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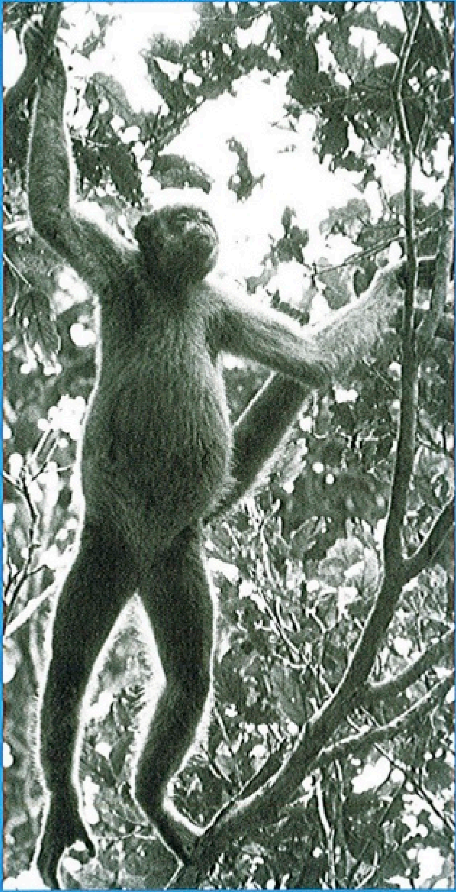
NEOTROPICAL PRIMATES



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THE TRUE IDENTITY AND CHARACTERISTICS OF *SIMIA ALBIFRONS* HUMBOLDT, 1812: DESCRIPTION OF NEOTYPE

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Abstract

The historic holotypic description of Alexander von Humboldt for the primate *Simia albifrons* contains obvious errors which have created various taxonomic problems, since it has been impossible to compare descriptions of subspecies with an original holotype, which was never preserved. An historic taxonomic error was the recognition of *Cebus albifrons unicolor* as a different taxon from *Cebus albifrons albifrons*, which we correct in this paper by the recognition of *Cebus albifrons unicolor* as a synonym for *Cebus albifrons albifrons.* We describe *Cebus albifrons albifrons* for the first time, based on a neotype collected by us close to the type locality. Additionally, confusions about the type locality are discussed and clarified. Maypures is established as the correct type locality. General information on the geographic distribution and natural history of the species and subspecies is also provided.

Key Words - Primates, Cebidae, pale-fronted capuchin monkey, *Cebus albifrons albifrons, Simia albifrons* Humboldt, 1812 (type locality, characters, neotype), distribution, natural history.

Resumen

La descripción holotípica e histórica de Alexander von Humboldt para el primate *Simia albifrons* contiene obvios errores que han creado varios problemas taxonómicos, dado que ha sido imposible comparar descripciones de subespecies con un holotipo original, el cual nunca se preservó. Un error histórico es el reconocimiento de *Cebus albifrons unicolor* como un taxon distinto de *Cebus albifrons albifrons,* el cual corregimos en este articulo por el reconocimiento de *Cebus albifrons unicolor* como sinónimo para *Cebus albifrons albifrons.* Describimos *Cebus albifrons albifrons* adecuadamente en este artículo por la primer vez, basado en un neotipo colectado por nosotros cerca a la localidad típica. Adicionalmente, se discute y se clarifica confusiones sobre la localidad típica, indicando Maypures como la localidad típica correcta. Adicionalmente, se presenta información general sobre la distribución geográfica y la historia natural de la especie y la subespecie nominal.

Palabras Claves – Primates, Cebidae, capucino de frente blanca, *Cebus albifrons albifrons, Simia albifrons* Humboldt, 1812 (localidad típica, caracteres, neotipo), distribución, historia natural.

Introduction

During the years 1799-1804, on an extensive biological and geographical reconnaissance of Colombia, Venezuela, Ecuador, Peru, Cuba and Mexico, including the Orinoco and Magdalena rivers and the Colombian and Ecuadorian Andes, Baron Alexander von Humboldt and his companion Aimé Bonpland explored isolated and little-known regions of South America, studying geographical, climatological and geophysical aspects of the countryside, local customs, archaeology and the innumerable plants and animals native to those parts. As fruit of their explorations, many organisms were described for the first time in the thirty volumes which were published, complemented with numerous articles in scientific journals. This was surely the most extensive project of its kind ever published by one individual, given that Humboldt's friend Aimé Bonpland, except for the botanical part, contributed very little to the actual writing of the results of the voyage of these two scientists. Even with the botanical work, Bonpland prevaricated until Humboldt was forced to search for other collaborators such as Karl Sigesmund Kunth in the preparation of the seven volume *Nova genera et species plantarum* (Botting, 1973: 205) [1].

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† It is with great sadness that I inform the primatology and conservation community of the untimely death of Professor Jorge Ignacio Hernández-Camacho on September 15, 2001. Professor Hernández or "El Mono" was my friend, colleague and teacher for over 25 years. My knowledge of Colombian primatology and other vertebrate fauna was greatly enriched by having known and worked with him. His human qualities were considerable, and he will be missed by many. (TRD)

While in the Orinoco region, Humboldt (1812a: 305-363) discovered and described five new taxa of primates: *Aotus trivirgatus* [= *Simia trivirgata* Humboldt], *Callicebus torquatus lugens* [= *Simia lugens* Humboldt], *Lagothrix lagothricha* [= *Simia lagothricha* Humboldt], *Cacajao melanocephalus* [= *Simia melanocephala* Humboldt], *Chiropotes satanas chiropotes* [= *Simia chiropotes* Humboldt] and *Cebus albifrons* [= *Simia albifrons* Humboldt] [2].

This article discusses the characteristics of *Simia albifrons*, the species' taxonomy, its authentic type locality, the fixation of a neotype for the taxon, the status of *Cebus gracilis* Spix, 1823, the synonymy of *Cebus albifrons unicolor* with *Cebus albifrons albifrons*, the geographic distribution of *C. albifrons*, and aspects of the species' natural history.

