

Cordero R., G.A. 1987. Composición y diversidad de la fauna de vertebrados terrestres de Barlovento, Estado Miranda, Venezuela. *Acta Científica Venez.* 38: 234-58.

Crockett, C.M. and J.F. Eisenberg. 1987. Howlers: Variations in group size and demography. In: *Primate Societies*, B.B. Smuts, D.L. Cheney, R.M. Seyfarth, R.W. Wrangham and T.T. Struhsaker, eds. Univ. of Chicago Press, Chicago, pp. 54-68.

Ewel, J.J., A. Madryz and J.A. Tosi. 1976. Zonas de vida de Venezuela. Fondo Nac. Invest. Agropecuarias, Caracas.

Freese, C.H. and J.R. Oppenheimer. 1981. The capuchin monkeys. Genus *Cebus*. In: *Ecology and behavior of neotropical primates*, A.F. Coimbra-Filho and R.A. Mittermeier, eds. Academia Brasileira de Ciências, Rio de Janeiro, pp. 331-90.

Gilmore, R.M. 1943. Mammalogy in an epidemiological study of jungle yellow fever in Brazil. *J. Mammal.* 24: 144-62.

Handley, C.O. Jr. 1976. Mammals of the Smithsonian Venezuelan project. *Brigham Young Univ. Sci. Bull., Biol. Ser.* 20(5):1-90.

Levy, L.E. and R. Bodini. 1985. Estudio del comportamiento de infante del mono capuchino (*Cebus nigrivittatus*) en cautiverio. *A Primatologia no Brasil 2*. An 2° Congr. Bras. Primatologia, Campinas, pp. 151-61.

Mack, D. 1979. Growth and development of infant red howling monkeys (*Alouatta seniculus*) in a free ranging population. In: *Vertebrate Ecology in the Northern Neotropics*, J.F. Eisenberg, ed. Smithsonian Institution Press, Washington, D.C., pp. 127-36.

Mondolfi, E. and J.F. Eisenberg. 1979. New records for *Ateles belzebuth hybridus* in northern Venezuela. In: *Vertebrate Ecology in the Northern Neotropics*, J.F. Eisenberg, ed. Smithsonian Institution Press, Washington, D.C., pp. 93-96.

Neville, M.K. 1972. The population structure of red howler monkeys (*Alouatta seniculus*) in Trinidad and Venezuela. *Folia Primatol.* 17: 56-86.

Neville, M.K. 1976. The population and conservation of howler monkeys in Venezuela and Trinidad. In: *Neotropical Primates. Field Studies and Conservation*, R.W. Thorington, Jr. and P.G. Heltné, eds. National Academy of Sciences, Washington, D.C., pp. 101-9.

Racenis, J. 1952. Some observations on the red howling monkey (*Alouatta seniculus*) in Venezuela. *J. Mammal.* 33: 114-15.

Robinson, J.G. 1986. Seasonal variation in use of time and space by the wedge-capped capuchin monkey, *Cebus olivaceus*: Implications for foraging theory. *Smithsonian Contr. Zool. No.* 432: 1-60.

Robinson, J.G. and C.H. Janson. 1987. Capuchins, squirrel monkeys, and atelines: Socioecological convergence with old world primates. In: *Primate Societies*, B.B. Smuts, D.L. Cheney, R.M. Seyfarth, R.W. Wrangham, and T.T. Struhsaker, eds. Univ. of Chicago Press, Chicago, pp. 69-82.

Rudran, R. 1979. The demography and social mobility of a red howler (*Alouatta seniculus*) population in Venezuela. In: *Vertebrate Ecology in the Northern Neotropics*, J.F. Eisenberg, ed. Smithsonian Institution Press, Washington D.C., pp. 107-26.

Rudran, R. and J.F. Eisenberg. 1982. Conservation and status of wild primates in Venezuela. In: *Int. Zoo Ybk.* Vol. 22, P.J.S. Olney, ed. The Zoological Society of London, pp. 52-59.

