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Neotropical Primates

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POPULATION GROWTH IN THE BELIZEAN BLACK HOWLING MONKEY (*ALOUATTA PIGRA*)Robert H. Horwich¹, Robin C. Brockett^{1,2}, Roxie A. James^{1,3} and Clara B. Jones^{1,4}¹Community Conservation, Inc., RD 1, Box 96, Gays Mills, Wisconsin 54631, USA.²Zoo Atlanta, Atlanta, Georgia 30315, USA.³Kean College, Union, New Jersey 07083, USA.⁴Livingstone College, 701 W. Monroe Street, Salisbury, North Carolina 28144, USA.

Abstract

Population growth in black howling monkeys (*Alouatta pigra*) was studied in an area of 0.63 km² from 1990 to 1999 at the Community Baboon Sanctuary, Bermudian Landing, Belize, Central America. Population density increased over time, and population growth was found to be density-dependent, with a higher rate of increase between 1991-1996 than between 1997-1999. The shape of the age distribution of the population was similar across years, although the proportion of adult males in the population decreased significantly with increased population density. Changes in membership over time for 18 monkey groups suggested that population growth may also result from an increase in the number of groups and length of tenure of groups. Groups with no or only one immature (infant, juvenile, or subadult) were confined to the period of population increase. Although more male infants were estimated to have survived to the juvenile age class, the result was statistically insignificant. Interbirth intervals were within the range for other species of *Alouatta*. Our results also indicate that increased population density and consequent increases in mean group size decrease the ability of single males to monopolize female groups due, in part, to decreased opportunities for single males to found new groups. A consequence of this condition would be increased male-male competition for mates.

Key Words - *Alouatta pigra*; Belize; population growth; intrinsic rate of increase; age distribution; infant survival; male strategies.

Introduction

Alouatta pigra, the black howling monkey, has the most restricted geographical distribution of any species in the genus (Wolfheim, 1983). It is found in undisturbed and disturbed habitats of southern Mexico, northern Guatemala, and Belize (Horwich and Lyon, 1987; Wolfheim, 1983) and appears to favor riparian and seasonally flooded forests (Horwich and Johnson, 1986; Lyon and Horwich, 1996). Black howlers are classified at a low risk of extinction according to the Mace-Lande system (Rylands *et al.*, 1995), although populations may be locally endangered or extinct (Horwich *et al.*, 1993). Like all of the other species of *Alouatta* except *A. palliata* (the mantled howling monkey), *A. pigra* are generally organized into polygynous demographic subunits of one adult male and two or three adult females in addition to immatures (Crockett and Eisenberg, 1986; Wolfheim, 1983; Chapman and Balcomb, 1998; Horwich *et al.*, in press). Like other howlers, however, variation in population structure is noteworthy (Crockett and Eisenberg, 1986), ranging from single male-single female to multimale-multifemale subunits (Bolin, 1981; Horwich and Gebhard, 1983; Horwich *et al.*, in press).

As discussed by Ricklefs (1979) and Begon and Mortimer (1986), populations of organisms may be increasing in number, decreasing, or may be found at a stable equilibrium. These authors point out that population trends may be correlated with variations in food supply, climate, predators, parasites, or other factors (e.g., habitat disturbance). Changes in population numbers during a specified time period can be classified as "stabilizing" (density-dependent) or "non-stabilizing" (density-independent), and the relative role

of each in regulating population growth has been sharply debated. Density-dependent factors imply competition for limited resources such as food or space, which influences the survival and reproduction of individuals with consequent results upon the growth of populations. Predation is also generally density-dependent, varying with the density of the population, with predation pressure increasing with increases in population growth. Density-independent factors (e.g., climate) influence population growth without regard to density, and density-independent and density-dependent factors may interact. Here we report studies of population growth in the Belizean black howling monkey (*A. pigra*) and discuss the observed results in terms of current evidence for other species of the genus.

Methods

Study area, site, and animals

The study was conducted at the Community Baboon Sanctuary (CBS, 17°33'N, 88°35'W), a managed reserve of 47 km² formed in 1985 by a cooperative agreement among private landowners (Horwich, 1990). Black howlers are the only primate species found at the CBS and are not hunted there. The CBS is a mosaic of small farms, pastures, and secondary tropical moist semi-deciduous forest fragments, including riparian habitat along the Belize River (Horwich and Lyon, 1990; Lyon and Horwich, 1996). The primary study area of 0.63 km² is composed of mapped trails, including mapped and identified trees. The landscape of the CBS is continuously changing due to farming, including "milpa"

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(slash-and-burn) agricultural practices and clearing for other reasons (Lyon and Horwich, 1996). Nonetheless, large areas of the CBS are revegetating, providing habitat for the monkeys. From 1985 to 1999, home ranges have contracted, and maps demonstrate that population increase has resulted in howlers settling previously unoccupied habitat, in new units settling in areas of home range overlap between existing groups, and in the increase of home range overlap (R. Horwich, unpublished data). Consistent with these observations, our maps show that colonization is the primary outcome of bisexual dispersal (Horwich *et al.*, 2000), similar to polygynous *A. seniculus* in Venezuela (Pope, 1992) and differing from polygynandrous *A. palliata* at La Pacifica, Costa Rica, which primarily immigrate into existing groups (Glander, 1992). Howlers are generally regarded as "pioneer species" (Eisenberg, 1979).

Details of the study site can be found in Horwich and Lyon (1990) and Silver (1998; also see Silver *et al.*, 1998). In brief, forest rhythms are seasonal, with new leaf production occurring mainly during the early rainy season (late May or early June). In the Belize District of northern Belize, flower production demonstrates a large peak during the dry season (February through May), with a second, smaller peak occurring about one month after the initiation of the rainy season. Fruit is available to black howlers in every month, but availability peaks near the end of the dry season and shortly after the initiation of the rainy season. Silver (1998; also see Silver *et al.*, 1998) found that fruit accounted for about 41% of the diet of black howlers at the CBS while young leaves made up about 37% of the diet for these wholly herbivorous monkeys.

During our studies, we were able to discriminate four habitat types inhabited by black howlers: late successional, early successional, pasture, and marsh. Both late successional and early successional habitats are dominated by *Coccoloba hondurensis* ("black grape") and *Inga vera* ("bri-bri") with three other species having a relative dominance >5% (*Lonchocarpus* sp. 1, *Guazuma ulmifolia*, *Cobuna orybigna*) (Silver, 1998). The habitats were discriminated by canopy height and canopy cover. Late successional canopy height was estimated to vary from 60 to 100 feet while early successional canopy height was <50 feet. Late successional canopy cover varied from 50 to 100%, while early successional cover was less than 25%.

Data collection and analysis

A. pigra have been studied at the CBS since 1979 (Bolin, 1981), with systematic research beginning in 1983 (Horwich and Gebhard, 1983). Researchers surveyed and mapped a 4.05 km² area from 1985 to 1989, concentrating on the 0.63 km² study area from 1990-1999, the time period comprising the present report. Data for 1994 were incomplete and therefore eliminated from our analyses. In the study site, more than 1500 trees have been tagged and mapped. Marking of animals and related genetic and morphometric studies began in 1990, and an estimated 5,000 h of observation time has been devoted to the black howlers at the CBS by our research group. The surveys were initiated by R.H.H. and his field assistants, and were continued yearly until 1992 when monthly censusing and mapping of home ranges were undertaken by

R. H. H. and R. C. B. and their field assistants. *Ad libitum* behavioral observations were also made during these periods of study, concentrating especially on male takeovers, patterns of dispersal, and social behavior within groups (Brockett *et al.*, 1999; Brockett *et al.*, 2000; Horwich *et al.*, 2000). Age/sex classification followed the system of Clarke (1990) for *A. palliata*, and sub-adults were counted as juveniles. Unmarked individuals were identified by scars, broken bones, or other distinguishing features (e.g., ectoparasites), a possible source of error in the present study.

Our census protocol depended upon enlarged topographic maps (1:1,200) of the study site upon which repeated sightings of monkeys were marked daily for the duration of each study period. We defined a demographic group as any bisexual unit of two or more (reproductive) individuals on a home range. "True censuses" (Smith, 1966) were possible because we had the manpower to count every individual black howler monkey encountered in the target areas, because black howlers are relatively sedentary and faithful to their home range, because howlers are relatively easy to locate due to their vocalizations, because we assumed that mortality and recruitment were negligible during the census periods, and because we assumed that each individual of the focal population had an equal likelihood of being counted. Our maps yielded quadrats which were assigned to survey parties of 2-5 fieldworkers daily, and efforts were concentrated between 0600-1100 and 1400-1700 when black howlers are most active. Survey parties initiated their search in the study area walking at ~1,250 m/h on parallel transects through the forest ~20 m apart. One member of each search party walked ~15 m behind the other surveyors, most of whom were familiar with the habits of black howlers and were experienced field workers, local inhabitants, or students. Return walks and rotation of observers between transects on different days were conducted opportunistically, a possible source of error. When an individual or group of monkeys was sighted, observers recorded pertinent information (e.g., identity or distinguishing marks, age/sex classification, time, weather conditions, behaviors) and remained in the vicinity of the individual or group for at least 1 h. Individual and group positions were recorded on maps for later analysis and estimation of home range sizes. Surveys were rarely conducted in the rain. Because of the frequency of surveys at this site and the large number of fieldworkers involved, we believe that our data represent a confident assessment of black howler population numbers at the CBS.

Our measures of population density are "crude density" estimates (numbers/total area). Two-tailed statistical tests are used for statistical analyses, and level of significance was set at 5%.

Results

Growth rate of population

Figure 1 shows population size and population density for the nine survey years. The intrinsic rate of population increase was computed for two time periods: 1991 to 1996 and 1997 to 1999. Population increase from 1991-1996 was 0.07, from 1997-1999, 0.01. These results indicate that population growth for black howlers at the CBS is density-dependent (see Ricklefs, 1979, p.324), demonstrating an initial period of modest increase,

possibly as a result of recovery from the 1979 population crash and slowing with time. Population growth from 1990 to 1999 may partially reflect growth in howler numbers occasioned by cooperative conservation agreements with landowners at the CBS.

Age distribution of the population

Figure 1 shows the age distribution (percent of individuals in different age classes) of the black howler population at the CBS from 1990 to 1999. If the proportions of the immature age classes (infants, juveniles, and subadults) are summed, immatures represent a relatively large proportion of adults in the population for all years, suggesting that the population is neither rapidly increasing nor declining.

In an attempt to assess the stability of the population over time, a chi square test of proportions was performed for each age classification across the nine years of study. Significant differences in proportions of infants, juveniles, subadults, or adults across years would indicate that density-independent factors are in effect. Insignificant differences across years would suggest that density-dependent factors shape population architecture in important ways. No comparisons were statistically significant (Infants: $\chi^2 = 14.27$, $df = 8$; Juveniles: $\chi^2 = 8.35$, $df = 8$; Subadults: $\chi^2 = 9.8$, $df = 8$; Adults: $\chi^2 = 6.27$, $df = 8$). This pattern implies a stable age distribution and a population that is not rapidly expanding (Odum, 1971).

What is the relationship between increasing population density and age/sex class? While proportions of infants ($r = 0.36$, $df = 7$) and juveniles ($r = 0.64$, $df = 7$) are positively correlated with population density, these coefficients are not statistically significant. Proportions of subadults per year are negatively correlated with increasing population density ($r = -0.32$, $df = 7$), a statistically insignificant coefficient. Proportions of adult females are negatively correlated with increasing population density ($r = -0.34$, $df = 7$); however, this coefficient is, likewise, not statistically significant. Proportions of males in populations are negatively and significantly correlated with increasing population density ($r = -0.78$, $P < 0.02$, $df = 7$). Thus, as population density increased, the proportion of males in black howler populations at the CBS decreased from 1990 to 1999. Coefficient of determination (r^2) equals 0.61. Thus, 61% of the variance in male population numbers is attributable to population density. This relationship is complicated, however, by the observation that, as population density increases, the proportion of groups with >1 male ("multimale groups") increases ($r = 0.59$, $df = 7$, n.s.). Overall, increased population density leads to a decreased proportion of adults in the population ($r = -0.78$, $P < 0.02$, $df = 7$), primarily accounted for by decreases in the proportion of adult males.

Changes in group membership

Table 1 exhibits changes in group membership by age/sex class from 1990 to 1999. Eight (44%) groups had a relatively brief tenure on the study site (≈ 5 years) showing that extinction of groups is a relatively common occurrence during the early years of population increase. This finding suggests that population growth may also result from an increase in the number of groups and length of tenure of groups. The number of groups in the study site increased from 11 to 16 from 1990 to 1999. While

net changes in group membership across years are often positive, net changes across years are small (generally fewer than 5 individuals). The same row as well as inspection of specific groups also indicates that juveniles, subadults, and adults of both sexes emigrate from and immigrate into groups (Brockett *et al.*, 2000).

A related finding of our study demonstrates that of the 128 group counts between 1990 and 1999, 24 (19%) exhibited no or only one immature (infant, juvenile, or subadult). All of these groups were observed from 1990 to 1996 during the period when rate of increase was highest. This result may reflect the establishment of new groups during the phase of population expansion.

Related demographic events in populations

Figure 2 shows our results for mean group size per census year, mean number of males per group per census year, and mean number of adult females to mean number of adult males per

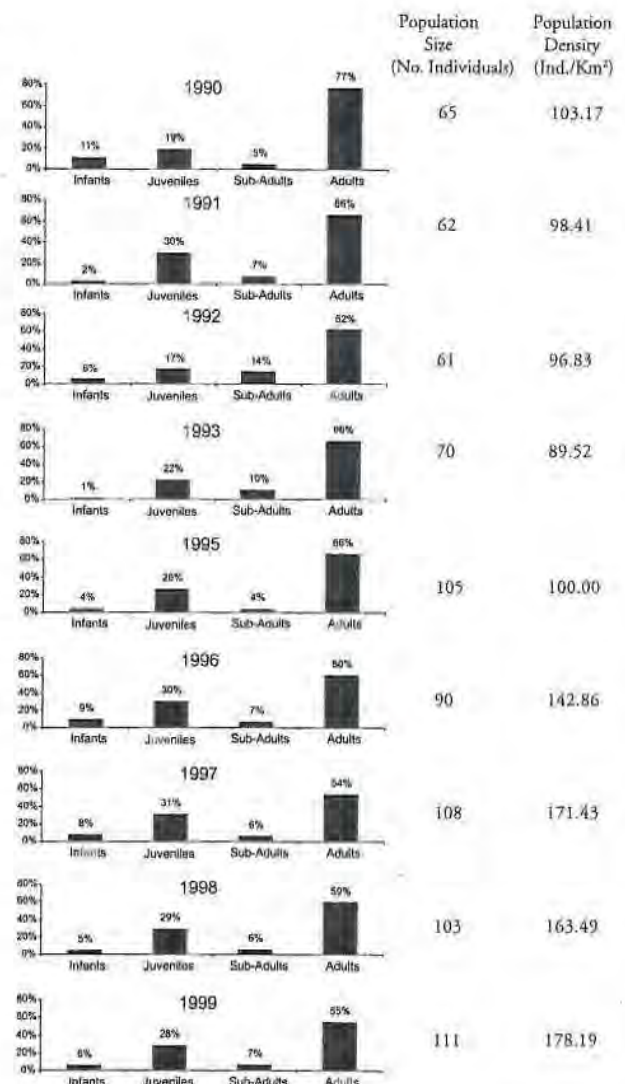


Figure 1. Age distribution per census year (1990 - 1999) for the black howling monkey (*A. pigra*) at the CBS. Population size per year (number of individuals) and population density (individuals/km²) per year displayed to right of each yearly histogram.

Table 1. Changes in group membership of black howlers at the Community Baboon Sanctuary, 1990-1999. Numbers represent net annual changes in each age/sex class for period of group tenure on study site (dates).

GROUP	AGE/SEX CLASS								TOTAL
	Adult Males	Subadult Males	Juvenile Males	Infant Males	Adult Females	Subadult Females	Juvenile Females	Infant Females	
School 1990-99	0	0	0	0	0	+2	-1	0	+1
Baizar 1991-96	+1	0	-1	+1	0	0	+2	+1	+4
Fig 1990-99	0	0	+1	+1	0	0	+1	+1	+4
Joseph 1995-99	0	0	0	+1	0	0	-1	+2	+2
Swamp 1990-99	+1	+2	+1	0	+2	0	0	0	+6
Baptist 1990-99	-1	+1	+3	+1	0	0	+1	+1	+6
Roxie 1995-99	0	0	-1	+2	0	0	0	0	+1
Vincente 1995-99	-1	0	-1	0	0	0	0	0	-2
River 1995	0	0	0	0	0	0	0	0	0
Wade 1990-99	+1	+1	+1	+1	-1	0	+1	+1	+5
Bamboo 1990-99	-1	0	-2	+2	-3	-3	-2	0	-9
Marsh 1990-95	-1	+1	+1	0	0	0	+1	0	+2
Della's 1090-99	0	-2	-3	+4	-1	0	0	0	-2
Y 1990-99	-1	+1	-1	+1	0	0	+1	0	+1
Peninsula 1990-99	-1	+1	+5	+1	-1	0	-4	+4	+5
No. A 1990-99	+1	0	+3	+2	-1	0	-1	0	+4
A 1990-95	+1	0	+1	+1	-1	0	0	0	+2
Ghost 1993-99	+1	+1	+1	0	-1	0	+2	+1	+5
TOTAL	0	+6	+8	+18	-7	-1	0	+11	+35

census year. Mean group size per year correlates positively with population density. ($r = 0.64$, $df = 7$, n.s.). Coefficient of determination (r^2) equals 0.41. Thus, 41% of the variance in group size is attributable to population density. Mean number of males per group in the population demonstrates a weak positive correlation with population density ($r = 0.26$, $df = 7$, n.s.). Mean number of females:mean number of males per group is not correlated with population density ($r = -0.12$). These findings show that, on average, mean group size is strongly affected by population density and that, on average, numbers of males per group remain relatively stable. Adult sex ratio in the population appears to be independent of population density.

