienna, Austria. Hosted by the Schoenbrunn Zoo. For more information contact: Austropa Intercovention, Conference office, Friedrichstrasse 7, A-1010, Vienna, Austria. Fax: +43 1 315 56 50, e-mail: <austral.congress@verkehrsbuero.at>.

The International Association of Zoo Educators, 17–22 August, 2002, Redoutensale, Vienna. Hosted by the Schoenbrunn Zoo. For more information contact: Austropa Intercovention, Conference Office, Friedrichstrasse 7, A-1010 Vienna, Austria. Fax: +(43) 1-315-56-50, e-mail: <austra.congress@verkehrsbuero.at>.

The American Zoo and Aquarium Association (AZA) Annual Conference, 10–14 September 2002, Fort Worth Zoological Park, Fort Worth, Texas. The conference program is geared toward the many disciplines in the zoological profession - directors, animal curators, keepers, society members, scientists, gift shop merchandisers, and practitioners in public relations, development, education, and government affairs will all find something of interest. Most of the AZA committees and special interests groups meet in conjunction with the Annual Conference. For more information: <http://www.aza.org/ConfWork/>.

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: Jennifer Pervola, 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.pervola@conservation.org>, and all Spanish contributions to: Ernesto Rodrìguez-Luna, Instituto de Neuroetologìa, Universidad Veracruzana, Apartado Postal 566, Xalapa 91000, Veracruz, MÈxico. Tel: 281 8-77-30, Fax: 281 8-77-30, 8-63-52, e-mail: <saraguat@speedy.coacade.uv.mx>

Contributions

Manuscripts can 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.pervola@conservation.org>.(English, Portuguese) or <saraguat@speedy.coacade.uv.mx> (Spanish) Hard copies should be supplied for all Ýgures (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 Ýrst language is not English, 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 are 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 can include small black-and-white photographs, high quality Ýgures, 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 can be found throughout this journal. Please refer to these examples when listing references.

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