Thorington, R.W., Jr., R. Rudran and D. Mack. 1979. Sexual dimorphism of *Alouatta seniculus* and observations on capture techniques. In: *Vertebrate Ecology in the Northern tropics*, J.F. Eisenberg, ed. Smithsonian Institution Press, Washington, D.C., pp. 97-106.

## Primate Survey of Eastern Bolívar, Venezuela

by Warren G. Kinzey, Marilyn A. Norconk and Eduardo Alvarez-Cordero

Despite a recent summary of the distribution of primates in Venezuela (Bodini and Perez-Hernandez, 1987), the exact location of primates in the eastern part of the state of Bolívar (Fig. 1) is poorly known. In order to provide additional information from this area and to find a site for the study of pitheciine primates, we explored the region from 24 May-8 June 1988. By boat we covered 350 km investigating islands in Guri Lake (Embalse Guri), and by jeep we toured 2,000 km in nearby basins east of the Caroni River, from the Supamo River to the Rio Grande. We report here on our observations in three areas: (1) on islands in the lake (#1 and #3) and the mainland east of the lake (#2), (2) three areas of the Rio Supamo (#4-6), and (3) three areas of the Serranía de Imataca (#7-9) (refer to Fig. 2).

Guri Lake is the result of flooding behind the Raul Leoni hydroelectric power dam, near the town of Guri, on the Caroni River. (The Caroni/Paragua river system, which drains the Guiana Highlands, is the largest river in Bolívar State.) Construction of the first stage of the dam was completed in 1968, when the lake reached its initial level of 215 m. In January 1978, construction began on the final stage of the dam, reaching the current maximum lake level of 270 m in November 1986. The dam, the 4,240 km<sup>2</sup> reservoir, and the land immediately surrounding the lake (part of the 95,000 km<sup>2</sup> of the Caroni River basin) are under the administration of EDELCA (Electrification of the Caroni River). Within the lake are a number of islands of varying sizes that were formerly hilltops on either side of the river.

We surveyed islands by boat and by foot, giving special attention to those previously inventoried by E.A.-C. that were known to have primates. We explored localities on land by following abandoned or recently-opened jeep trails to reach other parts of the forest. In these areas we walked along trails, both day and night, censusing primates. In addition, we questioned local people about primates in the area, including members of the National Guard, lumbermen, and farmers who were familiar with the local species. We encountered four species of monkeys: *araguato* (*Alouatta seniculus stramineus*), *mono capuchino* (*Cebus nigrivittatus*), *capuchino del Orinoco* (*Chiropotes satanas chiropotes*), *viuda negra* (*Pithecia pithecia*), and received reports of a fifth, *mono de noche* (*Aotus* sp.). We summarize our observations below.

### Results of the Survey

*Alouatta* was common in all areas sampled and was the species best known by local inhabitants. In Guri Lake we found groups of *Alouatta seniculus* on practically every island that contained a patch of forest, even islands as small as one hectare or less. We observed both solitary individuals and groups as large as five adult animals. Average group size (n=14) observed on islands was 3.2 adult animals (range=1-5, excluding carried infants). Four of the groups had from 1-4 infants. We assumed that from the boat we could see groups within 100 m of the edge of each island, and we observed one group of *Alouatta* from the boat about every nautical mile. On this basis, the density was computed to be about 5.4 groups/km<sup>2</sup> or about 17 animals/km<sup>2</sup>. This is about the same density as reported by Mittermeier (1977) for Suriname.