Infant survival and mortality

Based upon an analysis of individually recognized adult females, infant survival was approximated by comparing the number of infants of each sex born in each group per year against the number of juveniles counted in the subsequent year. Thus, if an infant was born in one year and the juvenile age/sex class was not increased by one in the subsequent year, the infant was presumed to have died. Forty-four (44) infants were born from 1990 to 1998. Nineteen (19) infants survived (43%), 12 (63%) of these males (binomial test= 0.0961). Thus, survival appears to affect male and female infants equally.

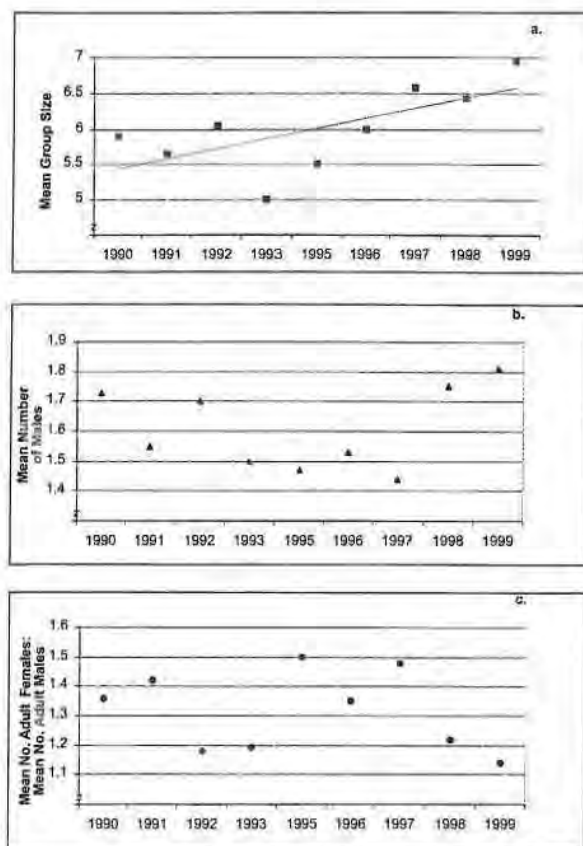


Figure 2. Changes in *A. pigra* population characteristics, 1990–1999 (a, mean group size per census year; b, mean number of males per census year; and, c, mean number of adult females: mean number of adult males per census year.)

Interbirth intervals

Mean interbirth interval (IBI) for the present study was 19.4 months ($N = 64$ IBIs for 32 individually identified females, range = 10–35 months).

Discussion

The present report demonstrates density-dependent population growth for black howlers at the CBS. Figure 1 appears to demonstrate a stable profile. It would be a mistake, however, to consider this description of the population's status as a permanent state or as a linear progression of population growth to be maintained indefinitely. Bolin's (1981) description of a low-density population decimated by a density-independent event (a cyclone) was no more a starting point than is our study the description of an end-point. As Crockett's (1996) report of population growth in the red howling monkey (*A. seniculus*) shows, historical events, both density-dependent and density-independent, affect the dynamics of populations, often in a non-linear manner. Similar conclusions can be drawn from reports for *A. caraya*, the black and gold howling monkey (Rumiz, 1990) and *A. palliata*, the mantled howling monkey (Milton, 1982; Clarke and Zucker, 1994). As a further comparison, it would be instructive to analyze age distributions of Venezuelan *A. seniculus* (Crockett, 1996) and of Costa Rican *A. palliata* (Clarke *et al.*,

1986; Clarke and Zucker, 1994), particularly since environmental perturbations that might have led to temporary or permanent changes in the age distribution are known or suspected for these populations.

Strier (2000) argues that demographic processes are complex in species exhibiting bisexual dispersal (e.g., *Alouatta*) due to the consequences within and between groups of alternative strategies for the establishment of new groups. Decisions by individuals to join existing groups or to found new breeding units may influence sex ratios of immatures and adults as well as their survivorship and fecundity. Table 1 reflects these demographic changes during the study period. Of course, changes can occur in the structure and composition of specific groups due to variations in microsite factors without leading to changes in population parameters. This condition is evident by comparing Figure 1 with Table 1. Group composition varies over time, apparently without major changes in population architecture over time. For *A. pigra* at the CBS, population expansion occurs as a result of bisexual dispersal and the founding of new groups (Horwich *et al.*, in press; Brockett *et al.*, 2000) as reflected in Table 1. These patterns are characteristic of *Alouatta* and may account for the often cited plasticity of their social organization (e.g., Crockett and Eisenberg, 1986).

The finding that increasing population density is positively correlated with increasing numbers of multimale groups has been observed in another study at the CBS (Ostro *et al.*, in press) and has important implications for an interpretation of population growth at the site. Ostro and her colleagues argue that a male's options and decisions will change with changes in population density. Our results support this interpretation and suggest that further studies on the causes and consequences of variations in the number of males in howler groups would be worthwhile (see Nunn, 1999). Overall, increased population density leads to a decreased proportion of adults, in particular, adult males, in the population. It appears, then, that population growth may decrease the ability of single males to monopolize a female group, leading to more multimale groups, possibly as a result of increased male-male competition for females as population density and, possibly, crowding increase. This condition would also result in some males being expelled from the population. Our finding that mean number of males per group in the population decreases with population density can be viewed as a consequence of increased group size with increases in population density.

As Strier (2000) notes, mechanisms of dispersal and group establishment may also have consequences for life history parameters (survival and fecundity). More than 50% of infants died in our study. Our estimates of infant survival (43%) are closer to Clarke and Glander's (1984) findings (55%) for mantled howlers in Costa Rica than Crockett and Rudran's (1987) (>80%) for Venezuelan red howlers. It is interesting to note that population density is high at both the CBS and Hacienda la Pacifica. Our data are similar to those of Crockett and Rudran (1987) with respect to survival of infants as a function of sex. For both black howlers at the CBS and red howlers, a larger proportion of male infants survive, although the results are not significant for *A. pigra*, possibly due to small sample size. Mantled howlers exhibit the opposite pattern (Clarke and Glander, 1984), a finding that

may relate to differences in social organization between black and red howlers, on the one hand and mantled howlers on the other.

Mean interbirth interval observed in the present study is comparable to those reported for other species of the genus (20–22.5 months) by Strier (2000, Table 7.3). The range in IBIs for black howlers at the CBS indicates that female reproductive physiology is highly plastic and capable of responding to variable population events such as infanticide and stochastic demographic processes such as fluctuations in population density. Crockett (1998) reports that the reproductive potential of howler monkeys is high relative to body size since reproductive parameters such as IBIs are short relative to body size. Citing the literature, she suggests that this condition may represent adaptation to “opportunistic habits”, recurrent yellow fever epidemics, or relatively small brain size (to body size ratio). The greater reproductive potential of howlers may in part explain their success in disturbed conditions (Crockett, 1998).

In conclusion, population growth in the black howler monkey at the CBS is density-dependent, and population architecture as measured by the proportion of infants, juveniles, subadults, and adults in the population across years appears to be stable. Further studies are required to describe the environment’s impact upon *A. pigra* at the CBS and to compare and contrast its specific features with those of its congeners. Our research also documents changes in group membership across years which impact population growth and indicates possible causes and consequences of these changes, including bisexual dispersal, increased group size, increases in the number of groups over time, and increases in the length of tenure of groups. The mechanisms of these patterns require investigation. Our studies, like those of Clarke and Glander (1984) on mantled howlers at Hacienda la Pacifica, exhibit high infant mortality. This pattern is consistent with life history tactics that favor adult over juvenile (including infant) survivorship, as reported for *A. palliata* at Hacienda la Pacifica by Jones (1997). The factors underlying these results require investigation within and between species of *Alouatta*. Finally, similar to the findings of Ostro *et al.* (in press), our findings indicate that population growth may have significant consequences for the reproductive tactics of adult males. In particular, increased population density may increase male-male competition for groups and their resident adult females, and may influence a single male’s ability to monopolize female groups.

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Short Articles

DISTRIBUTION AND CONSERVATION OF THE SPIDER MONKEY (*ATELES HYBRIDUS*) IN THE COASTAL RANGE OF NORTHERN VENEZUELA

Gerardo A. Cordero-Rodríguez
Hernán J. Biord F.

Introduction

The distribution of spider monkeys in Venezuela is known from the works of Handley (1976), Mondolfi and Eisenberg (1979), and Bodini and Pérez-Hernández (1987). *Ateles belzebuth belzebuth* (cf. Bodini and Pérez-Hernández, 1987) occurs in southern Venezuela; *Ateles hybridus* (cf. Collins and Dubach, 2000) has a patchy distribution in western and northwestern Venezuela. The latter was also recorded in south and southeastern Miranda State (Mondolfi and Eisenberg, 1979; Ochoa *et al.*, 1995) and in San Julian village (Robinson and Lyon, 1902), Vargas State. Congdon (1996) monitored four spider monkey troops at Caparo Forestry Reserve, Barinas State, and recently, the Venezuelan Wildlife Service reported the monkey's presence near the village of Mene de Mauroa, Falcón State in northwestern Venezuela (Boher-Bentti, 1998). These findings suggest a discontinuous distribution, although this may only be due to forest destruction and fragmentation with changes in land use, human encroachment, and hunting (Rudran and Eisenberg, 1982; Mittermeier, 1986a, 1986b; Mittermeier and Cheney, 1987). The purpose of this paper is to report new observations on the presence and distribution of spider monkeys in northern Venezuela.

Methods

Study Area

Fieldwork was conducted mainly in the Guárenas-Guátire region, about 40 km east of Caracas. The area is about 615 km². The elevation ranges from about 400 m to 1800 m. According to the Holdridge Life Zones System (Ewel *et al.*, 1976), the main vegetation types are tropical dry forest, tropical humid premontane forest, and very humid tropical montane forest. Annual mean temperature and total yearly precipitation recorded at Guárenas are 23.5°C and 852 mm (Guevara-Díaz, 1983). The southern slope of El Avila National Park (10°27'-10°37'N, 66°12'-67°01'W) is partly within the northern range of the region. Annual mean temperature varies from 24°C to 29°C, and at El Avila total yearly rainfall is 600-1400 mm. The elevations at El Avila vary from sea level to 2,765 m. The principal vegetation types found in the national park are tropical dry forest, humid and very humid premontane forest, and humid and very humid low montane forest.

On July 7, 1997, while conducting a survey near the town of Araira, one of us (HJBF) discovered a young spider monkey being kept as a pet by the owners of the "Hacienda Capayita"

farm close to Araira, Miranda. This finding encouraged us to investigate the occurrence of spider monkeys in the region.

We first inquired about the history of the young monkey, the site where it was caught, date and time of capture, and the size of troop sighted. We took body measurements and noted the pelage and its behavior. We also interviewed farmers living in or around seven villages close to Araira and we conducted a two-day survey in Guatopo National Park (09°57'-10°14'N, 66°15'-66°43'W) and its borders, Barlovento Region, Miranda.

Results

Capture Site of Infant

On August 8, 1997, early in the morning a troop of around 20 spider monkeys was sighted in an evergreen forest at an elevation of 1100 m at the "Hacienda El Limón". This site is located within El Avila National Park, 30 km north of Guatopo National Park in the northern coastal range of Venezuela. A female infant was captured and taken home for nursing. Assuming she was a dependent infant, we estimate an age of around 12 to 18 months at the time of her capture.

Description

Mona, as she was called, was kept by the Biord-Marinez family. External body measurements in millimeters (August 8, 1997) were as follows: total length 1,340, head and body length 480, hind foot 185, and ear 42. Dentition fully erupted. General coloration light brown; whitish triangular patch on the forehead; light blue eyes; black face; whitish whiskers; small black ears; hair on forehead directed forward; upturned hairs on nape. Underparts whitish on chest and abdomen. Forelimbs light brown. Vestigial nailless thumb on each hand. Hind limbs light brown on and around the knee joint contrasting with a lighter color ventrally. Dorsal surface of tail light brown, whereas the ventral surface was lighter brown.

Distribution

In addition to the "Hacienda El Limón", peasants from seven villages around Araira town also reported the presence of spider monkeys. All villages are located to the east and southeast of El Avila National Park and to the north and northwest of Guatopo National Park. We confirmed the presence of this monkey on all of these locations (Table 1). Troops of red howler monkey (*Alouatta seniculus*) and capuchin monkey (*Cebus olivaceus*) were also sighted in the area.

Recently (May 15, 1999), farmers sighted a troop of spider monkeys at the "Hacienda Las Pavas", near Araira. The ranger of Guatopo National Park sighted a troop of spider monkeys at La Macanilla (Table 1) at about 07:00 hours on May 25, 1999. During July 1999, rural people sighted spider monkeys close to the Río Taguaza, 6.5 km southwest of Caucagua town and at the Chorrerones site close to the Río Cuira, 8 km southwest of Panaquire town. Both localities are close to the northern and eastern boundaries of Guatopo National Park. They also called the spider monkeys "mono frontino". A group of six spider monkeys was sighted close to the Río Taguaza by rural hunters sometime between January and May 1999. They shot three to eat.

Table 1. Localities for *Ateles hybridus* in northern Venezuela. a = Robinson and Lyon 1902; b = Mondolfi and Eisenberg 1979; c = Ochoa *et al.* 1995; d = this study. ¹The first locality is in Vargas State, the others are in Miranda State.

Location	Coordinates	Date & Ref.
San Julian, southeast of La Guaira ¹	10° 35' N-66° 51' W, 400-800 m	1901, a
Guatopo National Park, 2 km S of Los Alpes	10° 10' N-66° 30' W, 300 m	1974, b
Guatopo National Park, 4.5 km SE of Los Alpes	10° 08' N-66° 29' W, 300 m	1975, b
Guatopo National Park, SIMAB Biodiversity Monitoring Plot	10° 01' N-66° 27' W, 850 m	1993, c
Quebrada El Machete	10° 30' N-66° 26' W, 1000 m	1997, d
Brazo Grande	10° 31' N-66° 23' W, 800 m	1997, d
Brazo Chiquito	10° 30' N-66° 24' W, 600 m	1997, d
Fila Mirador	10° 25' N-66° 29' W, 800 m	1997, d
Hacienda El Limón	10° 31' N-66° 27' W, 1100 m	1997, d
Fila del Viento	10° 29' N-66° 32' W, 800 m	1997, d
Fila Juan Torres	10° 29' N-66° 21' W, 800 m	1997, d
El Salmerón	10° 27' N-66° 22' W, 600 m	1997, d
Forests close to Río Taguaza	10° 13' N-66° 25' W, 40 m	1999, d
Chorrerones site next to Río Cuira	10° 10' N-66° 18' W, 400 m	1999, d
La Macanilla Ranger's Post, Guatopo National Park	10° 07' N-66° 31' W, 800 m	1999, d
Hacienda Las Pavas	10° 24' N-66° 27' W, 1000 m	1999, d

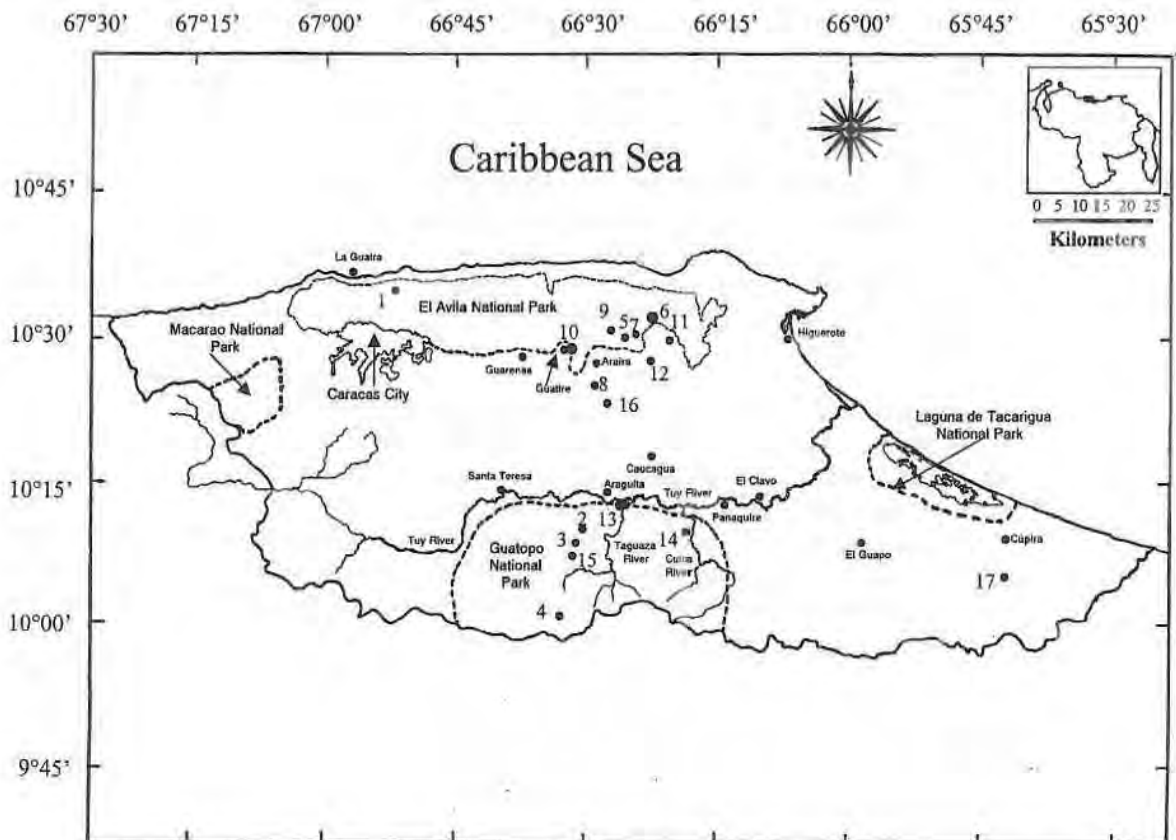


Figure 1. Map showing *Ateles hybridus* localities and national parks in the States of Miranda and Vargas, northern Venezuela. 1. San Julian, 2. Guatopo National Park, 2 km S of Los Alpes, 3. Guatopo National Park, 4.5 km SE of Los Alpes, 4. Guatopo National Park, SIMAB Biodiversity Monitoring Plot, 5. Quebrada El Machete, 6. Brazo Grande, 7. Brazo Chiquito, 8. Fila El Mirador, 9. Hacienda El Limón, 10. Fila El Viento, 11. Fila Juan Torres, 12. El Salmerón, 13. Forests close to the Río Taguaza, 14. Chorrerones site next to the Río Cuira, 15. La Macanilla Ranger's Post, Guatopo National Park, 16. Hacienda Las Pavas, 17. 7 km S of Cúpira.

