CDD: 599.809814

PRIMATES OF RORAIMA (BRAZIL). I. NORTHEASTERN PART OF THE TERRITORY

Andrea P. Nunes¹ José Márcio Ayres¹ Kduardo S. Martins¹ José de Sousa e Silva¹

ABSTRACT — Preliminary surveys of the primates of northeastern Roraima, Brazil, were carried out during the second half of 1987. Most censures were done on Maracá Island in the Uraricoera River, an ecological station of the Brazilian Special Secretary for the Environment (SEMA). Surveys revealed the occurrence of seven species of primates in the study areas, the most abundant species being the spider monkey Ateles belzebuth belzebuth. Review of the Museu Paraense Emílio Goeldi indicate the presence of four additional primates in Roraima. The geographical distributions of the primate species of Roraima and their conservation status are discussed.

KEY WORDS. Primates, Survey, Distribution, Roraima, Maracá Island.

RESUMO — Durante o segundo semestre de 1987, foi feito um levantamento preliminar dos primatas do nordeste do Território Federal de Roraima, dando-se énfase aos levantamentos na Estação Ecológica da SEMA, na 'Ilha de Maracá'', Rio Uraricoera. Durante os levantamentos, foram detectadas a presença de pelo menos sete espécies de primatas das quais os coatás(Ateles belzebuth belzebuth) foram os mais abundantes. Revisão da literatura e o exame de espécimens na coleção do Museu Goeldi indicam ainda a presença de pelo menos outras quatro espécies em Roraima. No presente trabalho suas distribuições geográficas são discutidas com base nos levantamentos; bem como a situação atual das espécies em relação à ocupação humana na região.

PALAVRAS-CHAVE: Primatas, Levantamentos, Distribuição, Roraima, Ilha de Maracá.

¹ MCT/CNPq/Museu Paraense Emilio Goeldi - Deptº de Zoologia.

1. INTRODUCTION

According to recent surveys on the distribution of Amazonian primates (e.g., Hershkovitz, 1977; 1983; 1987 a,b), at least 11 primate species occur in the Territory of Roraima, in the northern part of Brazilian Amazonia. This represents nearly 30% of the Amazonian species of primates.

Until very recently, the fauna of Roraima was one of the least known within the Amazon basin. This territory is located in the northernmost part of Brazil, and has an area of approximately 230,104 km² or 6.7% of the Brazilian Amazon. Until 1980 the total population of Roraima did not exceed 82,018 inhabitants, indicating the smallest population density among Brazilian federative units (0.4 inhabitants/km²) (Kleinpenning & Volbeda 1985). The relief is mainly characterized by the crystalline basement with occurrence of pre-Tertiary sediments and Neogene-Quaternary alluvium (Klammer 1984). The area is quite important relative to faunal distribution because it has a wide variety of vegetation types, ranging from the dense Amazonian lowland forests incluing flooded habitats, mountain forests, to open savannahs (corresponding to the great Rio Branco — Essequibo depression) and grassland plateaus near the Venezuelan and Guiana borders.

More recently, however, there has been a considerable increase in biological research in the region due to the programs organized by the National Institute for Amazonian Research (INPA / MCT), together with the Royal Geographic Society (RGS). The project, however, is mainly concentrated at the "Ilha de Maracá", an ecological station mantained by SEMA (Secretaria do Meio-Ambiente).

The present report deals with preliminary surveys of the resident primate fauna, with the objective of making a first assessment of the densities, distributions and conservation status of the primate populations in the northeastern and central part of the territory.

2. STUDY AREA AND METHODS

All surveys presented in this report were carried out in the northeastern part of the territory of Roraima, an area corresponding to part of the Rio Branco basin and the Serra de Pacaraima. Predominant vegetation in this part of Roraima are the open savannahs, which account for more than 70% of this area.

Most censuses, however, were conducted at the "Ilha de Maracá" (Ecological Station), at 3° 25'N and 61° 40'W (Figure 1), an island formed by the branching of Rio Uraricoera, near its confluence with the Rio Branco. The island has approximately 92,000 hectares, nearly 60 km in length and ranging between 15 and 25 km in width. The vegetation is mainly dry upland forest

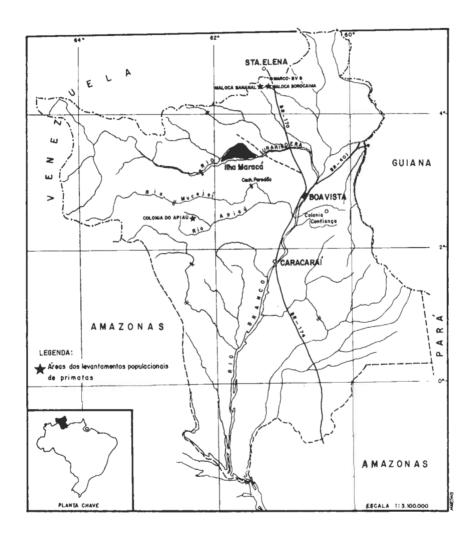
("terra firme"), transitional with isolated pockets of open savannah. The forest is 30 m hight on average and emergent trees never exceed 40 m height. Despite the fact that swampy areas do not represent a significative proportion of the total area, these are quite frequent in the eastern part of the island. A previously established trail system for the tortoise study of D. Moskovitz was used for the primate surveys.