In continuous forest on the mainland, *Alouatta* was more difficult to observe, but easily detected by its calls. In the area of the Río Supamo (areas 4-6, Fig. 2) we confirmed that they ate yellow flowers of the *arbol de Araguaney* (*Tabebuia* sp., Bignoniaceae), one of the most valued hardwoods of the region. Near El Palmar (area 9, Fig. 2), we located an isolated group in a small fragment of secondary forest used to shade

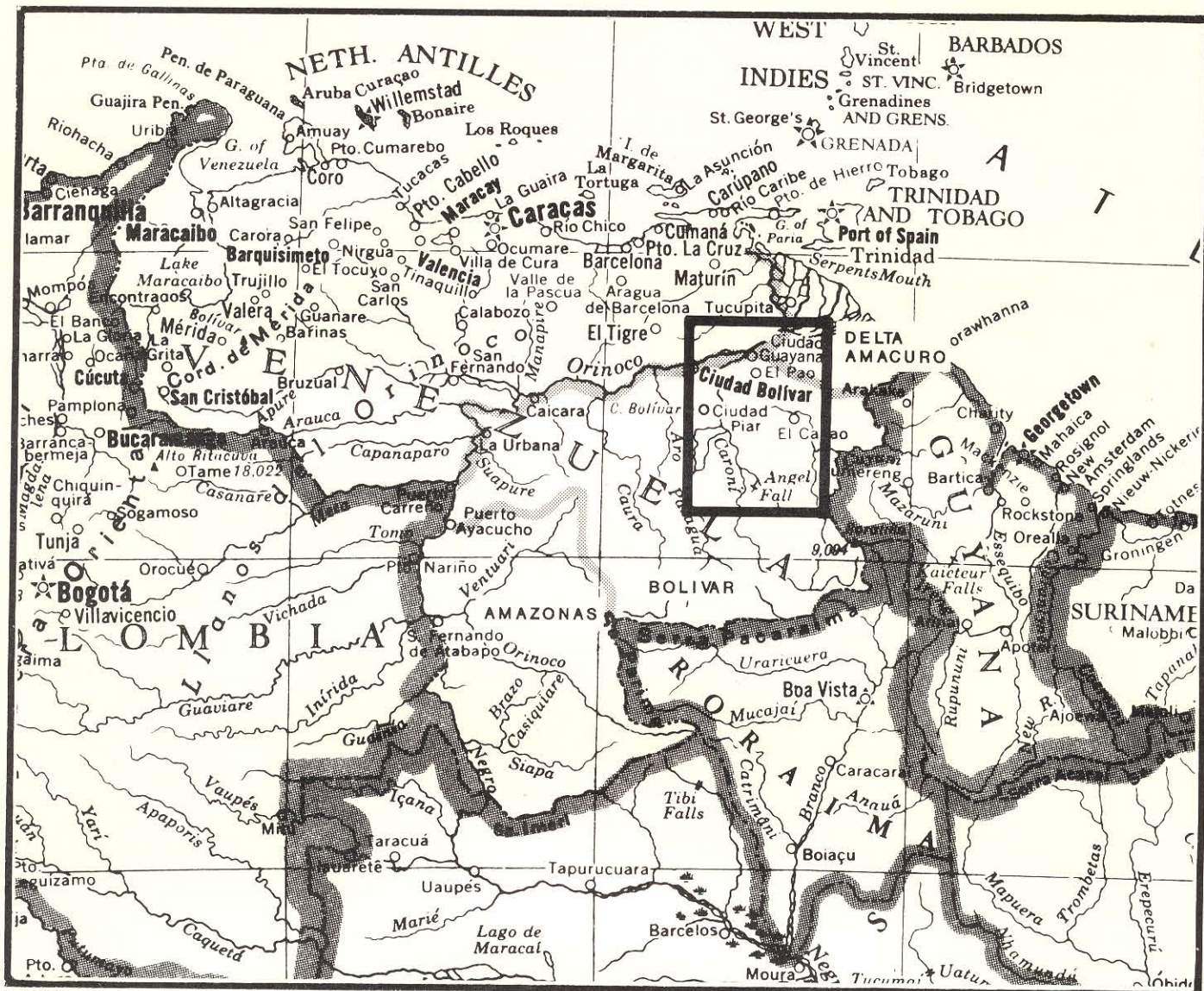


Fig. 1. Map of Venezuela showing the state of Bolívar, and federal territories of Delta Amacuro, and Amazonas. Area of map in Fig. 2 is boldly outlined (map provided by authors).

growing coffee plants. This site was encountered amidst pastureland, low scrub vegetation and farmhouses.