Methods

Color terminology for pelage descriptions follows Ridgway ("1912" = 1913). Measurements are expressed in millimeters, unless otherwise noted. Head and body length were obtained by subtracting the tail length from total length. For this article we examined all specimens of *Cebus albifrons albifrons* and *Cebus albifrons unicolor* deposited in Colombian collections (11 specimens), comparing them to our knowledge of Venezuelan and Brazilian specimens of *Cebus albifrons unicolor*. Additionally we reviewed specimens of other *Cebus albifrons* subspecies deposited in Colombia (21 specimens), and we cursorily examined specimens in the United States National Museum (68 specimens, including holotypes for *Cebus albifrons cesarae* and *Cebus albifrons pleei*). There are no specimens of Colombian *Cebus albifrons albifrons* (= *C. a. unicolor*) held in collections outside of Colombia except for a series collected from the right bank of the río Arauca and deposited in the Field Museum of Natural History (FMNH), Chicago.

The following acronyms are used:

AMNH - The American Museum of Natural History, New York, USA.
FMNH - Field Museum of Natural History, Chicago, USA.
ICN - Collection of mammals in the Instituto de Ciencias Naturales, Museo de Historia Natural, Facultad de Ciencias, Universidad Nacional de Colombia, Santa Fe de Bogotá, Colombia.
IVH - Instituto de Recursos Biológicos Alexander von Humboldt, Ministerio del Medio Ambiente, Villa de Leíva, Boyacá, Colombia.
MNHNP - Muséum National d'Histoire Naturelle, Paris, France.
UNIFEM - mammal collection, Unidad de Investigaciones Federic Medem, Institututo Nacional de Recursos Naturales y Protección al Medio Ambiente (INDERENA), Santa Fe de Bogotá, Colombia. This collection is now deposited in IVH.
USNM - Natural History Museum, Smithsonian Institution, Washington, DC, USA.

Simia albifrons Humboldt, 1812

The original description of *Simia albifrons*. As von Humboldt and Bonpland entered the world of the "Upper Orinoco" [3] they began to see individuals of species of "Matchís" [4]. They were already acquainted with both *Cebus apella*, the "Sajou" [5], and the "saï" [6] from earlier collections. Humboldt named this new monkey *Simia albifrons*: "Face bluish gray with the exception of orbits and forehead, which are pure white. The contrast of these two colors distinguishes the "Ouavapavi", which I name *Simia albifrons*, from the "Saï" and from the ordinary "Sajou" (translation from the French) (Humboldt, 1812a: 324).

Humboldt (1812a: 324-325) described *Simia albifrons* as follows:

> "Le Matchi du Haut-Orénoque, que les Indiens Guarekens [7] appellent *Ouavapavi* a 0^{m},378 (14 pouces) de long du sommet de la tête à l'origine de la queue: il a la face gris-bleuâtre, à l'exception des orbites et du front qui sont d'un blanc pur. Le contraste de ces deux couleurs fait distinguer au premier abord l'*Ouavapavi*, que je désigne sous le nom de *Simia albifrons*, du Saï et du Sajou ordinaire. La tête est un ovale très-alongé. Le pelage du corps est grisâtre, plus clair vers la poitrine et le ventre, plus obscur vers les extrémités que son d'un brun-jaunâtre. Le sommet de la tête est d'un gris tirant sur le noir: une strie cendrée se prolonge longitudinalemente de la calotte par le milieu de front vers le nez: les sourcils sont de même d'un gris très-obscur. Les yeux son grands, bruns et très-vifs. Les oreilles ont un rebord et sont couvertes de poils. La queue est prenante, mais toute couverte de poils, et par conséquent sans callosité: elle est à peu près de la longueur de corps, cendrée par dessus, blanchâtre par dessous, et d'un brun-noir à l'extrémité. Les ongles son tous arrondis et très-peu convexes. Une strie d'un gris foncé obscur descend le long de dos.
> *SIMIA ALBIFRONS, imberbis, cauda prehensili, ex albo cinerascens, vertice nigro, facie coerulea, fronte et orbitis niveis, cruribus et brachiis fuscescentibus."*

Further on in the above publication, Humboldt lists *Simia albifrons* in his *Tableau Synoptique des Singes de l'Amérique* as follows:

> "19. *Simia albifrons, ex albo cinerascens, vertice nigro, facie caerulea, fronte et orbitis niveis, cruribus et brachiis fuscescentibus.*" (Humboldt, 1812b: 356).

Type specimen and type locality. Humboldt did not specifically designate a type specimen nor a type locality, although he added the following comment:

> "Les *Ouavapavis* sont très-laids, mais extrêmemement doux, agiles et moins criards que les Singes pleureurs [*Cebus nigrivitattus*]. Ils habitent, par troupeaux, les forêts qui avoisinent les cataractes de l'Orénoque [8] et la mission de Santa Barbara [9]. Nous en avons trouvé un individu à Maypures [10] qui, tous

> les matins, saisissoit un cuchon sur lequel il resoit monté toute la journée en parcourant la savane qui environne les cabanes de Indiens [Maypures]. Nous l'avons même vu souvent sur le dos d'un chat qui avoit été élevé avec le Singe dans la maison du missionnaire, et qui souffroit patiemment les effets de la pétulance de l'*Ouavapavi*."(Humboldt, 1812a: 324–325).

The original description was based exclusively on a captive individual that Humboldt (1812a: 325) first reported he saw at Maipures, on the left bank of the río Orinoco, but added that he had observed wild individuals around the Mission of La Esmeralda (Estado Amazonas, Venezuela), on the upper río Orinoco (right bank) and in the forests on both sides of the Orinoco between La Esmeralda and Maipures. Later, Humboldt (1824a: 98-99, [1]) wrote in his *Relation Historique* of the journey to the río Orinoco where he had supposedly observed *Simia albifrons* in the Atures Mission [11], 50 km north of Maipures on the opposite side of the river, directly contradicting his original statement in Humboldt (1812a: 325).