Other survey localities include Rio Apiaú (2° 39'N 61° 12'W) (Figure 1), Pacaraima (4° 05'N 61° 30'W) and Confiança (2° 15'N 60° 45'W) (Figure 1). The Apiaú is a clear-water river, perhaps the largest tributary on the right bank of Rio Mucajaí, an affluent of the Rio Branco. This area has a great variability of soils, with a predominance of latosols with sandy and silty spots. A number of elevations are present in the area and these originated from metamorphic rocks. The predominant vegetation at the Apiaú site is dry upland forest (''terra firme''), with a variable biomass depending on soil types. Characteristic species in this area include: Tetragastris sp. (Burseraceae), Manilkara sp. (Sapotaceae), Caryocar sp., (Caryocaraceae) and the palms Euterpe sp., Oenocarpus spp., Maximiliana sp., resembling physiognomically some forested areas on the Precambrian shields of eastern Amazonia. Trails used for censuses were originally used for geological prospection or selective logging, while other were opened for this study.

The other important area investigated corresponds to the northern portion of the territory, on the Venezuelan border, at the Serra do Pacaraima. This area consists of intersected plateaus derived from metamorphic rocks of Precambrian origin and sedimentary basins. All censuses in this area were carried out at altitudes ranging from 600 to 1,000 m above sea level. The forest is mainly characterized by medium sized trees, of 25-30 m height with relatively clear understory. Trails around the villages of Sorocaima and Bananal (Taurepan Indians) were used for most surveys in this area.

Surveys were conducted in the three above cited localities in ''terra firme'' upland forests. These were divided into two groups: a) those for which the task was only to verify the presence or absence of certain primates; and b) those for which the numbers of groups and their distance from the observer/or path were registered per linear distance and/or area surveyed. All transect surveys were carried out from June to October, 1987, coincident with the middle and late rainy season.

Approximately 442 km of systematic census were carried out in the three main sites and most of these surveys were either in the first part of the morning (6:30-11:00 hs) or later in the afternoon (15:00-18:30 hs), periods when primates are usually more active. Usual procedures of transect census were employed such as King's method (NRC, 1981), Fourier series (Burnhan et al 1980), and/or the simple counting of groups per distance traveled u.g., Emmons 1984).



3. PRIMATES SPECIES OF RORAIMA

According to recent surveys on the distribution of Amazonian primates, there are 11 species of primates within the area of the territory of Roraima as follows: Saguinus midas midas, Saimiri sciureus sciureus, Callicebus torquatus lugens, Aotus trivirgatus, Cebus apella, Cebus nigrivittatus, Pithecia pithecia chrysocephala, Chiropotes satanas chiropotes, Alouatta seniculus, Ateles belzebuth belzebuth and Ateles paniscus paniscus.

During our surveys, we were able to confirm the presence of seven of these species in the wild, plus the presence of others held in captivity or through specimens at Museu Goeldi collection. In the next segment we analise the information gathered during surveys and that available in the literature.

- 1 Saguinus midas midas (Linnaeus 1758) (see also Plate I) The Midas Tamarin is perhaps the only callithrichid in Roraima. No individuals of this species were observed during our surveys. Hershkovitz (1977), however, indicated the presence of this species throughout most of the territory with a distribution extending west to the left bank of the Rio Negro and north to the Parima and Pacaraima mountain complexes. Since this callitrichid is quite an abundant primate in other areas of the Brazilian Amazonia (e.g., Martins & Ayres 1987), we suspect that its absence in the areas surveyed (over 200 primate group sightings), weighs for the non-occurrence of the species in these areas. Hershkovitz's (1977) distribution in this area is based on three skins, recorded from the left bank of Rio Branco, and another on the Rio Cuieras. possibly near Manaus, in spite of the probable misplotting of this locality. Since our surveys were carried out on locations of the right bank of Rio Branco, it is possible that this river represents the western limit for the species. Saguinus, bicolor bicolor, another callithrichid reported for this region of the Amazon, does not extend its distribution north to Roraima. The northern limit of this subspecies is near km 30 of Manaus-Caracaraí road (Avres, Mittermeier & Constable, 1980).
- 2 Callicebus torquatus lugens (Humboldt 1812) (Plate II) Titis are not among the most common primates in Roraima, at least in the areas surveyed. This species does not occur either in the "Ilha de Maracá" or in the elevations in the north. Two groups have been seen in the Rio Apiaú area, both with few individuals. One of the troops was seen in a sandy soil area of tall primary forest, while the other was in vegetation characterized by the abundance of the "ubin" palm (Geonoma baculifera), over a silty swampy soil. The subspecies is probably limited to the east by Rio Branco. Because of its small body weight, it is not hunted in the area of the Rio Apiaú. The only skins at the Museu Goeldi were collected near the mouth of Rio Mucajaí by E. Dente in the 1950's.