Figure 1 shows the distribution of the spider monkey in Miranda State. The new records (Table 1) are significant and represent an extension of the distribution of *A. hybridus* for northern Venezuela. The elevation of all sites varies from 40 m to 1,100 m at El Avila National Park.

Discussion

Distribution

The geographic distribution of *A. hybridus* was considered disjunct in northern Venezuela (Mondolfi and Eisenberg, 1979; Mittermeier, 1986a, 1986b). Our findings suggest that its range is less disjunct than has been assumed, and in fact was once continuous from northern to northwestern Venezuela. Habitat destruction, hunting, and human encroachment have resulted in the gaps in its distribution. Habitat modification or destruction caused by agriculture and cattle ranching, lumber, oil and mining extraction, construction of dams and roads, and other human activities have affected northern Venezuela more severely than in the south (Bisbal, 1988).

Little information is available regarding the hunting of spider monkeys by indigenous or rural people in Venezuela. They are hunted for food by Yékuana and Yanomamo people in southern Venezuela (Ojasti, 1993). In the lowlands of the Barlovento Region, Miranda State, rural people usually hunt the red howler monkey (*Alouatta seniculus*) for food, and capture capuchin monkey (*Cebus olivaceus*) juveniles to keep or sell as pets (Cordero R. and Boher, 1988; Cordero R., 1990). Occasionally spider monkeys are hunted for their meat in the highlands of the region (R. Bellotta, pers. comm. 1999). In the region of Guárenas-Guátire rural people occasionally capture young monkeys to raise as pets. Nowadays, however, hunting might no longer be a severe threat to the survival of the spider monkey in northern Venezuela.

It is therefore worth investigating whether spider monkeys still inhabit the forested habitat enclosed by the network of natural protected areas, which include national parks, natural monuments, and protected zones along the coastal cordillera region of Venezuela. Seven National Parks range in size from 15,000 to 122,500 ha, while 12 protected zones vary in size from 214 to 276,000 ha. There are also two natural monuments totaling 11,908 ha.

Mondolfi and Eisenberg (1979) reported the presence of *A. hybridus* at two distant locations, Guatopo National Park and 7 km south of Cúpira (10°10'N-65°42'W), Miranda State. The latter locality marks its range limits in northeastern Venezuela. The sightings of *A. hybridus* in the northern and eastern boundaries of Guatopo indicate that its distribution may extend uninterrupted from Guatopo National Park to Cúpira along the highland forested habitats of the Barlovento Region mountain range in the Serranía del Interior of Cordillera de la Costa. Changes in land use have affected the highlands less than the lowlands.

We agree with Fernández-Badillo and Ulloa (1990) that the spider monkey might exist in the Henri Pittier National Park

(10°14'-10°32'N, 67°24'-67°52'W), Aragua State, because good quality habitat exists in the highlands there. It is also likely that this monkey is present in other protected areas in northern Venezuela, but this remains to be confirmed by surveying the network of protected areas in northern Venezuela. We are therefore formulating a proposal to search for spider monkey populations in national parks and other protected areas, and determine their relative abundance and distribution in order to draw up a conservation program for northern Venezuela.

Conservation and Management in the Coastal Range Region

Habitat destruction is the major threat to the survival of spider monkey populations in northern Venezuela. Hunting pressure is probably low; rural people hunt spider monkeys only occasionally and urban hunters do not hunt them at all because they are not considered game animals in Venezuela.

Little information is available on population and troop size and how many spider monkey populations still remain in protected and unprotected areas. Eisenberg *et al.* (1979) estimated a population density of roughly 5.6 ind/km², based on transect surveys and a mean group size of 3.5, based on two sightings for Guatopo National Park. This is a rather low density compared to the 15 to 18 ind/km² and troop size of 18 reported for *A. belzebuth* in Colombia (Klein and Klein, 1976). Congdon (1996) reported an average troop size of 14 (six to 20) for four troops of *A. hybridus* at Caparo Forestry Reserve (7°26'N-70°40'W, 140 m a.s.l.), Barinas State, whereas we found a group of 20 in this survey. It is likely that Eisenberg *et al.* (1979) sighted temporary subgroups (Van Roosmalen and Klein, 1988).

The worst-case scenario is that spider monkey populations are small and isolated by habitat fragmentation. They are thus threatened with extinction by random demographic fluctuations and environmental stochasticity. This being the case, it is likely that we are dealing with metapopulations of spider monkey subdivided into small populations sometimes linked by dispersal. Spider monkeys are large, frugivorous canopy-dwellers of primary forests. They have low reproductive rates: Gestation varies from 225 to 250 days, inter-birth intervals are greater than 36 months, and maturity is reached at about five years of age (Klein, 1971; Klein and Klein, 1976; Robinson and Janson, 1987). Robinson and Redford (1991) pointed out that the population density of Neotropical primates varies with diet and body mass, and suggested that frugivore-herbivores require larger protected areas for maintaining viable populations than other trophic groups. Fruit sources in mature forests are widely dispersed, and population numbers are probably limited by bottlenecks of fruit availability (Robinson and Ramirez, 1982).

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SURVEY OF THE POPULATION OF HOWLER MONKEYS (*ALOUATTA PALLIATA*) AT YUMKÁ PARK IN TABASCO, MEXICO

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David Muñoz & Berenice Franco

Introduction

The state of Tabasco in southern Mexico harbors representatives of the three species of wild primates that exist in Mexico: *Alouatta palliata*, *A. pigra* and *Ateles geoffroyi* (Smith, 1970, Horwich and Johnson 1986; Rylands *et al.*, 1995). Tabasco is the only state of Mexico, and the only area in the Mesoamerican region, where representatives of these three primate species are found. Tabasco additionally harbors the transitional zone between *A. palliata* and *A. pigra* and in some localities both species are sympatric (Smith, 1970). As a result of human activity in Tabasco, a great proportion of the habitats of these three primates has disappeared or remains in a fragmented condition. About 60% of the total surface area of the state (24,141 km²) was originally covered by evergreen rain forest, but as a result of human activity more than 60% of this rain forest disappeared in the last few decades at a rate of 600 km² per year, particularly in the lowlands (Masera, 1996; México, SEMARNAP, 1999). Published data on population, natural history, ecology, and behavior of these three primate species for this part of the Mesoamerican region is nonexistent. Here we report the results of the first of a series of population surveys of *A. palliata*, *A. pigra*, and *A. geoffroyi* conducted at several localities in the state of Tabasco. Specifically, we report on population parameters for an isolated population of *A. palliata* existing at Yumká Park in central Tabasco.

Methods

Study site

Yumká park is located at 17°45' y 18°00'N, 92°45' y 93°00'W, at about 12 miles south of the city of Villahermosa. Yumká is a public park encompassing an area of 101 ha, of which 32 ha contain tropical rain forest, 47 ha are savannas and the rest form part of a lake (Fig. 1). Elevation is 15 m above sea level. The weather is hot and humid, and mean annual precipitation is 2,159 mm (average from 10 years). Rainfall is seasonal, and the rainiest period is August-October (average precipitation 383 mm). Mean temperature is 26.9°C (maximum 29.4°C in May-June and minimum 23.8°C in January).

Vegetation

The vegetation at the site is tall evergreen rain forest (Pennington and Sarukhán, 1968). There is a predominance of tree species in the plant families Euphorbiaceae (e.g., *Psychotria viridis*, *Genipa americana*), Caesalpiniaceae (e.g., *Dialium guianensis*, *Cynometra retusa*), Palmae (e.g., *Scheelea liebmanni*, *Sabal yucatanica*), Lauraceae (e.g., *Nectandra ambigens*, *N. glabrens*), Moraceae (e.g., *Cecropia obtusifolia*, *Brosimum alicastrum*), Meliaceae (e.g., *Ceiba pentandra*, *Guarea glabra*), and Sapindaceae (e.g., *Cupania dentata*, *C. glabra*) (Jiménez, 1987; Pineda, 1988).

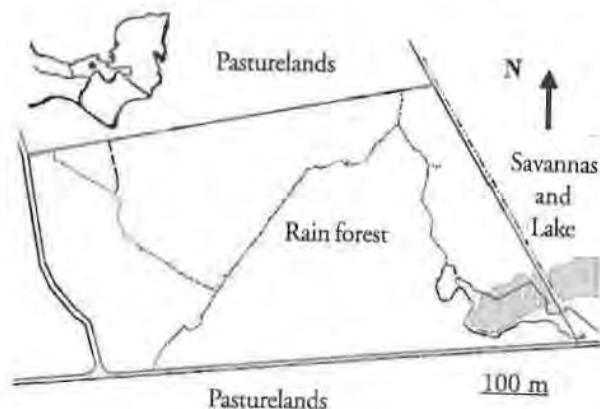


Figure 1. Location of Yumká Park in central Tabasco (black dot in map of southern Mexico). Parallel and solid lines are paved and unpaved roads, respectively. Thin lines within this perimeter are trails. Shaded area at the right bottom is a lake.

Surveys

Surveys of *A. palliata* existing in the forest of Yumká Park were conducted from September to December 2000 and from January to February 2001. In total, 56 field days encompassing 444 man-hours of surveys were completed. Surveys of howlers were conducted in two ways: By triangulation of dawn and dusk choruses and by direct counts of troops. In the first case, we chose a strategic location surrounding the area of forest vegetation using access roads and trails. Monitoring was conducted daily between 0500 and 0700 hrs and between 1700 and 1900 hrs by three teams of two people each. The direction from which howling was heard was determined with the use of a compass. Resulting information was placed on a detailed topographic map. In the second case, the three two-person teams searched for different triangulated troops using existing trails or by walking through the forest.

Contacted troops were followed for several hours and repeatedly counted by each team to confirm identification and age and sex composition. Confirmation was made by examining the consistency in the age and sex composition of each troop and the consistency in the spatial location of the troops in relation to the trail system and to topographical features of the terrain and the relative location of other troops. Troop identification was also helped by recording body markings on certain individuals, such as patches of blonde hair on the hands, feet and tail, as well as varied patterns of skin pigmentation on the palms and soles of the hands and feet. Trees used by howler monkeys as a source of food were marked and measured (DBH and maximum height).

Results

Our surveys detected the presence of 55 howler monkeys forming part of four troops (Table 1). Average troop size was 14 individuals (range 4-28). Adult males comprised 23% of the population surveyed, adult females 36%, juveniles 22%, infants 9%, and young adult individuals for whom sex could not positively be determined accounted for the remaining 9%. Crude density was estimated at 1.67 ind/ha and ecological density was estimated at 167 ind/km² (Table 1). Average adult sex ratio

Table 1. Age and sex composition of howler monkey troops detected at Yumká Park in Tabasco, Mexico.

Troop	Adult males	Adult Females	Juveniles	Infants	Young adults: sex unknown	Total
1	4	4	3	1	1	13
2	6	11	5	3	3	28
3	1	3	3	1	1	9
4	2	1	1	0	0	4
Total	13	19	12	5	5	54

(male:female) was $1:1.42 \pm 0.70$. Average adult female-to-non-adult ratio was $1:1 \pm 0.26$. Average adult female-to-infant ratio was $1:1 \pm 0.26$. Average juvenile-to-infant ratio was $1:0.31 \pm 0.29$. Average adult-to-nonadult ratio was $1:0.56 \pm 0.23$.

An examination of the DBH and height of trees used by howlers during our surveys showed that all sightings were in trees with a DBH ranging from 50-100 cm (average 78.6 ± 31.3 cm) and from 18 to 25 m (average 21.5 ± 3.1 m) in height (Fig. 2).

Discussion

The *A. palliata* population present in the forest of the Yumká Park exists in a very small habitat-island. Examination of an aerial photo mosaic showed that only about 7% of the original forest remains today in a 300 km² area, and consists of very small, isolated forest fragments. The habitat-island forming part of the Yumká Park is one of the largest forest fragments and is totally isolated from nearby forest. Preliminary surveys in some of the forests in the vicinity of the park showed that they were not inhabited by howler monkeys. Interviews with the local people and the park administrators indicated that the howler population at the site has been there since the foundation of the park in 1960, but was isolated when the land surrounding the park was cleared shortly after.

Troop size of howlers at the Yumká Park ranged from 4 to 28 individuals. The size of the largest troop (#2) is unusual. Population data for *A. palliata*, 500 km north of Yumká Park, at Los Tuxtlas indicate, for troops existing in forest tracts >500 ha in size, an average troop size of 9.12 individuals (range 5-16 individuals) (Estrada, 1982). In a fragmented landscape at Los

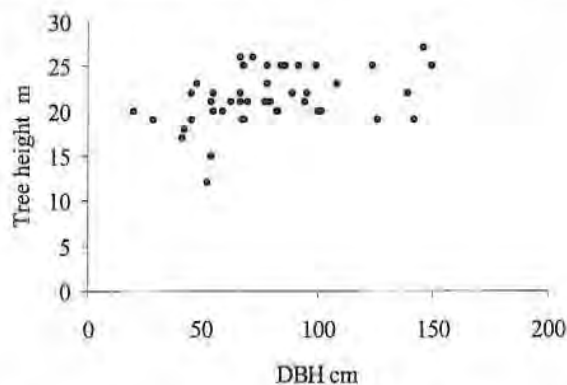


Figure 2. Relations between tree DBH and height for trees used by howlers during our surveys. Note that only trees >10 m in height were used. Average DBH of trees was 78.6 ± 31.3 cm.

Tuxtlas, four forest fragments of similar size (30-50 ha) to that of the Yumká Park showed that howler monkey troop size varied from 4 to 16 individuals (Estrada *et al.*, 1999). At Yu-Balcah, located about 50 km west of Yumká in the state of Tabasco, preliminary surveys of *A. palliata* conducted by our research team in a forest tract about 200 ha in size showed that troop size varied from 2 to 12 individuals (Estrada *et al.*, 2000a). Troop size of populations of *A. pigra* at Palenque, Chiapas, 150 km south of Yumká in a forest tract about 600 ha in size, was reported to range from 2 to 11 individuals (Estrada *et al.*, 2000b). The causes for the unusually large troop observed at Yumká are unknown, but it is possible that it could be the original troop residing at the site prior to isolation and that many individuals have remained in the troop as a result of kinship ties and an inability to disperse as a result of the small size of the forest patch and of its isolation. Individuals that may have been expelled from the troop probably gave rise to the smaller troops detected by us at the site.

Adult sex ratios for the relict population of *A. palliata* at Yumká are within the range reported for this species in forest tracts >500 ha in Los Tuxtlas (Estrada, 1982). The 1:1 ratio found for adult females and non-adults suggests that all reproductively active females are breeding. However, the adult-to-non-adult ratio of 1:0.56 and the juvenile to infant ratio of 1:0.31, suggests moderate-to-high mortality in the juvenile and infant groups, respectively.

Causes of such mortality are unknown, but predators such as *Boa constrictor* and small *Felis* spp., exist in the forest. Another feature related to possible juvenile mortality could be the ingestion of toxic plants. The large edge-to-area ratio of the habitat island and the many gaps present in the interior have favored the growth of many second growth trees and vines, the leaves of which may be rich in secondary compounds (Glander, 1982; Garay-Arroyo and Alvarez-Buylla, 1997). For example, during our surveys we encountered, on two different occasions, a juvenile on the ground convulsing and foaming at the mouth. The juvenile died shortly after, suggesting intoxication.

The vegetation at the study site is characterized by the presence of many gaps caused by branch and tree falls, events especially affecting small forest fragments (Laurance *et al.*, 1997). Frequent open spaces in the canopy may complicate travel by young individuals, possibly accounting for some mortality. For example, in one instance we found a stunted juvenile on the ground. Examination of its body showed evidence of a healed fracture in one of the legs.

The densities reported by us of 166 ind/km² for the howlers at Yumká Park are unusually high compared with those reported for populations of the same species at Los Tuxtlas in southern Veracruz, where we detected densities of 23 ind/km² in extensive tracts of forest (>500 ha) (Estrada and Coates-Estrada, 1996). However, such high densities are within the range for troops of *A. palliata* surveyed by us in 21 small (<100 ha) isolated forest fragments in Los Tuxtlas (Estrada *et al.*, 1999a). We estimated howler biomass at Yumká to be approximately 8.75 kg/ha (for average weight of *A. palliata* see Estrada, 1982). This contrasts

with 1.28 kg/ha reported for troops of *A. palliata* existing in undisturbed and contiguous (>500 ha) forests in Los Tuxtlas (Estrada and Coates-Estrada, 1996). Continuous growth of the troops and the high densities for this population at Yumká, coupled with the small size of the habitat-island, suggest significant pressure on food resources and available space (Estrada *et al.*, 199b).