This new account (Humboldt, 1824a: 98-99) [12] is entirely based on the original one, including the Latin diagnosis, but no mention of Maipures is made nor a clarifying explanation. Under such circumstances, von Humboldt certainly created a source of confusion twelve years after the original description was published, since there is no evidence of the presence of *Cebus albifrons* in the vicinity of Atures on the right bank (Venezuelan bank) of the Orinoco, where *Cebus nigrivittatus* occurs instead (see Bodini and Pérez-Hernández, 1987; Bodini, 1989) [13].

One of us (TRD) studied the distribution of *Cebus albifrons* and *Cebus apella* in the Maipures region and was not able to confirm the presence of *Cebus albifrons* in the inmediate location of Maipures, south of the río Tuparro (Defler, 1985). The site that Maipures formerly occupied is in an extensive natural savanna with isolated forest patches that contain some *Cebus apella* as well as *Alouatta seniculus* and *Aotus* sp. (perhaps *A. trivirgatus*)[14]. However, *C. albifrons* is common (and replaces *C. apella*) immediately 3 km north (on the northern bank of the lower río Tuparro) where there are nearby extensive gallery forests (Fig. 1).

As such, this argues against the possibility that the specimen upon which Humboldt based the original description of *Simia albifrons* was obtained at the Atures mission or any other locality in Venezuela and suggests that it was captured in the neighborhood of Maipures mission, Vichada, Colombia, where *Cebus albifrons* (as currently understood) is known to occur close by.

Possible doubts for the occurrence of *Cebus albifrons* on the Colombian bank of the río Orinoco that could eventually arise were definitively resolved with the findings of the above survey and of the additional collection of the species in the río Bita (Vita), further to the north of the survey area.

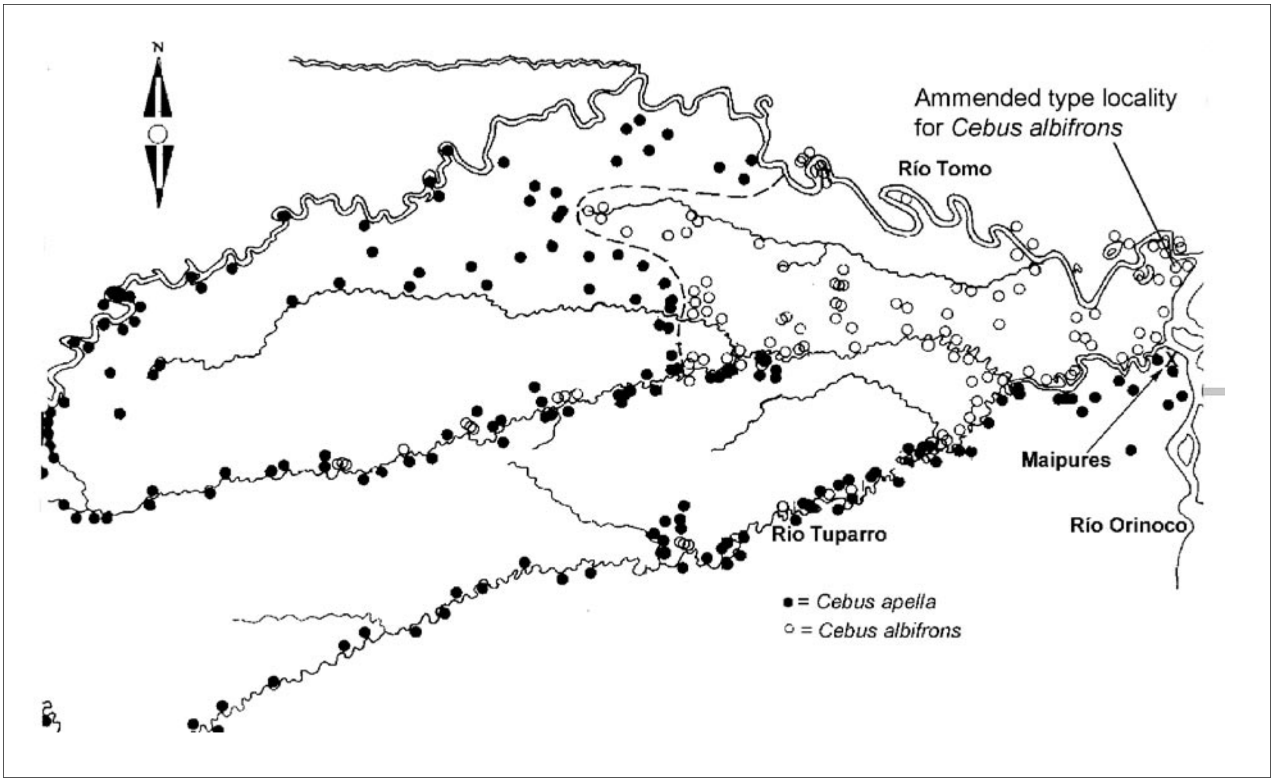

Figure 1. Map of Maipures region north to the río Tomo showing the distribution of *Cebus albifrons* and *Cebus apella*, and including the amended type locality for *Cebus albifrons* (based on Defler, 1985).

Fixation of a neotype for *Simia albifrons*. The fixation of a neotype is justified because: It is desirable to establish the neotype to secure nomenclatural stability; the holotype was not preserved; and it is convenient to clarify the type locality of the species and suppress any ambiguity that could lead to confusion or controversial interpretations.

The identity and the proper characterization of *Simia albifrons* Humboldt. There can be no doubt the original description of *Simia albifrons* was based upon the specimen kept in the mission at Maipures, since it was obviously handled in order to take accurate measurements of head and body length (taken from the crown). However, Humboldt did not publish a figure of it, neither did he record its sex or relative age, and unfortunately it was not preserved. The specimen was possibly a juvenile, since it rode about on the back of a pig, and piggy-back riding is typical of the young (when pigs or other species are available).