- 3 Aotus trivirgatus trivirgatus (Humboldt 1812) (Plate III) Night monkeys have not been observed in the few night surveys conducted during this study. Locals, however, report their presence on the ''Ilha de Maracá'' and the Rio Apiaú. There are only two localities recorded for this subspecies in the literature (Hershkovitz 1983). The only specimen in the Museu Goeldi was collected by B. Albert on Rio Tootobi, a tributary of the Rio Demini. The western limit of distribution for this subspecies is not known, but as for other species, it could well be the right bank of the Rio Branco.
- 4 Saimiri sciureus sciureus (Linnaeus 1758) (Plate IV) There are four collection localities for this squirrel monkey in Roraima, all near Boa Vista. It probably occurs over most of Roraima, especially near water courses in riverine habitat, flooded forests and swampy areas. It is not found in the mountain complexes to the north and west of the Territory. At "Ilha de Maracá" it was the fifth most abundant species (1.1 0.4 groups/km²), probably because surveyed areas included only "terra firme" (Table 1). On the Rio Apiaú site it was the least abundant among observed primates (Table 2). These densities are lower than most other areas surveyed for this species (Robinson & Janson 1987). Groups vary between 20 to 30 individuals in the two areas censused.
- 5 Cebus apella (Linnaeus 1758) The Black-capped Capuchin probably occurs in most areas of Roraima, and was observed on ''Ilha de Maracá'' where mixed bands with Cebus, nigrivittatus were not uncommon. Troops vary from a few up to 14 individuals and their densities are higher than for its congeneric in the island. No individual of this species has been observed in the Serra de Pacaraima or on the Rio Apiaú site. This is not to say that they do not exist in these areas, but they could have low population densities. There are no specimens at Museu Goeldi of this species from the study area.
- 6 Cebus nigrivittatus (Wagner 1848) (Plate V) This species probably occurs in most areas of Roraima, simpatrically with Cebus apella. It has been observed on ''Ilha de Maracá'', lower Rio Mucajaí, Serra do Pacaraima (600 m altitude) and Colônia Confiança (left bank of the Rio Branco). I was the fourth most abundant primate in Maracá and the third at Rio Apiaú. Troops vary from a few to 10 individuals. Observed troops in Maracá were smaller than those seen on the Rio Apiaú. A single troop was observed at Maloca Bananal, but it did not exceed 6 individuals. The habitat is usually tall ''terra firme'' forest. In a single observation they were seen feeding on ants in the Rio Apiaú area, in a low scrubby forest with a predominance of Myrcia ehrenbergiana. Their densities on ''Ilha de Maracá'' are much lower than those found for the same species in the Venezuelan ''llanos'' by Robinson (1986).

Table 1 – Primate densities at Maracá Island (Ecological Station – SEMA), Roraima. (Number of troops observed – 81.)

Species	groups per 10 km	King's method g/km²	Fourier method g/km²	individuals per km² (Fourier)	group size (range)
Saimiri sciureus	0.1	1.1	1.1	26.3	+/- (20-30)
Cebus apella	0.5	4.3	3.8	23.4	6.1(1-14)
Cebus nigrivittatus	0.3	2.3	1.7	4.0	2.3 (2-3)
Alouatta seniculus	0.6	5.2	4.5	14.9	3.3 (1-5)
Ateles belzebuth*	1.2	8.6	8.7	34.0	3.9 (1-9)
Not identified	0.1	-	-	-	_
Total distance	·				-
surveyed (km)	297.5	149.5	149.5	149.5	_
Number of groups	0.1	5.7	F-7		•
observed	81	57	57	5 7	

subgroups of Ateles

Table 2 - Comparative densities of primates for three localities in Roraima.

Cebus apella — — 0.5 Cebus nigrivittatus 0.5 0.1 0.3 Chiropotes satanas 0.3 — — Alouatta seniculus 0.6 — 0.6 Ateles belzebuth* 0.8 — 1.2	Species	R. Apiaú	Pacaraima	Maracá Island
Cebus apella - - 0.5 Cebus nigrivittatus 0.5 0.1 0.3 Chiropotes satanas 0.3 - - Alouatta seniculus 0.6 - 0.6 Ateles belzebuth* 0.8 - 1.2	Callicebus moloch	0.3	_	_
Cebus nigrivittatus 0.5 Chiropotes satanas 0.3 - Alouatta seniculus 0.6 Ateles belzebuth* 0.8 - 0.3 - 0.6 Ateles belzebuth*	Saimiri sciureus	0.1	-	0.1
Chiropotes satanas 0.3 Alouatta seniculus 0.6 - 0.6 Ateles belzebuth* 0.8 - 1.2	Cebus apella		_	0.5
Alouatta seniculus 0.6 - 0.6 Ateles belzebuth* 0.8 - 1.2	Cebus nigrivittatus	0.5	0.1	0.3
Ateles belzebuth* 0.8 - 1.2	Chiropotes satanas	0.3	_	
	Alouatta seniculus	0.6		0.6
Total 2.6 0.1 2.7	Ateles belzebuth*	0.8	_	1.2
	Total	2.6	0.1	2.7
Distances surveyed 77 67 297.5	Distances surveyed	77	67	297.5

