

NEOTROPICAL PRIMATES

VOLUME 7, NUMBER 4

December, 1999

A Newsletter of the Neotropical Section of the IUCN/SSC Primate Specialist Group

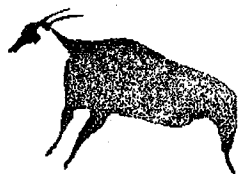
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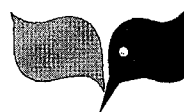
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Articles

A NEW PRIMATE RECORD FOR BOLIVIA: AN APPARENTLY ISOLATED POPULATION OF COMMON WOOLLY MONKEYS REPRESENTING A SOUTHERN RANGE EXTENSION FOR THE GENUS *LAGOTHRIX*

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R. Lilian E. Painter

The common woolly monkey (*Lagothrix lagothricha*) inhabits mature terra firme and seasonally flooded forests in western Amazonia to an altitude of 1800 m in the Andean foothills, from Colombia to the Río Tambopata in southern Peru (Fooden, 1963; Ramirez, 1988; Eisenberg, 1989; Emmons and Feer, 1999; see Fig. 1). The distribution of *L. lagothricha cana* is known to reach the Bolivian border in two areas of Brazil; along the Rio Abunã in northeastern Pando Department (Brown and Rumiz, 1985), and along the Rio Guaporé-Iténez in northeastern Beni and Santa Cruz Departments (Wallace *et al.*, 1996; D. Romero, pers. comm. to R. B. Wallace, 1997; see Fig. 1). Nevertheless, as yet no official sightings exist for woolly monkeys in the Bolivian Amazon (Brown and Rumiz, 1985; Wallace, 1995). Apparently, *L. l. cana* historically occurred in the northeast corner of Pando Department, Bolivia, but this premise stems from anecdotal information (Izawa and Bejarano, 1981; Brown and Rumiz, 1985; Buchanan-Smith *et al.*, in press). Overhunting is suggested as the cause for the current absence in this area (Izawa and Bejarano, 1981).

On September 22, 1999, we observed woolly monkeys on two occasions at an Andean cloud forest site within Madidi National Park and Natural Area of Integrated Management. The observations occurred at an altitude of approximately 1500 m in a narrow steep-sided valley running north-south (14°39.63'S, 68°41.49'W), about a 6-hour hike south-west from the local community of Pata (14°37.73'S, 68°40.32'W). Upon arriving at the crest of the valley in the late afternoon of 21 September, 1999 (c. 17:30 hrs) we heard vocalizations from the valley below. They were varied, a mixture of yelps and trills, and at times resembled both spider monkeys (*Ateles*) and parrots (*Amazonas*).



Figure 1. Geographic distribution of the woolly monkey, *Lagothrix lagothricha*.

The following day during the mid-morning (c. 10:15 hrs) we observed a woolly monkey group of at least five animals: an adult male, an adult female, a young juvenile and two unsexed larger individuals. We observed them from the opposite side of the valley at a distance of c. 100-150m for about 30 minutes. The monkeys were initially located due to vocalizations similar to those of the previous afternoon. They were apparently resting, but later they saw us and moved off rapidly down the valley. These primates were large, robust animals with the classic *Lagothrix* body shape. Overall, individuals were dark smoky gray with ventral areas noticeably darker and head and face essentially black. There was some individual variation in pelage color; the adult male had a darker line running from the head down the middle of the back to the tail. Another individual in the group had clear tawny patches on both hind-quarters.

Early in the afternoon (c. 14:00 hrs) we disturbed a very dark gray (almost black) adult female carrying an infant. Before fleeing, the female was resting in a nest approximately 25 m up in the canopy. The nest was approximately 60 x 30 cm in size and made from small sticks, twigs and leaves. Another similar-sized nest was observed the following day. The origin of these nests is unclear, but on examination contained no feather remains and was probably too small for spectacled bears (*Tremarctos ornatus*), signs of which we were observing in this forest. Apparently these nests are frequently used by the woolly monkeys but as yet local inhabitants have not actually seen them being constructed (F. Portillo, pers. comm. 1999).

A local informant, Florel Portillo, said that the observed social group used the entire length of the valley ranging from about 1300 m to 1900 m a.s.l. The vegetation in the valley is low elevation Andean cloud forest with abundant mosses, tree ferns, bromeliads and orchids and a mossy ground layer on the steep slopes. Cock-of-the-rock (*Rupicola peruviana*) are frequently observed in this forest. Apparently the woolly monkey social group we observed is particularly partial to the small basins within the valley where the forest canopy reaches 30-35m, but also uses the dryer and lower forest found on the steeper slopes. Furthermore, several local inhabitants reported these monkeys as more common in higher cloud forest between 1500 m and approximately 2500m. Social groups of between 10-20 animals are most commonly observed at these more remote sites (F. Portillo, pers. comm. 1999).

The provisional distribution map presented in Figure 2 is a result of the sighting reported here as well as anecdotal information from three reliable local sources; Florel Portillo, Francisco Novack and Park Guard Radamir Sevillano. In general, the forests of northern La Paz Department remain relatively unexplored from a biological perspective, and to date lowland forests have received far more attention than the cloud forest formations occurring between 1500-3500 m a.s.l. Apparently this woolly monkey population has a localized and disjoint distribution in a limited geographical area. Faunal surveys and anecdotal information from adjacent Bolivian lowland forest suggest the absence of this species in forests below 1000 m a.s.l. (Parker and Bailey, 1991; Novack, Portillo, Sevillano and B. Hennessey, pers. comm. 1999). Indeed, this primate is locally known as 'mono rosillo' or 'marimono del frio', which

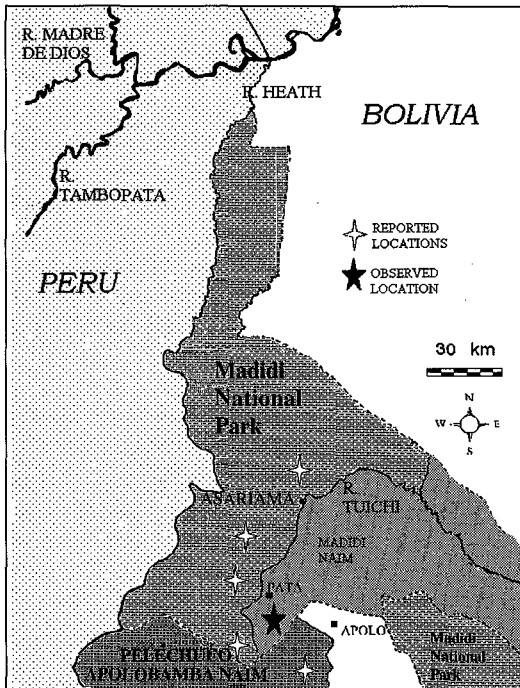


Figure 2. Reported Bolivian woolly monkey distribution.

roughly translated means 'spider monkey of the cold', further suggesting their restriction to the cloud forest in this region.

According to available distributional information this *Lagothrix* sighting represents a southern range extension for the genus and would seem to be an isolated population (see Figure 1). This isolation could be a result of over-hunting in the adjacent lowland forests of Bolivia and southern Peru. However, the relatively high densities of another popular bushmeat primate, the black spider monkey (*Ateles chamek*), within the lowland portions of Madidi National Park (Parker and Bailey, 1991) would argue against this. If this population is naturally isolated, and especially given its peculiar distribution with regard to habitat, then the possibility of it representing an undescribed subspecies must be considered. To this end, we intend to return to the area in late 1999, when in collaboration with the Bolivian National Parks Service and the Bolivian Faunal Collection, we intend to obtain further biological information, including samples for genetic analysis. For the moment, however, we prefer to consider this an apparently isolated population of *Lagothrix lagothricha cana*. We appeal to any Peruvian colleagues who have more accurate information regarding the presence or absence of *L. lagothricha cana* in southern Peru, particularly south of the Río Tambopata, to please contact us as soon as possible.

Finally, from a conservation perspective, Figure 2 demonstrates how the known distribution of this population is entirely within two Bolivian protected areas; Madidi National Park and Natural Area of Integrated Management and Apolobamba Natural Area of Integrated Management. Although these woolly monkeys are occasionally hunted by local inhabitants, this practice is apparently becoming rarer and this region of Bolivia is very sparsely populated. Indeed, large areas of the theoretical distribution of this population are completely uninhabited. However, the ongoing construction of a road through the

Tuichi valley from Apolo to Asariama will facilitate access to some of these remote areas and may pose problems for these woolly monkeys in the future.

Acknowledgments: We were first alerted to the presence of this primate species in June 1999 following conversations with Park Guard Radamir Sevillano. Francisco Novack independently described woolly monkeys to us in July 1999, and accompanied us providing substantial logistical support on our trip to Canton Pata. Critically, Florel Portillo guided us to the monkeys with great skill, enthusiasm and determination. We would also like to thank the Bolivian National Parks Service (SERNAP) for permission to work in the protected areas of northern La Paz Department and for providing logistical support on many of our field trips. Finally, we acknowledge the continuing support of the Wildlife Conservation Society.

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A PRELIMINARY STUDY OF MANTLED HOWLING MONKEY (*ALOUATTA PALLIATA*) ECOLOGY AND CONSERVATION ON ISLA DE OMETEPE, NICARAGUA

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Introduction

In this paper we examine the ecology and conservation status of mantled howling monkeys (*Alouatta palliata*) on Isla de Ometepe, Nicaragua (Fig. 1). Ometepe ($11^{\circ}40'N$ and $85^{\circ}50'W$) is a volcanic island located within the southeastern edge of Lake Nicaragua. It is the largest island in the world (276 km^2) situated in a fresh water lake, and is characterized by zones of dry deciduous forest, cloud forest, forest-shaded coffee plantations, agricultural fields, and other areas cleared for human use. Human impact has been most severe in zones between the lake and the foothills of the volcanoes. The cloud forest that covers the slopes of the volcanoes is characterized by abrupt changes in elevation and habitat, and remains relatively undisturbed. Two volcanoes dominate the island. Concepción, the tallest, is active and rises to a height of 1,610 m. Maderas, the other volcano is dormant and measures 1,394 m at its summit (Salas Estrada, 1993). It is estimated that Ometepe has been separated from the mainland for approximately 10,000 years (Gillespie, 1994), however, little is known concerning when nonhuman primates first arrived on the island, and the degree to which howling monkey populations on Ometepe differ genetically, behaviorally, or ecologically from howling monkey populations in other regions of the Neotropics. White-faced capuchins (*Cebus capucinus*) also occur naturally on the island.

Nicaragua is a country rich in natural resources, with approximately one-third of its tropical lowland rainforest remaining intact. However, as a result of political instability and civil war, there have been virtually no published studies of the ecology and conservation status of Nicaraguan primates

over the past 25 years (Crockett *et al.*, 1997). With the assistance of the Nicaraguan Government, the University of Illinois, Universidad Nacional Autónoma (Managua), Universidad Nacional Autónoma (Leon), Universidad Centro Americana, Universidad de Mobile (Nicaraguan Campus), and the Molina family, a research and educational foundation (Fundación Ometepe) was established in Nicaragua. One of the main goals of Fundación Ometepe is to study the behavior, ecology, and demography of primate populations in Nicaragua in order to develop both community-based and internationally-based plans for the conservation and management of Neotropical forests.

In December 1997, we established a biological field station on the eastern part of the island (Estación Biológica de Ometepe) near the settlement of San Ramón (see Figure 1), and initiated a preliminary field investigation of the behavioral ecology of mantled howling monkeys (*Alouatta palliata*). The genus *Alouatta* represents the most geographically widespread taxon of New World primates (Strier, 1992; Crockett, 1998). Howling monkeys range from southern Mexico, throughout Central America and the Amazon Basin, and as far south as northern Argentina (Hershkovitz, 1977). Although most of the six currently recognized howler species are reported to live in relatively small groups composed of 1-2 adult males and 1-2 adult females (mean group size <10 individuals; Crockett and Eisenberg, 1987; Chapman and Balcomb, 1998; Fedigan *et al.*, 1998), mantled howlers (*A. palliata*) are unusual in that group size tends to be large (12-20), containing 2-4 adult males and 3-9 adult females (Crockett and Eisenberg, 1987; Chapman and Balcomb, 1998; Fedigan *et al.*, 1998). Compared to other *Alouatta* species, sexual dimorphism in body weight (Ford and Davis, 1992) and hyoid size (Crockett and Eisenberg, 1987) in *A. palliata* are reported to be low, suggesting that factors contributing to reproductive competition and mate choice in this species may differ significantly from those present in more dimorphic howler species.

In this paper, we present the results of a preliminary field study of mantled howling monkeys conducted on Isla de Ometepe, Nicaragua. In particular, we examine: 1) group size and composition; 2) feeding behavior and the plant species composition of the diet; 3) the physical structure of the habitat

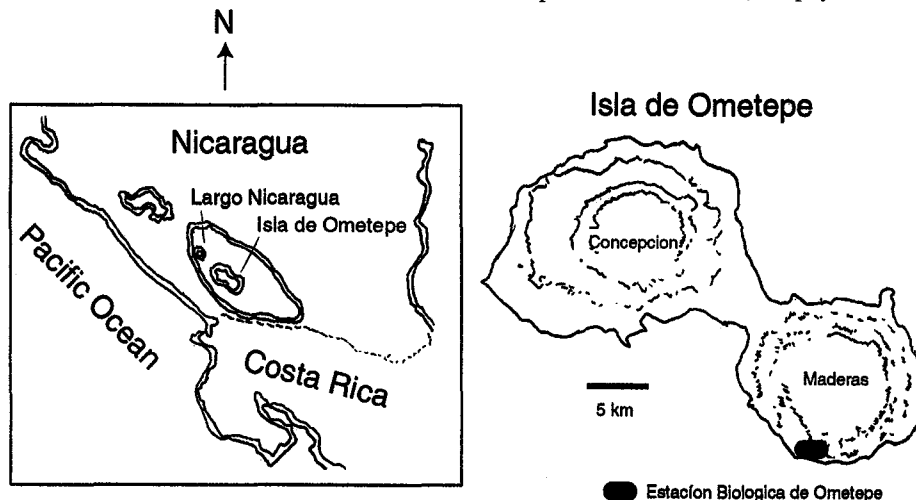


Figure 1. Map of Nicaragua showing Isla de Ometepe and the location of the Estación de Ometepe.

of the study group. In addition, we have developed an initial set of recommendations for effective community-based conservation efforts to protect the wild primate populations on Ometepe.

Methods

From December 1997 through January 1998 and July through August 1999, we conducted a field study of a group of approximately 20 mantled howling monkeys (Volcano Group) inhabiting a 4 ha area on the foothills of Volcan Maderas. Additional observations of this group were conducted in July and August, 1999. The group's home range is part of Estación Biológica de Ometepe, and was characterized by a dry semideciduous forest of low to medium stature (Salas Estrada, 1993). Rainfall in this part of Nicaragua averages from 1200-1900 mm per year, with most rain falling during the months of May through November (Salas Estrada, 1993). Tree species characteristic of this type of forest include *Albizia guachapele* (Mimosaceae), *Brosimum alicastrum* (Moraceae), *Coccoloba floribunda* (Polygonaceae), *Ficus cotinifolia* (Moraceae), *Hymenaea courbaril* (Caesalpinaceae), *Bursera simarouba* (Burseraceae), *Lonchocarpus latifolius* (Fabaceae), and *Malpighia* sp. (Malpighiaceae) (Salas Estrada, 1993).

Howlers in our main study group were observed for 62 hours on 23 days. Data on activity budget, ranging patterns, diet, and the location of feeding trees were compiled. Behavioral data were collected at 2-minute intervals throughout the day using a focal animal time sampling technique. We also noted the size of the group or subgroup, identified, marked and mapped the location all trees howlers were observed to feed in, and collected data on the size, diameter at breast height (DBH), and crown diameter of the feeding trees. Subgroups were recorded as the number of howlers simultaneously visible to the observer. We estimate that each subgroup represented the number of howlers present within an area with a radius of 25 m.

A trail system and map of the study group's home range was constructed using a Brunton transit mounted on a tripod. In all, the coordinates of 116 trail markers and 84 trees were included on the field map (total of 200 mapped points). These points encompassed an area of 48,125 m² (4.8 ha). The distances between nearest neighbor trees of the same species and the distances that howlers traveled between successive feeding sites were calculated directly from the field map.

In order to identify the structural characteristics of the forest, we divided the study group's home range into seventy-seven 25 x 25 m quadrats. Each quadrat was plotted on the field map, and measurements of tree height, density, and degree of human disturbance were compiled. We interviewed members of the local community in order to identify whether trees important in the howling monkey diet were among the set of species commonly cut by island inhabitants for firewood, canoes, house construction, or other purposes. A second group of howlers (Beach group) was also monitored for information on group size, composition, and the presence of dependent young.

Results

Size and Composition of Study Groups

Two groups of howlers were censused daily to determine the size and composition of the groups. The Beach group contained five adult males, five adult females with dependent offspring, six adult females without dependent offspring, two preadults, and five infants (total 23 individuals). This group was found to spend much of its time each day exploiting a small (1 ha) isolated patch of tall remnant forest adjacent to the lake. This fragment contained a large number of fig trees that were fruiting in December and January. The howlers reached this forest patch by going to the ground and crossing the main road on the island. In July and August 1999, however, this group was never observed to cross the road and spent all of its time in an adjacent 8 ha patch of forest.

The Volcano group contained at least 5-6 adult males, five adult females, five preadults, and two infants (18-20 individuals). This group was frequently observed to split into smaller subgroups during the day. Mean subgroup size was 8.4 individuals (± 3.5 ; range 3-17). Subgroups represent the number of howlers simultaneously visible to the observer. The average number of adult males per subgroup was 3.1 (± 1.4) and the average number of adult females per subgroup was 2.9 (± 1.5). Although we failed to observe any aggressive encounters between members of the same or neighboring groups, several of the adult males in each study group showed evidence of facial scars, cut lips, and broken digits, which would suggest that although adult males tolerate the presence of several other adult males in a group, fighting among adult males can be extremely severe.

Feeding Patterns and the Distribution of Feeding Sites

During the course of the dry season study (December-January), 84 trees which the howlers fed in were marked, identified, and mapped. Seventy-four of these trees were of nine species (87%). They included *Spondias mombin*, *Cecropia* spp., *Bursera simarouba*, *Gliricidia sepium*, *Calycophyllum candidissimum* and *Lonchocarpus parviflorus*. The howlers consumed leaves from 53% of these trees, flowers from 32%, and fruits from 14%. On average, each howler subgroup fed in 3.0 trees per observation hour. Subgrouping may enable members of a single large group to exploit more effectively a set of small clumped feeding sites that are scattered across their home range (see below).

In order to examine howling monkey feeding and ranging patterns, the nearest neighbor distances between feeding trees of the same species and distances traveled between feeding sites were calculated. As indicated in Table 1, tree species exploited by howlers tended towards a clumped distribution. Mean nearest neighbor distances in five of 10 species were less than or equal to 35 m, and in two of the remaining cases mean nearest neighbor distances was less than 50 m. The greatest distance howlers traveled between successive feeding sites within a resource clump was 20 m.

We also examined the distribution of feeding sites by counting the number of trees in each of the seventy-seven 25 x 25 m

Table 1. Spatial distribution of feeding trees exploited by mantled howlers on Ometepe.

Tree Species	No. of trees	Mean NN distance m	Range NN distance m
<i>Gliricidia sepium</i>	21	9	4-25
Chaperno	12	41	5-97
<i>Spondias mombin</i>	11	29	9-140
Purple Flower	9	24	2-27
<i>Cecropia</i> sp.	8	35	7-88
<i>Bursera simaruba</i>	5	30	12-63
Melastomaceae	4	84	64-142
<i>Schizolobium</i> sp.	3	106	17-201
<i>Hymenaea courbaril</i>	2	49	-
<i>Calycophyllum candidissimum</i>	2	225	-

NN = Nearest Neighbor

quadrats overlain on our field map. As indicated in Table 2, 45 of 84 howler feeding trees (53.5%) were distributed in only 10 quadrats (an area of 0.64 ha or 13% of the home range). The greatest number of feeding trees in any single quadrat was seven. In contrast, howlers were not observed to feed in 42 of these quadrats (2.6 ha or 54% of the home range). The distribution of feeding trees exploited by the howlers on Ometepe differed significantly from a Poisson or random distribution ($\chi^2 = 21.805$, $df = 3$, $p < 0.01$). Based on calculations of the coefficient of dispersion ($CD = 1.4574$), these resources are best characterized as local aggregations of clumped feeding sites. Given the relatively large concentration of feeding trees in circumscribed areas of their home range, even during the dry season, these howlers were able to exploit small forest fragments successfully.