Simia albifrons must unquestionably be considered as belonging to the genus *Cebus* Erxleben, 1777, following É. Geoffroy Saint-Hilaire (1812) and the current usage of subsequent authors. The only species of non-tufted capuchin approaching the original description is undoubtedly *Cebus albifrons*, as interpreted by Hershkovitz (1949: 371). There are discrepancies in the original description of the coloration, as shown above, but there is no doubt that the chromatic pattern of the species is the same in the Department of Vichada population in Colombia as well as the Amazonas state population in Venezuela. There are some differences in the presence of eumelanin in the pelage, which can be interpreted as individual variation. The dark color of the hair of the tip of the tail described by von Humboldt (1812a: 325) is a color pattern that the authors have not detected in other individuals. This allows us to hypothesize that the dark tail tip was an individual variant and the general color of the "grayish" pelage may suggest that the holotype was a young animal in which the color was lighter than in adults, or that the captive animal had been exposed to so much sunlight that depigmentation (fading) had occurred and the yellowish-red tones had been lost. We have noticed that captive specimens, when exposed to too much sun tend to lose their natural color, such that tonalities become duller towards gray.

However, as previously noted, no type or syntype of this species was preserved. It has also been established here that the type locality is fairly clearly the former site of the Maipures mission, although only *Cebus apella* exists in the immediate vicinity of Maipures (south of the río Tuparro), as established by Defler (1985). The species of *Cebus* can be identified as *Cebus albifrons* due to the white color of the orbits and the forehead indicated by von Humboldt (1812a: 324-325) in the original description of *Simia albifrons.*

Hershkovitz (1949: 371) rightly indicated that the original description (and Latin diagnosis) of *Simia albifrons* "refers to a monkey with some characters that have never been found [observed] until now in any of the specimens [in other populations of the species]". Having now available topotypes of *Simia albifrons*, in addition to a considerable number of preserved and live specimens examined from most of the geographic range of the species, we fully agree with Hershkovitz' remarks.

The distinctive chromatic characters used by Humboldt to define *Simia albifrons* are:
—*Face bluish gray ("facie caerulea") except for the orbital regions and the forehead which are white* ("*niveis*"). Comments: The usual condition in this species for all specimens examined is a depigmented facial skin, including the forehead, instead of a pigmented facial skin, with unpigmented orbits and forehead. However, a certain grade of facial pigmentation as blotches of eumelanin over a light pinkish skin color has been observed in the populations of the río Matavén (s. Vichada) and in the río Apaporis (s. Vaupés) region (T. R. Defler, pers. obs.). It is conceivable that a general pale bluish gray color could appear in the facial skin (excluding the orbits and the forehead), due to small amounts of scattered eumelanin as an individual variation.
—*Eyebrows very dark gray* ("*gris très-obscur*"). Comment: Von Humboldt undoubtedly referred to the presence of very dark hairs ("*sourcils*") in the eyebrows, as in *Cebus albifrons*, and not to a dark superciliary stripe.
—*Crown gray tending to black* ("*vertice nigro*"), *anteriorly continued as a grayish narrow stripe* ("*strie cendrée*") *that descends towards the nose.* Comments: The basic contrasting dark design of the crown occurs in all the various subspecies of *Cebus albifrons*, but its color can change, varying from a medium brown to a dark brown (almost blackish), but never with gray tonalities. Possibly the dark gray almost black color might be due to some degree of bleaching due to excessive exposure to sunlight.
—*Underparts grayish* ("*grisâtre*"; "*albocinerascens*" in the Latin diagnosis), *darker in the extremities* ("*cruribus et brachiis*") *which are yellowish brown* ("*fuscescentibus*") *with a darker middorsal stripe* ("*gris foncé obscur*"). Comments: The "*grisâtre*" coloration can be translated as "grayish" or "grayish brown" that would be closer to the tonalities present in the topotypes of *Simia albifrons* (in any case, not tending to ashy gray), and the middorsal stripe is not darker gray. The color of the extremities, including hands and feet, can be interpreted as yellowish brown, not duller ("*fuscescentibus*").
—*Tail above ashy gray* ("*cendrée*"), *whitish underneath* ("*blanchâtre par dessous*") *blackish brown* ("*brun-noir*") *towards the tip.* Comments: In the topotypes of *Simia albifrons* the tail is more richly colored and not strikingly darker (brownish black) towards the tip. In none of the specimens of *Cebus albifrons* does the tail tip approach a very dark brown color; on the contrary, a tendency towards a lighter tail tip is frequent.
—*Breast and belly whitish.* Comment: The breast and belly are brighter colored in the topotypes. Some individuals, however, have a very white ventrum.

To summarize: the coloration described for the middorsal area, the proximal dorsal surface of the tail and the sides of the body in the type specimen of *Simia albifrons* is rather duller and decidedly more grayish than in the topotypes, and with a unique feature; the brownish black tip of the tail. These discrepancies cannot be entirely attributed to a process of bleaching or fading due to excessive exposure to sunlight. It is well-known that black (eumelanin) hairs bleach or fade to reddish brown instead of deep gray due to excessive exposure to sunlight, unlike the case here. Under these circumstances we can conclude that either the type of *Simia albifrons* was abnormally colored, or the published chromatic description was affected by inaccuracies in the terminology used, or the description was at least in part subject to defective perception of the tonalities involved. Otherwise we should expect a close similarity or even identity in chromatic characters between the type and the topotypes.

A strict interpretation of the original description of *Simia albifrons* leads us to the conclusion that *Cebus albifrons* cannot be satisfactorily identifiable and should be replaced by *Cebus unicolor* Von Spix, 1823. The obvious alternative is to preserve the use of *Simia albifrons,* based on the characters of the topotypes now available and the acceptance of Maipures as the type locality for this binomen. As this procedure essentially is in accordance with the taxonomic and nomenclatural treatment of Hershkovitz (1949) that has generally been followed since then, and in order to consolidate nomenclatural stability, in this article we fix one of the specimens collected by us a few kilometers north of Maipures as a neotype for *Simia albifrons.*

There are no arguments to suggest that the populations subsequently observed by us in the wild nearby are not of the same population as the holotype. Since the species is polytypic with a wide geographic range, the taxonomic identity needs to be consolidated according to Article 75 of the International Code of Zoological Nomenclature. It is important to designate a neotype for the species with the object of establishing a nomenclature and taxonomic base for the species and genus.