Available space for growing and newly-formed troops may also become a limited resource. Our observations indicate that the largest troop at Yumká is monopolizing a large proportion of the available habitat, with the smaller troops existing in the periphery of the forested area of the park. We have seen members of some of these smaller troops coming down from the trees and crossing dirt and paved roads surrounding the park to feed on nearby trees. Interviews with the local inhabitants indicate that on some occasions monkeys have been run over. People on foot and dogs may be additional potential dangers for these howler monkeys. The average distance (1.7 km) from the Yumká forest to the nearest forest fragments may be too large for howler monkeys to traverse on foot, and they have never, according to the local people, been seen travelling to some of these forest fragments.

The protection of the Yumká forest by the state government has ensured the conservation of the relict population of *A. palliata* existing there. The successful conservation of the forest and of this small population of *A. palliata* for over four decades by the government of Tabasco is an important proof that, in spite of being located in the vicinity of the state capital (city of Villahermosa) and in an area undergoing rapid development, local conservation efforts can be effective. The term Yumká is a Mayan-Chontal name for a mythical "guardian of rain forest plants and animals".

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INTERAÇÕES SOCIAIS E DIETA DO BUGIO-RUIVO, *ALOUATTA GUARIBA CLAMITANS*, NO PARQUE ESTADUAL DE ITAPUÃ, RIO GRANDE DO SUL, BRASIL

Rose Mari Martins Silveira
Thaís Leiroz Codenotti

Os representantes do gênero *Alouatta* são animais gregários, dóceis e pacíficos, que vivem em bandos mistos. Embora considerados como animais sociais, não apresentam altas taxas de interações entre si. O trabalho de Oliveira (1993) demonstrou que apenas 1,5% da frequência de comportamentos observados em *Alouatta guariba clamitans* foi gasto em atividades sociais: catação, brincadeiras e agressões. Nos conflitos inter-grupais, a agressão física é normalmente substituída pela emissão de vocalizações agressivas. Os indivíduos adultos alimentam-se isolados, sem interação com os membros do grupo. A distância mais próxima registrada

durante a alimentação foi de 1,50 m (Chitolina e Sander, 1981). As espécies do gênero *Alouatta* são consideradas consumidoras primárias, que alimentam-se, principalmente, de folhas, frutos e flores (Carpenter, 1934; Glander, 1978; Milton *apud* Marques, 1996). Além desses itens comem pecíolos, brotos, sementes, caules e ramos, em maior ou menor quantidade, dependendo do habitat e das diferenças sazonais de oferta de recursos (Crockett e Eisenberg, 1987). São animais seletivos, tanto com relação à espécie vegetal, quanto com os itens alimentares preferidos (Glander, 1978; Milton, 1980).

A. guariba clamitans Cabrera, 1940 é um animal pouco ativo, consumindo mais de 50% de seu período diurno em repouso, podendo locomover-se rapidamente mas, em geral, caminha devagar. A economia energética reflete uma estratégia de sobrevivência e decorre de seu hábito folívoro e de um aparelho digestivo pouco adaptado para extrair das folhas todo o potencial energético necessário para o ritmo de vida mais ativo (Marques, 1996).

O objetivo da pesquisa foi estudar o comportamento dos bugios sob dois enfoques: interações sociais e aspectos da dieta alimentar, procurando contribuir com a conservação da espécie e de seu habitat natural.

Métodos

Área de Estudo

A pesquisa foi realizada no Parque Estadual de Itapuã (30°23'S, 50°55'W), localizado ao sul do distrito de Itapuã, no município de Viamão. Tem como limites, ao norte a área remanescente da Fazenda Santa Clara, hoje Hospital Colônia de Itapuã, e o Beco Santa Fé; ao Sul e ao Leste, a Laguna dos Patos e a Oeste o Lago Guaíba (Fig. 1). O Parque abrange uma área de 5.566,50 ha e

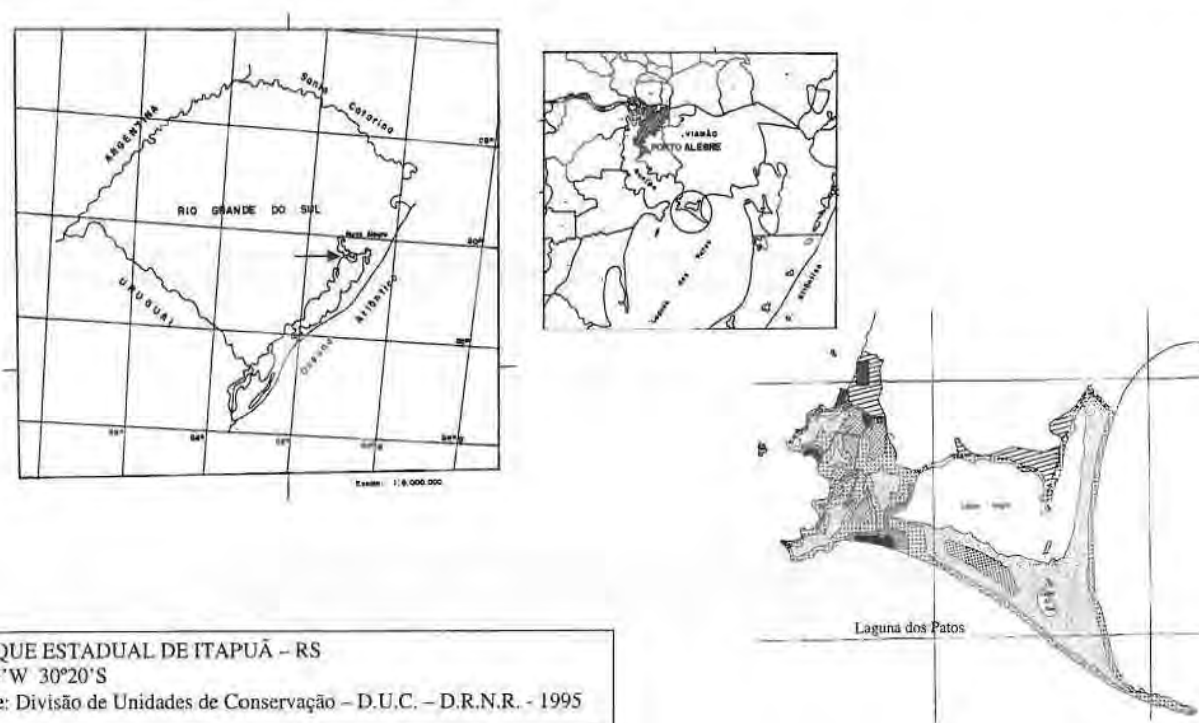


Figura 1. Mapa da área de estudo.

apresenta cobertura vegetal diversificada, em função de fatores determinantes, registrando-se florestas e campos, com grande diversidade de tipos fisionômico-florísticos. O estrato superior é descontínuo, constituído por *Ficus organensis* (figueira), *Pachystroma longifolium* (mata-olho) e *Syagrus romanzoffiana* (geriva). O estrato médio de mata que se segue é contínuo, formado por árvores não muito altas. Entre elas destacam-se: *Gyapira opposita* (maria-mole) e *Trichilia clausenii* (catiguá). No estrato das arvoretas predominam *Actinostemam cancelor* (laranjeira-domato), *Sorocea bomplandii* (cincho) e *Casearia silvestris* (chá-de-bugre). O clima caracteriza-se como subtropical úmido, sem estação seca, com temperaturas médias anuais em torno de 17,5°C e precipitação média anual entre 1.100 a 1.300 mm. As chuvas são bem distribuídas ao longo do ano, os verões são quentes com temperaturas superiores a 22°C (DRNR, 1997).

Grupo de Estudo

Foram observados e registrados dados etológicos de um bando de bugios composto por um macho adulto, com pelagem ruivo-avermelhada sobre todo o corpo, e presença de barba típica. Duas fêmeas adultas com pelagem de coloração amarronzada, sobre todo o corpo; uma fêmea subadulta de coloração mais escura que a da fêmea adulta; e dois filhotes, de aproximadamente seis meses de idade, com a coloração mais escura que a da fêmea subadulta. Estes indivíduos já consomem alimento sólido, porém ainda mamam.

Observações

Na coleta de dados os critérios para diferenciar as classes sexotárias, assim como para os registros de interações sociais e de seleção de alimento foram os sugeridos no trabalho de Marques (1996). Os dados foram tomados diariamente durante o verão de 1999 (exceto nos dias de chuva forte), desde as primeiras horas da manhã (6h.30 min) até o anoitecer (20 h), a partir do dia 02 de janeiro até o dia 31 de março. Foi intercalado o método "animal focal" com sessões de 10 minutos de observação para cada animal, com 5 minutos de intervalo, em sessões seguidas ou separadas, e, o método de varredura, "scan sampling method" (Altmann, 1974). Os intervalos entre um método e outro foram

suprimidos para possibilitar um melhor aproveitamento na coleta de dados durante o seguimento do bando. Os animais foram observados mantendo-se o observador uma distância mínima aproximada de 5m do bando, procurando não interferir no comportamento espontâneo dos indivíduos. Para os registros das seqüências comportamentais contínuas e instantâneas, considerou-se a freqüência e a duração de cada episódio.

Resultados e Discussão

Os resultados foram obtidos a partir de 2.100 registros, de alimentação e de interações sociais, totalizando 300 horas de observação. As interações sociais entre os bugios ocorrem com pouca freqüência, sendo os atos de catar e brincar os que apresentaram maior grau de interação como relataram (Carpenter, 1934; Altmann, 1959; Bernstein, 1964; Neville, 1972b; Baldwin e Baldwin, 1976; Jones *apud* Mendes, 1989).

Os dados obtidos nessa pesquisa mostraram que a conduta social mais expressiva foi a catação, e abrangeu todos os membros do grupo, obedecendo certa hierarquia sexo-etária, onde os mais catados em seqüência foram: o macho adulto ($n = 53$), as fêmeas adultas ($n = 157$), e os filhotes ($n = 49$), por serem dependentes de suas mães. Em 143 episódios com observação focal houve diferença na duração desse comportamento: macho adulto (1.856 segundos), as três fêmeas (5.318 segundos) e as duas crias (924 segundos).

O comportamento de catação foi mais executado pelas fêmeas, concordando com os resultados obtidos por Neville *apud* Mendes (1989). Em 44 observações obteve-se valores significativos nas interações entre: Fêmea adulta 1 e cria 1, fêmea adulta 2 e cria 1, fêmea adulta 2 e cria 2, fêmea subadulta e macho adulto, fêmea subadulta e fêmea adulta 2. Todos os casos foram altamente significativos, $p < 0,0001$ (Tabela 1).

Esses resultados corroboram com as observações de campo, em que os filhotes não catam nenhum membro do grupo, porém são catados por suas respectivas mães e algumas vezes pelo ma-

Tabela 1. Valores significativos do χ^2 nas interações comportamentais entre os membros do Grupo (MA-macho adulto, FA1-fêmea adulta 1, FA2 fêmea adulta 2, FSA-fêmea subadulta, CR1-Cria 1, CR2-Cria 2) (verão de 1999). Conduta Catar.

Valores	FA1-CR1	FA2-MA	FA2-FA1	FA2-CR1	FA2-CR2	FSA-MA	FSA-FA1	FSA-FA2
χ^2	24,87	20,38	28,90	51,22	67,96	51,96	22,82	45,38
p	0,0001	0,1577	0,0246	0,0001	0,0001	0,0001	0,1975	0,0001
Df	2	15	16	1	17	3	18	19

$p < 0,001$

Tabela 2. Valores significativos do χ^2 nas interações comportamentais entre os membros do grupo (MA-macho adulto, FA1-fêmea adulta 1, FA2-fêmea adulta 2, FSA-fêmea subadulta, CR1-Cria 1, CR2-Cria 2) (verão de 1999). Conduta Brincar.

Valores	MA-CR1	MA-CR2	FA1-CR1	FA2-MA	FA2-CR2	CR1-CR2	CR2-CR1	MA-FA2-CR1-CR2
χ^2	44,74	45,03	116,34	63,60	38,98	36,34	14,64	7,24
P	0,0001	0,0001	0,0001	0,0001	0,0044	0,4529	0,9636	0,0071
Df	7	8	3	3	19	36	26	1

$p < 0,001$

cho, ou por outra fêmea. O macho por ser o dominante foi o mais catado, em seqüência aparecem as fêmeas adultas 1 e 2, respectivamente; a fêmea subadulta foi pouco catada, porém executou esse comportamento com todos os adultos. O Macho sempre foi catado pelas fêmeas adultas, e registrou-se uma interação em que este catou a fêmea adulta 2, imediatamente antes de copular com ela. O comportamento social Catar fortalece os laços de união entre os animais, assim como deixa patente a hierarquia existente entre os membros do grupo. Os resultados revelaram que neste bando a Fêmea Adulta 1 ocupa posição mais elevada de que a Fêmea Adulta 2.

Quanto à conduta Brincar, o macho manifestou sua atenção às crias brincando com elas e com a fêmea adulta 2. As fêmeas adultas também brincavam com as crias, que interagiram entre si com vários tipos de manifestação, que consistiram em atos imitando agressões, em mordiscadas, perseguições e vocalizações baixas, como também foram descritos por Prates *et al.* (1990b). As iniciativas nas brincadeiras partiam sempre das crias, que se alternavam nas brincadeiras. Também foi registrado o comportamento de brincar em grupo de três ou quatro indivíduos (Tabela 2). Nas 44 observações realizadas obteve-se valores de Qui quadrado, altamente significativos ($p < 0,0001$) nas interações entre: Macho adulto e cria 1, Macho adulto e cria 2, fêmea adulta 1 e cria 1, fêmea adulta 2 e macho adulto.

As brincadeiras ocorreram mais entre os filhotes como observou Oliveira (1993), sobressaindo alta freqüência de interações ($n = 269$), alcançando uma média total de 44 segundos para esse comportamento, o que indica que os bugios embora brinquem muitas vezes, não se detém muito tempo nessa interação social.

As agressões foram raríssimas, com apenas um registro de disputas por alimento, que não passaram de vocalizações e ameaças de perseguições, confirmando serem os bugios animais pacíficos, como demonstram diversos trabalhos (Carpenter, 1934; Altmann, 1959; Bernstein, 1964; Neville, 1972b; Baldwin e Baldwin, 1976; Jones, 1980; Mendes, 1989; Oliveira, 1993; Marques, 1996).

As tarefas de amamentar e carregar filhotes são atribuições das fêmeas adultas, que executaram esse comportamento cada uma com sua prole. Os filhotes aos seis meses de idade já ingeriam alimentos sólidos. Durante o período de estudos observou-se que a fêmea adulta 1 dedicou, em média 160 segundos a esse comportamento, e a fêmea adulta 2, 109 segundos.

Quanto ao comportamento de carregar os filhotes, a fêmea adulta 1 apresentou maior freqüência de execução ($n = 43$), que a fêmea adulta 2 ($n = 38$ vezes). Essa interação mãe-filhote dava-se em situações de travessia de uma árvore para outra, ou em circunstâncias que representavam perigo iminente, como a presença de animais ou de pessoas estranhas na área.

Para ambos os comportamentos, em 30 observações, não se alcançou valores estatisticamente significativos, a não ser quando analisados os totais.

O macho não participou do cuidado com as crias, porém, posicionava-se na mata de tal forma, que sempre pudesse ver o local onde o grupo estava reunido. As seis cópulas observadas e identificadas como interações sexuais ocorreram entre o macho adulto e as fêmeas adultas. As cópulas observadas apresentaram média de duração de 60 segundos, contrastando com o que foi observado por Braza (1980), ocasião em que registrou cópulas em *Alouatta seniculus* com duração de 2 minutos. No bando estudado as iniciativas nas interações sexuais foram sempre tomadas pelas fêmeas adultas, assim como também relatou Carpenter *apud* Mendes, 1989.

O bando alimentavam-se três vezes ao dia: ao amanhecer, ao meio dia e antes de dormir, gastando em média 1 h 40 min, na execução dessa categoria. Durante o período de estudos os bugios demonstraram uma dieta essencialmente vegetariana, feita à base de frutos e folhas, coincidindo esses dados com Braza *et al.* (1983). Crockett e Eisenberg, 1987 os consideraram folívoros-frutívoros. Registrou-se que a preferência por frutos excedeu à de folhas (Tabela 3). O consumo médio de figos foi alto (398,50;

Tabela 3. Média total e porcentagem do consumo de diferentes itens vegetais utilizados pelos Bugios (MA-macho adulto, FA-fêmea adulta, FSA-fêmea subadulta, CR-cria), durante o verão de 1999.

Famílias	Espécies	Nomes comuns	Itens consumidos	Médias	Classes sexo-etárias %			
					MA	FA	FSA	CR
Meliaceae	<i>Trichilia clausenii</i>	Catingá	Folha nova	2,00	33,33	16,67	0	50,00
Myrtaceae	<i>Myrciaria tenella</i>	Cambuim	Folha nova	3,75	53,34	20,00	13,33	13,33
Moraceae	<i>Sorocea bomplandii</i>	Cincho	Folha nova	11,75	21,28	29,79	40,43	8,50
Rutaceae	<i>Zanthoxylum rhoifolium</i>	Mamica-de-cadela	Folha nova	17,75	32,39	30,99	22,54	14,08
Minosaceae	<i>Mimosa bimucronata</i>	Maricá	Folha nova	1,00	0	50,00	0	50,00
Moraceae	<i>Ficus organensis</i>	Figo	Fruto	398,50	21,33	34,50	21,90	22,27
Annonaceae	<i>Rollinia exalbida</i>	Araticum	Fruto	8,75	20,00	31,43	34,29	14,28
Guttiferae	<i>Rheedia gardneriana</i>	Bacupari	Fruto	9,67	11,76	23,53	64,72	0
Myrtaceae	<i>Psidium guabava</i>	Goiaba	Fruto	43,25	31,22	38,15	16,76	13,87
Ebenaceae	<i>Diospyros kaki</i>	Caqui	Fruto	2,00	0	100,00	0	0
Palmae	<i>Syagrus romanzoffiana</i>	Coco (Gerivá)	Fruto imat.	10,00	26,67	36,67	36,67	0
Palmae	<i>Butia eriospata</i>	Butia	Fruto	8,25	24,29	48,48	18,18	9,09
Leguminosae (Mim.)	<i>Enterolobium contortisiliquum</i>	Timbaúva	Semente	1,00	0	100,00	0	0

Nomenclatura científica (Lorenzi 1992)

$n = 1.594$ episódios), e constituiu a base da alimentação dos bugios nesta época do ano, por ser um fruto com grande disponibilidade durante todo o verão (Fig. 2), confirmando os resultados obtidos por Prates *et al.* (1990a) e Marques (1996). A média registrada de consumo de outros frutos, embora baixa, demonstrou que os bugios preferem esse item alimentar, selecionando-o conforme o grau de amadurecimento de cada espécie. A porcentagem de consumo de todos os frutos disponíveis na estação, por classe sexo-etária, obteve índices similares.