Table 2. Distribution of feeding trees used by howlers at Ometepe.

No. of feeding Trees per quadrat	No. of quadrats
0	42
1	11
2	14
3	3
4	3
5	2
6	0
7	2

Comparison of Howler Feeding Trees and Sample Trees

A comparison of the height and DBH of howler feeding trees with the height and DBH of trees sampled within twelve 15 x 4 m quadrats (720 m²) is presented in Table 3. Of the 67 trees measured in the sample quadrats, mean tree height was 9.2 m and mean DBH was 17.5 cm (range 5-52.5 cm; trees of diameter <5cm were not included in the sample). In contrast, data collected on 74 trees fed in by howlers indicate a very different height/DBH profile. Howler feeding trees were significantly taller (13.7 m \pm 2.9; $\chi^2 = 547$, $df = 3$, $p < 0.001$) and had a greater DBH (110 cm \pm 78; $\chi^2 = 2314$, $df = 3$, $p < 0.001$) than trees in our sample plots. In the case of Ometepe howlers, 80% of trees fed in had a DBH >41 cm. Trees of this diameter accounted for only 10% of the trees sampled in the groups' home range.

Forest Characteristics

A major focus of our research was to determine the degree to which the forests exploited by howlers were impacted by human activity. This was accomplished by evaluating the vegetation and structural characteristics of 67 contiguous 25 x 25 m quadrats (4.1 ha) within the home range of the study group. This area represents over 85% of the study group's

range. Within each quadrat the following were recorded: canopy height, the number of trees of at least 2 m in total height, degree of understory vegetation, the number of *Cecropia* trees (an early successional plant species), and evidence of human disturbance.

Table 3. Dimensions of trees in sample plots and trees fed in by howlers.

Sample plot	Tree height (m)					Total
	0-5	6-10	11-15	16-20	>20	
(N)	10	38	17	2	0	67
%	14.9	56.7	25.3	2.9	0	
Feeding trees						
(N)	0	8	54	17	2	81
%	0	9.8	66.6	20.9	2.4	
Sample plot	DBH (cm)					
	5-20	21-40	41-60	61-80	81-100	100+
(N)	46	14	7	0	0	0
%	69.6	20.8	10.4	0	0	0
Feeding trees						
(N)	2	14	14	2	9	40
%	2.4	17.2	17.2	2.4	11.1	49.3

Quadrats that evidenced recent human activities such as cut trails and forest cleared for pasture, agriculture, and logging were scored as human-impacted zones. These accounted for 40.3% (N = 27 quadrats) of the study area (three additional quadrats showed evidence of both human disturbance and natural edge habitat; Table 4). Human-impacted areas were characterized by trees of low stature and a well developed understory. In over 51% (N = 14) of these quadrats, 75-100% of the forest floor was covered with low shrubs and grasses. Quadrats that included stream beds and tree fall gaps are referred to as natural edge zones (Table 4). Natural edge zones made up 14.9% (N = 11 quadrats) of the study area. Trees of between 10-15 m in height were found in 64% (N = 7) of these quadrats. Natural edges tended to have limited ground cover (55% [N = 6] of the quadrats within this zone were characterized by 0-25% ground cover). This may reflect the fact that many of these quadrats bordered seasonally dry stream beds formed from volcanic rock which served as a barrier to plant growth. *Cecropia* trees were found in eight of 11 natural edge quadrats and averaged 4.9 trees per quadrat (range = 0-19). This shade-intolerant, pioneer genus requires high light levels for growth and is commonly associated with gap-phase regeneration (Denslow and Hartshorn, 1994). Fifty-six percent (N = 54) of all reported *Cecropia* trees were located within this zone.

The interior forest zone is comprised of quadrats that exhibited little to no evidence of recent human-disturbance or natural edges. These quadrats made up 37.3% (N = 26) of the study area. Trees of 10-15 m in height were found in 92% (N = 24) of interior zone quadrats. More than half of these quadrats also contained trees that were greater than 15 m in height. Understorey density was highly variable in these quadrats. *Cecropia* averaged 1.2 trees per quadrat (range = 0-6).

Table 4. Comparison between habitat types found within the howler home range and the distribution of feeding trees.

Habitat type	% Area	% Howler feeding trees
Human Edge	40.3%	16.0%
Natural Edge	16.4%	23.2%
Forest Interior	38.8%	58.9%
Human/Natural Edge	4.4%	1.7%

As indicated in Table 4, there was a significantly greater number of howler feeding trees in the interior forest zone than expected based on the availability of this habitat type in the group's home range ($\chi^2 = 5.8$, $df = 1$, $p < 0.02$). For example, 58.9% of trees fed in by howlers were located in areas of minimally disturbed forest. This area accounted for only 38.8% of the group's range. There was a significantly smaller number of howler feeding trees in areas of the forest altered by human interference ($\chi^2 = 8.1$, $df = 1$, $p < 0.01$). Areas impacted by human activities accounted for 40.3% of the home range but contained only 16.0% of feeding trees. In natural edge zones, however, the howlers used feeding trees in proportion to the size of the area exploited ($\chi^2 = 1.6$, $df = 1$, $p > 0.10$). These data suggest that tree species regenerating in areas heavily impacted by recent human activity are unlikely to provide sufficient resources to support mantled howling monkeys.

Deforestation

Many of the families living near the field station regularly enter the forest to extract wood for cooking and as building materials. We therefore interviewed members of the local community to identify which trees were most frequently harvested. Several tree species important in the howling monkey diet, such as *Gliricidia sepium* and *Calycophyllum candidissimum*, were among the most common tree species used for firewood. Effective conservation policies on Isla de Ometepe must include working with local residents in finding alternative sources of cooking fuel.

Discussion

Based on our preliminary findings, it appears that the remaining forests on Isla de Ometepe support a large population of mantled howling monkeys. These howlers were found to exploit patches of fragmented forest located near the margins of the lake, on the foothills of the volcano, in areas impacted by the cultivation of shade coffee, and in undisturbed cloud forest going all the way up to the top of the volcano. Areas cleared for pastures or cultivated for other crops such as corn, plantains, and rice do not support howling monkeys. However, we have observed howlers using extremely small strips of forest and tree-lined fence rows to move from one area to another or to migrate between groups. From a conservation perspective, even small corridors connecting forest patches appear to be effective in facilitating dispersal.

The size and composition of the two study groups observed on Ometepe were generally consistent with reports of mantled howling monkeys from several sites in Mexico, Costa Rica, and Panama (Estrada, 1982; Chapman and Balcomb, 1998; Fedigan *et al.*, 1998). Both of our howler study groups were large, however, and both contained at least 5-6 adult males. In fact, we have counted as many as nine adult males residing in the same group (Bezanson, pers. comm.). Based on a comparative study of howler population demography, Fedigan *et al.* (1998) proposed that under conditions of low population density and during the initial stages of forest regeneration, males may exhibit enhanced survivorship resulting in an increase in the number of males per group. On Ometepe, however, it still remains unclear how howler groups are

distributed across the island, the degree to which individuals in fragmented forests are isolated from neighboring groups, and whether limited dispersal opportunities frequently result in subadult males and females remaining in their natal groups. A goal of our continued research is to examine age and sex-based patterns of howler dispersal on Ometepe in order to understand better how the density, distribution, and isolation of established social groups impact on individual survivorship and the genetic diversity of howler populations on the island.

Previous studies have indicated that howlers can successfully exploit small patches of fragmented and disturbed forest (Crockett, 1998). In part, this may reflect their ability to use a diet that contains a high proportion of both immature leaves and leaves of early successional plant species. The home range of the Volcano group contained areas of natural edge forest that were characterized by approximately five *Cecropia* trees per hectare. The leaves and fruits of these trees are commonly eaten by howlers (Milton, 1980). However, the ability of howlers to persist under conditions of severe habitat fragmentation has been questioned (Crockett, 1998). Crockett (1998), for example, has suggested that increased exposure to parasite loads, natural disasters, and inbreeding may limit the long-term viability of fragmented howler populations (see also Horwich, 1998). Our impression of the distribution of howlers on Isla de Ometepe is that areas of more continuous canopy cover, including areas of shade-coffee, support a higher density of individuals and groups. In areas of highly fragmented forest, group size may be large, but individuals tend to spend the majority of their time in subgroups composed of 4-8 individuals. Leighton and Leighton (1982) also reported subgrouping in mantled howlers. They suggested that howlers form subgroups when exploiting "locally high densities of preferred food sources that occur in small patches" (Leighton and Leighton, 1982, p.88).

The large number of males residing in our howler study groups may be indicative of limited opportunities for male migration. Given the low levels of genetic diversity which are reported to characterize island populations in general (Crockett, 1998) and isolated groups in particular, effective primate conservation and management programs on Ometepe may require a sustained effort to regenerate forested corridors between isolated forest patches, and in extreme cases the translocation of individuals from the mainland to increase the genetic diversity of the population.

Howlers are not hunted for food or killed as agricultural pests on Ometepe. Occasionally infants are captured by local people as pets. There is no evidence, however, of any organized pet trade on the island. Habitat destruction and forest fragmentation remain the major conservation problems faced by both animal and plant species on Ometepe.

Based on archaeological evidence, humans first colonized Isla de Ometepe some 4000 years ago (Haberland, 1992). The island was used principally as a ceremonial center and its precontact population was small. Today, there are some 40,000 inhabitants on Ometepe (this is double the population just 30 years ago). Although most of the population is concentrated in a few

towns (Altagracia, Moyagalpa), the impact of human activity is pervasive. In the area near our field station, clearing of land between the lake and the foothills of the Volcan Maderas has been so extensive that even selective logging is likely to have a severe negative impact on the survival of local howler populations. In order to address these problems, the Fundación Ometepe has purchased several parcels of land between the foothills and the volcano. This area will serve as a buffer zone to limit continued forest destruction, promote forest regeneration, and provide corridors for howler migration and colonization.

Compared to other atelines, *Alouatta* is characterized by an early age at first reproduction and a high intrinsic rate of population increase (Fedigan and Rose, 1995; Strier, 1996; Crockett, 1998). Given their relatively fast life history pattern and ability to colonize regenerating habitats (Crockett, 1998; Fedigan *et al.*, 1998; Horwich, 1998), we are hopeful that our efforts to protect and conserve mantled howling monkey populations on Isla de Ometepe will succeed. However, in order to safeguard the continued survival of wild primate populations in Nicaragua and other areas of Latin America members of the local community, National governments, and International Aid Agencies must work together to develop informed and successful wildlife management policies.

Acknowledgments: Support to conduct this research was provided by Fundación Ometepe, the Government of Nicaragua, and the generosity of the Molina Family. PAG wishes to thank Sara and Jenni for being Sara and Jenni, and for sharing a summer with me on Isla de Ometepe.

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TESTIS SYMMETRY IN THE MANTLED HOWLING MONKEY

Clara B. Jones

Markow *et al.* (1996) studied fluctuating asymmetry (random deviations from symmetry in traits on opposite sides of the body) in the sex combs of two *Drosophila* species and found no evidence for sexual selection in this secondary sexual character, contrary to the predictions of Moller and Pomiankowski (1994). The latter authors argued that symmetry would be positively related to male copulation success and that secondary sexual characteristics would exhibit the

strongest associations because they are under directional selection. Differential symmetry among males, then, may provide cues to females of male fitness, explaining variance in male reproductive success. Markow *et al.* propose that Moller and Pomiankowski's ideas require further investigation in a range of taxa before it can be concluded that they are general. The purpose of this correspondence is to present preliminary observations on fluctuating asymmetry in testis size in the mantled howling monkey (*Alouatta palliata*).

Mantled howlers, large Neotropical cebids, are found throughout the forests of Mesoamerica and the northern coast of South America. Age is negatively correlated with dominance rank and copulation success, and significant sexual dimorphism in weight between adult males and females suggests that sexual selection has operated in this species (Jones, 1985). A prominent aspect of male morphology is the large, white scrotum (Fig. 1) employed in stereotyped displays in sexual and aggressive contexts (C. B. Jones, unpubl. data).

Animals were studied at Hacienda La Pacifica, Cañas, Guanacaste, Costa Rica (see Clarke and Zucker, 1994) in the early to mid 1970's by Dr. Norman J. Scott, Jr. and his assistants, including the present author. Monkeys were tranquilized, aged, weighed, and measured (Scott *et al.*, 1976). I divided adult males into four age classes: I (n = 7), an individual @ 5-7 years old; II (n = 11), @ 7-10 years old; III (n = 7), @ 10-15 years old; and, IV (n = 2), > 15 years old. The vertical and horizontal height and width (mm) of each testis was obtained by measuring its outline through the tissues of the scrotum with a sliding caliper. Mean vertical height of right testis was 32.2 ± 2.5 mm; mean width of right testis was 23.9 ± 1.9 . Mean vertical height of left testis was 31.4 ± 2.6 mm; mean width of left testis was 23.1 ± 1.7 . In order to assess fluctuating asymmetry of each male, I computed two ratios: a ratio of the smallest to largest (left testis to right testis or right to left) vertical height of testis (VR); and a ratio of the smallest to largest (left to right or right to left) horizontal width of testis (HR) of each male. This paper assumes that testis shape and scrotal shape are highly positively correlated.

Across males, weight did not differ significantly by age (Sign Test: $X^2 = 3.1$, $df = 3$, $P = 0.50$). Thus, differences across males in mating success cannot be explained by differences in weight. Likewise, while VR (range = 0.92-0.99, median = 0.97) correlates positively with weight ($r = 0.44$, $N = 27$, $P < 0.01$), VR did not differ significantly across males by age (Sign Test: $X^2 = 4.18$, $df = 3$, $P = 0.30$). Fluctuating asymmetry in the ratio of vertical circumference of both testes, then, apparently cannot explain variance in copulation success across males.

An analysis of HR (range = 0.88 - 1.00, median = 0.95) revealed that it failed to correlate with weight ($r = 0.10$, $N = 27$, $P = 0.31$), possibly exhibiting developmental instability, compared with the vertical orientation. Similar to the findings for VR, HR exhibits no differences across males by age (Sign test: $X^2 = 2.23$, $df = 3$, $P = 0.70$), possibly showing that female mantled howler monkeys do not employ fluctuating asymmetry in testis size as a visual cue of male quality. Fluctuating asymmetry in two secondary sexual characteristics in the mantled howler

monkey (VR and HR) does not appear to be sexually selected, then, consistent with the findings of Markow *et al.* (1996).

Moller and Pomiankowski (1994) predicted that the highest correlations with asymmetry are expected in secondary sexual characters. If the range in asymmetry for mantled howler testes are representative of other secondary sexual traits in the species (e.g. incisor length), it seems unlikely that symmetry will correlate with male fitness or that female "choices" will be a function of low fluctuating asymmetry. It would be important to know the heritability of secondary sexual characteristics for this monkey since a trait with low heritability may not be a reliable measure of fitness for females who may be evolved to select "good genes". Further, female mantled howler monkeys appear to be very sensitive to the proximate context of mating, such as the availability of resources (Jones, 1995), a condition that would dampen any tendency for female selectivity to correlate with secondary sexual characteristics.

Finally, Allen and Simmons (1996) suggest that fluctuating asymmetry in visual signals, such as scrotal displays, exhibit an "equivocal" association with male fitness compared to structures having "mechanical significance" (e.g., the penis), and show for dung flies that "coercive mating" is correlated with symmetry and male mating success. The mating system of mantled howlers is not characterized by coercion (Jones, 1985), possibly explaining the failure to find a relationship between fluctuating asymmetry, age, and, thereby, male mating success in this species. These tentative results for mantled howlers should be tested with larger sample sizes but suggest that Moller and Pomiankowski's predictions require adjustment to taxonomic and, possibly, to ecological differences.



Figure 1. Adult male mantled howler monkey exhibiting asymmetrical scrota. Note outline of testes in scrotal sac.

Acknowledgments: I am grateful to N. J. Scott, Jr. for providing me with the results of his morphometric studies, to T. Markow for her constructive criticism of an earlier draft of this note, and to K. E. Glander for details on the methods of testis measurement.

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ON A NEW WHITE BALD UAKARI POPULATION IN SOUTHWESTERN BRAZILIAN AMAZONIA

José de Sousa e Silva Júnior
Eduardo de Souza Martins

The geographic distributions of the four subspecies of the bald uakari, *Cacajao calvus*, have been reviewed by Hershkovitz (1987) and Barnett and Brandon-Jones (1997). They occur in the upper Amazon, with *C. c. calvus* restricted to a very small range between the lower Rio Japurá and the Rio Solimões, west as far as the Auatí-Paraná, *C. c. rubicundus* to the west of *C. c. calvus*, in a small area north of the Rio Solimões west of the Auatí-Paraná and also between the Rios Solimões and Içá, *C. c. ucayalii* between the Ríos Ucayali and Javará in Peru and Brazil, and the disjunct population of the white uakari, *C. c. novaesi* described by Hershkovitz in 1987, which, with the limited information available to him, he restricted to the south bank of the upper Rio Juruá between the Rios Eiru and Tarauacá. Hershkovitz (1987) indicated the likelihood of its occurrence, however, west to the Rio Gregório or beyond to occupy the entire basin between the Rio Tarauacá and right bank of the Rio Juruá. Here we summarize some recent information that modify the distributions of *C. c. calvus* and *C. c. novaesi*, and report on the discovery of an outlying, new white bald uakari population on the border of the states of Amazonas and Acre in Brazil.

The Museu Paraense Emílio Goeldi (MPEG) mammal collection has a specimen of *C. c. calvus* labeled "Rio Juruá" (MPEG-576), a south bank tributary of the Rio Solimões. Peres (1990) recorded *C. calvus* on the upper Rio Riozinho, an affluent of

the Rio Jutaf (west of the Rio Juruá), and (Peres, 1997) at Vira Volta, left (west) bank the lower Rio Juruá. A. Percequillo (pers. comm.) also observed the uakaris from Vira Volta, recognizing them as *C. c. calvus*, based on specimens in the Zoology Museum of the University of São Paulo (MZUSP). On the basis of this, *C. c. calvus* evidently occurs on both sides of the Solimões occupying at least the interfluvium between the Rios Juruá and Riozinho and possibly extending to the Jutaf, just south of the Rio Solimões. The red uakari, *C. c. rubicundus*, occurs in the Jutaf-Solimões Ecological Station, west of the lower Rio Jutaf (Nogueira-Neto, 1992).

C. c. novaesi is distinct from the white *C. c. calvus* in having a general orange color, with the dorsum, from the nape to the tip of the tail, paler orange, buffy or whitish (Hershkovitz, 1987). Peres (1988, 1990, 1997) recorded it to the north-east of the range described by Hershkovitz (1987), on the left bank of the Rio Juruá, at Lago da Fortuna, Carauari; 500 km to the north and roughly tripling the size of the range. Peres (1997) also recorded *C. calvus* at Sobral on the right bank of the upper Rio Juruá, but whether they belong to the subspecies *ucayalii*, extending the range to east, or to *novaesi*, extending the range to the west, as was proposed by Hershkovitz (1987), is not known.

Unconfirmed reports of a number of uakari populations were also obtained by Fernandes (1990) in the state of Acre. They included: the Mamoadate Indigenous Area on the Peruvian border on the upper Rio Iaco, a right bank tributary of the Rio Purus (possibly *ucayalii*); the Seringal Republica, on the Rio Moa, a left (west) bank tributary of the upper Rio Juruá (possibly *ucayalii*); the Seringal Boca da Pedra on the headwaters of the Rio Tarauacá (possibly *novaesi*); the Rio Acurauá a left (west) bank tributary of the middle Rio Tarauacá (possibly *novaesi*); and the Kulina Indigenous Area on the upper Rio Envira (possibly *novaesi*).