We encountered *Cebus nigrivittatus* less often than *Alouatta*, although we found it to be widely distributed in the region. *Cebus* is locally known as *mono maicero* for its habit of invading planted maize (corn). This behavior made it a persistent target for marksmen and therefore we found it to be very timid in the proximity of inhabited areas and farmland. We found it on islands in Guri Lake, on the east side of the Caroni River, and we saw a large group in the Serranía de Imataca (area 8, Fig. 2). *Cebus* was also seen previously in the forest of the Supamo (area 4, Fig. 2; E.A.-C., pers. obs., March and May, 1987), although we did not see it there during this survey. As described by Bodini and Perez-Hernandez (1987) the Caroni River serves as the boundary between *C. n. apiculatus* to the west, and the darker form of *C. n. olivaceus* to the east.

Our observations of *Chiropotes satanas chiropotes* on two islands that had originally been part of the mainland west of the Caroni River (area 1, Fig. 2) are among the first recorded for bearded saki in this region. One of these groups is now being intensively studied. We have not found any evidence of *Chiropotes* on the eastern side of the Caroni River.

We observed *Pithecia* in Guri Lake on two islands which had previously been part of the mainland east of the Caroni River (area 3, Fig. 2). They had also been observed there in 1983 and 1986 (E.A.-C., pers. obs.). We have three groups on these islands under intensive study. S. Gorzula (pers. comm.) previously collected a female *Pithecia* (currently in the EDELCA collection) from a group seen on the eastern edge of the lake south of El Manteco, but we did not observe *Pithecia* there during this survey (area 2, Fig. 2).

Our queries to local inhabitants of the Serranía de Imataca indicated that an abundant population of *Pithecia pithecia* still exists in fragments of forest a few kilometers north of El Palmar (area 9, Fig. 2). We observed several small groups in the area. One group of at least eight adults was seen moving and feeding together in the same tree. This observation corroborates those of other investigators (Buchanan *et al.*, 1981; Happel, 1982) who have suggested that large groups of *Pithecia* may form, consisting of several monogamous subgroups. After several days of walking through the forests of the Reserva Forestal de Imataca east of the Río Grande (Territorio Federal Delta Amacuro) we saw only a single group of three *Pithecia* (area 7, Fig. 2). On a recent trip to this area (July, 1989) E.A.-C. observed a large group of *Pithecia* (approx-