O consumo de caqui (*Diospyros kaki*) apresentou o menor índice de frequência, provavelmente por haver pouca oferta desta frutífera na região habitada pelo grupo estudado. Este item não foi referendado em nenhum outro trabalho. Quando os frutos da figueira tornaram-se suficientes para a sua dieta, os indivíduos usaram a maior parte do seu tempo em deslocamentos para encontrar outros frutos e folhas novas. Milton (1980) demonstrou que os bugios selecionam itens de determinadas plantas com densidade relativamente baixa, ignorando outras com densidades altas. Tal preferência provavelmente poderia estar vinculada à qualidade nutricional de determinado item vegetal.



Figura 2. Comparação do consumo médio mensal de frutos, realizado por todos os indivíduos do bando, durante os meses de verão de 1999.

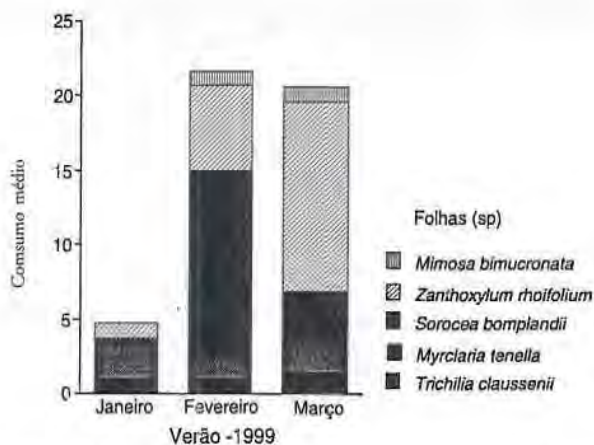


Figura 3. Comparação do consumo médio mensal de folhas, realizado por todos os indivíduos do bando, durante os meses de verão de 1999.

Os bugios também demonstraram preferência por folhas novas, quando ocorreu a escassez de frutos maduros na área (Fig. 3). Alguns autores afirmam que o consumo elevado de folhas ocorre em estações em que a predominância de frutos é baixa (Cunha, 1994; Chiarello, 1994). A porcentagem média de consumo de folhas foi alto, destacando-se as folhas de Cambuim (*Myrciaria tenella*), especialmente selecionadas pelo macho, além das folhas novas de Mamica-de-cadela (*Zanthoxylum rhoifolium*) e de Cincho (*Sorocea bomplandii*), apreciada por todos os indivíduos do bando, cuja preferência sobressaiu às demais espécies de vegetais registradas (Tabela 3). Isso deve-se à presença de folhas novas nessas árvores, como também observaram Prates *et al.* (1990a), constituindo juntamente com os frutos, itens importantes da dieta dos bugios no verão, sendo mais expressiva no mês de março.

Quanto à utilização de sementes na alimentação dos bugios, somente um registro foi feito, do qual participou uma fêmea adulta consumindo uma semente de Timbaúva (*Enterolobium contortisiliquum*).

Conclusões

Concluiu-se que: As interações sociais, não sendo frequentes, reforçam que o mais importante para um bando é a manutenção dos vínculos entre os indivíduos, enfatizando seu tipo de organização social e conseqüente sistema de acasalamento; Os bugios são primatas dóceis e pacíficos, mantendo uma comunicação estável entre os membros do bando, obedecendo uma clara e harmônica hierarquia social; Sendo animais que não apresentam grandes taxas de atividade diária, necessitam estar próximos à fonte de alimentação, caracterizada por vastas áreas com grande disponibilidade de vegetais; A preservação de seu habitat natural e o conhecimento de seu comportamento são os fatores mais importantes para a sua conservação.

Agradecimentos

Agradecemos à administração do Parque Estadual de Itapuã, pela autorização de permanência para a pesquisa, e aos funcionários pela colaboração. À diretora do ICB, Profa. Lorena Teresinha Consalter Geib pelo grande apoio e incentivo; à Profa. Nêmore Pauletti Prestes pelas valiosas opiniões na revisão do texto; à doutoranda Ana Alice B. Marques por ter-nos apresentado o bando do bugios e facilitado uma valiosa bibliografia; à Márcia da Silva Jorge pelo apoio técnico.

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PRIMATES OF THE CHAPADA DAS MANGABEIRAS, PIAUÍ, BRASIL: A NORTHERN EXTENSION TO THE RANGE OF *ALOUATTA CARAYA*

Kevin Fleisher

Introduction

Dissimilar range maps of the primates inhabiting the northern cerrado in three field guides reflect the ambiguity of species ranges for this poorly sampled area. Auricchio (1995) and Emmons and Feer (1997) show the range of *Alouatta caraya* extending north to 13° S, reaching the upper Tocantins and São Francisco watersheds. To the north of this, an area encompassing approximately 40% of the cerrado biome, Emmons and Feer (1997) place a question mark on the map, while Auricchio (1995) leaves this region blank. Eisenberg and Redford (1999) place a similar northern limit on *A. caraya* (12.5° S), but show *A. belzebul* inhabiting the northern cerrado. FURPA (1997) also list *A. belzebul* as the species present in the northern cerrado, citing it in the upper Parnaíba watershed at 10°S.

Auricchio (1995) uses the Rio Parnaíba watershed as the divide between *Callithrix jacchus* (inhabiting the east bank and extending into and encompassing the caatinga biome) and *C. penicillata* (inhabiting the west bank and extending through much of the southern cerrado). Eisenberg and Redford's (1999) maps for these two species are similar to Auricchio's (1995), but they place question marks over the shading on the northern cerrado region. Emmons and Feer (1997) place *C. jacchus* on the east bank as well, but leave the western bank of the Rio Parnaíba blank, with the northern limit of *C. j. penicillata* (different taxonomy referring to the same animal) being the border of Tocantins and Maranhão, just south of the Rio Parnaíba watershed. FURPA (1997), who sampled both sides of the river, cite *C. jacchus* as the only marmoset of the upper Rio Parnaíba. The three field guides and the FURPA APA (Área de Proteção Ambiental) report (1997) indicate *Cebus apella* as the third primate species of the northern cerrado, showing this as the only capuchin species occurring there.

Chapada das Mangabeiras

The Chapada das Mangabeiras is a series of sandstone plateaus extending approximately 300 km along the borders of Tocantins, Maranhão, Bahia, and Piauí (9-11° S and 45-47° W). These plateaus mark the divide between the São Francisco, Tocantins, and Parnaíba river drainages. The vegetation of the region has elements of both the cerrado and caatinga biomes with savanna as the predominant habitat, including densely wooded areas and open savannas with sparse tree and shrub cover.

The study site was located in the upper Rio Parnaíba watershed in the state of Piauí (Fig. 1). Here, the Serra da Tabatinga rises 200–400 m above a vast sandy plain, with steep cliffs reaching 700–800 m a.s.l. Springs rising at the base of these cliffs feed the many streams and rivers that course through the wooded savannas. Gallery forests, backed by buriti palm (*Mauritia flexuosa*) wetlands (*veredas*), grow along these waterways creating a latticework of extensive green corridors. The few rivers on the plateau cut deeply into the sandy soils creating tight ravines with narrow bands of gallery forest.

Methods

I visited the Chapada das Mangabeiras in June 1999 and for two weeks in July 2000. The aim of the visits was to census the medium and large mammals of the Fazenda Serra Vermelha (10°10'S, 45°32'W, a private reserve owned by the Fundação

BioBrasil) and to make a general reconnaissance of the region (Fig. 1). Census methods consisted of hiking throughout the 4,000 ha property and recording any signs of wildlife. In addition, I interviewed several local hunters from the town of São Gonzalo who were familiar with the area. Day census hours totaled 129 hours for the two visits. I spent an additional 40 hours conducting censuses by car on the plateau of the Serra da Tabatinga in July 2000.

Results

Three species of primates inhabit the cerrado in this region: *Alouatta caraya*, *Cebus apella*, and *Callithrix jacchus*. The three species occur on Fazenda Serra Vermelha, and while I saw no primates on the plateau, a more thorough survey of the gallery forests along the rivers is necessary to determine whether they are present. *C. jacchus* also inhabit the towns in the region.

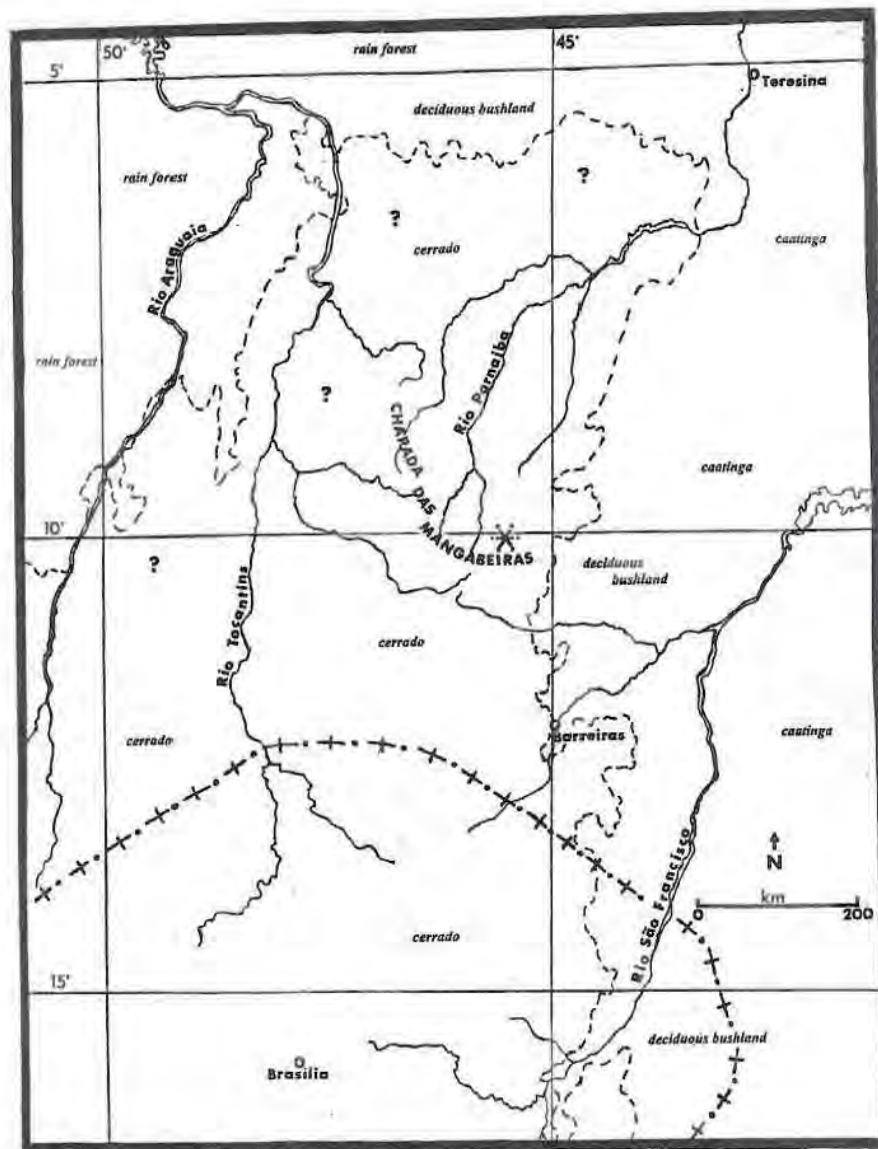


Figure 1. The expanded range of *Alouatta caraya* in the northern cerrado. The hatched line marks the limit of the cerrado biome (IBGE 1993); crosses and dots show the northern range limit of *A. caraya* according to Auricchio (1995), Emmons and Feer (1997), and Eisenberg and Redford (1999); the star marks the census area and the new northern limit of *A. caraya*'s range. Question marks indicate areas where censuses are needed to clarify species ranges.

Alouatta caraya (guariba)

I saw a lone black male in the narrow (5-10 m) gallery forest of a seasonally dry stream in the Fazenda Serra Vermelha. Several of the local workers reported occasionally seeing a group of three howlers (two yellow females, one black male) and another group with 6-9 individuals in the gallery forest of the Rio de Ouro. I failed to see any howlers or howler feces along this river or in the gallery forest of the Rio Uruçuí, despite repeated attempts, and never heard howlers calling.

On a visit to the Fazenda Arucusão (several km S/SE from Barrieras de Piauí) in 1999, I saw a group of 5-6 howlers (one male, 2-3 females, and two sub-adults) in a gallery forest of a small stream. Another scientist saw a female of a second group in the same gallery forest, approximately 400 m from the first group. The adult male was black, while the females were yellow with orange "beards", and the sub-adults had yellow over-fur with black under-fur.

Callithrix jacchus (mico-estrela)

I saw marmosets twice in the gallery forest of the Rio de Ouro, a group of three and a single individual. The marmosets were gray with black stripes down the back and tail, grayish to white ear tufts, black/gray on the throat, back of the head, and around the face, with a white "star" on the forehead. The marmosets feed on buriti exudates, and several trees were scarred with small cuts. Marmosets inhabit several of the towns in the region, and I saw two marmosets in a garden in Correntes and heard a group calling from some trees in another garden.

Cebus apella (macaco-prego)

I did not see capuchin monkeys, but several of the local workers and researchers reported sporadically seeing a group of approximately 16 monkeys. The capuchins appear to range widely, using the wooded savannas in addition to the gallery forests, and raid mango trees during the fruiting season. I found a "mortar and pestle" site in the woodlands where capuchins use stone hammers to open hard palm nuts.

Conservation status

Although it would appear that the extensive network of gallery forests would provide ample habitat for the three primate species, they are all rare. FURPA (1997) reported low densities for all species, with *C. jacchus* being the most abundant, followed by *C. apella*, and with *A. caraya* (listed incorrectly as *A. belzebul*) on the verge of extinction in the region due to over-hunting. Informants (five hunters interviewed) told me that while some people eat howler monkeys, capuchin monkeys and marmosets are rarely, if ever, eaten. Eisenberg and Redford (1999) cite yellow fever epidemics as another possible explanation for low howler densities throughout the cerrado biome. Natural predators include boa constrictors, jaguars, pumas, several smaller cats, and raptors.

Biogeography

The howler monkeys I saw were undoubtedly *Alouatta caraya*, with the characteristic sexual dimorphism and female coloration

of the sub-adults. This expands the distribution of this species to 10° S, an increase of 2 to 3° over former estimates, adding a minimum of 180,000 km² to the species range. While Eisenberg and Redford (1999) place the southern range limit of *A. belzebul* at 15° S, their southernmost data collection site is in the Amazon rain forest biome at 5° S. Coimbra-Filho *et al.* (1995), however, discussed a record of *A. belzebul* in the far south of Piauí (Angico, Parnaguá; Neiva and Penna, 1916). This is a little south of the Chapada das Mangabeiras, and in area believed to be humid forest at the time (Coimbra-Filho and Câmara, 1996). *A. caraya* is the howler of the cerrado/caatinga in Brazil, and it has probably expanded its range north, replacing *A. belzebul* in North-east Brazil, as the caatinga (desert scrub) has expanded with the widespread destruction of the forests, as argued by Coimbra-Filho and Câmara (1996). Today, the ranges of the two howlers interdigitate as the cerrado grades into rain forest in southern Maranhão.

The presence of *Callithrix jacchus* on the east bank of the Rio Parnaíba conforms with the distribution maps of Auricchio (1995), Emmons and Feer (1997), and Eisenberg and Redford (1999). Whether or not the western bank is occupied by *C. penicillata* (or *C. j. penicillata*), remains to be determined, although if the FURPA (1997) report is correct, *C. jacchus* also occurs on the west bank in the river's upper watershed. This implies that the upper Rio Parnaíba is not a biogeographic barrier separating these two marmoset species. It is difficult to imagine that the streams and small rivers of the upper Parnaíba watershed are wide enough to create movement barriers for any of these primates.

While I did not see capuchin monkeys, local informants and other scientists identified *Cebus apella* as the species present when asked to select a capuchin monkey from the plates in Emmons and Feer (1997), and as this information conforms to the distribution maps of the three field guides and the FURPA report, there is no reason to suspect that the species was misidentified.

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News

NEW FIELD SITE: PRELIMINARY CENSUS OF PRIMATES AT EL ZOTA BIOLOGICAL FIELD STATION, COSTA RICA

El Zota is a new biological field station located in northeastern Costa Rica (10°57.6'N, 83°75.9'W) near the Barro del Colorado Reserve (Fig. 1). The Station includes approximately 1000 hectares (over 2470 acres) of lowland rainforest that is host to a diverse native fauna and flora. It is among the largest of its kind in Costa Rica and is home to more wildlife than in any other biological station of its kind in the country. Portions of El Zota were formerly used as a cattle ranch, but have now been converted to a functional tree farm, producing both native and exotic trees for harvest as a means of sustainable land use. The majority of the station is natural forest (~700 ha), including lowland rain forest, lowland swamp forest, pasture (~30ha), and the reforested areas of monospecific stands of trees used for timber and paper. A small river meanders through the swamps.