In September 1988, a preliminary inventory of the primate communities on the border between the Brazilian states of Amazonas and Acre was carried out by ESM. A new white bald uakari population was discovered in the flooded forests along the Rio Jurupará, a right bank tributary of the Envira-Tarauacá-Juruá drainage, Amazonas (Figure 1). Three adult specimens were collected and deposited in the MPEG (21861, 21862, 21863). The Rio Jurupará is outside the known geographic distribution of any *C. calvus* form. Due to the proximity of Jurupará to the Rios Eiru and Tarauacá, the uakaris were identified in the field as *C. c. novaesi*. A comparison with the material in the collections of MPEG, MZUSP and the Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ), however, revealed differences in the pelage of the specimens collected with that of *C. c. novaesi*. The appearance of the specimens from the Rio Jurupará was closer to *C. c. calvus*. *C. c. novaesi* has an almost entirely reddish coat, with a short whitish mantle that extends from the nape to the lower third of the back (Hershkovitz, 1987). The uakaris of the Rio Jurupará are almost entirely white on the upperparts, without a contrasting mantle on the back, and yellowish on the underparts (including throat and beard), as in *C. c. calvus*. The Jurupará series was examined by P. Hershkovitz in the MPEG, and later

through photographs sent to the Field Museum of Natural History for comparison with the *C. c. novaesi* types. Hershkovitz (in litt.) concluded that it was an undescribed *C. calvus* subspecies, convergent with *C. c. calvus* in its pelage color. Hershkovitz reinforced his argument, recalling that the upper Juruá basin is rich in mammal endemisms (see, for example, Hershkovitz, 1977; Emmons and Feer, 1997). Hershkovitz' hypothesis is not, however, supported by differentiation in any of the classic morphological characters. Morphologically the Rio Jurupari population and *C. c. calvus* are very similar. The Rio Jurupari population is separated from the known distribution of *C. c. calvus* by more than 700 km, with *C. c. novaesi* enclaved between them.

C. A. Peres also examined the material from the Rio Jurupari and disagreed with Hershkovitz. Based on his observations of *C. calvus* in unflooded forest habitat (see also Bartecki and Heymann, 1987; Aquino, 1998), Peres (pers. comm.) suggested that the *C. c. calvus* distribution may not be disjunct, possibly being continuous through *terra firme* forest east of the *C. c. novaesi* distribution. However, there is no evidence that *C. calvus* occurs east of the Rio Juruá or west of the Rio Tefé (Peres, 1997).

In an attempt to clarify this mystery, we are conducting a morphometric analysis involving 40 cranial measurements (including an initial ANOVA to determine the variables with significant differences between taxa to be used in multivariate analysis) to examine the affinities between the new population, *C. c.*

calvus and *C. c. novaesi*. A study of DNA extracted from hairs will be also carried out in collaboration with the Molecular Genetics Department of the Federal University of Pará. An affinity with *C. c. novaesi* may reinforce Hershkovitz' hypothesis. An affinity with *C. c. calvus*, on the other hand, would call for a major rethinking of current views on the evolutionary history and taxonomic arrangement of the *C. calvus* subspecies.

Specimens Examined

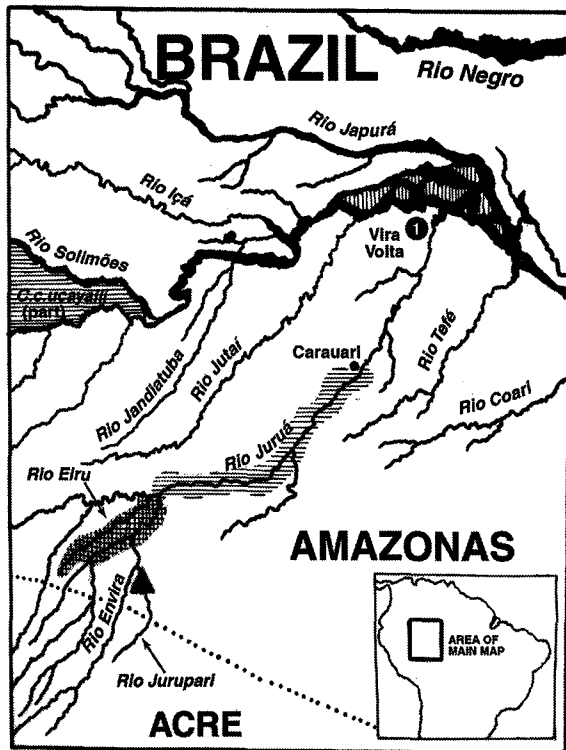
Specimens examined in the mammal collections of MZUSP, MNRJ and MPEG for comparison. *Cacajao calvus calvus*: BRAZIL: AMAZONAS: Lago Mamirauá, Rio Japurá mouth region: MZUSP-17536, 17537; Lago do Tracajá, Rio Japurá mouth region: MZUSP-17535, 17539; Ressaca de Vila Alencar, Rio Japurá mouth region: MZUSP-17542; Paranã do Maiana: MNRJ-1599, 2441, 2443, 2444, 2445, 2446, 2447, 2450, 2451, 2452; Paranã do Marauí, north bank of the Rio Solimões, municipality of Fonte Boa: MPEG-8990; Rio Juruá: MPEG-576. *Cacajao calvus novaesi*: BRAZIL: AMAZONAS: Santa Cruz, Rio Eiru: MZUSP-4149, 4150, 4151, 4330, 4331, 4332, 4333, 4334, 4335, 4336, 4337, 4338, 4339, 5496, 19359, 19701. *Cacajao calvus rubicundus*: BRAZIL: AMAZONAS: Buiucu, Auati-Paraná channel region: MZUSP-17552, 17553. *Cacajao calvus ucayalii*: PERU: Chimbote, Rio Solimões: MPEG-461, 468, 505; Rio Napo: MPEG-49, 462, 499, 506, 511, 512; PERU: MNRJ-2453; BRAZIL: AMAZONAS: Estirão do Ecuador, Rio Javarí: MPEG-1848, 1849, 1850, 1851, 1852, 1853, 1854. *Cacajao calvus* ssp.: BRAZIL: AMAZONAS: Rio Jurupari, right bank tributary of the Rio Envira: MPEG-21861, 21862, 21863.

Acknowledgments: We are grateful to Philip Hershkovitz (in memoriam), José Márcio Ayres, Carlos A. Peres and Anthony B. Rylands for their comments, and to Alexandre Percequillo for the information on the uakaris observed in Vira Volta. To the curators of the Museu de Zoologia, Universidade de São Paulo (Mário de Vivo) and Museu Nacional (João Alves Oliveira and Stella Maris Santos Franco) for permission to examine specimens in their respective mammal collections. Special thanks are due to Francisco Ramos for the preparation of the specimens collected, to Diego Astúa de Moraes for the correction of the English version, and to Carlos Eduardo de Viveiros Grelle for his suggestions concerning the organization of this article.

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C.c. calvus
 Hershkovitz (1987)
 Percequillo (Pers. comm.)
 The new white bald uakari population

C.c. novaesi
 Hershkovitz (1987)
 Peres (1988)

Figure 1. Location of the new white bald uakari population *Cacajao calvus*. Map by Stephen D. Nash.

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NUEVO MUNDO, NUEVOS MONOS: SOBRE PRIMATES NEOTROPICALES EN LOS SIGLOS XV Y XVI.

Bernardo Urbani

La presente entrega se propone dar a conocer una parte poco conocida de la historia de la primatología americana, referida a las primeras menciones y descripciones de primates dadas por los cronistas y viajeros en América, en los siglos XV y XVI. Para ello, las referencias se presentan cronológicamente. En aquellos casos donde se conozca con exactitud la localidad aludida en la crónica, se emplea en la interpretación por comparación biogeográfica, la obras de Wolfheim (1983) y Emmons & Feer (1997) en el caso de Latinoamérica y la de Bodini & Pérez (1987) y Linares (1998) en Venezuela, para la determinación del posible primate avistado. En éste orden de ideas, a continuación se relatan las primeras noticias de primates del Nuevo Mundo:

1498. En el tercer viaje de Cristóbal Colón, y precisamente en el primer desembarco europeo en tierra continental americana, en la costa sur de la península de Paria, noreste de Venezuela, Colón envía un bote para el desembarco, nos dice ...y *envié los barcos a tierra, y hallaron que de fresco se habían ido de allí gente, y hallaron todo el monte cubierto de gatos paúles; bolviéndose.* (Colón, 1996). Los gatos paúles según la denominación de la literatura del medioevo son los monos

(Acosta, 1992), los cuales también serán denominados gatillos y gatos monillos por los españoles (Ridruejo, 1969). Considerando que el reporte fue hecho en Paria, Venezuela, podría referirse a *Alouatta seniculus* o *Cebus olivaceus*. Por otro lado, es importante destacar que Colón llegó al Nuevo Mundo con la idea de la existencia de primates. En el *Libro de Marco Polo anotado por Cristóbal Colón*, éste último destaca al margen del texto la presencia de monos. En el *Capítulo XV. Del reino de Bosman* de este libro, Marco Polo señala que ...*En este reino hay muchos monos de diversas clases: unos son pequeños y tienen la cara parecida a la humana e incluso en el resto de sus miembros se conforma mucho con el hombre...*, a esto escribe Colón al margen *muchos monos* (Polo, 1987) Posteriormente, en el mismo libro pero en su *Capítulo XXXII. De la provincia de Comari*, agrega ...*Esta región es muy salvaje y tiene muchos animales y muy diferentes de los demás, y en particular simios. Hay allí muchos monos que tienen rostro de hombres. Hay gatos que se llaman paulos, muy distintos de los demás...*, del cual Colón anota al margen de libro *muchos monos, gatos paulos* (Polo, 1987). Nótese en ambas referencia de Marco Polo el referente "humanizado" de los primates.

1502-1504. Cristóbal Colón en su cuarto viaje, estando en Centroamérica probablemente Honduras y/o Nicaragua, relata una escena de cacería de un primate. Dice ...*Un balletero había herido una animalia, que se parece a un gato paúl, salvo que es mucho más grande y rostro de hombre, tenía atravesado con una saeta desde los pechos hasta la cola...* (Colón, 1996). Es posible que se trate de *Alouatta palliata*, *Ateles geoffroyi* o *Cebus capucinus*.

1502. Amerigo Vespuccio, navegante italiano, en una carta enviada desde Lisboa a Lorenzo di Pierfrancesco de Medici de Florencia, señala la presencia de muchos tipos de *babuinos* y *macacos* en tierra continental del Nuevo Mundo, la cual recorrió desde las costas intermedias de Brasil hasta la costa occidental de Venezuela (Vespucci, 1986). Nótese el referente africano para representar a monos del Nuevo Mundo.

1511. En el libro de la "Nao Bretoa" a cargo de Fernando de Loronha, Benedito Morelli, Francisco Martins y Bartolomeu Marchione, se reporta tráfico de primates neotropicales a Europa, señalando 16 saguis y 3 monos (Ribeiro & Araujo Moreira Neto, 1992). Esta nave permaneció básicamente en la desembocadura del río São Francisco, Brasil, por tanto es muy probable que se refieran entre los saguis a *Callithrix jacchus penicillata* y/o *Callithrix jacchus* híbrido y entre los monos a *Cebus apella* y/o *Alouatta belzebul*.

1518. Pero de Magalhães de Gândavo reporta cerca de Río de Janeiro al *Sagoí* de color amarillo y rojo (Magalhães de Gândavo, 1576). Esta es posiblemente la primera referencia de *Leontopithecus rosalia*.

c. 1519. En el mapa policromo llamado *Terra Brasilis*, el cual se le atribuye a Lopo Homen, se reproduce un posible primate neotropical (Figura 1a) (Ribeiro & Araujo Moreira Neto, 1992).

1526. Gonzalo Fernández de Oviedo en su *Sumario de la*

Natural Historia de las Indias, dedica el capítulo XXV a la descripción de primates del Nuevo Mundo. De ella reseña la astucia de los monos, la variedad de colores, la amplia distribución así como la diferencia de tamaños*Haylos tan pequeños como la mano de un hombre, y menores, otros tan grandes como un mediano mastín* (un perro). También, hace mención del envío de primates a España, además del uso de herramientas (Oviedo, 1996; Urbani, 1998). Al realizar sus viajes en tierras del Darién y cercanías, Panamá y norte de Colombia, es probable que se refiera a *Cebus capucinus*, *Alouatta palliata* o *Ateles geoffroyi*, y probablemente *Saguinus geoffroyi* o *Saguinus oedipus*.

1530. Pedro Martín de Anglería, a pesar de no haber estado en América fue considerado el primer cronista de América (Perera, 1992). Refiere a monos del norte de Venezuela, del cual dice sobre los de la región de Cumaná al noroccidente de Venezuela ...*Críanse en aquella tierra gatos silvestres; la madre, trepando entre los árboles, lleva abrazados a sus hijos. Entonces tiran un flechazo, y cayendo muerta cogen los gatillos, y los conservan por gusto, como nosotros a los cercopitecos o monas* (Anglería, 1965). En éste caso debe referirse a *Alouatta seniculus* y/o *Cebus olivaceus*. Además, indica la presencia de primates en Panamá que van ...*saltando de árbol en árbol con espantable griterío...* (Anglería, 1965). Posiblemente *Cebus capucinus*, *Alouatta palliata* y/o *Ateles geoffroyi*.

1535. Gonzalo Fernández de Oviedo señala la presencia de *gatos monillos* en abundancia en Tierra Firme (Fernández de Oviedo, 1535, en Becco, 1983)

1537. Alvar Nuñez Cabeza de Vaca, refiriéndose a los primates de la región del Iguazú, dice ...*los monos que comen estos piñones de esta manera: que los monos se suben encima de los pinos y se asen de la cola, y con la mano y pies derruecan muchas piñas en el suelo, y cuando tiene derribada mucha cantidad, abajan a comerlos... y comesen los piñones... los gatos estaban dando gritos sobre los árboles.* (Nuñez Cabeza de Vaca, 1969). Considerando el final de la descripción probablemente se refiera a *Alouatta fusca* o *Alouatta caraya* y/o inclusive *Cebus apella*.

1539-1553. Galeotto Cey, hace una descripción de primates del occidente de Venezuela. "*Monos hay en gran cantidad y diversas suertes. Hay algunos pequeños con la pelambre negra y muy crecida, que son muy afables, pero se mueren por cualquier pequeño desdén. Otros son más grandecitos con el pelo menor y grisáceo. Hay unos grandes como ovejas, feísimos, velludos y con un palmo de barba, de color pardo o rojizo, los cuales hacen un gritar y resoplar que se siente a una legua de distancia... Cuando caminamos por los bosques nos acompañan sobre los árboles orinándose encima de nosotros y vaciando el vientre, tirándonos pedazos de ramas secas* (Cey, 1994). Por su parte reseña el temor de los monos al agua. Además, señala una nueva acepción para primates del Nuevo Mundo para los indígenas de la región, a quienes llaman *damoteyes*, es decir, *sus compañeros, pero por nombre propio los llaman micos* (Cey, 1994). Los primates referidos deben ser *Cebus olivaceus* y *Alouatta seniculus*.

1550. Pedro Cieza de León, señala que en las montañas andinas del Perú ...*hay unas monas muy grandes que andan por los árboles...* *Dicen más: que no tienen habla, sino un gemido y un aullido temeroso.* (Cieza de León, 1945).

1552. Francisco López de Gomara publica su obra *Historia General de las Indias*, en la cual al referirse a animales de caza de los indígenas de Cumaná, al noreste de Venezuela, expresa literalmente, *Usan una montería deliciosa con otro animal dicho arañata, que por su gesto y astucia debe ser del genero de los monos: es del tamaño del galgo, hechura de hombre en boca, pies y manos, tiene honrado gesto y la barba de cabrón; anda en manadas, aullan recio, no comen carne, suben como gatos por los árboles; huye el cuerpo al mortero, toman la flecha y arrójanla al que la tiro graciosamente* (López de Gomara, 1979). El animal referido es sin duda *Alouatta seniculus*.

1555. Agustín de Zarate en su crónica del Perú, nos dice ...*Hay por los montes... monos de diversas maneras.* (Zarate, s/f).

1555. Bernardino de Sahagún en su *Historia de las Indias*, escribe un apartado titulado *De la mano de la mona*, donde expresa la costumbre de indígenas de México de emplear manos de monas como elementos que les permitía a aquellos que comerciaban vender toda la mercancía que poseían (Sahagún, 1986). Es probable que se refieran a *Alouatta pigra*, *Alouatta palliata* o *Ateles geoffroyi*.

1557. Hans Staden en tierra de los Tupinamba cercana a Río de Janeiro, sobre la presencia nos dice, *También hay monos de tres especies. Una especie se llama Key (cay), y es la que nos traemos por acá (¿Europa?). Después hay otra especie que se llama Acha Keyy (Aka kay), que andan generalmente en grandes grupos, saltando entre los árboles y armando un gran griterío en el bosque. Y hay otra especie que se llama Pricki, son rojos, tienen barbas como los machos cabríos y son de tamaño de un perro normal* (Standen, 1983). Éste último es sin duda, *Alouatta fusca*, los llamados Cay probablemente se refieran a *Callithrix jacchus aurita* y/o *Callithrix jacchus flaviceps*. Realiza uno de los dibujos más tempranos de primates de Nuevo Mundo (Figura 1).



Figura 1. a- Ilustración de primate de Lopo Homen (circa 1519); b- Dibujo de primate de Staden (1557); c- Mono con túnica y bastón descrita para el Perú por Vico (1562); d- Primate de Guamán Poma de Ayala (1584). Tomados de Ribeiro & Araujo Moreira Neto (1992); Standen (1983); Rojas Mix (1992) y Guamán Poma de Ayala (1980), respectivamente.

1557. André Thevet asentado por la misma zona de Staden al referirse a los primates de la región de Río de Janeiro, nos dice que hay monos (*mones*), pero no grandes primates (*singes*) como en Africa realizando una comparación entre los primates del Nuevo Mundo y los del Viejo Mundo. (Thevet, 1557 en Perera, 1992).

1561. Girolano Benzoni reseña el consumo de monos por indígenas en la Península de Paria, Venezuela (Benzoni, 1989). Siendo estos posiblemente *Alouatta seniculus* o *Cebus olivaceus*. Sobre los primates nos dice lo siguiente *...comiendo casi siempre caracoles y unos frutos silvestres que se encuentran en aquellos bosques y de los cuales se nutren los monos que continuamente van saltando por los árboles.* (Benzoni, 1989). Por su parte, indica que existen *...muchos monos...* en la región de Suere, aparentemente en Centroamérica, los cuales podrían referir a *Alouatta palliata*, *Alouatta pigra* o *Ateles geoffroyi*.

1562. Enea Vico en su obra *Recueil de la diversité des habits qui presentet en visage tantae pays d'Europe, Asia, Afrique, et illes Sauvages. Letout fait apres de natural* hace referencia a la presencia de un mono con túnica y bastón, común en la literatura fantástica de la época (Rojas Mix, 1992) que supuestamente habitaba en Perú (Figura 1c). Dice *...pres le Peru par effect le voit on, Dieu a donné au Singe tel forme.* (Vico, 1562, en Rojas Mix, 1992).

1563. Juan de Castellanos señala la presencia de micos en el norte de Venezuela (Castellanos, 1962). Probablemente se refiera a *Alouatta seniculus*, *Ateles belzebuth* o *Cebus olivaceus*.

1566-1569. Rodrigo Ponce de León reporta para el noroeste de Venezuela *...micos en mucha cantidad, grandes, pequeños y algunos barbudos* (Arellano Moreno, 1964). Posiblemente se refiere a *Cebus olivaceus* y *Ateles belzebuth*, y con seguridad a *Alouatta seniculus* para el último de ellos.



Figura 2. Monos de América de Theodoro de Bry (1598). Tomados de Bry (1995).

1570. Tomás López Medel al escribir sobre los animales del Nuevo Mundo se refiere que los *...gatillos ...son de hechura y suerte de monos...* (López Medel, 1990). Señala su comercio hacia Sevilla, España, debido a su clima cálido. Además, refiere que son de gran variedad de colores y tamaños, sólo comparable entre la variedad existente entre los papagayos. Para terminar su descripción efectúa la primera descripción de un primate probablemente del género *Aotus*, dice *...un género*

de gatillos que son pardos y blancos... cuya naturaleza es dormir de día y de noche velar y andar a buscar comida. (López Medel, 1990). Si consideramos que López de Medel visito la zona de Popayán y cercana a Santa Fé de Bogotá, norte y oeste de Colombia es posible que se refiera a *Aotus lemurinus*.