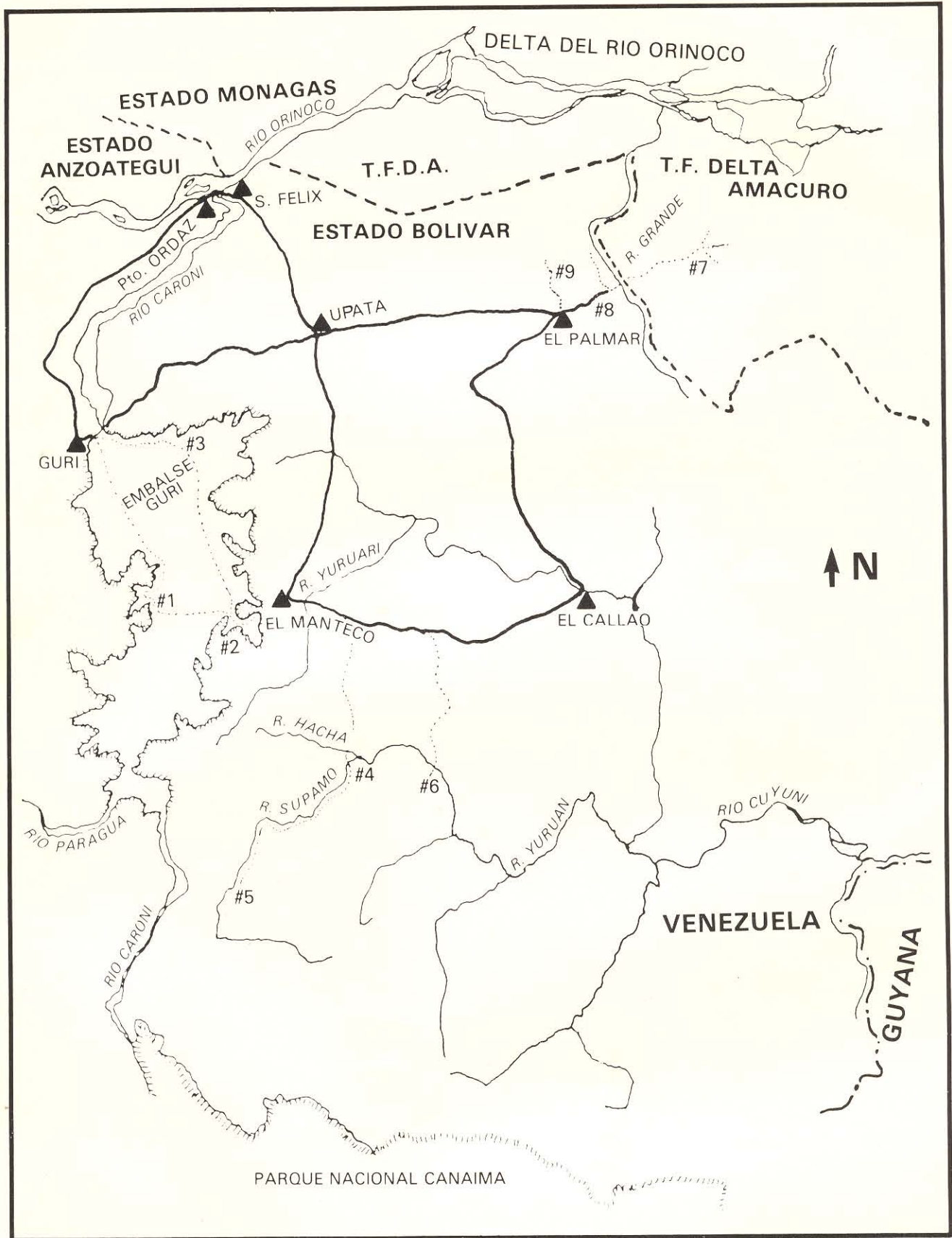


Fig. 2. Map of the area surveyed in Bolívar State and Delta Amacuro Territory, Venezuela. Key: Heavy lines indicate main roads travelled. Dotted lines indicated jeep trails and boat routes travelled. Nos. 1-9 refer to areas surveyed and described in the text. Cities and towns are shown as triangles (map provided by authors).

imately eight animals) in continuous forest that was recently logged.

We heard reports of (but did not observe) *Aotus* in the forest immediately east of the Río Grande (area 7, Fig. 2). A chain saw contractor reported cutting a hollow tree during the day about two months earlier and seeing *mono de noche* exit from the tree. Also, local hunters reported that they had seen *Aotus* in the area, and near the Supamo River (area 5, Fig. 2) as well. If confirmed, this would be the first report to document the distribution of *Aotus* east of the Caroni River in Venezuela.

We inquired about the presence of *Ateles* (*mono araña*) everywhere we went. A few people we interviewed described a monkey resembling *Ateles* in the area of El Miamo, north of El Callao. In the state of Bolívar, *Ateles* has only been seen in the Caura River basin (Wolfheim, 1983), and we know of only a single specific locality record — on the Río Nichare at the confluence of the Río Caura (6°33'N, 64°49'W) (S. Strahl, pers. comm.).

## Discussion

The observations made during this survey suggest that we do not fully understand the geographic distribution and dispersion of cebid primates in the Guayana region. The term "Guayana" is used in Venezuela to refer to one of the original provinces of the country and currently includes the state of Bolívar, and the territories of Amazonas and Delta Amacuro (Fig. 1). The term should not be confused with that of the country, Guyana, on the eastern boundary of Venezuela.