The mammals at El Zota include white-fronted capuchins (*Cebus capucinus*), mantled howlers (*Alouatta palliata*), black-handed spider monkeys (*Ateles geoffroyi*), tapirs (*Tapirus bairdii*), jaguars (*Panthera onca*), peccaries (*Tayassu tajacu*), Honduran tent bats, and white-tailed deer (*Odocoileus virginianus*). The avifauna includes the great green macaw (*Ara ambigua*), several other species of parrots, including *Amazona farinosa*, three species of toucans (*Ramphastos* spp. and *Pteroglossus torquatus*), king vultures (*Sarcoramphus papa*), swallow-tailed kites (*Elanoides forficatus*), purple-throated fruit crows (*Querula purpurata*), semiplumbeous hawks (*Leucopternis semiplumbea*), laughing falcons (*Herpotheres cachinnans*), and a host of others. The brown caiman (*Caiman crocodilus*), green iguana (*Iguana iguana*), green basilisk (*Basiliscus plumifrons*), yellow-headed gecko (*Gonatodes albogularis*), fer-de-lance or terciopelo (*Bothrops asper*), hog-nosed viper (*Porthidium nasutum*), and boa constrictor (*Boa constrictor*) are among the documented species of reptiles, and the strawberry (*Dendrobates pumilio*) and green-and-black (*D. auratus*) poison dart frogs are among the amphibians. Several of these species are considered endangered or threatened (e.g., spider monkey, jaguar, and tapir). Faunal surveys are still in progress.

The El Zota field station is designed to allow students to learn techniques that can be applied to field research on ecology, behavior, and conservation in the tropics as well to the protection and management of the research station itself. The station is owned by the Hiner Ramirez family of Costa Rica and affiliated

with the Fundación Neotropical in Costa Rica. The field school curriculum is designed by a group of seasoned faculty from various universities. Together, all parties involved are committed to the conservation and the land and its inhabitants in this part of Costa Rica.

We surveyed El Zota Biological Field Station from 21 to 29 July, 2000, specifically to census the primates. Over the course of five days we walked line transects, at a speed of less than 1 km per hour, following old trails and recording the species, number, age and sex, activity, heights, and reactions of all primates observed. Transect length totaled 18.9 km, and the area surveyed was approximately 7% of the total forest (5.7 km²). Detection distances for the primates were set at 20 m. Transects were thus considered to be 40 m in width (2 x 20 m). A total of 16 spider monkeys, 20 howlers, and 17 capuchins were recorded in 13 different groups. We observed one mixed species group containing capuchins and one spider monkey. Spider monkey parties (n = 6) ranged from one to eight individuals and averaged 3.3 individuals per party. Capuchins averaged 5.4 individuals per group (n = 3, range 4-8 individuals), and howling monkeys averaged 4.2 individuals per group (n = 5, range 1-6 individuals).

The densities of the different primate species were calculated by dividing the number of individuals sighted by the area surveyed (length x width of transects). The density of spider monkeys at El Zota is estimated to be approximately 28 ind/km². Howling monkeys were recorded at a density of 35 ind/km², while capuchins were present at a density of 30 ind/km². Densities reported for spider monkeys at other sites in Central America are similar (Cant 1978, Gonzalez-Kirchner, 1999). Using these values, we estimate there to be two to three spider monkey communities within the boundaries of El Zota Biological Field Station. Densities of howling monkeys at El Zota agree with findings from other sites as well (Estrada, 1982). One howling monkey group was observed more than once and was identifiable based on the pelage color of some individuals. This group consisted of at least six individuals: two adult males, one subadult male, two females, and one immature.

Inaugural class sessions, including courses in Primate Behavioral Ecology and Tropical Herpetology, will be held at El Zota



Figure 1. Location of El Zota Biological Field Station.

Biological Field Station during June-July 2001. Class size is limited to around 20 students, with one professor and up to three teaching assistants per class. Each class includes a series of lectures and a field component that includes orientation to the station and field techniques that are useful in tropical research, such as census and mapping methods, classification of vegetation, and behavioral observation of animals. In addition, each student is required to propose and conduct a research project of his or her own design. Classes are 28 days long and include one overnight field trip to another site in northeastern Costa Rica. Please contact the authors for more information about attending classes, instructing classes, or conducting research at El Zota Biological Field Station.

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NEW LEMURS AND LEMUR ORIGINS

The December 2000 issue of the *International Journal of Primatology* (Vol. 2, No. 6), edited by Russell H. Tuttle, was dedicated to the Madagascar lemurs. There are four articles, taxonomic revisions of three groups of lemurs (the mouse lemurs *Microcebus*, the dwarf lemurs, *Cheirogaleus*, and the woolly lemur, *Avahi*), and a review of the evolution and diversity of the lemurs, as well as two book reviews.

The first article, by Urs Thalman (Anthropological Institute, Zurich University) and Thomas Geissmann (Institute of Zoology, Tierärztliche Hochschule Hannover), discusses the distribution and geographic variation in the western woolly lemur (*Avahi occidentalis*) and describes a new species, *Avahi unicolor*, from Cacamba on the peninsula of Ampasindava, north-west Madagascar. The authors also refer to a third distinct form from Bemaraha, near the village of Ambalarano in eastern Madagascar, but did not name it due to lack of adequate type material. They conclude that further distinct populations may be found. In the second article, Colin P. Groves (School of Archaeology and Anthropology, Australian National University) provides a new classification of the dwarf lemurs (*Cheirogaleus*). Two species were recognized in the past, but in this revision Groves distinguishes seven different morphs. The *Cheirogaleus medius* group was split into two closely related allopatric species, *C. medius* E. Geoffroy

St. Hilaire, 1812, from the western dry forests, and *C. apidicaudatus* Grandidier, 1868, from the southern spiny forest. The *Cheirogaleus major* group was found to have two widespread and partially sympatric species, *C. major* E. Geoffroy St. Hilaire, 1812, from the lowland rain forests and *C. crossleyi* Grandidier, 1870, from the plateau margins. A third species was also recognized, *C. sibreei* Forsyth Major, 1896, known only from three sites: its type locality, Ankeramadinika, and Imerima and Pasandava. Groves described two further species in this group, *C. rufus* from Tamatave, with a small coastal range within that of *C. major*, and *C. minusculus*, known only from its type locality, Ambositra. The third article, by Rodin M. Rasoloarison (Université d'Antananarivo, Madagascar), Steven M. Goodman (Field Museum of Natural History, Chicago) and Jörg U. Ganzhorn (Zoologisches Institut und Zoologisches Museum, Hamburg), is a taxonomic revision of the smallest extant primates, the mouse lemurs (*Microcebus*) in the west of Madagascar. Until recently they were considered to comprise just three different species. In this review the authors recognize seven species from western Madagascar. Three they name and describe: *Microcebus tavarua* from the Réserve Spéciale de l'Ankarana; *Microcebus sambiranensis* from the Réserve Spéciale de Manongarivo; and *Microcebus berthae* from the region surrounding Kirindy. The authors also resurrect a previously synonymized form, *M. griseorufus* Kollman, 1910, and revise diagnoses for *M. murinus* (J. F. Miller, 1777), *M. myoxinus* Peters, 1852, and *M. ravelobensis* Zimmerman *et al.*, 1998.

Well illustrated in these three articles, the number of recognized lemur species has increased significantly in recent years, and in the fourth article, Robert D. Martin (Anthropological Institute, Zurich University) reviews their origins, diversity and relationships. Martin points out that the modal value for distribution size of the lemurs is an order of magnitude smaller than for other primates. The 33 species he lists (increasing to 43 with the new and resurrected species described in the previous three articles) occupy a land area of only 587,045 km². As Martin points out, this makes them especially vulnerable to extinction, and the need for conservation action, including genetic monitoring and effective management policies, is particularly urgent. Martin goes on to discuss developments in the discovery of new taxa and the resurrection of old taxa, and in our knowledge of geographic distributions. The general consensus is that lemurs form a monophyletic group, with genetic studies arguing against the morphological evidence that cheirogaleids are more closely related to the lorisiformes. Chromosomal, immunological, and molecular phylogenies have identified the aye-aye, *Daubentonia madagascariensis*, as the first offshoot in the clade, but Martin points out that studies of the mitochondrial COII gene have indicated that it branched off before the divergence between lorisiformes and lemuriformes, and that further genetic studies are needed. Martin then proceeds with fascinating discussions on the inference of taxonomic status from phylogenetic trees, and on continental drift, the time of origin, and the invasion of Madagascar by these primates. His argument is that primates are a much older order than previously thought, originating around 90 million years ago rather than 55 million years ago as indicated by a direct reading of the fossil record. Lemurs, he concludes, would then have colonized Madagascar

about 80 million years ago – double the date usually accepted. This issue of *International Journal of Primatology* concludes with two book reviews. In the first, Deborah Overdorff reviews *New Directions in Lemur Studies*, edited by Berthe Rakotosamimanana, Hanta Rasamimanana, Jörg Ganzhorn, and Steven M. Goodman (1999, Kluwer Academic/Plenum Publishers, New York). The second review, by Colin P. Groves, is of *Walker's Primates of the World*, by Ronald M. Nowak (2000, Johns Hopkins University Press, Baltimore).

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4º PRÊMIO HENRY FORD DE CONSERVAÇÃO AMBIENTAL

A Ford e a organização não-governamental Conservation International do Brasil promoveram no dia 24 de novembro de 1999, no Recife, a entrega do 4º Prêmio Henry Ford de Conservação Ambiental, reconhecendo os trabalhos mais importantes de preservação ambiental desenvolvidos no País durante 1999. A solenidade teve como convidados de honra o vice-presidente da República, Marco Maciel, o ministro do Meio Ambiente, José Sarney Filho, e contou também com a presença da vice-presidente mundial de Engenharia de Segurança e Meio Ambiente da Ford, Helen Petrauskas, e do diretor da Conservation International do Brasil, Roberto Cavalcanti, além de outras autoridades, executivos da Ford e ambientalistas.

Lançado no Brasil em 1996, o Prêmio Henry Ford de Conservação Ambiental vem conhecendo um aumento crescente de popularidade e firma-se como a premiação de maior prestígio nessa área no País. Esse crescimento pode ser medido, por exemplo, pelo número de trabalhos inscritos - 92 em 1999, contra 70 na edição anterior - vindos de todas as regiões do País. Outro indicador é a grande variedade de iniciativas concorrentes, que abrange desde projetos de empresas de grande porte e instituições tradicionais de pesquisa até pequenos grupos organizados de catadores de papel, refletindo a disseminação da cultura conservacionista em diversos níveis da sociedade.

Os trabalhos inscritos foram analisados e selecionados por um júri de alto nível, formado por: Eric Stoner, assessor ambiental da USAID - Agência Norte-Americana para o Desenvolvimento Internacional; Jader Marinho Filho, professor do Departamento de Zoologia da Universidade Nacional de Brasília; e Geraldo Wilson, professor da Universidade Federal de Minas Gerais. Foi distribuído um total de US\$ 40 mil em prêmios, em quatro categorias: Conquista Individual, Negócios em Conservação, Ciência e Formação de Recursos Humanos e Iniciativa do Ano em Conservação.

Categoria Conquista Individual: Maria Tereza Jorge Pádua, Presidente da Funatura - Fundação Pró-Natureza, de Brasília, pela dedicação e pioneirismo na criação e consolidação do sistema de unidades de conservação do País. Na direção do Instituto Brasileiro de Desenvolvimento Florestal (IBDF) e do Instituto Brasileiro de Meio Ambiente e Recursos Naturais Renováveis (IBAMA), viabilizou a criação do mais expressivo número de unidades de conservação e da maior superfície territorial protegida de toda a história do Brasil, com destaque para a região amazônica.

Categoria Ciência e Formação de Recursos Humanos: Museu de Biologia Prof. Mello Leitão, do Espírito Santo, fundado pelo naturalista Augusto Ruschi, patrono da ecologia no Brasil, por seus 50 anos de trabalho pioneiro voltado à pesquisa biológica, estudo de plantas e animais, educação ambiental e conservação da natureza. Reconhecido como principal pólo de formação de recursos humanos na área de conservação biológica no estado, treina e capacita agentes comunitários, gerencia áreas protegidas e recebe anualmente cerca de 30.000 turistas, estudantes e cientistas.

Categoria Negócios em Conservação: Agência de turismo Mata Dentro Ecoturismo e Aventura, que ajudou a transformar a cidade de Brotas, no centro do estado de São Paulo, região dominada pelo cultivo de cana-de-açúcar, em um centro de ecoturismo, aventura e esportes ligados à natureza. Seu trabalho envolve uma iniciativa simples e barata, com ampla participação da comunidade local, parcerias, treinamento de monitores, educação ambiental e recuperação de áreas degradadas, mostrando que a preservação pode ser lucrativa e promover o desenvolvimento regional.

Iniciativa do Ano em Conservação: Programa Biota/Fapesp: o Instituto Virtual da Biodiversidade, de Campinas, São Paulo, pelo trabalho pioneiro de integração da comunidade científica do estado de São Paulo para o mapeamento da biodiversidade da região. O diagnóstico de tudo o que se conhece da flora e fauna paulista, resultado de três anos de trabalho, está reunido numa série de sete livros - Biodiversidade do Estado de São Paulo: Síntese do Conhecimento no Final do Século XXI. O projeto envolveu mais de 200 doutores e cientistas e seus dados estão disponíveis na Internet.

O Prêmio Henry Ford de Conservação Ambiental faz parte da parceria entre a Ford e a Conservation International do Brasil (CI-Brasil), que também permite o desenvolvimento de vários outros projetos, com investimentos que totalizaram US\$ 1 mi-

lhão, de 1996 a 1999, para a implantação de modelos inovadores de conservação da biodiversidade na Amazônia, Mata Atlântica, Cerrado e Pantanal. *Informação da Imprensa Ford, Tel. +55 011 754 9585. Internet: <www.ford.com>*.

IPÊ – INSTITUTO DE PESQUISAS ECOLÓGICAS - CURSO EM BIOLOGIA DE CONSERVAÇÃO

O Curso Latino Americano de Biologia da Conservação e Manejo da Vida Silvestre será realizado durante o período 05 de novembro a 07 de dezembro de 2001, na sede do IPÊ - Instituto de Pesquisas Ecológicas, Nazaré Paulista, e no Parque Estadual Morro do Diabo no Pontal do Paranapanema, São Paulo. Para maiores informações, por favor escreva ou entre no site do IPÊ. *Para maiores informações:* Eduardo H. Ditt ou Clarice Bassi, IPÊ - Instituto de Pesquisas Ecológicas, Caixa Postal 47, Nazaré Paulista 12960-000, São Paulo, Brazil, Tel/Fax: +55 (11) 4597-1327, Cel.: 55 (11) 9973-8555, e-mail: <ipecurso@ig.com.br>. Web page: <www.ipe.org.br/agenda.htm>.

PRIMATE REFUGE AND SANCTUARY OF PANAMA

Created as an international effort to protect Panamanian nonhuman primates, the Primate Refuge and Sanctuary of Panama (PRSP) provides a naturalistic environment for long-term studies and education to all levels of the public on Panama's primates. The Sanctuary takes in former pets and monkeys confiscated from the illegal trade. Tamarins, howlers, spider monkeys, owl monkeys and capuchins are rehabilitated and reintroduced to the islands of Tigres and Brujas, a group of about a dozen islands in Lake Gatun, an artificial lake created in 1914 with the construction the Panama Canal. These refuges provide controlled access to the primates and also act as an isolating mechanism for species which may be harmful to each another.

Important aspects of the PRSP include research, educational, and ecotourism opportunities. Courses are offered on nonhuman primates as well as tropical ecology and tropical botany. An intensive program on primate behavior and ecology is given once a year in which students receive 7 semester credits during a four-week course. PRSP currently has sufficient housing and kitchen facilities for 30 students and faculty. The Sanctuary also encourages day visits by universities, high schools and elementary schools, as well as ecotourists. Professional scientists can arrange to spend a night or several days at the PRSP.

D. R. Rasmussen, Director, Primate Refuge and Sanctuary of Panama and Associate Professor, Florida State University-Panama, e-mail: <islatigre@yahoo.com>.

2000 IUCN RED LIST

Accessing the IUCN Red List website had been proving problematic, but it is now back up on-line again at <http://www.redlist.org/>. The revamped site looks much the same but the database behind the search function has been moved to a

more stable platform, combining Oracle with Linux on an Apache server. This new platform is much faster. Taking advantage of the opportunity, a number of changes were made: 1) Correction of some errors in the data, particularly the distributions of the birds; 2) Improved functionality of the search options by adding in some new search 'modifiers' and a list of special animal keywords to help those without any taxonomic knowledge (i.e., it is now possible to search under words like "bats", "sharks", etc.); 3) A complete re-write of the Help menu to provide improved guidance on the search functions, and printing and saving options; 4) Updates to many of the static background documents, including drawing attention to the fact that the 2000 Red List does NOT incorporate all the plant assessments from the 1997 IUCN Red List of Threatened Plants; 4) Addition of a new static page providing links to a number of other related web sites which contain additional information on species, photographs and details of conservation programmes. We hope that you will all find the revamped site much more accessible and faster. Please report any problems you may encounter to us. The next major update to the site will be in January 2002 when the 2002 Red List is launched. The IUCN Red List Programme is sponsored by the Center for Applied Biodiversity Science (Conservation International) and the UK Dept. of Environment, Transport & the Regions.

Craig Hilton-Taylor, IUCN Red List Programme Officer, IUCN/SSC UK Office, 219c Huntingdon Road, Cambridge CB3 0DL, UK, Tel: +44-1223-277966, Fax: +44-1223-277845, e-mail: <craig.hilton-taylor@ssc-uk.org>. Web: <http://www.redlist.org/>.