1574. Juan López de Velasco, señala que en Venezuela existe *...muy grande diversidad de monos y gatillos...* (López de Velasco, 1971). Posiblemente refiere a los más comunes del norte de Venezuela, a saber, *Alouatta seniculus*, *Cebus olivaceus*, y/o *Ateles belzebuth*.

1575-1576. Francisco Hernández, en su copiosa obra *Historia de los Animales de Nueva España*, se encuentra el *Tratado sobre los cuadrúpedos*, destacando entre los diferentes géneros de mamíferos, a los primates (Perera, 1992). Considerando que Nueva España corresponde con el actual territorio de México, es posible que se refiera a *Alouatta palliata* o *Alouatta pigra*, e inclusive *Ateles geoffroyi*.

1576-1583. Juan de Pimentel reporta primates para la región cercana a Caracas y costa central de Venezuela. De ellos nos dice *...monos de los cuales hay géneros y entre ellos, unos muy grande barbudos* (Arellano Moreno, 1964). Puede referirse a *Ateles belzebuth* o *Cebus olivaceus*, y para el último se refiere a *Alouatta seniculus*.

1578. Jean de Lery quien convivió con los indígenas en la región aledaña a Río de Janeiro, escribió su obra *Historie d'un voyage fait en la terre du Brasil*; y refiriéndose a los monos del Brasil nos reseña la presencia de monos que llama *...Aquiqui. Son de pelo negro y tienen una larga barba en el mentón. Entre ellos hay a veces un macho de color rojizo, que los Salvajes llaman Rey de los Monos... y grita con la voz engolada, tan fuerte que puede oírse desde bastante lejos.* (Lery, en Laet, 1988). Este mono con seguridad se refiere a *Alouatta fusca*, es interesante notar la presencia del macho rojo, lo cual coincide con los machos de esta especie en la región, que son anaranjados-rojizos y rojizos-marrones (Emmons & Feer, 1997). Señala la presencia de pequeños monos negros que denominan los indígenas *...Cay, muy hermosas a la vista y al oído, pues gritan en coro en la cumbre de los árboles...* (Lery, en Laet, 1988), probablemente se tratan si consideramos a la región cercana a Río de Janeiro de *Callithrix jacchus flaviceps* y/o *Callithrix jacchus aurita*. Por último, describe monos que los indígenas llaman *Sagouin, del tamaño de una ardilla y hasta con el mismo pelo rojo, parecidos por lo demás en cuanto al hocico, cuello, pecho y en casi todas otras partes al león... y no les van a la zaga en belleza a los demás animalitos pequeños.* (Lery, en Laet, 1988). Este primate probablemente corresponde con *Leontopithecus rosalia*.

1579. Fray Pedro de Aguado, señala la presencia de micos en la región de Santa Marta Colombia y norte de Venezuela, bajo la denominación de micos o gatos de arcabuco (Aguado, 1579 en Vaquero de Ramírez, 1981). Esto posiblemente sean *Cebus albifrons*, *Cebus olivaceus*, *Alouatta seniculus*, *Ateles geoffroyi* y/o *Saguinus oedipus*.

1584. Fernão Cardim en su obra, *Tratado da terra e gente do Brasil*, se refiere a la presencia del *aquiguiq* que son monos con gran poder de aullar, sin duda alguna debe referir a *Alouatta fusca* o *Alouatta caraya*. (Cardim, 1584, en Perera, 1992).

1584. Felipe Guamán Poma de Ayala, en su obra *Nueva Corónica y Buen Gobierno*, nos señala que en el Perú ...*la séptima coya Ipauaco Mamachi Coya... fue amiga de criar...micos y monos...*, siendo a su vez representado como ilustración. (Figura 1d) (Guamán Poma de Ayala, 1980).

1590. José de Acosta escribe en su obra un capítulo *De los micos o monos de Indias* donde señala la variedad de monos que existen en Tierra Firme y admirando su *discurso y razón... no parecen animales brutos, sino de entendimiento humano* (Acosta, 1962). Como visitó Panamá y Cartagena, Colombia es probable que se refiera a *Cebus capucinus*, *Cebus albifrons*, *Ateles geoffroyi*, *Alouatta seniculus*, *Alouatta palliata*, *Saguinus geoffroyi* y/o *Saguinus oedipus*.

1598. Theodoro de Bry publica ilustraciones de primates del Nuevo Mundo (Figura 2) (Bry, 1995).

Finalmente, la información presentada destaca la importancia que tuvieron los mamíferos, y particularmente los primates, del Nuevo Mundo durante los siglos XV y XVI. Las representaciones de los primates fueron parte de la cotidianidad, imaginario y continuo contexto de "descubrimiento" que caracterizó el inicio del período de Contacto en América.

Agradecimientos: A la Dra. Erika Wagner, Antrop. Edgar Gil y Marcia López del IVIC por sus comentarios. Al Prof. Emanuele Amodio (UCV), Sr. Pedro Pérez (Librería Ludems) y Dr. Ángel Viloria (Museo de Biología - Universidad del Zulia) por su colaboración. A la Dra. Liliana Cortés-Ortiz y Dr. Anthony Rylands por sus sugerencias finales.

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COLOR PERCEPTION IN THE CAPUCHIN MONKEY, *CEBUS APELLA*: A STUDY USING THE ISHIHARA TEST

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Introduction

The biological advantages of color vision in the natural world have motivated comparative studies in different species of monkeys. Color can be used for the perceptual segregation of targets and is certainly one of the cues that monkeys use to identify conspecifics and species of particular plants (Mollon, 1989). In the case of obligate frugivorous monkeys, such as cebids (Rosenberger, 1992), one of the most important functions of color vision is expected to be to judge the ripeness of fruit from the external appearance (Mollon, 1989; Osorio and Vorobyev, 1996).

Recent studies on marmosets (*Callithrix*) and tamarins (*Saguinus*) have shown a sex-linked color vision polymorphism, characterized by the presence of three types of trichromacy and three types of dichromacy; males expressing only dichromatic phenotypes (Tovée *et al.*, 1992). However, there are some inconsistencies. While the saddle-backed tamarin (*S. fuscicollis*) follows the trend and shows a sex-linked polymorphism (Jacobs *et al.*, 1987), the cotton-top tamarin (*S. oedipus oedipus*) makes accurate discriminations across the visible spectrum (Savage *et al.*, 1987). Interspecific and/or methodological differences may, however, account for such differences.

Regarding the family Cebidae, studies of color vision in squirrel monkeys (*Saimiri sciureus*), which report a sex-linked polymorphism (for example, Bowmaker *et al.*, 1987) are in contrast with a fragmentary knowledge of color vision in capuchin monkeys (*Cebus apella*). In this last species, studies have suggested both the presence of dichromacy in male *C. apella* (see Jacobs and Neitz, 1987) and its absence (see Gunter *et al.*, 1965; Ptito *et al.*, 1973).

As suggested by Jacobs (1993), ideally, a survey of color vision should include direct behavioral evidence for color vision. In order to increase our understanding of this question, we recently presented evidence of behavioral trichromaticity in the capuchin monkey (Pessoa *et al.*, 1997a; Pessoa *et al.*, 1997b). In these studies, the ability of two males and a female *Cebus* in discriminating chromatic and achromatic stimuli was tested with Munsell color chips. However, the chips require a broad range of brightness values at each discriminable hue to eliminate the possibility of subjects using brightness cues rather than hue to make the discrimination. One speedy, simple, and effective method used with humans to distinguish between normal and deficient red-green color perception is provided by Ishihara pseudoisochromatic plates (Birch, 1997). Its popularity abides, partially, in the imperviousness of the test to changes in experimental viewing conditions (Long *et al.*, 1985). In such plates, the perceptual segregation of a figure is done by color cues, while the environment and figure vary randomly in lightness. Besides the keen technique for masking luminance edges, the plates offer conditions which are common in the complex scene of the natural world (Mollon, 1989).

Taking this into account, the purpose of this study was to investigate the possibility of color perception in *Cebus* through Ishihara pseudoisochromatic plates. As far as we know there has been no previous work using Ishihara plates with non-human primates.

Methods

Subjects

Three young adult capuchins, *Cebus apella* - two males and one female - served as subjects (Ss) for this study. They were housed in cages (4 m length, 2.9 m width, 2 m height), at the Primate Center of the University of Brasília. The animals were tested in their own home cages and they were not food deprived. Prior to an experimental session food was removed and was again available only after the test. They had free access to water. All the Ss had previous experience with two-choice color discrimination training, using Munsell color chips.

Equipment

A modified version of the Wisconsin General Test Apparatus was used. The apparatus was mounted on a portable table in front of the animal's home cage. A tray carried the stimuli and a wooden screen was used to permit the experimenter to set up problems and prevent animals observing stimuli between trials. This set up was manually operated.

Procedures

The experimental sessions were conducted three times a week, between 13.00 and 15.30 h under daylight diffuse illumination according to viewing conditions as prescribed by the Ishihara test. Training was begun with the presentation of one pair of stimuli at a time. On any given trial, the subject was faced with a choice between two discriminating stimuli. A food reward (SD+, a grape) was placed under one of these stimuli (a wooden cube) and was accessed by the monkey only if its choice was correct. The left or right position of the reinforcer was determined according to the Gellerman table of random numbers. Nine correct responses on ten given trials was used

as a learning criterion for the Ss. Thereafter, they were tested in a reversal learning procedure until reaching 90% of correct responses. In this phase, the SD+ was changed to SD- and *vice-versa*. A delay of 10 s was used as an intertrial interval.

Stimuli

The stimuli consisted of 75% reduced photocopies of Ishihara plates on the upper surface of wooden cubes (size = 3cm; weight = 10g) covered by a white paper. For the purpose of this study, three different designs from a 24-plate edition (Ishihara, 1980) were used: (a) an introductory plate, (b) vanishing plates and (c) hidden digit plates. The numeral in the introductory plate (plate 1) can be detected both by the trichromat as well as by the various color vision deficient. The vanishing format (plates 8, 10 and 11) discriminate between color-normal and color-abnormal subjects. The hidden digit group (plates 14 and 15) contained figures discernible only to individuals with red-green deficiencies, although many human subjects with normal color discrimination can detect them. To assess color perception in *Cebus* with Ishihara plates, each pair of stimuli presented to the animals consisted of copies from the same plate to be discriminated, that is, both contained the same elements or figures, but one stimulus was rotated 180°, being inverted with respect to the subject.

Results

All of the monkeys tested reached criterion within 251 trials on every discrimination problem presented during the original learning. Table 1 presents a summary of individual test performances.

Table 1. Performance summary: *Cebus* color vision test using Ishihara plates.

Plates	N°	N° of trials to criterion		
		Original learning - Reversal learning		
Design		Lola O-R	Túlio O-R	Edmundo O-R
Introductory	1	71-169	75-63	45-85
Vanishing	8	25-67	53-212	21-46
	10	148-57	95-10	91-80
	11	29-16	48-169	251-43
Hidden	14	125-84	24-10	106-160
	15	75-221	20-97	27-402

Number of trials in all sessions to reach the criterion (nine out of ten correct responses) for three different subjects (one female "Lola", and two males - "Túlio" and "Edmundo") using a discrimination learning procedure during original (O) and a subsequent reversal learning (R). The introductory, vanishing and hidden designs are meant to be seen, respectively, by trichromats and color vision deficient, by trichromats only and by dichromats only.

Discussion

All capuchin monkeys tested in the present experiments were able to discriminate the Ishihara plates designed to be perceived by normal trichromats as well as the hidden digit plates meant to be detected by dichromats. These findings are puzzling, at first glance. If *Cebus* are trichromats, as suggested in our previous study using a similar behavioral paradigm (Pessoa *et al.*, 1997a, 1997b), how did the monkeys discriminate the protan-deutan plates? In spite of the robustness of Ishihara plates to experimental manipulation, there is the possibility that the reproduction produced enough

changes in luminance and chromaticities to extinguish the diagnostic value of the original plates. This possibility is being currently investigated.

Our evidence of trichromaticity in *Cebus* contrasts with microspectrophotometrical and electrophysiological measurements in receptors of *Cebus apella*. These experiments show a single class of middle wavelength cone (Jacobs and Neitz, 1987) suggesting that male *Cebus* are obligatory dichromats. However, the correlation between number of retina cone types (photopigment types) and the dimensionality of resultant color vision must be considered with caution. Spectral positioning of photopigment alone fails to capture everything required to understand color vision. Differences in pigment optical density provide a possible account for red/green chromatic discriminations in some color-deficient observers with only a single opsin gene (Sanocki *et al.*, 1997). The fact that color perception is a result of active operations carried out in the nervous system as a whole has been stressed by Zeki (1993). Despite these arguments, it would be also interesting to assess the color vision of our putative trichromat monkeys through molecular biology approaches.

Regarding the uses of color vision in the natural environment, the presence of an exclusive trichromacy in *Cebus* monkeys is a plausible hypothesis. Selective pressures favor accurate color vision, thereby helping primates to discern the presence of ripe fruits (Osorio and Vorobyev, 1996). Furthermore, it has been suggested that a subset of neotropical trees depend upon primates for their dissemination and typically have fruits that are yellow or orange when ripe (Regan *et al.*, 1996).

Concerning *Cebus apella*, its diet during the fruiting season, is composed mainly of fruits which are in the long wavelength region of the spectrum when ripe (Terborgh, 1983). This is an inadequate foraging situation for dichromatic color vision (Regan *et al.*, 1996), unless the dichromats search for fruits cooperatively in groups, enjoying the advantage of female trichromacy (Mollon, 1989). However, differences in the nutritional costs and requirements of reproduction may influence the feeding patterns of male and female primates (Garber, 1987). For example, *C. olivaceus* males spend more time eating fruits, whereas females devote more of their foraging to the acquisition of higher protein resources such as leaves and insects. Polymorphism of color vision in *Cebus* may not, therefore, be advantageous. In addition, *Cebus-Saimiri* associations may involve cooperation in food searching, in which the squirrel monkeys, which have a color polymorphism, take advantage of the capuchin's detailed knowledge of the fruiting trees (Terborgh, 1983).

Cebus apella does not seem to be the only exception to the color vision polymorphism amongst the New World monkeys. A recent electrophysiological study shows that howler monkeys, *Alouatta*, have trichromat color vision (Jacobs *et al.*, 1996). Further studies in other species of monkeys and a knowledge of their foraging strategies and dietary preferences will help to clarify the question of the evolution of color vision in the New World monkeys.

Acknowledgments: This research was funded in part by the Fundação de Amparo à Pesquisa do Distrito Federal, Brazil, and a grant from the Brazilian Higher Education Authority (CAPES/DAAD/PROBAL - 058/98). We thank Raimundo Oliveira and Washington Luiz Vargas for their technical assistance. We are especially grateful to Dr. Cristina M. Curto for providing the Ishihara book.

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PRIMATES OF THE ITUBERÁ FOREST COMPLEX, BAHIA, BRAZIL

Kevin Flesher

Introduction

The near complete destruction of the Atlantic forest biome through deforestation and hunting has resulted in the precipitous decline of its endemic primates (Rylands *et al.*, 1997; Myers, 1987; Fonseca, 1985). Santos *et al.* (1987) pointed out the particular importance of preserving the remnant forests of southern Bahia where all six of the Atlantic forest primate genera historically occurred. The forests between the Rio de Contas and the Recôncavo of the Bahia have received only cursory scientific attention, and with the exception of surveys carried out by the WWF Primate Program (Mittermeier *et al.*, 1981, 1982; Santos *et al.*, 1987), by Alonso *et al.* (1987; *Callithrix* hybridization in the Recôncavo da Bahia), and by Oliver and Santos (1991), little information has been collected on the primates of this region. Here I report the results of a primate census from the forests near the town of Ituberá. Fundação BioBrasil (an NGO based in Salvador) initiated this study as part of an effort to determine the conservation value of these forests.

The Area

Ituberá is located on the southern Bahian coast (13°50'S, 39°15'W) in a hilly region dominated by plantation agriculture with rubber, cacao, oil palm, pupunha palm, guaraná, piaçava palm, heliconias, manioc and bananas, as the main crops, along with cattle ranching. The rich biological heritage of the area results from a diversity of distinct habitats including Atlantic

rain forest, *restinga* dune forest, salt marshes, freshwater wetlands, mangroves, estuaries, rivers, beach, and ocean. There is a minimum of 30,000 ha of forest remaining in the region (Fig. 1).

Methods

The study was conducted between May 1997 and July 1998. Primate censuses consisted of walking slowly (1 km/hour) along existing forest trails while scanning the canopy with the aid of binoculars, and yielded a total of 208 survey hours. Primate sightings and calls were also recorded while conducting other work in the forest (171 hours). All sightings and calls were mapped and then transferred onto 1:100,000 topographic maps (Brazil, SUDENE, 1975). The main *fazendas* (plantations/farms) surveyed and the primates found on these properties are shown in Figure 1. Attempts at estimating densities were abandoned after I realized that the harassed fauna was avoiding encounters with humans. As this violates the assumption that the animals will be detected prior to any movement in response to the observer (Peres, 1999; Southwell, 1996), I use frequency of encounters as a measure of relative abundance instead.

Results

Three species of primates were sighted: *Callicebus personatus*, *Cebus xanthosternos*, and a *Callithrix* species. *Brachyteles arachnoides* and *Alouatta fusca* no longer occur in the area.

Callithrix sp. (nico or mico)

The marmoset of the region resembles *Callithrix penicillata* shown in Plate 8 in Emmons and Feer (1997) with a dark gray body with gray and black stripes on the back, black head, a white "star" on the forehead, and black ear-tufts. Eighteen groups were seen and 13 others heard. Group sizes were difficult to determine because the marmosets fled quickly and traveled spread out in the canopy, but most (59%, $n = 17$) groups had a minimum of five animals and at least two groups had over 15. These marmosets are well adapted to the landscape mosaic of the region and were found inhabiting all forest types including degraded gallery forest, small isolated fragments, and *restinga* forests. They were most frequently seen in the upper canopy, but use all levels of the canopy and readily come to the ground to cross roads. This was the only primate species seen in agricultural lands (mostly in *cabruca* = cocoa groves where forest trees have been left for shade). Several

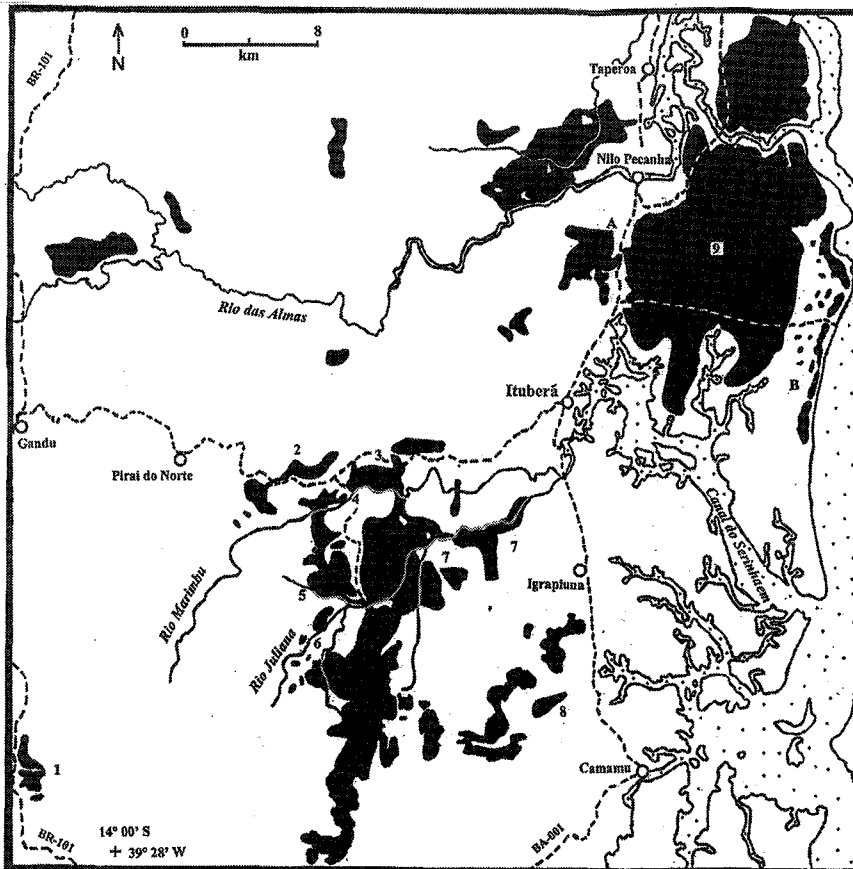


Figure 1. The Ituberá Forest Complex with primate sighting locations. The forest complex has two main fragments: 1) the 8-10,000 ha Pratiği *restinga* forest; 2.) the 7-9,000 ha Juliana/Marimbu basins-Camamu/Igrapiuana watersheds forest. Because most of the forest has been/is being logged, secondary forest dominates and old growth stands are extremely rare. All of the forest is on private property and only the Pratiği forest has protected status (APA = Environmental Protection Area). Numbers indicate the main study sites (*fazendas*), and C.x. = *Cebus xanthosternos*, C.p. = *Callicebus personatus*, Ca. = *Callithrix* sp.: 1) Paineras (C.x., C.p., Ca.); 2) Piauí (C.p., Ca.); 3) Karin (C.x., C.p., Ca.); 4) Gaudalope/Caipora (C.x., C.p., Ca.); 5) São Jose (C.p., Ca.); 6) Juliana (C.p., Ca.); 7) Plantações Michelin de Bahia (C.p., Ca.) (C.x. last seen in 1995); 8) Jacarandá (C.p., Ca.) (C.x. last seen 1994); 9) *Restingas*, mostly Fazenda Santarém, (Ca.) (C.p.?, C.x.? - this forest awaits a proper survey). Sites for C.x. for which anecdotal information was accepted - A) Three C.x. killed in 1997; B) Two C.x. seen in 'jataipeba' groves behind mangroves, 1998. Map sources - CNES, 1988; Brazil, SOS Mata Atlântica/INPE, 1997; Brazil, SUDENE, 1975. Aerial photographs 1997; and work on the ground 1997/98, Fundação BioBrasil.

people claimed that marmosets are poisonous and only one man was known to hunt them (he used them as fishing bait) and the species is in no immediate danger of extirpation.