^{*} subgroups of Ateles belzebuth

- 7 Pithecia pithecia chrysocephala (I. Geoffroy 1850) (Plate VI) Hershkovitz (1987a) indicates two localities for this subspecies of saki in Roraima: Maracá (same coordinates as the island) and Forte do Rio Branco (Boa Vista). No individual of this species was observed during our surveys and there is no indication that it occurs west of the Rio Branco in the central and northern areas of Roraima. The locality "Maracá" (reported by Hershkovitz 1987a) could be a mislabeled specimen or equivocal report.
- 8 Chiropotes satanas chiropotes (Humboldt 1812) (Plate VII) There are six skins from five localities reported in the literature, indicating the presence of bearded sakis in Roraima (Ayres, 1981; Hershkovitz 1985). Specimens were collected on the lower Rio Mucajaí, upper Rio Catrimani, Água Boa stream and Rio Tootobi (B. Albert, pers. obs.). Bearded sakis were observed only at the Rio Apiaú site. It probably does not occur in the eastern part of the "Ilha de Maracá", but there are reports that this species is found in the forests surrounding the island (D. Moskovitz, pers. comm.). Troops range between 20 to 30 individuals in size, but no prescise counts were obtained. Densities on the Rio Apiaú are similar to other Amazonian areas censused (Ayres, Martins & Nunes, in prep.).
- 9 Alouatta seniculus (Linnaeus 1766) (Plate VIII) Red Howlers occur throughout the territory including the mountain forests up to 1,200 m. Both on the Rio Apiaú and "Ilha de Maracá" it is the second most abundant primate. Densities found in these places are smaller than most other areas surveyed for this species (Crockett & Eisenberg, 1987). Troop size ranges from one to five individuals. Together with Ateles they are the largest primates in Roraima (Table 3).
- 10 Ateles belzebuth belzebuth (E. Geoffroy 1806) (Plate IX) This species of spider monkey is found in most forested areas of the territory, west of the Rio Branco. Despite the fact that this genus occurs in the northern mountains of Roraima, we do not yet know which species is to be found in these areas. In the two areas surveyed systematically it was the most numerous primate and probably represents the higher biomass (Tables 1 & 2). Subgroups vary from one to nine individuals in Maracá and up to 15 individuals have been seen at Rio Apiaú. They are mainly frugivorous, but preliminary observations at Maracá (APN, pers. obs.) and two stomach contents examined indicate higher proportions of leaves in the diet than other Amazonian Ateles studied (see Robinson & Janson 1987). This could be the reason for highest densities observed when compared to other Amazonian areas (Ayres, Martins & Nunes, in prep.; Robinson & Janson 1987). The densities on the Rio Apiaú and ''Ilha de Maracá'' are comparable to those found in Cosha Cashu, Manu, Peru (Emmons 1984).
- 11 Ateles paniscus paniscus (Linnaeus 1758) (Plate X) This species probably occurs east of the Rio Branco according to the sources of animals

kept in captivity in three places (Marco BV-8, Boa Vista and Colônia Confiança). This and the preceeding species are the largest primates of Roraima. Reliable informants also indicate the Rio Branco as the limit between the two species as suggested by Konstant, Mittermeier & Nash (1985). Kellog & Goldman (1944) list no specimens from Roraima, but there is a Guianan collecting locality (Maripa) close to the Brazilian border which suggests the presence of the species is Roraima.

Table 3 - Body weights of some primates captured in Roraima.

Species	sex/age	body weight (g)	locality
Saimiri sciureus	F/ad.	800	R.Apiaú
Saimiri sciureus	F/ad.	650	R.Apiaú
Cebus nigrivittatus	M/ad.	3,400	R.Apiaú
Cebus nigrivittatus	M/ad.	_	Banana
Cebus nigrivittatus	F/ad.	3,000	R.Apiaú
Alouatta seniculus	F/ad.	8,100	R.Apiaú
Alouatta seniculus	M/ad.	8,500	R.Apiaú
Alouatta seniculus	M/ad.	8,100	Bananal
Ateles b. belzebuth	F/ad.	9,000	R.Apiaú
Ateles b. belzebuth	F/ad.	8,000	R.Apiaú
Ateles b. belzebuth	F/subad.	5,400	R.Apiaú
Ateles b. belzebuth	F/subad.	5,000	R.Apiaú

M = males; F = females

4. CONSERVATION

Despite the fact that Roraima has the smallest human density within the Brazilian Amazon, it had the largest population growth rate for the region during 1970-1980 (93%) as shown by the last two censuses of the territory (Benchimol 1985). Until the sixties most of the human population of Roraima was Amerindian (e.g. Yanomamo, Macuxi, Taurepan, Uapixana, Xiriana, Waiwai) (Oliveira 1983). From 1970 onwards, the number of development projects has increased substantially, bringing colonists from other areas of Brazil, especially from the southern and northeastern part of the country, and also a great number of miners in search of gold, diamonds, cassiterite and copper (Santos 1981). The implantation of the Manaus — Caracaraí (BR — 174) and Boa-Vista to Marco (BV-8) roads has linked Roraima to other areas of Amazonia and to the northern part of the continent (via Caracas) and has probably been the main cause for the rapid growth observed in the territory.

Another development project which will have considerable impact on the local fauna is the hydroelectric dam being built at Paredão, located between

Boa-Vista and Mucajaí, on a tributary of the Rio Branco. This dam iteslf will flood an area of less than 6 km², however the area covered by its influence is much greater. In addition, plans for the implantation of the "Calha-Norte" program, to estimulate colonization in the Brazilian border with Venezuela, Colombia and the Guianas, may accelerate habitat disturbance rates in Roraima.