We found the distributions of *Pithecia* to be as reported by Bodini and Perez-Hernandez (1987) and by Hershkovitz (1987). Contrary to the distribution maps in Hershkovitz (1979) and Wolfheim (1983), there was no evidence of *Pithecia* west of the Caroni River. This river appears to form the western boundary of its distribution in the state of Bolívar. We did not find them on islands in Guri Lake that had previously been hills on the western side of the Caroni River, nor are they reported west of the Caroni by Bodini and Perez-Hernandez (1987), nor by Hershkovitz (1987). In the territory of Amazonas to the south, however, *Pithecia pithecia* does occur as far west as the Río Cunucunuma at Belén (3°30'N, 65°55'W; Handley, 1976). In addition, *Pithecia pithecia* appears remarkably more adaptable than previously supposed. They occur in moist evergreen forest, dry deciduous forest, tropical moist and wet forest, and subtropical moist forest (Handley, 1976). Hershkovitz states (1987:391) that "sakis are unknown from gallery or scrub forest," yet we found them surviving nicely in small scrub forest fragments near El Palmar, as well as in tropical dry forest on islands in Guri Lake.

This survey, and that of Alvarez-Cordero (1987), are the first reports of the bearded saki on islands in Guri Lake, and support the recent observation of *Chiropotes* on the nearby western mainland (Alvarez *et al.*, 1986). A single specimen of *Chiropotes satanas chiropotes* (cat. #1341), collected by L. Balbas on 15 January 1984, is in the Museo de Ciencias Naturales, UNELLEZ, Guanare (Estado Portuguesa). It was collected 18 km northwest of San Pedro de las Bocas (7°02'N, 63°03'W) just west of the confluence of the Caroni and Paragua rivers. Previously *Chiropotes* had not been reported east of the Caura River (Hershkovitz, 1985; Bodini and Perez-Hernandez, 1987). *Chiropotes* has thus spread farther east and north in Venezuela than previously recognized. Presumably it spread southwest from Suriname, through northern Brazil, into the headwaters of the Río Caura, to the eastern side of the river, and has migrated north between the Caura and the Caroni rivers. Thus, the Guiana Highlands have allowed the dispersion of *Chiropotes* and have not acted as a filter barrier in the sense of Eisenberg and Redford (1979). To the best of our knowledge *Chiropotes* has not crossed to the right bank of the Caroni River, and is not found east of the Caroni until one reaches the right bank of the Essequibo River in Guyana.

*Aotus* may have also spread farther east than previously reported

(Hershkovitz, 1983; Bodini and Perez-Hernandez, 1987). *Aotus* has not previously been reported east of the Caroni River. Cabrera (1958), Hill (1960) and earlier authors suggested that *Aotus* occurred in the Guianas, but since no museum specimens have been reported, this was regarded as questionable by Thorington (1975). Also, Muckenhirn *et al.* (1975) did not find any evidence of *Aotus* in their survey of Guyana. If reports to us are reliable, *Aotus* crossed the Caroni in the region of its headwaters in southern Bolívar State and spread north along the right bank of the river. Additionally it crossed the Serranía de Imataca, since it was reported in forests immediately east of the Río Grande. These reports obviously require further verification.

Much more needs to be done regarding the conservation of these animals in the state of Bolívar. We have several suggestions:

(1) These surveys should be repeated regularly, taking seasons into account, to continue monitoring the status of primates in the area. This is in keeping with priority 4.2.3 in the Venezuela Action Plan for Conservation (FUDENA, 1988).

(2) Primates appear to be surviving on disjunct islands in Guri Lake and every effort should be made to conserve them. They present an immense potential for scientific study and future tourism, thereby justifying the efforts for their conservation. The area that surrounds Guri Lake, and especially the islands in the lake, must be protected and managed in order to maintain a viable population of animals, to prevent hunting or capture of the animals, and degradation of the habitat.