Callicebus personatus (melanochir) (guigo)

These titis have long dull yellow/gray brown fur with orange/red on the lower back, sometimes going up the spine. The topside of the tail is orange/red while the underside is yellow/light brown. They have gray to black faces circled with a ring of darker fur and black/brown hands and feet. Masked titis were seen seven times and heard calling on 50 occasions. Of the groups seen, two consisted of three monkeys, three of two monkeys, and twice monkeys were seen alone. The titis appear to be well adapted to the mosaic of secondary forests (Pinto *et al.* 1993; Santos *et al.* 1987) and were encountered in all forest types except the old growth groves. They continue to survive in small (100-300 ha) isolated forest fragments, use forest edges, narrow (200 m wide) forest patches, and forest "peninsulas" jutting into agricultural lands. They were never seen in, heard calling from, or reported using agricultural lands, including *cabruca*. Anecdotal information suggests that they are absent from the *restinga* forests of Pratigi, and we neither heard nor saw titis there, but our surveys in this forest type were too brief (eight hours) to provide conclusive evidence one way or the other.

Titi monkeys are fairly abundant and widely distributed in the forests of the basins of the Rios Juliana and Marimbu and do not appear to be in immediate danger of extirpation. No one reported killing this monkey nor did people mention the species when asked to list the animals that were hunted, although when asked directly, hunters considered them edible. The titi's cryptic coloration and behavior, and small group sizes make this species difficult to find (Rylands *et al.*, 1997). Although their loud calls can make them vulnerable to hunters (Santos *et al.*, 1987), calling bouts in these forests typically consisted of a single burst (49%, n=22) or a series of short bursts with each burst lasting a few seconds to two minutes. These brief calling bouts allow a hunter little time to locate and approach the monkeys. Also, the titi's small size gives the hunter a low return for the effort required to kill it (Emmons, pers. comm.). The relative abundance of *C. personatus* in the Juliana and Marimbu basins makes these forests a high priority for the conservation of this threatened species.

Cebus xanthosternos (macaco-de-bando or macaco-prego-de-peito-amarelo)

Coloration was highly variable among the few individuals seen. The chest and back were dark brown to bright yellow, the shoulders and upper legs yellow, lower arms and legs brown, tail dark brown with yellow over-hairs, face dark to pink, bright yellow cap and a yellow ring around the face. Troops were only seen on three occasions, heard on another and reliably reported several times. Two of the sightings, the calling recorded, and all but one of the anecdotal accounts was of one group, and only three groups were known to exist there. Capuchins were seen in groups of two, three, and five animals. They use all forest types including the *restingas*. Anecdotal information suggests that capuchins used to be widespread and many people were familiar with the animal.

Various people reported knowing someone who had owned a pet capuchin, but none were located during the study.

Despite frequent reports that there were capuchins in particular forest patches, intensive searches almost always failed to locate them, and the extremely low encounter rate (1 encounter per 68 census hours) clearly indicates that this species is on the brink of extirpation. Three monkeys from one group were reportedly killed during our study. Its conspicuous group living, bright coloration, and relatively large size make it an optimal game species, and over-hunting as much as forestation is the main cause of species' decline (Coimbra-Filho *et al.*, 1992; Mittermeier *et al.*, 1989; Santos *et al.*, 1987). As this species is highly endangered, immediate efforts should be made to protect these remaining groups. If this cannot be achieved *in situ*, perhaps they should be removed to establish a captive-breeding colony.

Brachyteles arachnoides and *Alouatta fusca*

Neither of these species was seen, reported present, or familiar to any one in the area. Middle-aged hunters, whose fathers had hunted these forests before them, did not recall having heard their fathers mention them, so if they were present in the past, it must have been a long time ago.

Threats to the primate community

Agricultural expansion, logging, and hunting are the main threats to the primate community in the Ituberá forest. Habitat destruction threatens all three species, while hunting impacts especially *C. xanthosternos*. Agricultural expansion on the large plantations to increase pupunha palm production resulted in the loss of over one hundred hectares of forest. In addition to these clearings, the owner of Fazenda Contendas practically eliminated his forest by clearing over 50 ha to plant bananas and plantains. The owner of Itapema II has plans to clear several hundred hectares to plant pasture grasses.

Properties owned by small holders support little more than degraded hill top forest remnants, some of which were being cleared during the study, making it likely that all forest on these properties will be eliminated in the coming years. In the older established small holder areas such as the Colonia (established in the 1950s), the forest had already disappeared. The recent invasions of the Fazendas Karin and Cascata by more than 70 families of *sem terras* (landless peasants) poses a threat to the forests on these properties as the peasants consider them to be unproductive. They had cleared 15-20 ha by the end of the study.

Intensive logging began in the 1950s and most of the large trees were felled by the early 1980s. Logging continues with a minimum of 15 timber mills operating in the vicinity of the Ituberá forests. Fazendas Jubiaba, Cascata, and Itapema I and II and the forests of the Igrapiuna and Camamu watersheds were the main sites being logged in 1997/98.

Hunting, although illegal, is practiced openly. Most of the hunters are peasants who hunt for pleasure/subsistence, but there was at least one gang of commercial poachers operating in the Juliana/Marimbu forests. Gunshots were heard both

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during the day and night, and traps and hides were abundant. Hunting has devastated the local fauna, with the largest mammals mostly extirpated and many of the medium-sized mammal populations severely reduced (Flesher 1997).

The Instituto do Desenvolvimento Sustentavel da Bacia do Rio Juliana (IDES) is an institute established in 1998 which includes many of the larger landowners and leading businessmen in the Ituberá area, and has proposed the construction of four small hydroelectric dams on the Juliana River and an access road along the north bank. If these plans are carried out, the resulting deforestation will eliminate wildlife habitat and split the 7-9,000 ha Juliana/Marimbu forest in half.

Conservation initiatives

Local conservation initiatives have been limited and insufficient to guarantee the protection of the flora and fauna. The Centro de Recursos Ambientais (CRA) has been the government agency most involved in conservation work and has taken several measures to try to stop deforestation. They have included shutting down several timber mills, requiring bakeries to switch from using wood to electric ovens, and creating an APA (Area de Proteção Ambiental) for the Pratigi *restinga* forest (8-10,000 ha). Another APA has been proposed for the Cachoeira Pancada Grande that would protect the 50 ha surrounding the waterfall. Fundação BioBrasil's approach has been to collect and disseminate data on the flora and fauna, to promote agroforestry, and to work with landowners in establishing private reserves. Some plantation owners have posted "No hunting" signs on their properties and they have been ineffective.

All of the land is in private ownership, and the establishment of private reserves (Reserva Particular de Patrimônio Nacional - RPPN) and APAs may be the best approach to protecting the remaining flora and fauna. The owners of fazendas Juliana, Piauí, California, Caipora, Paineras, Guadalupe, São José, Plantações Michelin de Bahia, Jacarandá, and several others have recently declared their forests protected, but little has been done beyond this, and few of the reserves have been officially registered. For the RPPN/APA approach to be effective, reserves will have to be officially registered and organized into a regional network, so that the forest can be managed as a single entity instead of as isolated units (Fonseca, 1985).

Conclusion

The Ituberá forest complex is one of the largest remaining fragments in Bahia and its importance as a potential site for the long-term preservation of the region's biodiversity should be acknowledged. This forest is large enough to support viable populations of the three primate species as well as populations of rare endemics such as the bristle-spine porcupine (*Chaetomys subspinosus*), the hairy dwarf porcupine (*Coendou insidiosus*), the maned sloth (*Bradypus torquatus*), and the gray slender mouse opossum (*Marmosops incanus*). Laws exist that protect both the flora and the fauna, but few are enforced, and logging, hunting, and agricultural expansion continue to erode the region's biodiversity. This critical

situation warrants the involvement of the larger NGOs that have the expertise and the financial resources to take on the multi-faceted challenge that effective conservation of Ituberá's fauna entails.

Acknowledgements: Special thanks to Fundação BioBrasil for inviting me to help with their biodiversity assessment project. Also to Dr Noberto Odebrecht, Bernard Francois, Danilo Lima, Ian Walker, Erico Leite, and the community of Kilometro 25 for allowing us to work on their properties, and to Richard Hartley, Zildomar, Tia Memeca and Marcia Guimarães for help in the office and in the field. To Heber Franco of CRA for his indefatigable efforts enforcing the environmental laws and for working hard to get the Pratigi Environmental Protection Area declared.

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PROSTHENORCHIS ELEGANS (OLIGACANTHORHYNCHIDA, OLIGACANTHORHYNCHIDAE) AND DIPETALONEMA SP. (SPIRURIDA, ONCHOCERCIDAE) IN SAIMIRI SCIUREUS (PRIMATES, CEBIDAE) IN BRAZIL

Jaqueline Bianque de Oliveira
Alessandro César Jacinto da Silva
Adolphe Medeiros
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Introduction

The use of nonhuman primates as models in biomedical research has contributed significantly to the development of Medical Primatology, and the growing interest in the biology of these mammals has demonstrated the need for a better understanding of their diseases, especially with regard to zoonoses (Cooper, 1968; Melo and Pereira, 1986; Cubas, 1996). New World primates are hosts to a large number of internal and external parasites, the study of which, in both wild and captive populations is most important in order to (1) determine the consequences of host-parasite interactions, (2) to identify adequate anti-parasitic agents, and (3) to identify infection sources to develop efficient control and prevention programs (Wolff, 1993). Cebids have been identified as hosts to a number of helminths, including *Oesophagostomum* sp., *Strongyloides cebus*, *Trypanoxyuris* sp., *Molineus* sp., *Filariopsis godius*, *Trichuris* sp., *Dipetalonema* sp. and *Prosthenorchis* sp. (Kuntz and Myers, 1972; Rego and Schaeffer, 1988; Wolff, 1993; Cubas, 1996; Diniz, 1997). Despite this, there is little published information on the occurrence and clinical aspects of helminth infections in, for example, the

widely-used model for biomedical research, the squirrel monkey, *Saimiri sciureus*. Here we report on two parasite species found during the autopsy of a wild caught *S. sciureus*. The study is part of a larger project identifying parasites in captive and wild primates in the state of Pernambuco, North-east Brazil.

Material and Methods

A young male *Saimiri sciureus* (Primates, Cebidae), approximately one year old, captured in the state of Amazonas was sent to a private collection in Recife, state of Pernambuco, Brazil. A few days after its arrival, the monkey showed clinical alterations, including anorexia, acute caquexia, prostration and dermatitis and died after a week. The monkey was sent to the Parasitology Laboratory of the Department of Biology, Federal Rural University of Pernambuco (UFRPE) where an autopsy was carried out. Large numbers of filariiform parasites were found in the mesentery and beside the liver. The parasites were collected, fixed in hot alcohol-acetic formol (AAF), and cleared in Amman's lactophenol following the procedure prescribed by Amato *et al.* (1991). They were identified through the descriptions of Webber (1955) and Anderson and Bain (1974). When opening the intestine, helminths were found in the ileo-cecal ostium which was apparently totally obstructed by the parasites, and there was also a severe reaction noted in the intestinal tissues. The cecum and descending colon were partially obstructed. Thirty-two parasites were collected and placed in a recipient in distilled water and cooled until the probosci were extroverted (Amato *et al.*, 1991). They were subsequently fixed and mounted following Machado Filho (1950) and Amato *et al.* (1991), and identified according to the descriptions of Machado Filho (1950), Yamaguti (1963) and Amin (1987).

Results and Discussion

The parasites found in the abdominal cavity were identified as filaria of the genus *Dipetalonema* Diesing, 1861 (Spirurida, Onchocercidae), transmitted by hematophagous mosquitoes. According to Dunn (1968) *Dipetalonema* spp. are one of the most prevalent parasites of squirrel monkeys in Brazil, Peru, Colombia and Panama. Adults are frequently found in the peritoneum and mesentery and associated with the presence of fibrous and adherent exudates. As microfilaria they occur in the peripheral bloodstream, without any associated pathologies or clinical symptoms (Dunn, 1968; Potkay, 1992).

The helminths, found deep in the intestinal mucosa, were identified as acanthocephalans of the species *Prosthenorchis elegans* Diesing, 1851 (Oligacanthorhynchida, Oligacanthorhynchidae). *P. elegans* is a heteroxene acanthocephalan. Cockroaches and beetles are intermediate hosts (Stunkard, 1965; Cubas, 1996), and it has been diagnosed for a number of cebids and callitrichids (Machado Filho, 1950; Kuntz and Myers, 1972; Potkay, 1992; Wolff, 1993; Ferraz *et al.*, 1995; Cubas, 1996). Large numbers can be found without the hosts showing any clinical symptoms, although Ferraz *et al.* (1995) recorded diarrhea and loss of appetite and energy in wild and captive callitrichids as a result of parasitism by *P. elegans*. Dunn (1963) argued that infestations of

approximately 30 to 33 *P. elegans* are sufficient to cause intestinal obstruction; the cause of the demise of *Saimiri* and black-mantle tamarins, *Saguinus nigricollis*, studied in Colombia and Peru. According to Dunn (1968), death by intestinal obstruction provoked by *P. elegans* is not uncommon in recently-captured *S. sciureus* and results from increased parasite loads arising from the stress experienced during capture and transport and due to inadequate installations and changes in diet. The absence of any lesions on any other internal organs indicated to us that intestinal obstruction was also the cause of death in the squirrel monkey we studied. This is the first record of the presence of adult *Dipetalonema* sp. and of death by intestinal obstruction caused by *Prosthenorchis elegans* in a wild caught *Saimiri sciureus* in Brazil.

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PRIMATAS DA COLEÇÃO LÍQUIDA DO MUSEU NACIONAL, RIO DE JANEIRO

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A coleção mastozoológica do Museu Nacional da Universidade Federal do Rio de Janeiro (UFRJ) constitui o maior acervo do gênero na América do Sul com cerca de 90.000 exemplares (Hafner *et al.*, 1997), incluindo vários holótipos e parátipos (Langguth *et al.*, 1997), e representa uma das principais fontes de informações para estudos realizados no país sobre a mastofauna brasileira. A coleção preservada em meio líquido no Setor de Mastozologia contém cerca de 5.500 exemplares representativos das diferentes ordens que ocorrem no Brasil e de algumas ordens exóticas, e tem sido continuamente incrementada pela adição de material obtido em projetos recentes.

Paralelamente à utilização para estudos anatômicos, o material preservado em meio líquido pode fornecer dados que em geral não estão disponíveis nos espécimens taxidermizados. Aspectos da ecologia das espécies representadas, evidenciados pela análise do conteúdo estomacal, dos ecto e endoparasitas, da condição reprodutiva, assim como a necrópsia patológica de espécimens encontrados mortos na natureza, podem ser abordados (Bezerra, 1998). Coleções em meio líquido ainda proporcionam material para estudos histológicos e para preparações especiais do esqueleto (tais como diafanização), possibilitando o estudo de caracteres morfológicos relacionados aos processos de ossificação

(Jones e Owen, 1987; Quay, 1974). Da mesma forma, assomam como uma fonte potencial de tecidos para a amplificação e sequenciamento de material genético, em vista da crescente dificuldade de se obter novos materiais, seja pelo desaparecimento de áreas e populações causado pela ação antrópica, ou devido às rigorosas leis de conservação animal que restringem as possibilidades de novas coletas (Jones e Owen, 1987).

O projeto "Coleção em Meio Líquido do Setor de Mastozoologia: Identificação, Organização e Tombamento" teve como objetivo principal resgatar informações sobre os espécimens preservados em fluido, alguns dos quais ainda encontravam-se nos lotes originais de coleta ou transporte, datados até mesmo do início do século. Para facilitar o acesso à informação este material foi separado, identificado e distribuído em recipientes por espécie e localidade, seguindo a metodologia recomendada pela bibliografia (De Blase e Martin, 1981; Quay, 1974; Williams e McCarthy, 1984). Os exemplares foram rotulados com etiquetas novas transcritas das originais, sendo estas também mantidas, recebendo quando necessário um número de tombo do MN, e foram acondicionados em frascos com solução de álcool a 70%. As informações disponíveis foram incluídas no banco de dados informatizado da coleção mastozoológica. A identificação dos indivíduos foi realizada com base em chaves e trabalhos taxonômicos específicos para cada grupo, bem como por comparação com exemplares tombados na coleção mastozoológica do Museu Nacional.

Do total de 4.578 espécimens da coleção de mamíferos mantida em meio líquido, a ordem Primates foi representada por 124 exemplares distribuídos entre quatro famílias e 27 espécies (Tabela 1). O material é composto por espécimens inteiros ou partes, neste caso não identificados ao nível de espécie. A coleção inclui ainda espécimens-testemunho de eventos de hibridação referidos na bibliografia (Coimbra-Filho, 1973), bem como novos registros que se revelaram no decorrer deste projeto (Silva Jr., 1998).

Espera-se com este trabalho fornecer subsídios para a expansão planejada deste tipo de coleção e difundir sobre a sua importância, no sentido de viabilizar estudos que demandem a análise de estruturas tradicionalmente descartadas, como carcaças e vísceras, nas séries preservadas em museus, e à sua utilização como mais uma ferramenta em estudos zoológicos. Assim, espera-se possibilitar um aproveitamento mais completo de exemplares representantes de formas raras ou ameaçadas, que portanto tenham sua coleta para fins científicos restritas, como é o caso da maioria das espécies de primatas neotropicais.

Agradecimentos: Agradecemos a Patrícia Guedes por auxiliar na identificação de alguns exemplares, e à Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ) por financiar este projeto.

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Tabela 1. Lista das espécies de primatas presentes na coleção líquida do Setor de Mastozoologia, Museu Nacional, Rio de Janeiro.