Despite the increasing disturbance of habitat in Roraima, habitat deforestation until 1978 was the lowest within Amazonia (0.062%) (Fearnside 1984). This is mainly due to the fact that over 60.5% of the total human population is concetrated in urban areas, especially in Boa Vista and Caracaraí. Becaused of the poor quality of soils given to colonists, the settlement program partially failed and most migrants moved to the outskirts of Boa Vista. Due to the low carrying capacity of the soil, settlers turned into logging activity, disturbing greater areas than expected if agriculture were viable. Colonization areas are concetrated in the northeastern part of the territory (areas with road access), the same areas as the present survey.

The hunting of primates is mainly done on a subsistence basis in the colonization areas (along the Rio Branco) and among Indians from the western part of the territory. The most affected species are the Red Howler (Alouatta seniculus) and, to a smaller extent, the Spider Monkey (Ateles spp.). Medium-sized primates, such as Cebus spp. and Chiropotes, are also hunted but to a smaller degree. The preference for Alouatta seniculus is probably an acquired habit brought from other areas of the country where this genus occurs.

Taurepan indians, near the border with Venezuela, do not hunt primates for food. Recent cultrural changes, introduced by Seventh Day Adventists, established restrictions on the number of species which can be used as food sources. For example, besides primates, the wild pigs (Tayassu), armadillos, tapir, agoutis can not be eaten, and only one species of deer (Mazama sp.), curassows, tinamous and guans. This would be the ideal religion for conservacionists if the indians did not capture other game for selling at the market in Marco BV-8. This is, however, a quite limited activity at the moment. The main threats to primates and other larger game in the Pacaraima region are the small-scale placer-miners, working with rudimentary tools to extract gold and diamond, coming both from Brazil and Venezuela. For these miners, hunting is the main protein source.

Primate densities obtained for "Ilha de Maracá" are very similar to those found for the unprotected area in the Rio Apiaú basin (Tables 1 & 2), but the primate composition is sightly different due to the presence of *Chiropotes satanas chiropotes* and *Callicebus torquatus lugens* in the latter area. These sites, however, are quite different in abundance when compared to the northern part of Roramia, around the mountains of the Serra de Pacaraima.

Despite the fact that howlers could be heard at some distance from survey trails, only a single group of *Cebus nigrivittatus* was observed affer 67 km of census. Since most surveys were taken on Indian areas, where primate hunting is inexpressive do to religious beliefs, we are inclined to think that low primate densities in the mountain forests are due to other reasons. Altitude, allied with vegetational differences may be the main cause for the absence of other species and the low densities in the resident primates.

The overall primate densities found in the two former areas are quite low when compared to sites in the western part of Amazonia but similar to sites on the crystalline embasement (Table 4). One of the most interesting findings from our surveys is that Saimiri, Cebus spp. and Alouatta presented small densities when compared with other surveys (Robinson & Janson 1987; Crockett & Eisenberg 1987), but Ateles belzebuth presented unnusually high densities for a frugivore of its size. Densitis found for this genus are among the highest within Amazonia (Robinson & Janson 1987) and are similar to those found in Cosha Cashu (Emmons 1984).

Table 4 - Comparative densities of primates at several Amazonian localities.

Locality	groups per 10 km	number of species	distance suveyed (km)	source
Maracá Island	2.7	6	297.5	this study
R. Apiaú	2.6	6	77.0	this study
R. Xingú-Irirí	3.8	8	96.0	Ayres & Martins, pers obs.
R. Jarí	1.8	7	120.0	Martins & Ayres, (1987)
R. Jamari	4.0	7	97.0	Martins & Schneider, pers. ob
R. Japurá (t. firme)	5.7	9	655.0	Ayres (1986) & John (1986)
R. Japurá (varzea)	10.2	4	249.0	Ayres (1986)
R. Aripuanā	2.2	10	82.0	Ayres (1982)
R. Tapajós	3.1	9	34.0	Ayres & Milton (1981)
Manaus (north)	1.1	7	80.0	Ayres (1981)
R. Manu	8.2	9	67.0	Emmons (1984)
Tombepata	2.5	8	52.0	Emmons (1984)
CMSE * (nort Manaus)	3.0	6	49.0	Emmons (1984)

CMSE — Critical Minimum Size Ecosystem (WWF project)

Both species of Ateles are listed in the IUCN Red Data Book (Thornback & Jenkins 1982) as "vulnerable". Because of its high population density, Ateles belzebuth belzebuth is probably not threatened at the moment in Roraima, due to the fact that human activity is quite localized. Other species occurring in Roraima have a quite extensive geographical range within Amazonia and are not threatened at present.

At the moment, Roraima has two SEMA Ecological Stations (Maracá — already implanted; Caracaraí — being implanted) which probably contain all primates occuring west of the Rio Branco. The establishment of a third area for preservation is necessary for those primate species found east of the Rio Branco. In addition, a number of Indian reserves may partially serve as reservoirs for most Roraima primates. There are also two preservation areas near the Venezuelan border (El Caura — Fauna Reserve and Canaima — Forest Reserve) together covering an area of 81,340 km².