Cebus albifrons albifrons (Humboldt, 1812)

Synonymic history

Simia albifrons Humboldt, 1812a: (original description and Latin diagnosis).
- Humboldt, 1812b: 563 (Latin diagnosis; “Habite les environs de Maypures et d’Atures, sur les bords de l’Orénoque”).
- Humboldt, 1824a: 98-99, footnote 1 (citation in the text of the footnote; Latin diagnosis; characters; recorded among the primates seen “à la mission de Atures”, not Maypures!).

Cebus albifrons É. Geoffroy Saint-Hilaire, 1812: 111 (nomenclatorial transference to *Cebus*).
- Goeldi & Hagmann, 1904: 48 (including *Cebus chrysopus* and *C. gracilis* in synonymy).
- Elliot, 1913: 88 (*partim*; synonymy including *C. gracilis* and *C. leucocephalus* as synonyms; characters).
- Cruz Lima, 1945: 149 (characters based on the original description; erroneous citation of type locality as “Santa Barbara Mission, cataracts of río Orinoco”).
- Napier, P. 1976: (*partim*; catalogue of specimens in the British Museum [Natural History]).
- Handley, 1976: 42 (*partim*; Río Mavaca, 108 km SSE of Esmeralda, 140 km and Tamacama, Río Orinoco, 135 m., T[erritorio] F[ederal] Amazonas [= Estado Amazonas], Venezuela).
- Groves & Pulido, 1982: 228 (erroneous citation of type locality as “Venezuela, Orinoco River”).
- Cuervo-Díaz, Hernández-Camacho & Cadena [Gómez], 1986: (*partim*; actual distribution and synonymy with *C. a. unicolor*).
- Bodini & Pérez-Hernández, 1987: (*partim*; distribuction in Venezuela).
- Bodini, 1989: 105–106 (distribution of species in Venezuela).
- Groves, 1993: 259 (erroneous citation of type locality as “Venezuela, Orinoco River”).
- Uribe Hurtado & Ortiz Von Halle, 1993: fig. s.n. (Caño Limón, Department of Arauca, Colombia).
- Alberico, Cadena, Hernández-Camacho & Muñoz-Saba, 2000: 58 (Department of Putumayo and Vichada, Colombia).

C[ebus] c[apucinus] gracilis Pusch, 1941: 192 (*partim*: including records from the Amazonian region as well as *“Cebus gracilis* Hellsternig” described by Lönnb*erg* [1939]).

C[ebus] c[apucinus] versicolor Pusch, 1941: 193 (*partim*: including the records from the Amazonian region and “*Cebus flavus* Geoffroy”, non *Cebus versicolor* Pucheran, 1945 [=*Cebus albifrons versicolor*]).

C[ebus] cuscinus cuscinus Pusch, 1941: 196 (*partim*: “*Cebus gracilis* dunkelstirning” described by Lönnberg [1939] and a female from Chicosa, eastern Perú; non *Cebus flavescens cuscinus* Thomas, 1901 [=*Cebus albifrons cuscinus*]).

Cebus flavus É. Geoffroy Saint-Hilaire, 1812: 111 (original description; holotype MNHNP, no. 562 (type specimen catalogue) and 458 (general collection); unsexed adult (?) collected by Alexandre Rodrigues Ferreira in Brazil) [15].

Cebus unicolor Spix, 1823: 7, pl. 4 (original description; holotype: Zoologische Staatssamlung München, adult male, skin and skull, collect by the expedition of Jean Baptist Ritter von Spix and Carl Friedrich von Martius in Brazil). Type locality: forests of Río Tefé, near its junction with the Amazon River near Ega [= Tefé], Amazonas, Brazil).

Cebus gracilis Spix, 1823:8, pl. 5 (original description; holotype: Zoologische Staatssamlung, München, skin and skull collected by the expedition of Johann Baptist Ritter von Spix and Carl Friedrich von Martius in Brazil; type locality: Tefé, mouth of Tefé River on the Amazon River, Amazonas,

Brazil; distribution forests of the Solimões from "la ville de rio Negro [=Manaus, Amazonas, Brazil] vers le Peru").
- Cruz Lima, 1945: 149-150 (pl. xxiv (characters based on the original description).

"*Sajou à pieds dorée au chrysope"* F. Cuvier, 1825: 2pp., pl. (description of a living menagerie specimen from "l'Amerique septentrionale").

Cebus chrysopus Lesson, 1827: 55 (based on the original description of the "sajou a pieds dorées de F. Cuvier in 1825; type not preserved).

"Machín (*nuova vapari*; [*sic.* = *ouavapavi* ?]: Codazzi, 1841: 156 ("tiene pelo gris y cara azulada con las órbitas y la frente como la nieve; Venezuela, without definite locality).

S[imia] albifrons: Vergara & Velasco, 1902: 190 (cited in the text; Colombia without precise locality; common name "machín").

C[ebus] albifrons Pittier & Tate, 1932: 278 ("Raudales del Orinoco", Venezuela).

Cebus albifrons [*albifrons*] Defler, 1979a: 475, 487, 488 (ecological aspects of topotypical population).
- Defler, 1979b, 1979: 491, 501 (behavioral aspects of topotypic population).

Cebus unicolor unicolor: Cruz Lima, 1945:150 (characters based on the original description).

Cebus gracilis Spix (*vel C. albifrons* Humboldt ?): Lönnberg, 1939: 17 *et seq. q.* (Codajáz, rio Solimões, Amazonas, Brazil; Irocanga, rio Tapajós, Pará, Brazil; Jaburú, rio Purús, Amazonas; Igarapé do Gordão, rio Juruá, Amazonas; João Pessoa, rio Juruá, Amazonas; Lago Grande, rio Juruá, Amazonas, Brazil; San Antônio, rio Eirú, Amazonas, Brazil).