Espécie/Família	Cebidae Callitrichinae	Cebidae Aotinae Cebinae	Pitheciidae	Atelidae	Cercopitheciinae
<i>Callithrix</i> sp.	16				
<i>C. argentata</i>	3				
<i>C. chrysolaica</i>	2				
<i>C. geoffroyi</i>	3				
<i>Callithrix</i> di-híbrido	2				
<i>C. jacchus</i>	11				
<i>C. melanura</i>	1				
<i>C. penicillata</i>	6				
<i>Saguinus labiatus</i>	1				
<i>S. leucopus</i>	1				
<i>S. mystax</i>	3				
<i>S. nigricollis</i>	1				
<i>Actus</i> sp.		2			
<i>Cebus</i> sp.		3			
<i>C. apella</i>		13			
<i>C. olivaceus</i>		2			
<i>Saimiri</i> sp.		6			
<i>Saimiri sciureus</i>		1			
<i>Callicebus</i> sp.			2		
<i>C. moloch</i>			1		
<i>C. personatus</i>			2		
<i>Chiropotes</i> sp.			2		
<i>C. satanas</i>			1		
<i>Pithecia p. chrysocephala</i>			1		
<i>Alouatta</i> sp.				18	
<i>A. belzebul</i>				1	
<i>A. caraya</i>				3	
<i>A. fusca</i>				1	
<i>A. seniculus</i>				7	
<i>Ateles</i> sp.				1	
<i>Lagothrix lagothricha</i>				1	
<i>Macaca</i> sp.					1
<i>Papio</i> sp.					1
Não identificados	2	1		1	
Total = 124	52 (41,9%)	28 (22,6)	9 (7,3)	33 (26,6%)	2 (1,6%)

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News

NEOTROPICAL PRIMATES - ADDRESS CHANGE

After 10 years working at the National Institute for Amazon Research (INPA), Manaus, and a further 13 years at the Department of Zoology, Federal University of Minas Gerais, Belo Horizonte, seven of which were spent working with Conservation International do Brasil, in early December 1999 Anthony Rylands will be moving to Washington, D. C. to join Gustavo A. B. da Fonseca, Executive Director, and Claude Gascon, Deputy Director, of the Center for Applied Biodiversity Science at Conservation International, as Senior Director for Conservation Biology. Anthony Rylands will continue as editor of *Neotropical Primates* with Ernesto Rodríguez-Luna. However, discussions are underway regarding some possible changes, one of which is the upgrading of the newsletter to include in each issue a few full peer-reviewed articles, while maintaining of course the "newsletter" element, with short articles, notes, announcements, etc.

The sterling work and patience of Alexandre Dinnouti, battling with maps and tables of all shapes and sizes, and his skill in formatting the newsletter is very much appreciated, as is the support and encouragement of Gustavo Fonseca (former Director of Conservation International do Brasil) and Roberto Cavalcanti (current Director), and members of CI-Brazil's intrepid staff, Luiz Paulo Pinto, Paulo Gustavo Prado, Heloisa Oliveira, Mônica Fonseca and Ivonilde Pereira. A special thank you is due to Carlos Alberto Bouchardet, for seven years juggling the accounts and muttering endlessly about the boxes of *Neotropical Primates* cluttering the offices.

As of 1st December 1999, we would be most grateful if you could send all correspondence to Ernesto Rodríguez-Luna at the Universidad Veracruzana, Mexico, or to Anthony Rylands at the following address: Center for Applied Biodiversity Science, Conservation International, 2501 M Street NW, Suite 200, Washington DC 20037, USA, Fax: +1 202 331 0570, e-mail: <a.rylands@conservation.org>.

CENSUS OF THE PRIMATE COMMUNITY AT THE ESTAÇÃO BIOLÓGICA DE CARATINGA, MINAS GERAIS, BRAZIL

The 860 ha forest at the Estação Biológica de Caratinga (EBC) in Minas Gerais, Brazil, supports four species of primates: *Alouatta fusca*; *Brachyteles arachnoides*; *Callithrix flaviceps*; and *Cebus apella*, three of which (*A. fusca*, *Brachyteles* and *C. flaviceps*) are endemic to Brazil's Atlantic forest and in danger of extinction. All four primates in this community have been the subjects of numerous Master's and PhD theses and publications. Studies have focused, however, on single groups of *Brachyteles*, *Callithrix*, and *Cebus*, and there has been no overall appraisal of the status of the community as a whole. Two previous censuses of the *Alouatta* population, conducted in 1984 (Mendes, 1985, 1986) and 1994-

1995 (Hirsch, 1995) indicated a high density, with an expansion into areas of forest that were not previously used; findings consistent with the documented increase in the size and home range of one miquiqui study group (from 22 individuals in 1982 to >65 in 1999; Strier *et al.*, 1993; Strier, 1999). Together, these findings stimulated our interest in initiating a long-term monitoring program of this important primate community.

The first step in our monitoring program entailed an initial census of the entire primate community. This was conducted from 1-6 August, 1999, involving 16 observers in addition to support staff. All of the 16 observers had extensive recent experience with this forest and its primates. The census began with a half-day training session, during which methods and census routes were discussed and compass readings and distance estimating were practiced and standardized.

Six circuit routes using existing trails were selected to cover the widest possible diversity of habitat types in the Matão portion of the forest. Matão circuits were walked a total of 10 times, once in the morning, beginning at 0730 h, and once in the afternoon, beginning at 1330 h. Observers worked in pairs, and partners were changed after each route. No observer walked any route more than twice, and no two partners walked together more than twice, or together on the same route more than once. In this way, observers with different degrees of expertise at aging and sexing different species could be paired in different combinations to reduce potential biases.

An additional team of 3-4 participants, led by J. Gomes, censused the Jaó part of the forest using dirt access roads and two extant trails. Different teams of observers accompanied Gomes each day. Censusing in this part of the forest focused on locating miquiquis and identifying natal females from the long-term Matão study group that were known to have transferred into the Jaó group as adolescents (Strier *et al.*, 1993; Printes and Strier, 1999). Thus, although all four species were censused when encountered in the Jaó area, our analyses will focus on the more systematic data collected from the Matão area.

Each census team walked their designated census routes at a slow pace, roughly 10-20 m apart from one another, until a primate was sighted. Primates were sighted using visual contact, vocalizations, and vegetation movement or noises. The time and means of the sighting, the location relative to mapped trail markers, and the species were recorded. Observers then estimated their distance from the trail to the first primate sighted at each census point, and measured the direct observer-animal as well as the observer-trail angle with a compass. A maximum of 20 minutes was allocated for each sighting (except during encounters with miquiquis in Jaó), during which time all individuals present and whenever possible, age-sex class distinctions, were tallied. During this counting period, one member of each team remained on the trail where the first sighting was made while the other team member searched for additional monkeys in the vicinity. Distinguishing features of individuals were also noted and cross-checked with recurrent sightings of the same species in roughly the same areas.

Analyses of the Matão census data are still underway. The Jaó censuses confirmed the presence of several muriqui females who had previously transferred, some of whom were seen carrying what we presume to have been their own infants. An upcoming exhaustive census, in which a fraction of the EBC forest will be intensively sampled with the goal of counting every primate present, will yield important comparative data with which our larger census results can be calibrated. Future censuses planned for subsequent years will provide comparative data with which to monitor the long-term population dynamics of this rare primate community.

Acknowledgments: This census was funded by the National Geographic Society. We are grateful to Eduardo M. V. Veado for logistical and administrative support, and to Senhoras Lada and Vera for their help. We also thank W. P. Martins and V. O. Guimarães for their contributions to the census as they followed the Matão muriqui study group, W. A. Hoffmann for assistance with driving, the Fundação Biodiversitas, and the owners and residents of Fazenda Montes Claros.

K. B. Strier, S. L. Mendes, A. M. Bragança, C. C. Coelho, C. G. Costa, L. G. Diaz, L. T. Dib, J. Gomes, A. Hirsch, J. W. Lynch, C. P. Nogueira, A. Odália Rímoli, A.S. Oliva, R. C. Printes, J. Rímoli and R. R. Santos. Please address correspondence to: Karen B. Strier, Department of Anthropology, University of Wisconsin-Madison, 1180 Observatory Drive, Madison, WI, 53706, USA, e-mail: <kbstrier@facstaff.wisc.edu>, or Sérgio L. Mendes, Museu de Biologia Mello Leitão, Avenida José Ruschi 4, 29650-000 Santa Teresa, Espírito Santo, Brazil, e-mail: <mendes@sigma.tropical.com.br>.

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THE LAMI BIOLOGICAL RESERVE, RIO GRANDE DO SUL, BRAZIL, AND THE DANGER OF POWER LINES TO HOWLERS IN URBAN RESERVES

The Lami Biological Reserve (LBR) is a municipal protected area of 77.3 ha on the southern limits of the city of Porto Alegre, the capital of the state of Rio Grande do Sul (30°15'S, 51°05'W). It was created in 1975, and the first to be created in an urban area in Brazil. The main reason for its existence is to protect the rare *Ephedra tweediana*, a climbing gymnosperm endemic to the coastal, sandy soil forest (*restinga*) associated with the Laguna dos Patos. The reserve marks the northern limit to its range. Besides *Ephedra*, the reserve there protects remnants of the vegetation which was once widespread along the margin of the Lago Guaíba (Baptista *et al.*, 1979). The varied physiognomies and vegetation formations result in this small reserve protecting a very diverse flora. Some notable species include "corticeira" (*Erythrina cista-galli*), "caraguatã" (*Eryngium pandanifolium*) and "unha-de-gato" (*Acacia bonariensis*), and in forested areas "mata-olho" (*Pouteria gardeniana*) "figueira" (*Ficus organensis*), "tarumã" (*Vitex megapotamica*) and "açoita-cavalo" (*Luhea divaricata*). The fauna is also rich, with preliminary surveys recording 115 bird species (Albuquerque *et al.*, 1986), the majority migratory and typical of coastal wetlands. They include spoonbill (*Ajaia ajaia*), cormorant (*Phalacrocorax olivaceus*), and snail hawk (*Rosthramus sociabilis*). There are also large mammals and reptiles, some of which are threatened, including Neotropical otters (*Lutra longicauda*), capybara (*Hydrochaeris hydrochaeris*), the cayman (*Caiman latirostris*) and the brown howler (*Alouatta guariba clamitans*). Its small size means that there is considerable transit of the animals between the reserve and immediate vicinity (Cowling and Bond, 1991), and its usefulness depends on a strong involvement and commitment on the part of the surrounding communities, which for our purposes is a 10 km-wide buffer zone, as defined by Resolution N° 13/90 of the National Council for the Environment (CONAMA) (Brazil, CONAMA, 1992).

In the third week of April 1999, some residents near the LBR informed us of a howling monkey which had come out of the Reserve, and had attempted to cross using the power lines. The power lines short-circuited and the howler fell to the ground, was unconscious for a short while, but then got up, with a serious wound on its right arm, and disappeared into the vegetation beside the road. The residents were without electricity for some hours and the Environmental Police Battalion of the Military Brigade were called in to capture the howler, but had no success. It stayed in the vicinity for the next two weeks, easily identifiable because of the wound.

On 4 May 1999, the howler was found in a small country residence 1.5 km from the Reserve. It was captured by two of the LBR staff in a low forest beside the Lago Guaíba, and taken to a veterinary clinic. Its arm was gangrenous and severely infected with fly larvae, and was amputated. The howler, an adult male, recovered and is now a resident of the Sapucaia do Sul Zoo. Crockett and Pope (1988) reported a female red howl-

ing monkey, *Alouatta seniculus* which survived the loss of her arm from the middle of the humerus. She was alone, but did eventually join a group and breed. The loss of an arm is predictably more serious, however, for males in terms of their capacity to remain in a social group.

On 4 July 1999, another howler was trapped on an electricity cable of 110 volts, when attempting to reach an orchard beside the reserve. Two other howlers tried to help the animal but also ended up trapped themselves, stuck to the first howler. The electricity had to be switched off to allow them to free themselves.

Every day animals leave these sorts of small protected areas in otherwise urban or semi-urban areas in search of food, water, and new ranges and social groups (Mwalyosi, 1991). The consequences are frequently that they are hunted or caught, run over, killed by dogs, or suffer death or physical injury from such as power lines (Pyle, 1980). The management of these reserves demands that this problem be faced and if possible minimized; a task which is complicated by such aspects as: a) ignorance on the part of the neighboring communities of the importance and aims of the reserve; b) legal complications in terms of measures necessary outside the reserve limits; c) a lack of understanding of the behavioral and ecological requirements of the animals which leave and enter the reserve; and d) the fact that very little attention has ever been paid to the problem and the solutions available.

We suggest that there are preventative measures which could be adopted to reduce the frequency of such incidents as those of electrocution reported here. 1) The obvious solution is the use of underground electricity cables. 2) When not possible, the cables should be protected with insulating material; 3) regular checking and pruning of trees which could give access to power lines around the reserve; 4) the construction of bridges (see, for example, Valladares-Padua *et al.*, 1995; Cuarón, 1995) at passage points which are favored by arboreal mammals to bypass power cables or over roads; 5) maintain clear areas of say 30 -50 m between the reserve limits and neighboring orchards.

Acknowledgments: Prefeitura Municipal de Porto Alegre, Secretaria Municipal do Meio Ambiente - Reserva Biológica do Lami; Zoológico de Sapucaia do Sul; Dirceu S. Pinheiro, Ênio Manno, Fabiane Pruceh, Gerson Buss, Gleide Marciano, Hamilton F. P. Aguiar, Juanir Antunes, Mariana F. Correa, Yanina M. Sammarco, and Vitor H. M. Corrêa.

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PHYLOGENY OF THE MARMOSETS, *CALLITHRIX*

In April 1998, Leonardo dos Santos Sena completed his Master's dissertation, "The phylogeny of the genus *Callithrix* based on mitochondrial cytochrome oxidase II gene sequences", for the postgraduate course in Genetics and Molecular Biology at the Federal University of Pará (UFPA), Goeldi Museum (MPEG) and the Brazilian Agricultural and Cattle-Breeding Research Company (EMPRAPA), Belém. His supervisor was Dr. Maria Paula Cruz Schneider, and the study was supported by the Brazilian Higher Education Authority (CAPES). The following is an abstract of the thesis.

Phylogenetic relationships between 12 species of the genus *Callithrix* (Callitrichinae, Platyrrhini) are inferred from sequences of 549 bases of the mitochondrial gene cytochrome oxidase II (COII). As COII is a relatively conservative gene, most of the variable sites were located at the third codon position, which was not saturated in intraspecific comparisons. The nucleotide and amino acid sequences encountered were similar to those already documented for other mammals. The topologies of the phylogenetic trees produced by maximum parsimony, neighbor-joining and maximum-likelihood analyses were all very similar. The analyses clearly indicated the presence of three species groups - "argentata", "pygmaea" and "jacchus" - but no preferential arrangement between the first two, similar to the findings of Tagliaro (1997) based on nucleotide sequences of the mitochondrial D-loop. Regarding the "argentata" group, *C. argentata* and *C. emiliae* from southern Pará are closely linked, while "*C. emiliae*" from Rondônia does not group preferentially with any of the species. *C. humeralifera*, *C. mauesi*, *C. saterei*, and *C. melanura* form a third clade in the "argentata" group.

This arrangement confirms the need for a reclassification of the Rondonian "emiliae", as was argued by Rylands *et al.* (1993), while also indicating the existence of a major division within the "argentata" species group related to a geographic barrier (the Rio Tapajós) rather than to morphological traits such as the presence or absence of ear tufts (Hershkovitz, 1977). In the "jacchus" group, *C. aurita* is well differentiated, but the relationships between *C. penicillata*, *C. geoffroyi*, *C. jacchus* and *C. kuhlii* are less clear, indicating possible cases of ancestral polymorphism and/or differential introgression between some lineages, probably due to a rapid and recent radiation of these more recent forms (less than one million years ago). The phylogeny obtained in the present study is compared with existing proposals for *Callithrix*. The difficulties of inferring species' phylogeny from analyses of mitochondrial gene sequences and the contribution of this and other genetic studies to the definition of taxonomic relationships within the genus are discussed.

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ECOLOGY AND BEHAVIOR OF BLACK-FACED LION TAMARINS

In September 1999, Fabiana Prado defended her Master's thesis in Zoology at the Biosciences Institute of the Paulista State University at Botucatu, São Paulo. She successfully completed a study on the ecology and behavior of a wild group of black-faced lion tamarins, *Leontopithecus caissara*, in the Superagüi National Park, Paraná. The thesis was supervised by Dr. Valdir A. Taddei and Dr. Claudio Valladares Padua (University of Brasília), and the research was supported by the Brazilian

Institute for the Environment (IBAMA), most especially in the person of Guadalupe Vivekananda, Director of the Superagüi National Park, by the Fundação O Boticário de Proteção à Natureza, the Lion Tamarins of Brazil Fund, the Lincoln Park Zoo Scott Neotropic Fund, World Wide Fund for Nature - Brazil, WildInvest, IPÊ - Instituto de Pesquisas Ecológicas, and the Brazilian Higher Education Authority (CAPES). The following is an abstract of the thesis.

The black-faced lion tamarin (*Leontopithecus caissara*) is one of the four lion tamarin species endemic to the Atlantic forest. *L. caissara* occurs in coastal forests in the south-east of the state of São Paulo and north-east of the state of Paraná. Although the species was first described by Lorini and Persson in 1990, very little was known of its behavior and ecology in the wild. Valladares-Padua and Prado (1996) found it to be one of the most endangered of the South American primates. In this study, the aim was to describe the feeding ecology, ranging behavior, locomotion (substrates) and vertical use of the forest, and activity budgets of a wild group in the Superagüi National Park, Paraná: basic data required for conservation efforts for the species. The group, which ranged from four to seven individuals, was studied five days a month from April to December 1996. Young were born in December 1996. More than 50% of their time was spent travelling and 30% feeding and foraging. Resting was notable in the morning (around 0800 h) and the early afternoon. Grooming was the predominant social activity. The majority of the time the lion tamarins were active at heights of 6-10 m in the forest. In terms of the number of 50 x 50 m quadrats used, the home range was estimated at 125.5 ha, but the convex polygon method indicated a much larger range, exceeding 300 ha. The group used their entire range quite uniformly. As in other lion tamarins, tree holes were used as sleeping sites. Their diet included small animal prey, including tree frogs, fruits, exsudates (gums and nectar), and fungi. The diet showed clear seasonality, with more fruits eaten during the wetter months (April-June and October-December). Fungi were eaten especially during periods of low rainfall (July-September). Recommendations are given regarding future studies and measures for the conservation of the species.

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DISPERSAL OF ADOLESCENT FEMALE MURIQUIS, *BRACHYTELES*

In January 1999, Rodrigo Cambará Printes defended his Master's thesis which examined the behavior accompanying the dispersal of adolescent female mureiquis, *Brachyteles arachnoides hypoxanthus*, at the Caratinga Biological Station, Minas Gerais, Brazil. The study formed part of the postgraduate course in Ecology, Conservation and Wildlife Management of the Federal University of Minas Gerais, Belo Horizonte, and was supervised by Dr. Karen B. Strier, University of Wisconsin. It was supported by a host of organizations, including: The National Science Foundation (BNS 958298), The US Fish and Wildlife Service, The Fulbright Foundation, The Joseph Henry Fund of the National Academy of Sciences, Sigma Xi, The L. S. B. Leakey Foundation, The World Wildlife Fund, The Seacon Fund of the Chicago Zoological Society, The Liz Claiborne and Art Ortenberg Foundation, The Lincoln Park Zoo Scott Neotropic Fund, the Graduate School of the University of Wisconsin, The Fundação Biodiversitas, and the Brazilian Higher Education Authority (CAPES). The following is an abstract of the thesis.