Because primates are quite linked with forest habitats, they are not the best models for biological preservation in Roraima with its great diversity of non-forest habitats such as the "cerrados" and the mountain vegetation found in the northern and eastern part of the territory. Another important issue is that despite the low human population density in the territory, disputes due to land ownership are increasing at alarming rates and any plans for the conservation of biological diversity must soon be carried out. Programs such as those being carried out by INPA and the RGS are necessary, especially those studies related to the biogeography and autoecology of the region.

ACKNOWLEDGEMENTS

The authors wish to thank to all those who helped with this research. Mr. Celso Morato de Carvalho and Mr. José Antônio Gomes from INPA/Roraima provided invaluable help with logistics and their knowledge of the region. Dr. Jonh Hemming, Steve Bowles and Fiona Watson from Royal Geographic Society (RGS) provided much appreciated assistance in Maracá Island for APN and JMA. Natália Inagaki, Manuel Santa Brígida, José Nilton Santa Brígida and Dionísio Corrêa Pimentel from Museu Goeldi were extremely helpful in the field. The collaboration of Mr. José Ribeiro from INPA, on "Ilha de Maracá" was much appreciated. We also wish to thank the photographers Luiz Cláudio Marigo (Rio de Janeiro) and Antônio Lúcio (São Paulo Zoo) for the use of their pictures to draw monkey postures. Special thanks are due to Mr. A. Martins from the Museu Goeldi for illustrating this paper. This project was financed by the National Institute for Amazonian Research (INPA) through a grant from the Brazilian Ministry of Science and Technology (MCT) and RGS with logistical support from the Government of the Territory of Roraima.

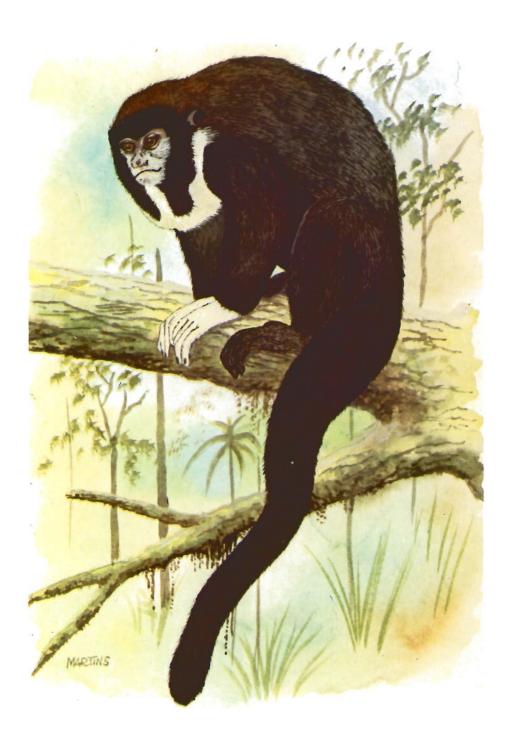
Note: All drawings were based on skins of monkeys collected in Roraima, except plates I, VI and XI for which there were no specimens in the Museu Goeldi collection. For these animals, skins collected in neighboring areas were used. Since there is much variation in *Cebus apella* populations within Amazonia, no plate was prepared for this species for which there are no skins from Roraima in the Museu Goeldi collection.

5. REFERENCES

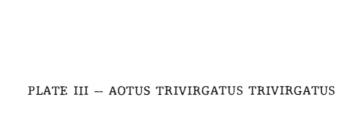
- AYRES, J. M. 1981. Observações sobre a ecologia e o comportamento dos Cuxiús (Chiroptes albinasus e Chiroptes satanas, Cebidae: primate). Belém, FADESP.
- ; MITTERMEIER, R. A., CONSTABLE, I. 1980. A distribuição geográfica e situação atual dos Saguis de cara nua. *Boletim FBCN*, Rio de Janeiro, 16: 62-68.
- . Uakaris and Amazonianflooded forest. University of Cambridge.
- BENCHIMIL, S. 1985. Population changes in the Brazilian Amazon. In: The fronties after a decade of colonization. Manchester, Manchester University Press. p. 37-50.
- BURNHAN, K.P.; ANDERSON, D.R.; LAAKE, J.L. 1980. Estimation of density from line transect sampling of biological populations. Wildlife Monographs, 72: 1-202.
- CROCKETT, C. M. & EINSENBERG, J.F. 1987. Howlers: variation in group size and demography. In: *Primate societies*. Chicago, University of Chicago, p. 54-68.
- EMMONS, L. 1984. Geographic variation in densities and diversities of nonflying mammals is Amazônia. Biotropica, 16: 210-22.
- FEARSIDE, P. M. 1984. A floresta vai acabar? Ciência Hoje, 2: 42-52.
- FIBGE. 1981. Atlas de Roraima Presidência da República. Rio de Janeiro. 44p.
- HERSHKOVITZ, P. 1977. living new world monkeys (Platyrrhini) with an introduction to primates. Chicago, University of Chicago. v. 1.
- . 1983. Two new species of night monkeys, genus Aotus (Cebidae, Platyrrhini). A preliminary report on Aotus taxonomy. American Journal of Primatology, 4: 209-43.
- ______. 1985. A preliminary taxonomic review of the South American bearded saki monkeys, genus *Chiropotes* (Cebidae, Platyrrhini) with the description of a new subspecies. *Fieldiana Zool.*, 27: 1-46.
- . 1987. The taxonomy of South American sakis, genus Pithecia (Cebidae, Platyrrhini): A preliminary report and critical review with the description of a new species and a new subspecies. American Journal of Primatology, 12: 387-468.