ZOOS GO WILD

Zoos Go Wild is an exciting new project aimed at assisting the European zoological community to develop closer links with and support for conservation projects in the wild. The first phase of the project began in May 2001, in the Biodiversity hotspots of Ecuador, Peru, Bolivia, Columbia, and Brazil. For further information contact: Nan Swannie at <nan@nswannie.freereserve.co.uk> or Jens Sigsgaard at <jsi@aalborg-zoo.dk>, or visit their website <www.zoosgowild.com>.

SOPHIE DANFORTH CONSERVATION BIOLOGY FUND

The Sophie Danforth Conservation Biology Fund (SDCBF), established by the Roger Williams Park Zoo and the Rhode Island Zoological Society in 1989, supports conservation programs which protect threatened wildlife and habitats worldwide. Field studies and other projects that demonstrate a multi-disciplinary approach to biodiversity and ecosystem conservation and projects that involve in-country collaborators receive the highest funding priority. Environmental education programs, development of techniques that can be used in a natural environment, and captive propagation programs that stress an integrative approach to conservation are also appropriate. The maximum annual request is US\$1,000. The maximum total proposal length is one title page, a three-page proposal narrative (10 point type minimum), two-page CV, and two

letters of recommendation. Applications and letters of recommendation must be received by 1 June, 2001. Grants are awarded 1 September, 2001. Further information and applications by e-mail, postal mail or fax to: Sophie Danforth Conservation Biology Fund, Roger Williams Park Zoo, 1000 Elmwood Avenue, Providence, Rhode Island 02907, USA, Fax: (401) 941-3988, e-mail: Lisa Dabek <Ldabek@rwpzoo.org>.

HARRY C. ROWSELL AWARD

The Harry C. Rowsell Award was established by the Scientist's Center for Animal Welfare (SCAW) in 1992 to honor Dr. Rowsell, who has made major contributions in promoting animal welfare nationally and internationally. The award is given to a person who has shown commitment to fostering both the goals of science and humane treatment of animals used in research, testing, and teaching. Nominations for the 2001 award will be accepted by the SCAW until September 28, 2001. To nominate a colleague send a description of his/her work which you feel exemplifies the goal of the Award, typed on a single-spaced 8 1/2 x 11 page. You may also include the nominee's CV or special project description. Once selected the recipient will be honored at the SCAW's winter meeting in San Antonio, Texas, on December 10-11, 2001, and will receive a \$1000 honorarium. Please send all information to: SCAW, 7833 Walker Dr., Suite 410, Greenbelt, MD 20770, Tel: 301 345 3500, Fax: 301 345 3503, e-mail: <info@scaw.com>.

Primate Societies

XVIII CONGRESS OF THE INTERNATIONAL PRIMATOLOGICAL SOCIETY



The XVIIIth Congress of the International Primatological Society was held in Adelaide, South Australia, from January 7 to 12, 2001. The Australasian Primate Society was the hosting organization, and the national organizing committee consisted of Graeme Crook, Carla Litchfield, Penny Harper, and Christine Baker. The committee had worked very hard over the past four years in an effort to make the congress a successful one.

There were 371 registered participants from 37 countries represented at the Congress. Over the course of the five days there were 35 organised symposia and another 19 sessions, in which a total of 332 papers were presented on almost all every aspect of Primatology. There were up to seven sessions running concurrently, and with a number of people either not turning up or withdrawing at the last moment, there were almost hourly changes to the program, which made the organisers' job even more difficult. There were also 33 posters presented and these were on display in the main venue hall for the duration of the congress, with authors having the opportunity to talk of their posters on the Thursday. The papers are currently being gathered

for publication on a CD-ROM of the Proceedings, which should be available later this year.

The General Meeting of the IPS was held on the Monday evening, and the Wednesday evening featured the launch of the Conservation International Action Plan for the world's most endangered primates. Both these events were featured in the national newspapers and on national radio and television news reports. Quite a few of the delegates were interviewed by the media on a wide variety of topics.

The event was held in middle of the hottest summer ever recorded in Adelaide. The average maximum temperature for the week was 37°C, peaking at 43.2°C on the Saturday. This made for some very hot delegates, some even resorting to tipping water over themselves in an effort to stay cool. All in all, the delegates handled the conditions and seemingly ever changing program with very good humour, and everyone enjoyed the congress.

The organisers would like to thank those organisations that provided support and assistance with the congress: EventsOz (especially Trevor Keeling and Pam Hammond), Conservation International, the Royal Agricultural and Horticultural Association of SA Inc, and the Adelaide Zoo.

Graeme Crook, Chair, Organizing Committee, XVIII Congress of the International Primatological Society, PO Box 500, One Tree Hill, SA 5114, Australia.

Recent Publications

TOPICS IN PRIMATE CONSERVATION

Primate-Science has announced the publication of a new monthly series on primate conservation. Brief reports will be accepted on the following topics: Conservation organization programs, Habitat preservation, Field work, Species survival plans, Managing wild populations, Maintaining viable genetic populations, Captive breeding, Projects supported by zoos, Reintroduction/Rehabilitation, Ecotourism, Field techniques and equipment, Field veterinarianship, Legislation, and the Bushmeat trade. The series will include already published literature as well as original submissions. For more information or to submit a report, contact: Dean Anderson, e-mail: <danders3@students.wisc.edu> or Nancy Ruggeri, e-mail: <nruggeri@facstaff.wisc.edu>.

BUSHMEAT HUNTING

The Center for Applied Biodiversity Science (CABS) at Conservation International (CI), Washington, DC, has begun a publication series, *Advances in Applied Biodiversity Science*, Series Editor, Philippa Benson. Number 1 in the series was "Regulating Genetically Modified Organisms: Striking a Balance between

Progress and Safety", by Cyril Kormos and Layla Hughes (2000, 42pp.). Number 2 has just been published - "Hunting and Bushmeat Utilization in the African Rain Forest: Perspectives Toward a Blueprint for Conservation Action", edited by Mohamed I. Bakarr, Gustavo A. B. da Fonseca, Russell A. Mittermeier, Anthony B. Rylands, and Kristen W. Painemilla (2001, 170pp., ISBN 1-881173-37-2). The publication resulted from a series of documents drawn up for a regional workshop on hunting and bushmeat utilization in West Africa, organized by CABS/CI and held in Ghana in December 1999.

The purpose of this volume was to draw attention to the complex nature of the bushmeat crisis in West and Central Africa and to serve as a starting point for dialogue across sectors about how best to develop and implement solutions. The ideas are neither a manual of conservation actions nor a prescription for addressing the bushmeat crisis. Instead, they are a collection of diverse perspectives to offer a framework for action, one that is based on the social, cultural, and ecological context within which the bushmeat crisis has arisen. The wildlife and human dimensions are analyzed by experts, all of whom submit their own methods, perspectives, and beliefs to help strengthen conservation initiatives. The audience targeted includes conservation practitioners, development agencies, and private sector industries interested in mitigating the bushmeat crisis. It includes the following chapters: Part 1. The Complex Nature of Bushmeat Hunting and Threats to Wildlife. 1. Regional dynamics of hunting and bushmeat utilization in West Africa - an overview - Hans-Ulrich Caspary; 2. Bushmeat hunting in the Congo basin - a brief overview - David S. Wilkie; 3. Colonial history, concessionary politics, and collaborative management of Equatorial African rain forests - Philippe Auzel & Rebecca Hardin; 4. Impacts of bushmeat hunting on wildlife populations in West Africa's Upper Guinea forest ecosystem - Heather E. Eves & Mohamed I. Bakarr; Part 2. The Human Dimensions and Conservation Challenges of the Bushmeat Crisis. 5. Social change and social values in mitigating bushmeat commerce - Anthony L. Rose; 6. Culture, ethics, and conservation in addressing the bushmeat crisis in West Africa - Kerry Bowman; 7. Wildlife utilization and the emergence of viral diseases - Rebecca Hardin & Philippe Auzel; 8. Legal and institutional mechanisms for wildlife and habitat protection in West Africa: The need for an integrated policy assessment - Cyril Kormos & Mohamed I. Bakarr. Part 3. Using Bioeconomic Modeling to Assess Sustainability of Bushmeat Hunting. 9. Potential applications of bioeconomic modeling in West Africa - Jim Cannon; 10. Assessing sustainability of hunting: Insights from bioeconomic modeling - E. J. Milner-Gulland. Appendix: Data on Protected Areas in Côte d'Ivoire, Ghana, Guinea, Liberia and Sierra Leone. *Available from:* Nedra Johnstone, Center for Applied Biodiversity Science, Conservation International, 1919 M Street NW, Suite 600, Washington, DC 20036; e-mail: <n.johnstone@conservation.org>.

ANIMAL WELFARE

A quarterly journal published by the Universities' Federation for Animal Welfare (UFAW), UK. *Animal Welfare* was established

as an international forum for peer-reviewed papers on all aspects of farm, laboratory, zoo, wild, and companion animal welfare science. The range of subjects included is constantly expanding and changing in response to new legislation, discoveries, and technologies. For further information regarding subscription or submission of an article, contact: UFAW, The Old School, Brewhouse Hill, Wheathampstead, Herts AL4 8AN, UK, Tel: + 44 (0)1582 831818, Fax: + 44 (0)1582 831414, e-mail: <ufaw@ufaw.org.uk>.

ENRICHMENT WORKBOOK

The Sacramento Zoo has just published an Enrichment workbook. If you are interested in receiving one, they are asking for a US\$5.00 donation to cover costs. Contact: Sue Johnson, e-mail: <russ_sue@msn.com>.

PARKS, PEOPLE, AND THE CONSERVATION OF BIODIVERSITY

Volume 14(5), October 2000, of the *Journal for the Society for Conservation Biology - Conservation Biology* - included a series of six papers in the section "Conservation Forum" which discussed the theme of people and parks. *Papers:* Rethinking tropical forest conservation: Perils in parks - S. Schwartzman, A. Moreira & D. Nepstad, pp.1351-1357; The fate of tropical forests: A matter of stewardship - J. Terborgh, pp.1358-1361; Extracting humans from nature - K. H. Redford & S. E. Sanderson, pp.1362-1364; Self-determination or environmental determinism for indigenous peoples in tropical forest conservation - M. Colchester, pp.1365-1367; Conservation theory meets practice - A. Chicchón, pp.1368-1369; Arguing tropical forest conservation: Perils versus parks - S. Schwartzman, D. Nepstad & A. Moreira, pp.1370-1374.

BIOESTAT 2.0 - UM PACOTE DE BIOESTATÍSTICA PARA AS CIÊNCIAS BIOLÓGICAS E MÉDICAS NO BRASIL

BioEstat 2.0: Aplicações Estatísticas nas Áreas das Ciências Biológicas e Médicas, autores Manuel Ayres, Manuel Ayres, Jr., Daniel Lima Ayres e Alex Santos dos Santos, 2000, 259pp. ISBN 85 85924 07 1. Sociedade Civil Mamirauá, Conselho Nacional de Desenvolvimento Científico e Tecnológico MCT-CNPq, Tefé e Brasília. Acompanha CD-ROM compatível com Windows 95/98/NT. O livro tem uma história de 13 anos. Em 1987 foi apresentado a primeira versão do Bioestat - Aplicações Estatísticas em Basic - publicada pela editora McGraw Hill. A segunda versão evoluiu para o BioEstat 1.0, editada pelo CNPq-MCT e Sociedade Civil Mamirauá, e reunia 100 testes estatísticos, paramétricos e não-paramétricos. A versão atual - BioEstat 2.0 (2000) - também tem CD-ROM e apresenta 139 testes estatísticos, além de gráficos e tabelas de frequência. Possui também maior número de testes de análise multivariada, regressão logística e polinomial, análise de sobrevivência e modelos de distribuição de probabilidades, dentre outros. O objetivo dos autores é facilitar o acesso e uso da estatística entre os estudantes de graduação

e de pós-graduação nas universidades do Brasil, e por isso sua distribuição é gratuita. Deste modo acredita-se que este pacote de bioestatística poderá contribuir com o desenvolvimento do ensino e pesquisa das ciências biológicas e médicas no país. *Para maiores informações:* Prof. Manuel Ayres, Rua Boaventura da Silva 304, Apto. 1.001, Bairro Reduto, Belém 66053-050, Pará, Brasil, e-mail: <mizayres.bel@zaz.com.br>.

BOOKS

Primate Conservation Biology, by Guy Cowlshaw and Robin Dunbar, 2000, 498pp. The Chicago University Press, Chicago. Price: £47.50 (hardback), £17.50 (paperback). ISBN 0-226-11637-9 (paperback). An extraordinary and excellent synthesis. It begins by reviewing the essential features of primate biology: Primate diversity (Chapter 2); behavioural ecology including species life history (Chapter 3); community ecology, including species richness, community structure, competition, and associations between primate and plant communities (Chapter 4); geographic distributions, abundance and rarity (Chapter 5); and finally population ecology, with the caveat that conservation action is ultimately targeted at ensuring the survival of populations (Chapter 6). Cowlshaw (research fellow at the Institute of Zoology, Zoological Society of London) and Dunbar (Professor of Biological Sciences at the University of Liverpool, UK) then review the intrinsic factors that influence extinction risk (Chapter 7) and examine the key causes of threat: Habitat disturbance (loss, fragmentation, modification) (Chapter 8); and hunting and trade (Chapter 9). The next part looks specifically at conservation strategies, including considerations of strategy design, taxonomic prioritization, regional prioritization (Chapter 10), and conservation tactics such as protected areas, sustainable use, captive breeding, and restocking (Chapter 11). The final chapter (12) covers their conclusions regarding past and future primate diversity, the diagnosis of populations in trouble, what they consider effective conservation action, and the need to find unique solutions, case-by-case based on correct diagnoses. Each chapter has a small introduction and a concise summary at the end. Three appendices: list primate species and conservation status according to the 1996 IUCN Red List of *Threatened Animals*; describe the use of Leslie Matrices to estimate future size and composition of populations based on data from life tables; and give the names and addresses of primate and conservation organizations. The literature cited in this book is extensive and the reference list takes up more than 50 pages. In their introduction the authors state that their purpose in writing the book is to contribute to the conservation process, with the focus on primates but with the aim of drawing on all "the diverse aspects of conservation and evolutionary biology that have emerged during the past few decades" and applying them to a single taxon in the hope of advancing the broad field of primate conservation biology and at the same time feeding the lessons learnt back into the discipline of conservation biology. *Available from:* The University of Chicago Press, 1427 East 60th Street, Chicago, IL 60637, USA, Tel: +1 (773) 702-7748, e-mail: <marketing@press.uchicago.edu>.

Histoire Naturelle des Primates d'Afrique Centrale, by Annie Gautier-Hion, Marc Colyn and Jean-Pierre Gautier, 1999, ECOFAC, Gabon. In French. Price, £60.00 (hardback + CD). Presents a summary of the natural history of the monkeys and apes in central Africa. The first part gives information on climate, the forests and habitat types, a history of the primates and their taxonomy, biogeography, and the faunistic regions, a short review of aspects of their morphology, reproduction, feeding behavior and diets, and social organization. The second part covers the natural history of the species and subspecies. The third part reviews communities in some of the key protected areas in Central Africa, and the fourth part describes their vocalizations, accompanied by a CD with 60 recordings by Catherine Bouchian. Amply and beautifully illustrated with maps and watercolor paintings by Maël Dewynter. *Available from:* NHBS Ltd, 2-3 Wills Road, Totnes, Devon TQ9 5XN, UK, Tel: +44 (0) 1803 865913, Fax: +44 (0) 1803 865280, e-mail: <nhsbs@nhsbs.co.uk>, web site: <www.nhsbs.com>, or write to ECOFAC, B.P. 15115, Libreville, Gabon. Website: <www.ecofac.org>.

Monster of the Madidi: Searching for the Giant Ape of the Bolivian Jungle, by Simon Chapman, 2001, 256pp. Aurum Press, Ltd., London. Price: £16.99 (hardback). The story of Chapman's journey into the jungles of northern Bolivia and up the Madidi River to find the mythical giant monkey known as the 'Mono Rey'. *Available from:* NHBS Ltd, 2-3 Wills Road, Totnes, Devon TQ9 5XN, UK, Tel: +44 (0)1803 865913, Fax: +44 (0)1803 865280, e-mail: <nhsbs@nhsbs.co.uk>, website: <www.nhsbs.com>.

Mapping Conservation Investments: An Assessment of Biodiversity Funding in Latin America and the Caribbean, by Gonzalo Castro and Ilana Locker, with Vance Russell, Laura Cornwell and Eric Fajer. 2001, 80pp. In English and Spanish. (*¿Dónde se Invierte en Biodiversidad? Una Evaluación del Financiamiento para la Biodiversidad en América Latina y el Caribe*). Published by The Biodiversity Support Program (BSP) of the World Wildlife Fund – US. This publication is the result of a three-year project implemented jointly with the World Bank and USAID, and examines the funding patterns for biodiversity in the region in order to ascertain funding gaps, especially for high-priority ecoregions, to encourage greater donor communication and awareness. *Available from:* Biodiversity Support Program, C/o World Wildlife Fund, 1250 24th Street NW, Washington, DC 20037, USA, Tel: +1 (202) 861-8347, Fax: +1 (202) 861-8324, e-mail: <BSP@wwfus.org>, web site <www.BSPonline.org>.

Andes to Amazon: A Wildlife Guide to South America, by Michael Bright, 2000, 216pp. BBC Books, London. Price (hardback): £15.50. A well-illustrated wildlife guide to South America with more than 100 color photos. Chapters include: The Andes, The Amazon: Flooded Forest, The Amazon: Terra Firme, Pantanal to Patagonia: Wild Coasts. *Available from:* NHBS Ltd, 2-3 Wills Road, Totnes, Devon TQ9 5XN, UK, Tel: +44 (0)1803 865913, Fax: +44(0) 1803 865280, e-mail: <nhsbs@nhsbs.co.uk>, web site: <www.nhsbs.com>.