The dispersal of individuals from their natal group is a powerful force in evolutionary processes and an understanding of this demographic process is most important for the conservation management of endangered species such as the mureiqui, *Brachyteles arachnoides*. Although male dispersal is most frequent in mammals in general, in primates the sex which disperses is more variable (Strier, 1994). In mureiquis it is female adolescents which disperse. This study of the behavior of young females was carried out from August 1994 to July 1995 at the Caratinga Biological Station, Minas Gerais. The aim was to identify behavioral and social patterns related to dispersal, specifically to support future possibilities for translocation as a conservation management tool. Four adolescent females (5-7 years old) changed groups (two emigrations and two immigrations in the Matão study group), while a further two females observed remained in their natal group. A total of 617 focal-animal samples (10 minutes each) revealed significant differences in the behaviors of the dispersing and resident females. Dispersing (immigrant and emigrant) females spent more time resting than resident females of the same cohort during the three months in which the transfers occurred. The emigrating females also spent more time eating ripe fruit than the immigrant females, although these differences were evident only during the season in which the dispersals occurred. With regard to their social behavior, immigrant females were recorded within 5 m of adult males more frequently than the emigrating females and those which remained resident, suggesting that proximity to adult males facilitates acceptance by them. Adolescent females were recorded being displaced from food sources on 27 occasions, most frequently by adult females. Immigrant and resident female adolescents were treated alike (number of expulsions = 8 and 6, respectively). The nearest neighbors were compared between a female which had immigrated previously (in the rainy season of 1995), the two female residents, and a female which had only just immigrated

(in the dry season of 1995, three months later). The female which had immigrated three months earlier showed a very similar pattern to the resident females, indicating that social relations as indicated by proximity to other group members are established over a short period of time. Both emigration and the success or otherwise of immigrating females can be predicted through the observation of behavioral and social parameters, an important aspect for any translocation program. Emphasis is given to the need for veterinary evaluation (especially the presence of parasites) prior to translocation, and the recognition of the differences between the southern and northern populations of mureiquis, which may be subspecifically or even specifically distinct. Females selected for transfer should come from groups with a healthy number of young or adult females, and they should be accompanied for at least two years.

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1998 EUROPEAN STUDBOOK FOR THE EMPEROR TAMARIN

Eric Bairrão Ruivo, EEP Co-ordinator for the Emperor Tamarin, *Saguinus imperator*, published the 1998 Studbook (5th edition, data current to 31st December 1998) in June 1999. He was assisted by Prof. Pereira da Silva, Patrícia Vilarinho, Orlando Silva and José Dias Ferreira. It includes the 1997 Annual Report, and a report of a research project "Environmental evaluation of *Saguinus imperator subgriseus* enclosures at Lisbon Zoo" by António Entrezede of the University of Évora. The Studbook includes a full historical listing of *S. i. imperator* and *S. i. subgriseus* and hybrids, births and transfers during 1998, a listing of the living population by location, a comprehensive demographic and genetic analysis (including age

pyramids, analyses of age distributions, mortality, fecundity, and inbreeding), recommendations regarding breeding and transfers for 1999, and an address list of holding institutions.

The full listing includes data on 690 tamarins (568 *S. i. subgriseus*, 47 *S. i. imperator* and 75 hybrids), 145 of which were alive on 31 December 1998. The current population in Europe is 130 *S. i. subgriseus* (69:56:5, sex ratio 1:0.81) in 37 institutions, an aged female *S. i. imperator* at Frankfurt Zoo, and 14 hybrids in four institutions; a total of 40 institutions. The hybrid population is being phased out, and future studbooks will deal only with *S. i. subgriseus*.

The *S. i. subgriseus* population arose from 34 founders. 29 wildborn and 5 animals of unknown origin; four are still alive, but will probably not breed any more. It has been increasing since 1980, but there was no population growth in 1998, and unfortunately a high mortality in breeding females offset a high birth rate. The number of institutions collaborating in the programme increased however and two Australian Zoos, Melbourne and Sydney, are also collaborating by keeping bachelor groups. Hodenhagen, Germany, and Wissel, The Netherlands, received emperor tamarins for the first time. A further three will enter the programme in 1999: Lille in France, Stuttgart in Germany, and Zagreb in Croatia. The main goal for 1999 is the publication of the husbandry guidelines as part of the Callitrichids EEP Primate TAG Husbandry Guidelines.

Acknowledgments: The invaluable support of The Board of Directors, Lisbon Zoo; the collaboration of all participating institutions, and the Lisbon Zoo staff, and others who contributed to the compilation of the studbook.

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Reference

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SPECIES INFORMATION SERVICE - AN UPDATE

Introduction

This report provides a brief update of progress in development of the SSC Species Information Service (SIS).



Development of a network-wide information management system was first prioritised with the adoption of SSC's 1994 strategic plan. The plan recognised that data, information, and expertise about species biology and status was SSC's most valuable asset. Opportunities offered by emerging electronic technologies coupled with increasing demands placed on SSC members to provide their information and

expertise for the IUCN Red List, Action Plans, CITES analyses and other advisory services, called for more comprehensive information management support to network members.

SIS is comprised of three elements: software, a data custodian model, and a central service unit. The software will be used by SSC Specialist Groups and IUCN Red List Authorities (in those instances where they are not the same entity), allowing them to collect and organise their data in a standardised form. Data will be managed in the context of a distributed data custodian model, with an aim to manage data as close to the source as possible, and capture the most current information available. In most cases the data custodian will be the Specialist Group. Through the central service unit, the SIS geo-referencing component will allow GIS linkage, thus enhancing the utility of the IUCN Red List as an analytical tool for management and conservation planning.

SIS will build capacity at three levels: 1) Specialist Groups and their members will be provided with the tools and training needed to strengthen their information management capacity; 2) SSC as a whole will be able to draw from the network-wide common framework to efficiently produce relevant and timely biodiversity conservation information products; 3) SSC will be positioned to contribute to integrated information products through the Biodiversity Conservation Information System (BCIS), a consortium of twelve international conservation organisations working together to produce better data for better conservation decisions. For more information on BCIS, go to <www.biodiversity.org, or contact the SSC secretariat>.

Progress to Date

Professors Luigi Boitani (member, SSC Executive and Steering Committees) and Andrew Smith (Chair, Lagomorph Specialist Group) are leading the SIS development process. The SIS Data Management Working Group (DMWG) guides development of the SIS software tool. It is comprised of members with expertise in informatics, information management and biodiversity analyses. Careful selection of the DMWG has ensured expertise representative of both terrestrial and aquatic species, plants, animals and invertebrates. As with the IUCN Red List Categories and Criteria, it is particularly challenging to develop a system relevant to the wide variety of life forms addressed by the SSC network, and the SIS planning team is committed to developing a software package and system that will support the needs and characteristics of all types of species.

General Program Development

Over the past 18 months, the SIS planning team has focused on development of the full Service. This effort has included not only software development, but also planning for sufficient support into the network, composition of the Central Service Unit, and planning for analytical products (biodiversity analyses). A significant amount of time has been devoted to raising funds for system implementation, including an effort to secure funds for Specialist Group participation. Proposals with the European Union DG XII (5th Framework) and the US National Science Foundation are now pending. Both include funding for Specialist Groups with Chairs based in Europe and the United States, respectively (a requirement of each of

these potential donors). Other small grants have been secured to support the SIS development process, and include funding for those Specialist Groups that are participating in the SIS testing phase (see below). Funding for SIS has been included in other programmatic budgets as well, for example proposals requesting support for developing SSC's freshwater capacity and Red List Programme. Copies of all funding proposals are available to Specialist Group Chairs. Please contact the SSC secretariat if you wish to see them.

Collaborative projects that will draw on SIS have been planned at the BCIS consortium level. For example, SSC, BirdLife International, the IUCN World Commission on Protected Areas and the World Conservation Monitoring Centre have designed a project to identify high concentrations of threatened species and analyse them against protected areas. Although the aim is to develop this capacity globally, BCIS is first proposing to test the concept in Mesoamerica, in collaboration with the IUCN Regional Office there (ORMA). SSC has chosen to pursue this project for several reasons, including relevance to information demands emerging from the CBD and the funding potential for SIS development (including support to Specialist Groups). The concept paper *Enhancing the Role of Protected Areas and Bio-Regional Planning in the Conservation of Threatened Species* is also available from the SSC secretariat upon request.

SIS Software Development

DMWG and representatives of several Specialist Groups met in November 1998 to evaluate the comments and critiques made to the first version of the SIS software (version 0.1), design the next version of SIS (content, structure, language, etc.) and plan for the second round of tests of the software, and prepare for the next stage of SIS implementation.

Based on the results and decisions made at that meeting, the next stages of SIS development (during the first half of 2000) were planned. One of the main tasks will be the completion of the software that is required. A three-step process was outlined to engage SSC members representing a wide variety of species. The process entails: 1) development of the 2nd trial software version (Version 0.2), to be completed by early November 1999; 2) review and test Version 0.2 throughout the remainder of 1999 and early 2000; 3) a workshop to agree to final revisions to Version 0.2, which will lead to the full working release version (Version 1.0). The workshop is scheduled to take place in Rome, Italy, in March 2000. Seven Specialist Groups have agreed to carry out in depth analysis of the software. These are the Mediterranean Island Plant, Orchid, Mollusc, Marine Turtle, Lagomorph, Primate, and Antelope Specialist Groups. BirdLife International and Wetlands International will test the system with their respective Specialist Groups as well. Representatives of the selected testing Specialist Groups, disciplinary Specialist Groups and SSC partners (e.g., BirdLife) will participate in the workshop.

Those Specialist Groups wishing to test the system that are not one of those selected for in-depth testing should contact Mariano Gimenez Dixon to discuss their intentions and to arrive at the most efficient and relevant testing approach for their SG.

Looking ahead

Once the trial software Version 0.2 is ready (early November) the testing Specialist Groups will be asked to: 1. Have a "hard-nosed" look at it and answer questions such as: Can it be used to manage the Specialist Group's data needs? Does it cover the modules and fields that are necessary? Is it user friendly? What are the problems? Can the data available be used in this system? (this includes importing existing data without too much difficulty). 2. Populate the system with data from the 50-100 species/populations identified to test SIS. 3. Compile the Specialist Group's comments and input to the SIS process and send these comments to SSC for their input at the workshop early next year.

From April 2000 onwards

Essential to the success of this process is timely follow-up to the decisions made at the workshop. Immediately following the workshop, the DMWG will meet to prepare the operational prescriptions to revise the software and programme the final (full release working) version (Version 1.0). The software is expected to be fully developed by September 2000 with the goal of presenting and officially launching it at the IUCN World Conservation Congress (Amman, Jordan, October 2000).

Following its presentation, the software will be distributed to all Specialist Groups and other relevant partners in the SSC network. Distribution will be by diskette or CD-ROM. Full implementation of the Species Information Service will begin with this distribution. It is anticipated that SIS implementation will phase in over a period of several years. Specialist Group Chairs should discuss timing with their respective SSC Program Officers, and determine resource needs and feasible phase-in. At that time, an appropriate SIS focal point within the Specialist Group will be discussed (noting that in most cases this will be someone other than the Specialist Group Chair). Further background information can be obtained at the following website: http://indaba.iucn.org/extranet/documents/BrowseUnit.cfmunit=SSC&cat=Meetings&folder=Rome_Meeting.

Mariano Gimenez Dixon, Programme Officer/SSC, IUCN - The World Conservation Union, rue Mauverney 28, CH-1196 Gland, Switzerland, Tel: 41 22 999 0155, Fax: 41 22 999 0015, e-mail: <mgd@hq.iucn.org>. Web site: <WWW: <http://iucn.org>>.

RAMON RHINE

We are sad to report that Ramon Rhine, Professor Emeritus of the Department of Psychology, University of California, Riverside, died on 9 November 1999. Professor Rhine earned his B.A. in Psychology from UC-Berkeley in 1950, his M.S. in Psychology from the University of Oregon in 1952, and his Ph.D. from Stanford University in 1955. Prior to joining the UCR faculty, he taught at the University of Massachusetts, Amherst, for one year and was a Systems Scientist Manager at RAND Corporation for nine years. He brought national and international recognition to the UCR campus through his service on professional committees and his extraordinary research record, addressing social attitudes, impression formation, social cognition, primate socialization, and baboon reproductive success. He established and managed a colony

of stumptailed macaque monkeys at UCR and a long-term baboon field station at Mikumi National Park in East Africa. His colony research focused on social dynamics and development and his field research on problems in behavioral ecology. The results of his research were published in 64 articles/chapters and 32 technical reports. Among his many fellowships and appointments, Professor Rhine received a Guggenheim Fellowship and was a Life Member of Clare Hall College at Cambridge University, a Visiting Scholar in the Zoology Department at Cambridge, and an Honorary Research Associate in the Psychology Department at Witwatersrand University (South Africa). He was an active member of the major professional society in his field, the American Society of Primatologists, acting as Chair of the Conservation Committee from 1992 to 1996. His research was funded by NSF, the Leakey Foundation, NIH, the National Geographic Society, the Guggenheim Foundation, the Foundation for Research Development (Republic of South Africa), and the International Science Foundation.

Throughout UCR, Professor Rhine was respected by all those who knew him; his influence will continue to be felt as a result of the many students he trained and his leadership in his department and on numerous Senate and systemwide committees. Besides serving as Chair of the Psychology Department and Chair of the Riverside Division of the Academic Senate, he served on or chaired academic personnel and personnel policy committees, both at UCR and at the systemwide level.

David H. Warren, Executive Vice Chancellor of UCR, wrote that Professor Rhine was a vital member of the UC Riverside community, both before and after his retirement. He joined the campus in 1964 and it is clear, if only from a brief summary of his record, how much he contributed to the reputation and operations of UCR through his 35 year tenure.

Gifts in memory of Professor Ramon Rhine are being accepted through the Department of Psychology for the American Society of Primatologists, Conservation Fund. Checks may be sent to Ms. Dianne Fewkes, Department of Psychology, University of California, Riverside, CA.92521, USA.

From: Primate-Science News Note, Larry Jacobsen <jacobsen@primate.wisc.edu>, WRPRC University of Wisconsin. Information kindly supplied by Mary Baker, Visiting Professor, University of California, Riverside, CA.

QUICK GUIDE TO THE WISCONSIN REGIONAL PRIMATE RESEARCH CENTER INTERNET PROGRAMS

The following Internet programs are run by the Wisconsin Regional Primate Research Center (WRPRC) at the University of Wisconsin - Madison, supported by grant number RR00167, Regional Primate Centers Program, National Center for Research Resources, the National Institutes of Health.

Primate Info Net (PIN): A WWW information resource for primatologists, includes taxonomy, endangered primates listings, the World Directory of Primatologists, newsletters, veterinary resources, etc. Documents can be viewed and downloaded locally. Connect to PIN at: <<http://www.primate.wisc.edu/pin>>.

Primate-Science: An electronic discussion forum for NCRR primate centers, and other research-based primate centers, laboratories, institutions and zoological gardens worldwide. You must have an electronic mail address and access to the Internet to participate in Primate-Science. To apply, fill out the Primate-Science application form at: <<http://www.primate.wisc.edu/pin/ps/pscentry.html>> or request an application form by sending a message containing "subscribe primate-science" (without the quotes) to: <primate-science-request@primate.wisc.edu>.

International Directory of Primatology (IDP): Coverage includes: (1) detailed entries for major primate centers, laboratories, educational programs, foundations, conservation agencies and sanctuaries, (2) a listing of field projects, (3) primate societies, and (4) population management groups. Connect to the International Directory of Primatology at: <<http://www.primate.wisc.edu/pin/idp/>>.

World Directory of Primatologists (WDP): A convenient Internet source of contact information for people in the field of primatology whose career interests involve or relate to primate research, conservation, education or veterinary medicine. Connect to the World Directory of Primatologists at: <<http://www.primate.wisc.edu/pin/idp/wdp.html>>.

Audiovisual Services: An archival collection of primate-related videotapes, slides and audiotapes which may be borrowed for research or educational purposes. To see the catalog of available videotapes, and instructions on how to borrow from the collection, link to: <<http://www.primate.wisc.edu/pin/av.html>>.

Askprimate: An Internet reference service available to the public. To ask a question or for referral, use the form at: <<http://www.primate.wisc.edu/pin/askprim.html>>.

Primate-Jobs: An Internet job listing service. It includes positions wanted and available. Connect at: <<http://www.primate.wisc.edu/pin/jobs>>.

Careers in Primatology: A source of information for those considering careers working with nonhuman primates. The URL is: <<http://www.primate.wisc.edu/pin/careers/careers.html>>.

For more information about WRPRC Internet Services, contact Ray Hamel, Special Collections Librarian, at <hamel@primate.wisc.edu>, or the Primate Center Library by phone: 1-608-263-3512, Fax: 1-608-263-4031, or e-mail: <library@primate.wisc.edu>.

Primate Societies

ASP CONSERVATION AWARD AND GRANTS

ASP The Conservation Committee of the American Society of Primatologists, chaired by Randall Kyes, approved the following awards on the 14th August 1999, during the Society's annual meeting, held in New Orleans, LA. **Conservation Award: Rondang S. E. Siregar** of Indonesia for her work with orang-utan rehabilitation and reintroduction and her commitment to primate conservation. **AJP Subscription Awards: Michael Abedi-Lartey** of the Ankasa Resource Reserve, Ghana; **Junus Daniel** of Sam Ratulangi University, Indonesia; **Edem A. Eniang** of the University of Uyo, Nigeria; and **Gabriel Ramos-Fernandez** of the Universidad Nacional Autonoma, Mexico. **Conservation Small Grants: Alex Degan**, University of Chicago, "The behavior of extinction: Predicting biogeographic patterns of lemur responses to habitat fragmentation in south-east Madagascar; **Kaberi Kar Gupta**, Arizona State University, "Ecology and conservation of slender loris in Kalakad-Mundanthurai Tiger Reserve, India"; **Joanna E. Lambert**, University of Oregon, "The influence of habitat conversion and hunting on primate populations in the Dja Faunal Reserve, Cameroon"; **Sahdin B. Lias**, Kinabatangan Orang-utan Conservation Project, Malaysia, "Solving orang-utan conflicts with local communities in the Kinabatangan floodplain, Sabah, Malaysia"; **Alecia B. Lilly**, Center of Orang-utan and Chimpanzee Conservation and SUNY - Stony Brook, "The effects of increasing human population density on intestinal parasite loads in gorillas (*Gorilla gorilla gorilla*), chimpanzees (*Pan troglodytes*), and indigenous human populations in and around the Mondika Research Center, Dzanga-Ndoki National Park, Central African Republic"; **Barita O. Manullang**, Wildlife Foundation of Indonesia, Indonesia, "Preliminary survey on population status and distribution of primate species in disturbed habitats after forest-fires in Central Kalimantan, Indonesia"; **Joseph A. Ntui**, Federal University of Technology, Nigeria, "A preliminary investigation of the chimpanzee (*Pan troglodytes*) in Oban Hills Forest Reserve, Nigeria"; **R. Ethan Pride**, Princeton University, "Population density, social behavior, and physiological stress in *Lemur catta*"; **Saúl Juan Solano**, Universidad Nacional Autonoma, Mexico, "A comparative study of resource use by groups of howler monkeys (*Alouatta palliata*) in isolated rain forest fragments in the region of Los Tuxtlas, Veracruz, Mexico"; **Sandra S. Suarez**, New York University, "Paternity, relatedness and male socio-reproductive behavior in red-bellied tamarins (*Saguinus labiatus labiatus*) in Bolivia: Training local investigators in field techniques"; **Elizabeth B. Yaap**, Harvard University, "An orang-utan conservation education programme for the Gunung Palung area, West Kalimantan, Indonesia". The 1999 *Senior Biology and Conservation Award* was not presented.

The Education Committee, chaired by Lynne E. Miller, also awarded prizes for the best student presentations at the meeting. **Christina J. Campbell**, Department of Anthropology,

University of California - Berkeley, won the oral presentation prize for her paper "Fur rubbing behavior in free-ranging black-handed spider monkeys (*Ateles geoffroyi*) in Panama". The prize for a poster presentation was given to **Jeffrey E. Fite**, co-authored by Jeffrey A. French, Department of Psychology, University of Nebraska - Omaha, for the study "The impact of infant care on sleep in marmosets (*Callithrix kuhlii*): Is less or disrupted sleep an additional cost of providing care to infants?".

EUROPEAN FEDERATION OF PRIMATOLOGY MEETING

The European Federation of Primatology will hold a scientific meeting in London on the 27-29 November, 2000. On Monday, 27th November there will be a series of workshops. Each will be run by two eminent primatologists. The topics will be in the areas of Behavioural and Physiological Development, Ecology and Sociality, and Cognition and Social Complexity (to be held at Roehampton Institute, London), and Genetics and Evolution, the Use of Primates as Research Models, and Viral Diseases in Simian Primates (to be held at Goldsmith's College, London). Applications will normally be considered from post-graduate students from EFP Societies. The workshops are available as half-day units and each participant will have the opportunity to attend two workshops. Further details about these workshops can be obtained from Ann MacLarnon, School of Life Sciences, Roehampton Institute, West Hill, London, SW15 3SN, U.K. Tel.: +44 (0) 20 8392 3524, Fax.: +44 (0) 20 8392, e-mail: <Life_Sciences@roehampton.ac.uk>.