(3) The extraordinary capacity to adapt and survive demonstrated by *Pithecia* and *Alouatta* in very small forest remnants close to human habitation means that — somewhat surprisingly for *Pithecia* — they can survive in relatively disturbed conditions. Their adaptability and our accessibility to these forest fragments provide an exciting opportunity to investigate how we might contribute to their future conservation. We suggest immediate concrete action to preserve the remaining forest fragments near El Palmar and to initiate studies of the primates on islands of various sizes and vegetational configuration in Guri Lake. Every effort should be made to protect these small forest tracts from further deterioration, and to protect the primates living in them.

(4) The majority of forests in the areas sampled on the mainland are in various stages of large-scale deforestation. This is mainly due to logging and, as previously pointed out in the Venezuela Action Plan for Conservation (FUDENA, 1988), to expansion of agriculture and extensive cattle ranching in much of the tropical lowland forest south of the Orinoco River. The effects of different forms of forest management on primate populations should be investigated.

As a result of this survey, we have inaugurated a research project on the ecology of primates on islands in two areas of Guri Lake (Kinzey and Norconk, 1988). The larger of the two islands (the area of Danto Machado; #1 in Fig. 2) is about 365 ha in size and supports a group of *Chiropotes* (currently 10 adults plus two infants) plus two groups of *Alouatta* and at least one group of *Cebus*. Virtually the entire island is forested.

The smaller island (the area of Las Carolinas; #3 in Fig. 2) is about 70 ha, and has several small patches of tropical dry forest interrupted by savanna. It supports a group of *Pithecia* in each of two patches, a group of *Alouatta* in a third patch, and *Cebus* that move among patches. A second group of *Alouatta* was decimated by a predator in late 1988 (pers. ob.).

Current research on the islands (*Proyecto de Primatología Ecológica de la Guayana Venezolana*) centers on the following activities: (1) study of feeding behavior of *Chiropotes* and *Pithecia*, emphasizing mechanical and chemical properties of foods eaten; (2) vocalizations and communication in *Pithecia*; (3) comparison of locomotor behavior in *Pithecia* and *Chiropotes*; (4) social behavior of *Chiropotes*; and (5) social behavior

of *Pithecia*. The project is international in character, currently including participation of American, Venezuelan, and German students.

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### Literature Cited

- Alvarez, E., L. Balbas, I. Massa and J. Pacheco. 1986. Ecological aspects of the Guri Reservoir. *Interciencia* 11 (6): 325-33.
- Alvarez-Cordero, E. 1987. Notas preliminares sobre el comportamiento del Mono Capuchino del Orinoco (*Chiropotes satanas chiropotes*) en la region del Embalse Guri, Estado Bolívar, Venezuela. Proc., 37th annual convention, Venezuelan Association for the Advancement of Science, Maracaibo, Venezuela. p. 268.
- Bodini, R. and R. Perez-Hernandez. 1987. Distribution of the species and subspecies of cebids in Venezuela. *Fieldiana: Zoology*, n.s. 39: 231-44.
- Buchanan, D.B., R.A. Mittermeier and M.G.M. van Roosmalen. 1981. The saki monkeys, Genus *Pithecia*. In: *Ecology and Behavior of Neotropical Primates*, Vol. 1. A.F. Coimbra-Filho and R.A. Mittermeier, eds. Academia Brasileira de Ciências, Rio de Janeiro. pp. 391-417.
- Cabrera, A. 1958. Catálogo de los mamíferos de América del Sur. I. *Rev. Mus. Argentino Cienc. Nat. "Bernardino Rivadavia" Zool.* 4 (1): 1-307.
- Eisenberg, J.F. and K. Redford. 1979. A biogeographic analysis of the mammalian fauna of Venezuela. In: *Vertebrate Ecology in the Northern Neotropics*, J.F. Eisenberg, ed. Smithsonian Institution Press, Washington, DC. pp. 31-6.
- FUDENA (Fundación para la Defensa de la Naturaleza). 1988. Hacia Una Estrategia Para La Conservación De Especies En Venezuela; Plan de Acción, 1988-1993. FUDENA, Caracas 67 pp.
- Handley, C.O., Jr. 1976. Mammals of the Smithsonian Venezuelan project. *Brigham Young Univ. Science Bull.* (Biol. Ser.) 20(5): 1-89.