Cebus albifrons albifrons: Hershkovitz, 1949: 370–372, fig. 54 (taxonomic revision; characters transcribed from the original description).
- Cabrera, 1958: 160 (type locality: "selvas próximas a los raudales del Orinoco"; distribution "alto Orinoco").
- Hill, 1960: 450–451 (characters translated from the original description; type locality and distribution after Humboldt [1812b]).
- Pusch, 1941 (*partim*: original description only?, as synonyms included belonging to the *Cebus apella* group and geographical distribution is given as "Rio de Janeiro and São Paulo", Brazil.
- Rylands, Mittermeier & Rodríguez-Luna, 1995: 120, 128, 137, 13 (Colombia; IUCN classification LR = Lower Risk).

C[ebus] a[lbifrons] albifrons: Hernández-Camacho & Cooper, 1976: 58, fig. 10 (characters taken from Humboldt compared with topotypical population; "eastern Vichada").
- Hernández-Camacho & Defler, 1989: 91–92 (basic characteristics; conservation status).
- Rylands, Schneider, Langguth, Mittermeier, Groves & Rodríguez-Luna, 2000:68 (tab. 5) 76, 78–79 (*C. a. unicolor* included as a junior synonym of *C. a. albifrons*).

C[ebus] a[lbifrons] unicolor: Hernández-Camacho & Cooper, 1976: 58, fig. 10 (possible junior synonym of *C. a. albifrons*; range in Colombia: Vaupés and south of the río Caquetá (except for the interfluvium between the río Guamués and río San Miguel or Sucumbíos, Department of Putumayo, inhabited by *C. a. yuracus*, Hershkovitz, 1949).

C[ebus] a[lbifrons] [subsp.]: Hernández-Camacho & Cooper, 1976: 58, fig. 10 ("pale and dull colored population" in western Arauca, northern Boyacá and southwestern and southeastern Norte de Santander; somewhat similar to *C. a. adustus* Hershkovitz, 1949).

Cebus albifrons unicolor: Hershkovitz, 1949: 372–375, fig. 54 (revision; characters; Marimonda, río Orinoco, Amazonas, Venezuela; Solano, río Cassiquiare, Amazonas, Venezuela; Yavanari, rio Negro, Amazonas, Brazil; Casas Pereira Igarapé, rio Negro, Amazonas, Brazil; Puerto Victoria, río Pachitea, Huanuco, Perú; Tingo María, Huanuco, Perú; no locality, Perú).
- Cabrera, 1958: 161–162 (distribution, including southeastern Colombia).
- Hill, 1960: 451–453 (characters essentially based on Hershkovitz [1949]; distribution).
- Rylands, Mittermeier & Rodríguez-Luna, 1995:120, 128, 135, 137, Perú and Venezuela; IUCN classification LR = Lower Risk).

Neotype. Young adult male in fresh pelage, skin and skull (Table 1), UNIFEM (Unidad Investigativa Federico Medem - INDERENA) now deposited in the collection of the Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IVH), Villa de Leyva, Boyacá, Colombia, No. 2844, collected by T. R. Defler on 30 January, 1978 (Figs. 2 & 3).

Amended type locality. About 10 km north of Maypures, 200 m north of the Cerro Rocoso, El Tuparro National Park, Department of Vichada, Colombia (5°20'N, 67°45'W) (Fig. 1).

Topotypes. Young adult male, skin and skull, UNIFEM, No. 2843 by T. R. Defler on 30 January, 1978. Adult female, skin and skull, UNIFEM, No. 2839 by T. R. Defler on 30 January, 1978, all specimens collected from the same group as the neotype and now deposited in the collection of the Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IVH), Villa de Leyva, Boyacá, Colombia.

Coloration of neotype. Alae nasi with dark brown pigmentation with sparse light *Cartridge Buff* hairs over

Table 1. *Cebus albifrons albifrons:* Measurements in millimeters of neotype and topotype.

Collection number	Head & body	Tail	Hind foot	Ear	Greatest skull length	Condylobasal length	Zygomatic width	Palatilar length	Palatal length	Occipital -nasal length
2844	385	430	90	40	91.1	68.8	57.6	24.3	31.8	84.4
2843	365	425	83	30	87.0	67.0	55.1	26.6	27.6	78.8
2839	338	412	85	30	84.1	60.2	55.2	22.0	24.6	76.1
Collection number	**Biorbital breadth**	**Postorbital Constriction**	**Braincase Width**	**Braincase Length**	**Mastoid Breadth**	**Basion Length**	**Basilar Length**	**Interorbital Breadth**	**Rostral Breadth**	**Bulla Length**
2844	51.4	41.4	50.2	70.1	47.8	63.3	64.0	4.8	24.5	19.5
2843	47.4	40.2	49.0	67.0	46.2	61.9	59.3	4.7	20.4	19.3
2839	48.9	39.1	49.6	67.7	44.3	54.4	50.0	3.7	21.0	19.2
Collection number	**Condilobasilar**	**I^1-M^3**	**C-M^3**	**PM^1-PM^3**	**I^{1-1}**	**I^{2-2}**	**M^1-M^1**	**C-M_1**	**Mandible Length**	
2844	62.0	35.0	27.2	22.0	9.3	14.4	28.6	29.	55.6	
2843	65.3	32.2	26.5	20.3	--	15.0	26.8	28.2	59.9	
2839	53.0	30.3	23.3	19.6	8.4	13.6	27.3	26.4	53.7	
Collection number	**Coronoidal Height (min.)**	**Coronoidal Height (plano)**	**Weight (g)**							
2844	27.8	30.5	2650							
2843	26.4	27.9	2156							
2839	26.0	27.1	2228							

frontal region; dark blackish narrow line extends from nose up, crossing supra-orbital band and ending in superciliary hairs *Hair Brown* above center of forehead; supra-orbital blackish band above and lateral to the orbits with *Hair Brown* superciliary hairs; crown *Sepia* with bases of hairs more pallid than *Cartridge Brown*; lightest parts of ears close to *Cartridge Buff* but slightly lighter and yellower; back at mid-dorsal line *Snuff Brown* x *Pale Pinkish Buff*; sides lighter with less brown, lateral fringe slightly lighter than *Cinnamon Buff*; no whitish patch in front of shoulders; scapular region and shoulder *Pinkish Buff* x *Pale Pinkish Buff*; chest and belly *Ochraceous Buff* x *Ochraceous Orange*; forearm and thighs *Ochraceous Buff* x *Zinc Orange* contrasting with dark lining of back; wrists and ankles *Mikado Brown* but fingers with much less hair and contrasting with blackish skin; feet dorsally same color as thighs; diminished hair on digits shows blackish skin. Palmar and plantar surfaces including digits dull pink; tail bicolored with broad dorsal stripe *Saccardo Umber* with grizzled effect due to *Ochraceous Buff* hair tips throughout to tail tip; distal dorsal part of tail slightly lighter *Xanthine Orange* x *Zinc Orange*, with tail ventrum lighter than *Cartridge Buff*.