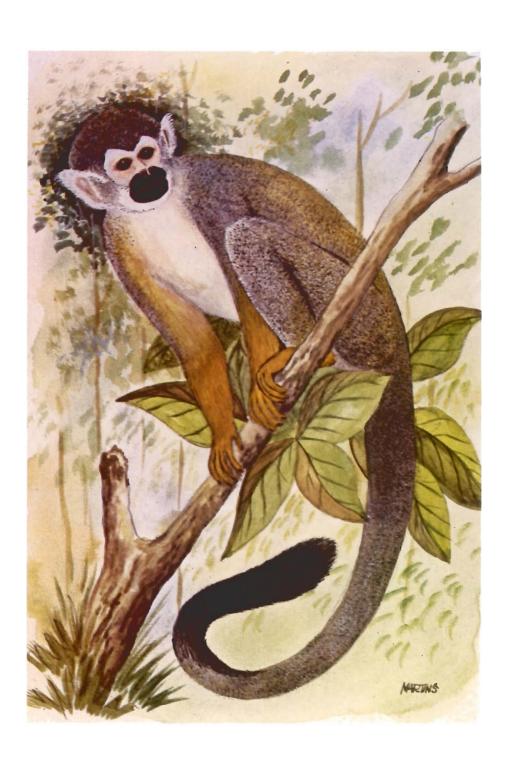
- _____. 1987. Uacaries, new world monkeys of the genus Cacajao (Cebidae, Platyrrhini): A preliminary taxonomic review with the description of a new subspecies. American Journal of Primatology, 12: 1-53.
- JOHNS, A. D. 1986. Effects of habitat disturbance on rainforest Wildlife in Brazilian Amazonia. 111 p.
- KELLOGG, R. & GOLDMAN, E. A. 1944. Review of the spider monkeys. *Proc. United States Nat. Mus.*, 96: 1-45.
- KLAMMER, G. 1984. The reliéf of extra Andean Amazon basin. In: The Amazon: Limnology and Landscape Ecology of a migth Tropical River and its Basin. Dordrecht. p. 47-83.
- KLEINPENNING, J. M. G. & VOLBEDA, S. 1985. Recent changes in population size and distribution in the Amazon region of Brazil. In: *The froties after a decade of colonization*. Manchester, Manchester University Press. p. 6-36.
- KONSTANT, W.; MITTERMEIER, R. A., NASH, S. D. 1985. Spider monkeys in captivity and in the wild. *Primate Conservation*, 5: 82-109.
- MARTINS, E. S. & AYRES, J. M. 1987. Levantamento faunístico do rio Jari: área de influência da UHE da Cachoeira de Santo Antônio. 37p.
- NATIONAL RESEARCH COUNCIL. 1981. Techniques for the study of primate population ecology (National Academy of Sciences). Washington, National Academic Press.
- OLIVEIRA, A. E. 1983. Ocupação humana. In: Amazônia: desenvolvimento integração ecologia. Brasília, CNPq.
- ROBINSON, J. & JANSON, C. M. 1987. Capuchins, Squirrel monkeys, and Atelines: Socioecological Convergence with old world primates. In: *Primate societies*. Chicago, University of Chicago Press. p. 69-82.
- _____. 1986. Seasonal variations in use of time and space by the wedgecapped capuchin monkey, Cebus olivaceus: implications for foraging theory. Smithsonian Contributions to Zoology, (431): 1-60.
- THORNBACK, J. & JENKINS. M. 1982. The JUCN mammal red data book. Switzerland, IUCN. 516 p.
- SANTOS, R. 1984. Law and social change the problem of land in the Brazilian Amazon. In: *Fronties expansion in Amazonia*. Gainesville, Unievrsity of Florida Press. p. 439-62.