During the following two days (28-29 November), a total of 14 to 16 talks will be given by invited speakers at the Meeting Rooms of the Zoological Society of London in Regent's Park, London. The main themes will be: Ecology and Conservation, Reproduction and Mating Systems, Evolution and Biology, and Cognition and Conflict. The following have agreed to present papers: Filippo Aureli, Mike Bruford, Alan Dixson, Robin Dunbar, Annie Gautier, Keith Hodges, Peter Kappeler, Bob Martin, Ronald Noë, Chris Pryce, Volker Sommer, Caroline Tutin, Jan van Hooft and Elisabetta Visalberghi. Further details about this part of the conference may be obtained from Hilary Box, Department of Psychology, University of Reading, Whitenights, Reading, RG6 2AL, U.K. Tel.: +44 (0)118 9316668, Fax: +44 (0)118 9316715, e-mail: <h.box@reading.ac.uk>.

The local organising committee for the conference is Bertrand Deputte (France), Hilary Box (UK), Ann MacLarnon (UK), Hannah Buchanan-Smith (UK) together with the invaluable assistance of both the President of the EFP, Régine Vercauteren-Drubbel (Belgium) and of the Primate Society of Great Britain, Phyllis Lee. Members of the advisory committee also include Fernando Colmenares (Spain) and Augusto Vitale (Italy).

We are delighted to have the opportunity to organise this meeting. It will provide many excellent opportunities for students and more senior colleagues in all aspects of primatology. It is worth noting that the dates of the meeting immediately precede that of the Winter meeting of the Association for the Study of Animal Behaviour that will also be held at the Zoological Society of London.

We shall provide more specific information about the EFP conference, its organisation and how to register in early 2000. This will be available on the PSGB web site: <http://www.psgb.org/>.

EUROPEAN MARMOSET RESEARCH GROUP



The European Marmoset Research Group (EMRG) is a non-profit organisation which was established in 1994 to facilitate interdisciplinary communication between institutions - academic and industrial - conducting biological and/or biomedical research with primates. The major goals of the EMRG are: 1) To identify the needs, capabilities, and susceptibilities of marmoset and tamarins in fundamental and applied research; 2) to optimise the laboratory maintenance of, and the experimental procedures performed on, marmosets and tamarins, relative to their needs, capabilities and susceptibilities; 3) to act as a forum for multidisciplinary information exchange via the organisation of workshops and publications, and affiliation to and interaction with other organisations; and 4) to identify the suitability in fundamental and applied research of marmosets and tamarins compared with other primate and non-primate species. The EMRG has published a *Handbook of Marmosets and Tamarins in Biological and Biomedical Research* (1997), produces a biannual newsletter, and has to date organised five workshops. The workshop proposed for April 2000 in Paris (see "Meetings") will bring together expert scientists, veterinarians, and technical personnel, on the one hand, and emerging doctoral and postdoctoral scientists on the other hand, in eight disciplines in the life sciences: Behavioural Neuroscience, Genetics, Immunology, Laboratory technology/management, Pharmacology, Reproduction, Toxicology and Wildlife biology.

The current Co-ordinating Committee is as follows: *President and Newsletter Editor* - Dr. Christopher Pryce, ETH, Zürich, Switzerland; *Secretary* - Dr. Annette Domenev, Neurofit, Illkirch, France; *Treasurer* - Hr. Christian Schnell, Novartis AG, Basel, Switzerland; *Liaison/Promotion* - Mrs. Leah Scott, DERA, UK; *Webpage Manager* - Hr. Michael Schwibbe, DPZ, Göttingen, Germany; *Regional Representatives - France* - Dr. Dr. Anne-Dominique Degryse, Pierre Fabre; *Germany* - Dr. Uwe Schönmann, DPZ, Göttingen; *Italy* - Dr. Augusto Vitale, Istituto Superior Di Sanita; *Netherlands* - Dr. Bert 't Hart, Primate Center TNO; *Scandinavia* - Dr. Tomas Ljungberg, University of Stockholm; *Switzerland* - Dr. Isabelle Allmann, ETH, Zürich; *UK* - Dr. Peter Pearce, DERA; *USA* - Prof. David Abbott, University of Wisconsin, Madison; *South America* - Prof. Anthony Rylands, Center for Applied Biodiversity Science, Conservation International, Washington, DC.

Formal membership procedures were introduced at a meeting of the EMRG in 1998. Persons considered by the Co-ordinating Committee to possess relevant experience of marmosets and tamarins in the laboratory or in the field are eligible for membership; the aim of which is to contribute to the pursuit and realisation of EMRG objectives. A candidate for membership shall apply using the form available on the home

page or from the Secretary: Dr. Annette M. Domenev, Secretary EMRG, Neurofit, rue J. Sapidus, Parc d'Innovation, 67400 Illkirch, France, e-mail: <domenev@tpgnet.net>. The candidate must be proposed by two members, both of whom know the candidate and his work. A modest annual subscription applies to members for all countries except for the USA, Japan and in South America (due to prohibitive bank charges). There is no annual subscription for students. EMRG web page: <www.dpz.gwdg.de/emrg/emrgcons.htm>.

Christopher Pryce, EMRG President, Behavioural Neurobiology Laboratory, Swiss Federal Institute of Technology, Schorenstrasse 16, CH-8603 Schwerzenbach, Switzerland. E-mail: <pryce@toxi.biol.ethz.ch>.

DONALD G. LINDBURG RECEIVES THE AZA PRESIDENT'S AWARD



Donald G. Lindburg, founder and former President of the American Society of Primatologists was awarded the American Zoo and Aquarium Association (AZA) President's Award. Is especially well-known for his work over 30 years on macaques, but has also studied cheetahs, lemurs, condors, rhinoceroses, drills, and golden monkeys. He was editor of *Zoo Biology*, and is species co-ordinator for the Giant Panda (AZA). From: *ASP Bulletin* 23(2): 5, June 1999.

Recent Publications

AFRICAN PRIMATES

A bumper issue, Volume 3 (1-2) (1997-1998), of the IUCN/SSC Primate Specialist Group newsletter, *African Primates*, has been published (Editors, Thomas M. Butynski and Debra L. Forthman). It was sponsored by the Zoo Atlanta's Conservation Action Resource Center (ARC), the National Museums of Kenya's Institute of Primate Research and Centre for Biodiversity, and the Dian Fossey Gorilla Fund-International, Atlanta, Georgia. Published with this issue is a supplement of a Report for the Ape Alliance by E. Bowen-Jones - "A Review of the Commercial Bushmeat Trade with Emphasis on Central/West Africa and the Great Apes" (42pp.). *Contents - Articles*: Conservation in Cental Africa: Time for a more business like approach - K. Amman, pp.2-6; Growing commerce in bushmeat destroys great apes and threatens humanity - A. L. Rose, pp.7-12; The drill - integrated *in situ* and *ex situ* conservation - E. L. Gadsby & P. D. Jenkins Jr., pp.12-18; De Brazza's monkeys *Cercopithecus neglectus* in the Kisere National Reserve, Kenya - J. Chism & M.Cords, pp.18-22; Survey of endangered primates in the forest reserves of eastern Côte d'Ivoire - W. S. McGraw, I. T. Monah & M. Abedi-Lartey, pp.22-25; Demography of chimpanzees *Pan troglodytes schweinfurthii* in Budongo Forest, Uganda - V. Reynolds, pp.25-28; Pygmy chimpanzees, bonobo, or gracile chimpanzee: What's in a name? - A. Kortlandt, pp. 28-35. *Notes*: Human relations with chimpanzees: A proposed code of

conduct - G. Teleki, pp.35-38; Lessons in self-medication from great apes?, pp.38-39. Précision de la situation du chimpanzé (*Pan troglodytes verus*) en Guinée Bissau: Une enquête en cours - E. Féron & F. Correia, pp.39-40; Birth of a wild gorilla - W. Betunga, pp.40-41; Elephant dung: A food source for the crested mangabey *Cercobus galeritus* - A. Gautier-Hion, pp.41-42; *Pseudopotto martini*: A new potto? - C. Groves, pp.42-43; *Pseudopotto*: When is a potto not a potto? - S. K. Bearder, pp.43-44; The validity of "*Pseudopotto martini*" - E. Sarmiento, pp.44-45; The problem of sub-species: a further comment - V. Birstein, pp.45-46; How to define a subspecies? - P. Leyhausen, pp.46-47; Baboon nomenclature - C. Jolly, pp.47-48; Current problems with *Papio* taxonomies - E. Sarmiento, pp.48-52; Foreign aid and conservation of tropical forests: An action plan for change - T. T. Struhsaker & C. Oren, pp.52-53; Convention Africaine por la Conservation de la Nature et des Ressources Naturelles, pp.53-55.

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Meetings

Primate Society of Great Britain - Millenium Meeting, 1 April 2000, Flett Lecture Theatre, British Museum (Natural History), London. The theme of the meeting is "Primates: Our past, their future". It will be a public understanding of science/primatology event, and will be associated with the Natural History Museum's two-week millenium celebration. Speakers will include Mike Bruford (Institute of Zoology), Robin Dunbar (University of Liverpool), John Fleagle (SUNY at Stony Brook), Phyllis Lee (University of Cambridge), and Steve Mithen (University of Reading). For more information, please contact: Dr. Mark Collard, Department of Anthropology, University College London, Gower Street, London WC1E 6BT, UK, Tel: +44 (0)171 380 7842, Fax: +44 (0)171 380 7728, e-mail: <m.collard@ucl.ac.uk>.

2000 Workshop of the European Marmoset Research Group (EMRG): Inter-disciplinary Research and Training in Primate Biological and Biomedical Research, 3-5 April 2000, Forest Hill Hotel, Cité des Sciences, Paris. Funded by the European Commission Human Potential Programme. Keynote

lectures, paper sessions and roundtable discussion sessions will be held on the following topics: Behavioural Neuroscience, Genetics, Immunology, Laboratory technology/management, Pharmacology, Reproduction, Toxicology and Wildlife biology. For more information, please contact: Dr. Annette M. Domeney, Secretary EMRG, Neurofit, rue J. Sapidus, Parc d'Innovation, 67400 Illkirch, France. EMRG web page: <www.dpz.gwdg.de/emrg/emrgcons.htm>.

69th Annual Meeting - American Association of Physical Anthropologists, 12-15 April 2000, Adam's Mark Hotel, Riverwalk, San Antonio, Texas. For program information: Mark Teaford, Department of Cell Biology & Anatomy, Johns Hopkins University, School of Medicine, 725 N. Wolfe Street, Baltimore, MD 21205, USA, Tel: 410 955 7034, Fax: 410 955 4129, e-mail: <mteaford@jhmi.edu>. Local arrangements: Sarah Williams Blangero, Department of Genetics, Southwest Foundation for Biomedical Research, P. O. Box 760549, San Antonio, TX 78245-0549, USA, Tel: 210 258 9434, Fax: 210 670 3317, e-mail: <sarah@darwin.sfbr.org>.

Association for the Study of Animal Behaviour General Meeting, 17-19 April 2000, University of Sheffield, UK. Please contact: Dr. M. Siva-Jothy, Department of Animal and Plant Sciences, University of Sheffield, Sheffield S10 2UQ, UK, e-mail: <m.siva-jothy@sheffield.ac.uk>.

International Conference - The Apes: Challenges for the 21st Century, 10-13 May 2000, Brookfield Zoo, Brookfield. Keynote speakers include: David J. Chivers (lesser apes); Carel van Schaik (orangutans); Gay Reinartz (bonobos); Claudia Olejnickzak (gorillas); and Toshishada Nishida (chimpanzees). The plenary speaker is Russell A. Mittermeier (Chair, PSG and Conservation International). Immediately following the Conference, the Lincoln Park Zoo, Chicago, will host the North American Ape Taxon Advisory Group meetings. Information on registration and submission of abstracts: Ape Conference Planning Committee, Brookfield Zoo, Brookfield, Illinois 60513-0719, USA, Tel: 708 485-0263 x 604, Fax: 708 485-3140, e-mail: <apecon@brookfieldzoo.org>.

EcoSummit 2000: Integrating the Sciences, 18-22 June 2000, Halifax, Nova Scotia. The theme is "Understanding and Solving Environmental Problems in the 21st Century". For more information: Amy Richardson, EcoSummit 2000 Secretariat, Elsevier Science, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK, Tel: +44 (0)1865 843643, Fax: +44 (0)1865 843958, e-mail: <a.richardson@elsevier.co.uk>, or in North America to: EcoSummit 2000 Seceteriat, PO Box 1656, New York, NY 10116-1656, USA. Website: <www.elsevier.com/locate/ecosummit>.

American Society of Primatologists - 2000 Meeting, 21-24 June, Regal Harvest House, Boulder, Colorado. The web site for the hotel is <www.boulder@regal-hotels.com> (under hotel directory click on boulder) and information regarding the Boulder area can be located at <www.visitorsbureau@chamber.boulder.co.us>. Local Arrangements Chair: Mark Laudenslager. For preliminary information on the meeting itself: <www.asp.org/asp2000/>.

3rd International Symposium-Workshop on Frugivores and Seed Dispersal: Biodiversity and Conservation Perspectives, 6-11 August, 2000, Hotel Fazenda Fonte Colina Verde, São Pedro, São Paulo, Brazil. For more information: Museu de História Natural, Instituto de Biologia, UNICAMP, Caixa Postal 6109, 13083-970 Campinas, São Paulo, Brazil, Fax: (019) 289-3214, e-mail: <frug2000@unicamp.br>. Web site: <http://www.unicamp.br/ib/f2000>.

Measuring Behavior 2000 - 3rd International Conference on Methods and Techniques in Behavioral Research, 15-18 August, 2000, Nijmegen, The Netherlands. For more information: Wineke Schoo, Measuring Behavior 2000, PO Box 268 6700, AG Wageningen, The Netherlands, Tel: +31 317 497677, Fax: +31 317 424496, e-mail: <mb2000@noldus.nl>, or <w.schoo@noldus.nl>. Web site: <http://www.noldus.com/events/mb2000/>.

European Federation of Primatology Meeting, 27-29 November, 2000, London, UK. Monday, 27 November there will be a series of workshops, each run by two eminent primatologists. Further details can be obtained from Ann MacLarnon, School of Life Sciences, Roehampton Institute, West Hill, London, SW15 3SN, U.K. Tel.: +44 (0) 20 8392 3524, Fax: +44(0)208392; E-mail: <Life_Sciences@roehampton.ac.uk>. During the following two days (28-29 November), a total of 14 to 16 talks will be given by invited speakers at the Meeting Rooms of the Zoological Society of London in Regent's Park, London. The main themes will be: Ecology and Conservation, Reproduction and Mating Systems, Evolution and Biology, and Cognition and Conflict. Further details about this part of the conference may be obtained from Hilary Box, Department of Psychology, University of Reading, Whitenights, Reading, RG6 2AL, U.K. Tel.: +44 (0)1189316668, Fax: +44 (0)1189316715, E-mail: <h.box@reading.ac.uk>.

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British Ecological Society '2000' Winter Meeting, 3-5 January 2001, University of Birmingham, England, UK. For more information: British Ecological Society, 26 Blades Court, Deodar Road, Putney, London SW15 2NU, England, UK.

XVIIIth Congress of the International Primatological Society, 7-12 January 2001, Adelaide, Australia. Hosted by the Australasian Primate Society, President Mr. John Lemon, Western Plains Zoo, Dubbo, NSW. Theme: "Primates in the New Millennium". Mr. Graeme Crook is Chairman of the Organizing Committee. *Symposia* - Participants wishing to register a symposium title must submit a 200 word abstract by 31 July 1999. E-mail to Carla Litchfield <aclitch@terra.net.au>. Titles of accepted symposia will be published on the webpage from August 1999. *Papers* - An abstract of 100 words is required. E-mail to Carla Litchfield <aclitch@terra.net.au>. Closing date for first call for papers: 31 January 2000. Closing date for second call for papers: 31 May 2000. A final list of papers will be published on the Internet by 30 June 2000. For more information, and to be put onto the Congress Organizer's mailing list, write to: Conventions Worldwide, PO Box 44,

Rundle Mall, SA 5000, Australia, Tel: +61 8 8363 0068, Fax: +61 8 8363 0354, e-mail: <satconv@camtech.net.au>, sending your postal address.

International Conference "Ecology of Insular Biotas", 12-16 February 2001, Victoria University of Wellington, Wellington, New Zealand. Focus: ecological patterns and processes of importance to isolated biotas, including true islands, and natural and artificial habitat islands. Examples of topics for papers include: dispersal and gene flow within and among isolated populations; ecology of small populations; ecological consequences of disharmonic floras and faunas; the relevance of island biogeography principles in conservation; islands as model ecosystems; and comparative ecology of true islands vs. habitat islands. Abstracts may be submitted electronically on the webpage (<http://www.vuw.ac.nz/sbs/conferences/island.shtml>) and submitting the requested information to <sbs-islands-conf@vuw.ac.nz>. Deadline for abstracts is 1 October 2000. If web access is not available, contact Dr. Christa Mulder, School of Biological Sciences, Victoria University of Wellington, P.O. Box 600, Wellington, New Zealand. The complete scientific program will be available on the conference website by 15 November 2000.

14th Annual Meeting of the Society for Tropical Ecology, 14-16 February 2001, Zentrum für Marine Tropenökologie (Center for Marine Tropical Ecology), Bremen, Germany. Topics: Aquatic ecosystems, Neotropics, Interdisciplinary research. Free topics in tropical ecology. Contact: Zentrum für Marine Tropenökologie, Fahrenheitstr. 1, D-28359 Bremen, Germany, Tel: +49 421-2380-029, Fax: +49 421-2208-330, e-mail: <gtoe2001@zmt.uni-bremen.de>, Homepages: <<http://www.gtoe.de>>, <<http://www.uni-bremen.de>>.

Contributions

Besides short articles, principally on the ecology, distributions, taxonomy and conservation of New World primates, we would be most grateful if you could send us information on projects, research groups, expeditions, surveys, events, recent publications, completed theses and dissertations, activities of primatological societies and NGOs, news items, considerations on, or summaries of, recent events, and suchlike. Manuscripts should double spaced and accompanied by the text in diskette for PC-compatible text-editors, MS-Word, Wordperfect. Articles, not generally exceeding 8 pages, double spaced, can include black and white photographs, high quality figures and maps, tables and references, but please keep them to a minimum. A special plea regarding maps – please make sure they are of publishable quality. The large majority submitted, including those on the backs of envelopes, are not!

Please send contributions to: **Anthony B. Rylands**, Center for Applied Biodiversity Science, Conservation International, 2501 M Street NW, Suite 200, Washington, DC 20037, USA, Tel: +1 202 974 9714, Fax: +1 202 331 0570, or **Ernesto Rodriguez Luna**, Instituto de Neuroetologia, Universidad Veracruzana, Apartado Postal 566, Xalapa, Veracruz 91000, Mexico, Fax: +52 (28) 12-5748.

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Neotropical Primates is produced in collaboration with Conservation International, Center for Applied Biodiversity Science, 2501 M Street NW, Suite 200, Washington, DC 20037, USA, and Fundacao Biodiversitas, Av. do Contorno 9155, 11° andar, Prado, Belo Horizonte, 30110-130, Minas Gerais, Brazil.

Design and composition: Glenda P. Fábregas, Center for Applied Biodiversity Science, Conservation International, Washington, DC.

Neotropical Primates ISSN 1413-4703.
 Abbreviated title: *Neotrop. Primates*.



This issue of *Neotropical Primates* was kindly sponsored by the **Margot Marsh Biodiversity Foundation**, 432 Walker Road, Great Falls, Virginia 22066, USA, the **Houston Zoological Gardens Conservation Program**, General Manager Donald G. Olson, 1513 North MacGregor, Houston, Texas 77030, USA, the **Los Angeles Zoo**, Director Manuel Mollinedo, 5333 Zoo Drive, Los Angeles, California 90027, USA and the **Grupo de Trabalho em Biodiversidade (GTB)**, through the Brazilian National Science Research Council (CNPq), Gustavo A.B.da Fonseca, Coordenador do GTB, c/o Conservation International do Brasil, Avenida Antônio Abrahão Caram 820/302, 31275-00 Belo Horizonte, Minas Gerais, Brazil.



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