Coloration of topotypes. UNIFEM No. 2843; similar to the neotype but crown *Warm Sepia* with bases of hairs more pallid than *Cartridge Buff*, back at middorsal line *Buckthorn Brown*, anterior parts darkening to *Russet* over hips; sides lighter with less brown; forearm and thighs *Ocraceous Buff* x *Ochraceous Orange*; tail bicolored with broad dorsal stripe *Saccardo Umber* proximal to the body, lightening considerably over middle and distal parts to *Cinnamon Buff*. UNIFEM No. 2839; essentially similar to the neotype except for the color of the chest and belly which appear slightly brighter *Ochraceous Buff* x *Zinc Orange*.

Comparison with *Cebus albifrons unicolor*. Spix (1823: 7) described *Cebus unicolor* (= *Cebus gracilis* Spix, 1823: 8) from near the mouth of Tefé (formerly Ega), Amazonas, Brazil. His animal has been identified throughout a wide area of the middle and upper Amazon, including Colombia, Peru and Bolivia, as well as part of the upper Orinoco in southern Venezuela. Elliot (1913) included *Cebus unicolor* Spix as a synonym of *Cebus albifrons*, and treated *C. gracilis* as a distinct species. *Cebus gracilis* Spix was based on an adult female collected in the same locality as the type male of *C. unicolor* Spix, and the alleged differences between those nominal species fall in the individual and sexual dichromatism known in other populations of *C. albifrons*. As a result, Hershkovitz (1949: 372-373) regarded *unicolor* and *gracilis* as synonyms. The characters, as published by Hershkovitz (1949:

Figure 2. Color plate of neotype of *Cebus albifrons albifrons* Humboldt, 1812. By Margarita Nieto.

372-375), based on the original description of material and upon color plates of *unicolor*, are as follows: "Most uniformly brightly colored race of *albifrons*, Cap Snuff Brown to Bister, frontal region buffy to ochraceous; back Ochraceous-Buff to Ochraceous-Orange or Tawny more or less lined with dark brown; sides with less brown, lateral fringe Ochraceous-Buff to Ochraceous-Orange; forearm and foreleg Ochraceous-Buff to Tawny contrasting with dark lining of black; hairs of belly Ochraceous-Buff to Ochraceous-Orange, of chest like belly or white; whitish patch obsolete on front of shoulder."

***Cebus albifrons unicolor* is a synonym of *Cebus albifrons albifrons*.** Hershkovitz' (1949: 372-374) description of *Cebus albifrons unicolor* seems very similar to the population north of Maipures. One of us (JHC) examined specimens from southern Venezuela (Amazonas State) in the AMNH and the USNM also ascribed to *C. a. unicolor*, and found them to be virtually identical to *C. a. albifrons* as represented by its neotype. Specimens examined by us from the area between the riós Amazonas and Vichada (Amazonia, Colombia) usually ascribed to *C. a. unicolor* also seem indistinguishable from *C. a. albifrons* as described here. This leads us to the conclusion that *unicolor* is a synonym of *albifrons*.

Other specimens examined. UNIFEM 3022 adult male, Mirití-Paraná, Amazonas, Colombia; UNIFEM 3023 adult male, Mirití-Paraná, Amazonas, Colombia; UNIFEM 3029 juvenile male, Mirití-Paraná, Amazonas, Colombia; UNIFEM 2843 adult female; UNIFEM (uncatalogued) adult female, Caño Brava, río Cotuhé, Amazonas, Colombia; UNIFEM 0206, río Arauca, 65 km upriver from the town of Arauca, Colombia; UNIFEM 1523, San José de Ocuné ("30 miles" [45 km] to the south), Vichada, Colombia; UNIFEM 2667, río Peneya, Caquetá, Colombia.

Distribution of *Cebus albifrons albifrons* as previously recognized. The geographic range of this apparently isolated population of *C. a. albifrons* is mapped in Defler (1985) and is reproduced in Figure 1. The range includes the lower ríos Tuparro (left bank), Tuparrito, Tomo, Bita and Meta (right bank) in Vichada. On the upper parts of these rivers *C. albifrons* is replaced by *C. apella* (Hernández Camacho and Cooper, 1976; Defler, 1985). Another apparently isolated population is found in Arauca, Colombia; though the limits of this population are not clearly defined and possibly reach into western Venezuela (Apure State). Because of the lack of specimens in many areas, it is not possible to define securely the limits of *C. a. albifrons* outside of Colombia.