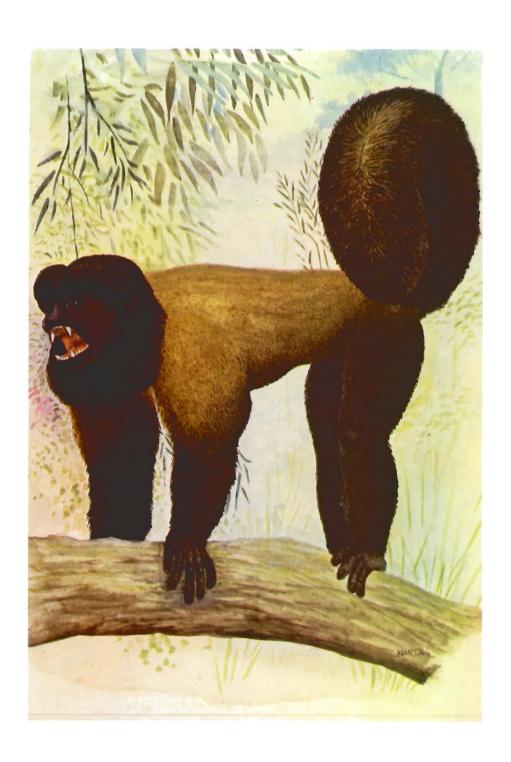














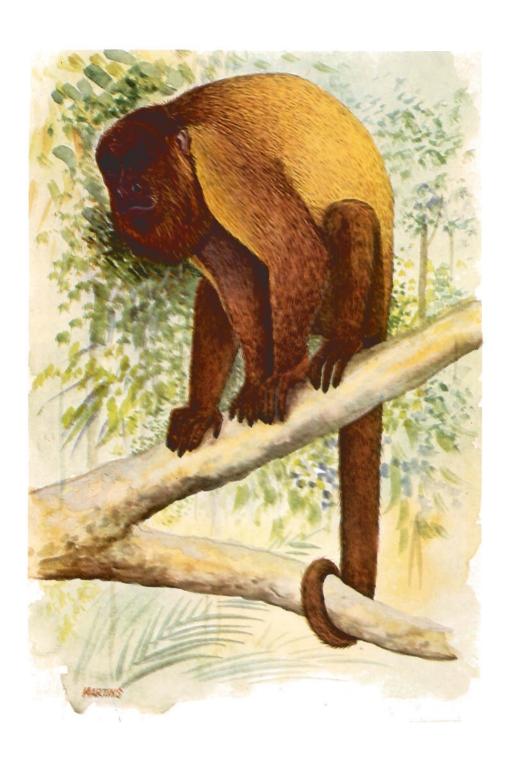
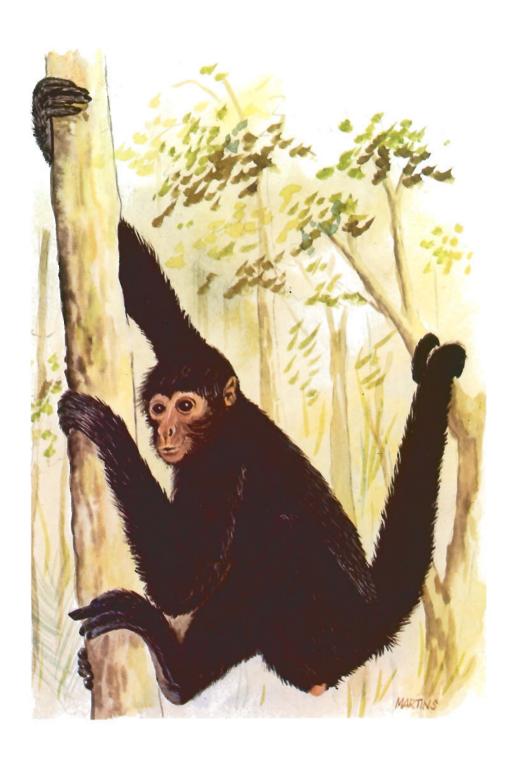


PLATE VIII - ALOUATTA SENICULUS





BOLETIM DO MUSEU PARAENSE EMÍLIO GOELDI INSTRUÇÕES GERAIS PARA PREPARAÇÃO DE MANUSCRITOS

Este Boletim é dedicado a publicar trabalhos originais de pesquisas sobre a Amazônia, nas áreas de Antropologia, Botânica, Geociências e Zoologia.

A redação dos manuscritos deve ser preferencialmente em Português, acompanhados de dois resumos, um em Português e outro em Inglês.

Os manuscritos devem ser entregues em três vias na forma definitiva, sendo uma original, datilografada em papel branco, tamanho ofício, em espaço duplo, sem preocupação com alinhamento da margem direita, evitando cortar palavras.

A Comissão Editorial é assessorada por um Conselho Científico para cada área de publicação do Boletim, a qual poderá sugerir alterações aos autores, juntamente com a devolução dos originais a serem refeitos.

As ilustrações devem limitar-se ao mínimo necessário para apresentação dos resultados e clareza do texto. Fotos coloridas não são aceitas, a não ser em casos excepcionais. Desenhos e gráficos são feitos a tinta nanquim em papel vegetal ou cartolina branca. As tabelas não devem conter traços verticais, sendo também resumidas tanto quanto possível. Tabelas e figuras devem ser auto-explicativas, prescindindo do texto para sua compreensão. A legenda é feita em cima, quando se trata de tabelas, e embaixo, se forem figuras. Desenhos e fotos devem ser montados em cartolina, com indicação exata do número da figura correspondente. As legendas das figuras devem ser datilografadas em folha separada, devendo ser incluído o nome do autor no caso de fotografias.

Palavras e letras a serem impressas em negrito deverão ser sublinhadas com dois traços e as impressas em grifo (itálico) deverão ser sublinhadas com um só traço.

Toda bibliografia citada no texto deve constar nas Referências Bibliográficas e vice-versa. A forma de citação no texto é: Cardoso & Vieira (1984) ou (Cardoso & Vieira 1984). Sendo mais de três nomes, fica assim: Cardoso et al (1984) ou (Cardoso et al 1984). A forma das Referências Bibliográficas, em especial quanto à posição da data, é a seguinte (um exemplo hipotético):

SILVA, A.B.; VIEIRA, C.D. & MORAES, E.F. 1984. A inteligência dos macacos. Ciência e Cultura, São Paulo, 30(1): 109-115.

Os autores receberão gratuitamente 30 separatas de cada artigo publicado. Número superior a este só será fornecido mediante encomenda do autor, que assumirá as despesas adicionais.