- Happel, R. 1982. Ecology of *Pithecia hirsuta* in Peru. *J. Hum. Evol.* 11: 581-90.
- Hershkovitz, P. 1979. The species of sakis, genus *Pithecia* (Cebidae, Primates), with notes on sexual dichromatism. *Folia primatol.* 31:1-22.
- Hershkovitz, P. 1983. Two new species of night monkeys, genus *Aotus* (Cebidae, Platyrrhini): A preliminary report on *Aotus* taxonomy. *Am. J. Primatol.* 4:209-43.
- Hershkovitz, P. 1985. A preliminary taxonomic review of the South American bearded saki monkeys, genus *Chiropotes* (Cebidae, Platyrrhini), with the description of a new subspecies. *Fieldiana: Zoology*, n.s. 27 (1363): iii, 1-46.
- Hershkovitz, P. 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. *Am. J. Primatology* 12 (4): 387-468.
- Hill, W.C.O. 1960. *Primates; Comparative Anatomy and Taxonomy*. IV. Cebidae, Part A. The University Press, Edinburgh.
- Kinzey, W.G. and M.A. Norconk. 1988. Primate ecology in eastern Venezuela. *Phys. Anthropol. News (PAN)* 7 (2): 1-2.
- Mittermeier, R.A. 1977. *Distribution, Synecology and Conservation of Suriname Monkeys*. Unpubl. Ph.D. dissertation, Harvard University.
- Muckenhirn, N.A. B.K. Mortensen, S. Vessey, C.E.O. Fraser and B. Singh. 1975. Report on a Primate Survey in Guyana. Pan American Health Organization Report, 49 pp.
- Norconk, M.A., E. Alvarez-Cordero and W.G. Kinzey. 1988. Levantamiento preliminar de primates en la Guayana Nororiental Venezolana, Estado Bolívar. *Acta Científica Venezolana* 39 (Supl. #1): 218.
- Thorington, R.W., Jr. 1975. The relevance of vegetational diversity for primate conservation in South America. In: *Proc. Symp. 5th Congr. Int. Primatol. Soc.*, S. Kondo, M. Kawai, A. Ehara, and S. Kawamura, eds. Japan Science Press, Tokyo, pp. 547-53.
- Wolfheim, J.H. 1983. *Primates of the World; Distribution, Abundance, and Conservation*. University of Washington Press, Seattle.

## The General Status of Monkeys in French Guiana by Christian Roussillon

French Guiana, situated 7,000 km from metropolitan France, is the largest French department but the least developed in terms of agriculture and forestry (Fig. 1). The small human population (80,000) is concentrated along the coast, so the vast, inland forests (90,000 km<sup>2</sup>) have been left relatively undisturbed. Because of geographic distance and historical relations between the two continents, the local government is exceptionally independent of France. French regulations protecting wildlife are rarely enforced (see Mahouy and Milhaud, 1978, for regulations concerning primates). Hunting licenses are often not required in French Guiana, hunting seasons are not restricted, and the use of any weapon is permitted. The right to hunt year-round has come to be considered an inalienable 'ancestral right' of all Guianese people. Thanks to French subsidies, the standard of living in French Guiana is high compared to neighboring countries, so people have money to spend on guns and cartridges. Primates are particularly at risk, since they are both relatively easy to hunt and good to eat.

### Hunting in French Guiana

The apparent wildness of some parts of French Guiana is misleading. Since the beginning of this century, people have penetrated deep into the forest, following even the smallest rivers, mapping and naming most of the country.