Requiem for Nature, by John Terborgh, 1999, 234pp. Shearwater Books, Island Press, Washington, DC. Price: £19.00 (hardback). ISBN 1-55963-587-8. A personal view examining current strategies for tropical biodiversity conservation and discussing the problems and advantages of such as protected areas from ecological, social, economic, and political standpoints. He makes a compelling case for the need for good science and also describes the difficult social context in which tropical conservation must take place. A good read. Available from: NHBS Ltd, 2-3 Wills Road, Totnes, Devon TQ9 5XN, UK, Tel: +44 (0)1803 865913, Fax: +44 (0)1803 865280, e-mail: <nhbs@nhbs.co.uk>, web site: <www.nhbs.com>.

A Manual of Mammalogy: With Keys to Families of the World, by Robert E. Martin, Anthony F. DeBlase, and Ronald H. Pine, July 2000, 352pp. 3rd Edition. McGraw Hill, New York. Price: £26.99 (spiralbound). ISBN 0-697-00643-3. Covers the techniques needed to recognize characteristics that differentiate mammals, and to understand their basic structural similarities and differences. Provides information and techniques for identifying all of the orders and families of mammals. Organized into three groups of chapters: Chapters 1 through 8 deal with the techniques needed to recognize characteristics that differentiate mammals and to understand their basic structural similarities and differences. Chapters 9 through 27 provide information and techniques for identifying all of the orders and families of mammals. Chapters 28 through 37 deal with ways to study mammals from ecological perspectives in both field and laboratory settings. Available from: NHBS Ltd, 2-3 Wills Road, Totnes, Devon TQ9 5XN, UK, Tel: +44 (0)1803 865913, Fax: +44 (0)1803 865280, e-mail: <nhbs@nhbs.co.uk>, web site: <www.nhbs.com>.

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ABSTRACTS

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Meetings

The First International Conference on Distance Sampling - Estimating Wildlife Abundance for Ecology, Management and Conservation, 30 July-3 August, 2001. St. Andrews, Scotland. Details from: Rhona Rodger, Tel: + 44 (0) 1334 463 228 or e-mail: <rhona@dcs.st-and.ac.uk>, Home Page <Http://www.ruwpa.st-and.ac.uk/icods/>.

The Animal Behavior Society Annual Meeting - Comparisons between Primates and Cetaceans, 5-9 August, 2001. Atlanta, Georgia, USA. Details may be obtained from the web site: <http://www.animalbehavior.org/ABS/Program>.

24th Annual Meeting of the American Society of Primatologists, 8-11 August 2001, Armstrong Atlantic State University, Savannah, Georgia. Symposia and workshop deadline: 15 March, 2001. Individual abstracts deadline: 1 April, 2001. Contact: Dr. Tammie Bettinger, ASP Program Chair, Cleveland Metroparks Zoo, 3900 Wildlife Way, Cleveland, OH 44109, USA, Tel: (216) 635 3314, Fax: (216) 661 3312, e-mail: <tlb@clevelandmetroparks.com>. Web site: <www.asp.org/asp2001/>.

8th International Theriological Congress, 12-17 August, 2001, Sun City, South Africa. Contacts: ITC 2001 c/o Event Dynamics, PO Box 98009, Sloane Park, 2152 Johannesburg, South Africa. Tel: +27 11 706 5010, e-mail: <dana@eventdynamics.co.za>. Web Page: <http://www.eventdynamics.co.za/itc>.

1st Mexican Congress of Primatology, 2-5 September, 2001. Mérida, Yucatán, Mexico. Sponsored by the Asociación Mexicana de Primatología (AMP) and by the Departamento de Ecología

Humana of the Centro de Investigaciones y Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN). For further information (abstracts for oral presentations, posters, or to submit proposals for symposia (due May 30), send e-mail to <primates-amp@correoweb.com>. A more detailed announcement, in Spanish, is in the April issue of the *Laboratory Primate Newsletter* ("Primates de las Américas La Página", p.20). Juan Carlos Serio Silva, Departamento de Ecología Vegetal, Instituto de Ecología AC, km. 2.5 antigua carretera a Coatepec, Apdo. 63, CP 91000 Xalapa, Veracruz, Mexico, e-mail: <serioju@ecologia.edu.mx>.



V Congreso Internacional sobre Manejo de Fauna Silvestre en la Amazonía y Latinoamérica - Criterios de Sostenibilidad, 10-14 septiembre de 2001, Centro de Convenciones Cartagena de Indias Colombia. Las entidades convocantes y organizadoras de

este evento son: Fundación Natura, Ministerio del Medio Ambiente, Dirección General de Ecosistemas, Instituto de Ciencias Naturales - Universidad Nacional de Colombia, Estación de Biología Tropical "Roberto Franco" - Universidad Nacional de Colombia, Instituto de Investigaciones Científicas Alexander von Humboldt, Conservación Internacional - Colombia, e Instituto Amazónico de Investigaciones Científicas - SINCHI. Fecha límite para recepción de resúmenes: 15 de Junio del 2001. Fecha límite para envío de respuesta de aceptación o rechazo de resúmenes: 30 de Julio del 2001. Mayores informes: Rocío Polanco Ochoa, Fundación Natura Calle 61 No. 4-26, A.A. 55402, Bogotá, Colombia, Tel.: +57 (1) 248 5820, Fax: +57 (1) 346 1382, e-mail: <quintocongreso@internodos.com>. Web page: <http://www.vcongresofauna.org/>.

Annual Conference of the American Association of Zoo Veterinarians, 18-23 September, 2001, Orlando, Florida. For more information on the scientific program: Ray Wack, Program Chairman, Sacramento Zoo, 3930 West Land Park Drive, Sacramento, CA 95822-1123, USA, Tel: 916 264 5887, e-mail: <rfwack@ucdavis.edu>. Conference or membership information: Wilbur Amand, Executive Director/AAZV, 6 North Pennell Road, Media, PA 19063, USA, Tel: 610 892 4812, Fax: 610 892 4813, e-mail: <aazv@aol.com>.

IV Congreso de la Asociación Primatológica Española, 26-27 September, 2001, Madrid, Spain, Salón de Actos. Facultad de Psicología. Universidad Autónoma de Madrid. Cantoblanco 28049 Madrid, Spain. For more information, contact: Dr. Susana Sánchez Rodríguez, Departamento de Psicología Biológica y de la Salud Facultad de Psicología, UAM, 28049 Madrid, e-mail: <susana.sanchez@uam.> Tel: 34.91.3978748 / 3975351, Fax: 34.91 3975215, Web site: <http://www.uam.es/ape>.

VII Congress of the Gesellschaft fuer Primatologie, 30 September - 4 October, 2001, Zürich, Switzerland. The focus will be on conservation, molecular genetics, field studies, physiology, palaeoprimatology, ethology, evolutionary biology. Symposia include: *Macaca sylvanus*, *Callithrix* and lemurs. For further information contact: Anthropological Institute and Museum

University of Zürich, Winterthurerstrasse 190 CH-8057, Zurich, Tel: +41+1 635 54 11, Fax: +41+1 635 68 04, e-mail: <basa@aim.unizh.ch> or see the web page: <http://www.anthro.unizh.ch>.

1º. Simposio de Área Protegidas: Pesquisa e Desenvolvimento Sócio-Econômico, 2-4 de outubro de 2001, Universidade Católica de Pelotas, Pelotas, Rio Grande do Sul, Brasil. O Simpósio tem por objetivo reunir profissionais e estudantes de graduação e pós-graduação que atuam em atividades de pesquisa, administração, implementação, manejo e conservação de áreas protegidas gerando um fórum de debates onde se discuta aspectos do desenvolvimento de pesquisa nestas áreas, assim como as alterações ao desenvolvimento sócio-econômico por sua implantação. Serão discutidos temas como manejo de fauna, planos de manejo, capacidade suporte, ecoturismo, comunidade de entorno, administração de UCs, entre outros. Coordenação: Prof. Alex Bager – Coordenador, Laboratório de Manejo e Conservação Ambiental, Curso de Ecologia, Universidade Católica de Pelotas; Dr. Elton Colares, Fundação Universidade Federal de Rio Grande; Régis Muller, MRS - Estudos Ambientais Ltda. Web page: <http://sap.ucpel.tche.br>.

Brazil's International Conference on The Human Dimensions of Global Change, 6-8 October 2001. The 2001 Open Meeting of the Human Dimensions of Global Environmental Change Research Community will be held in Rio de Janeiro, Brazil, on 6-8 October 2001. Following three successful meetings held at Duke University (USA) in 1995, the International Institute for Applied Systems Analysis (Austria) in 1997, and Shonan Village (Japan) in 1999, the human dimensions research community will meet for the first time in the Southern Hemisphere. Particular emphasis will be placed on research reports that include a regional or "place-based" perspective and that make a linkage between natural and social sciences, as well as among local, regional, and global scales. Plenary themes of the meeting will address the challenges of integration in human dimensions research across disciplines, across hemispheres, and across the science-policy interface. The Open Meeting is being organized by the Brazilian Academy of Sciences, the Inter-American Institute for Global Change Research (IAI), the International Human Dimensions Programme on Global Environmental Change (IHDP), and CIESIN. Information about the meeting, including instructions for the submission of abstracts, will be made available at the website <http://sedac.ciesin.org/openmeeting/>.

V Congreso Latinoamericano de Ecología, 15-19 de Octubre de 2001, Facultad de Ciencias Agrarias, Universidad Nacional de Jujuy, San Salvador de Jujuy, Argentina. La fecha límite de presentación de los resúmenes es el 30 de abril de 2001. Organiza: Facultad de Ciencias Agrarias, Alberdi 47, (4600) San Salvador de Jujuy, Argentina, Tel: 54 0388 4221550, 54 0388 4221553, Fax: 54 0388 4221547, e-mail: <vclae@fca.unju.edu.ar>. Web site: <www.fca.unju.edu.ar>.

V Congreso de la Sociedad Mesoamericana para la Biología y la Conservación (SMBC), 15-19 de Octubre de 2001, El Salvador, La Sociedad Mesoamericana para la Biología y la Conservación (SMBC). Se invita a todos los interesados en presentar ponencias

y/o organizar *simposia* mandar sus propuestas a: Eunice Echeverría: <eecheverria@hotmail.com> o Roberto Rivera: <rrbiosis@es.com.sv> con copia a: <mesoamerica2001@yahoo.com.mx>. Fecha límite para propuestas de simposia: 5 de marzo 2001. Fecha límite para ponencias: 31 de Mayo de 2001. Para más información sobre el congreso visite: <http://geocities.com/smbc_elsalvador_2001/>, esta página se estará actualizando periódicamente para mantenerles informados.

3rd Göttingen Symposium Primates in Biomedical Research: Diseases and Pathology, 25-26 October 2001, German Primate Centre, Göttingen, Germany. The scientific programme will focus on progress in the broad field of spontaneous and induced primate pathology and primate diseases. Papers are requested on all fields of veterinary medicine in primates. Deadline for submission of abstracts is July 31, 2001. Contact: Conference secretariat Ingrid Rosbach, German Primate Centre, Dept. of Veterinary Medicine and Primate Husbandry, Kellnerweg 4, 37077 Göttingen, Germany. Tel: +49 (0)551-3851 119, Fax: +49 (0)551-3851 277. E-mail: <rossbach@www.dpz.gwdg.de>, Website: <http://www.dpz.gwdg.de>.

5th International Conference on Environmental Enrichment, 4-9 November 2001, Taronga Park Zoo, Sydney, Australia. The theme is "Making Enrichment a 21st Century Priority". For information: Margaret Hawkins, 51EE Conference Co-ordinator, Taronga Zoo, PO Box 20, Mosman, NSW 2088, Australia, Tel: +61 2 9978 4615, Fax: +61 2 9978 4613, e-mail: <mhawkins@zoo.nsw.gov.au>. Web site: <www.zoo.nsw.gov.au>.

V Congresso Brasileiro de Ecologia do Brasil, 4-9 November, 2001, Porto Alegre, Rio Grande do Sul, Brasil. Tema: "Ambiente x Sociedade". Entidade promotora: Sociedade de Ecologia do Brasil. Apoio: Universidade Federal do Rio Grande do Sul, Instituto de Biociências, Centro de Ecologia e Departamentos de Ecologia, Zoologia e Botânica. Contatos e correspondência: Organização de Congresso, Rua João Abott, 44, cj.402, 90460-150 Porto Alegre, Rio Grande do Sul, Brasil, Tel/Fax: + 55 51 333 8737, e-mail: <nossaequipe@nosequipe.com.br>. Homepage: <www.ecologia/ufrgs.br>.

IV Simposio Internacional de Desarrollo Sustentable en los Andes. La Estrategia Andina para el Siglo XXI, 25 de noviembre - 2 de diciembre, 2001. Facultad de Ciencias, Instituto de Ciencias Ambientales y Ecológicas (ICAE), Universidad de Los Andes, Mérida. Informes: Maximina Monasterio o Rigoberto Andressen, e-mail: <amamrd@ciens.ula.v>.

Committing to Conservation Conference, 28 November - 2 December, 2001, Melbourne, Florida, USA. This will be the fourth Zoos and Aquariums "Committing to Conservation Conference". The goal is to bring together field researchers and zoo personnel to promote a greater involvement of zoos and aquariums supporting *in situ* work. There will be a mixture of sessions, panel discussions, and round tables with a special emphasis on audience participation and problem solving. The registration fee is US\$175.00 and includes sessions, some meals,

and social events. For more information contact: Beth Armstrong, Tel: 321-454-6285, e-mail: <elynn57@aol.com> or Margot McKnight, Tel: 321-254-9453, ext. 23, e-mail: <margo@brevardzoo.org>.

Primate Society of Great Britain - Winter Meeting 2001, 5 December 2001, Meeting Rooms of the Zoological Society of London. The theme of the meeting will be the Primates of the Western Ugandan Forests, organised by Prof. Vernon Reynolds, Institute of Biological Anthropology, University of Oxford. Speakers include: Linda Vigilant (Leipzig), Tony Mutebi (Leipzig), Martha Robbins (Leipzig), Tweheyo Mnason (Uganda), Donna Sheppard (USA), Chie Hashimoto (Kyoto), Duane Quiatt (Colorado), Nick Newton-Fisher (Washington State), Vernon Reynolds (Oxford), Chris Fairgrieve (Edinburgh), John Bosco (Bwindi), Craig Stanford (UCLA). There will also be posters. For further information, please contact: Professor V. Reynolds, Institute of Biological Anthropology, 58 Banbury Road, Oxford OX2 6QS, UK, Tel: (0)1865-274693/274700, Fax: (0)1865-274699, e-mail: <vernon.reynolds@bioanth.ox.ac.uk>.

3rd Göttinger Freilandtage: Sexual Selection in Primates, 11-14 December 2001, hosted by the German Primate Center (DPZ), Göttingen, Germany. Invited speakers will summarize and evaluate recent empirical and theoretical work dealing with causes, mechanisms, and consequences of sexual selection in primates, including humans. In addition, it is hoped to identify general principles through comparison with other mammals. Oral (15 min) and poster contributions. Deadline for submission of abstracts is 1 August 2001. Guests must also register in advance by October 1 2001. Additional details are available from Peter Kappeler, e-mail: <pkappeler@gwdg.de>, and the web site: <http://www.dpz.gwdg.de/voe_page/GFT2001/freiland01C.htm>.

2002

Annual Meeting of the American Association for the Advancement of Science, 14-19 February 2002, Boston, Massachusetts. For more information contact: Kathryn Papp, Senior Program Officer, Program on Ecology and Human Needs, International Directorate, AAAS, 1200 New York Avenue, NW, Washington, DC, 20005, USA, Tel: (202) 326 6427, Fax: (202) 289 4958 or see: <www.aaas.org/meetings/2002>.

3rd Student Conference on Conservation Science, 25-27 March 2002, Department of Zoology, Downing Street, Cambridge. "Building links among young conservation scientists and practitioners". Plenary lectures will be presented by Professor Lord Robert May PRS (Oxford University), Professor William Bond (University of Cape Town), Dr. Cristián Samper (Smithsonian Tropical Research Institute) and Dr. Russell A. Mittermeier (Conservation International). Application form for attendance: 1 November 2001. Supported by Conservation International, the RSPB, English Nature, and the University of Cambridge. For more information: Dr Andrew Balmford, Conservation Biology Group, Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK, Tel/fax: 01223

331770, e-mail: <apb12@hermes.cam.ac.uk>. Web site: <http://www.zoo.cam.ac.uk/scs/>.

American Society of Primatologists, 1-4 June 2002, Oklahoma City, OK, USA. For more information contact: Janette Wallis, Ph. D. Department of Psychiatry and Behavioral Sciences, University of Oklahoma Health Sciences Center, P. O. Box 26901, Oklahoma City, OK 73190, USA, Tel: 405-271-5251 ext. 47612, Fax: 405-271-3808, e-mail: <janette-wallis@ouhsc.edu>.

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

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



XIXth Congress of the International Primatological Society, 4-9 August 2002, Beijing, China. Organized by the Mammalogical Society of China and the Institute of Zoology, Chinese Academy of Sciences. The main themes of the Congress

will focus on the progress and prospects of primatology and the conservation of non-human-primates. The first deadline is for symposium and workshop titles, to be submitted by 31 August 2001. *Contact address:* Prof. Fuwen Wei, Secretary General, 19th Congress of the International Primatological Society, c/o Institute of Zoology, Chinese Academy of Sciences, 19 Zhongguancun Lu, Haidian, Beijing 100080, China, fax: (86-10) 82627388, e-mail: <IPS_Beijing@panda.ioz.ac.cn>. Home page: <http://www.ips.ioz.ac.cn>.

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

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

Notes to Contributors

Scope

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

Submissions

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

Contributions

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

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

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

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

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

References

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

Journal article

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

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

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Report

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