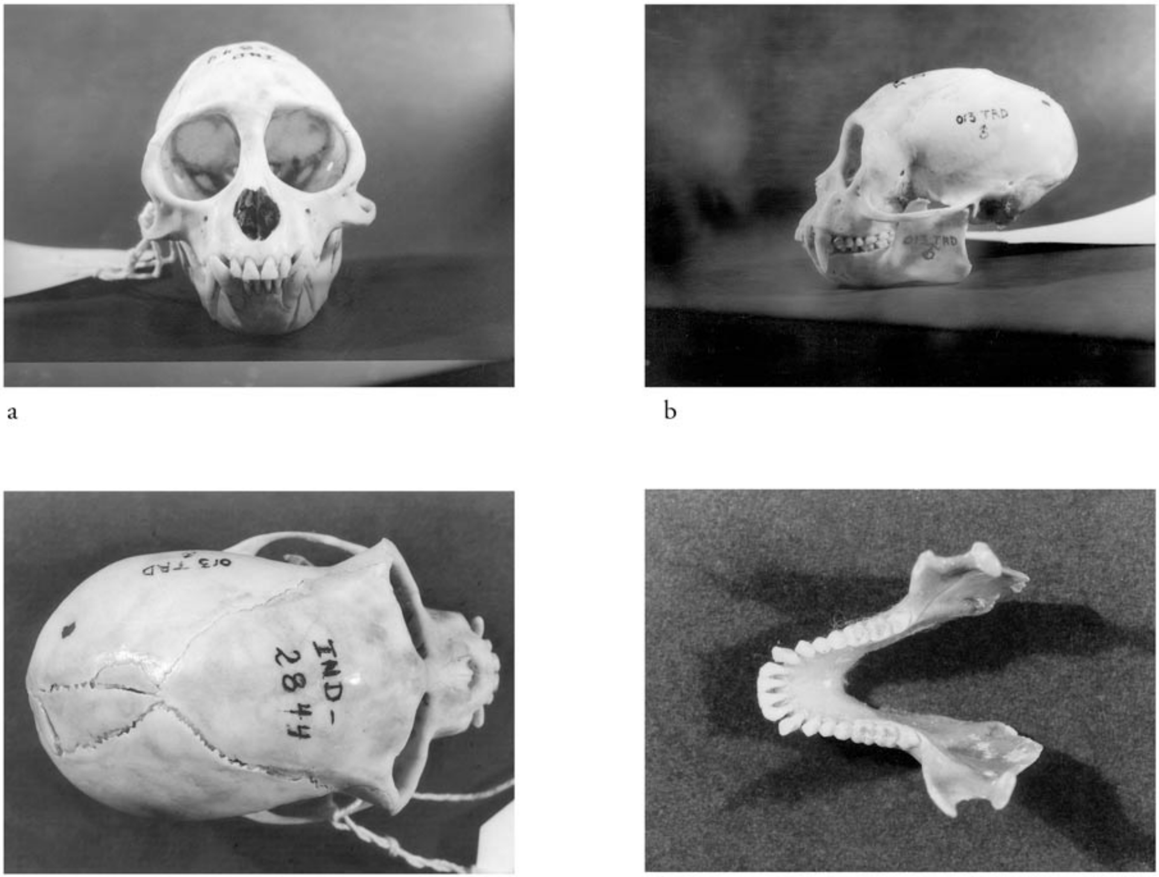

Figure 3. Photograph of skull of neotype: a. Frontal view; b. Lateral view; c. Dorsal view; d. Inferior mandible.

Expanded geographic range of *Cebus albifrons albifrons.* Accepting *C. a. unicolor* as a synonym for *C. a. albifrons* extends the range to a huge area in the upper Amazon of Brazil, Colombia, Peru and Bolivia from the right bank of the Marañon River in the south, but also crossing the Amazon and including much of southeast Colombia and southern Venezuela (Fig. 4). A gazetteer of Colombian specimens and observations by TRD of *Cebus albifrons* and *C. a. albifrons* is given in Defler (in press). Limits for the species are still imperfectly known.

Variation. Some specimens have an admixture more yellowish than reddish on the arms and legs. One male specimen collected at Puerto Rastrojo in the Miritií-Paraná of the Colombian Amazon weighed 4135 g (INDERENA No. 3033) and another male from the same locality (INDERENA No. 3022) weighed 3490 g. These specimens have a darker, buffy-brown forehead as compared to the neotype and topotypes, and the dorsal brown is darker. In general these animals also have a more reddish cast than the neotype, while the neotype and topotypes are lighter and more buffy. A juvenile male specimen from the same site (INDERENA No. 3029) is much lighter than INDERENA No. 3033 and 3022, approximating the neotype in most respects but without the grizzled effect on the tail. A young male specimen (INDERENA No. 0206) from Arauca Department (Colombia) was the lightest specimen examined. Fur on the forehead and shoulders is almost white, while the ventrum of the belly and tail is very light buff. Another young specimen (INDERENA No 1794) of about the same age as INDERENA No. 0206 is similar in coloration, although the forehead is slightly darker buff and the dorsal coloring over the hips is a darker brown. The most anomalous specimen examined is INDERENA No. 2667 from the río Peneya, Caquetá department (Colombia). This poorly preserved skin is the darkest brown of all specimens examined although, like the other specimens, the darker crown does contrast with the brown back, and there are tonalities of chestnut red on the arms, legs and hips. The forehead of this specimen is a buffy-gray.

Natural history and ecology of *Cebus albifrons.* The natural history and ecology of this species has been studied

Figure 4. The geographic distribution of *Cebus albifrons.* The revised range of *C. a. albifrons* is indicated in dark grey. Sources: Aquino and Encarnación (1994), Bodini and Pérez-Hernández (1987), Encarnación *et al.* (1990), Hernández-Camacho and Cooper (1976), Hershkovitz (1949), Linares (1998).

in Colombia by Defler (1979a, 1979b, 1980, 1985) and in two sites in Peru by Soini (1983) and Terborgh (1983). Currently it is being studied in Trinidad by K. A. Phillips (1998; in prog.). This review of the species' natural history and ecology has been summarized from Defler (in press).

Habitat preferences. Defler (1985) showed that in the region of the type locality the species prefers a slightly more xeromorphic habitat than does *C. apella.* Such habitats include *Bactris* palm forests in seasonally dry riverbeds, and rocky forests around the bases of inselbergs. *C. albifrons* commonly crosses open tracts of rock and savanna from forest patch to forest patch. In most areas studied it is also commonly found in flooded forest, which *C. apella* tends to avoid. Flooded forests, then, tend to be part of the habitat used by *C. albifrons* where *C. apella* is sympatric on *terra firme.* On the upper río Cahuinarí, Amazonas, Colombia, there is a population of *C. albifrons* in forests growing on white sand, where *C. apella* is apparently absent. However, both species are sympatric in very low numbers in white-sand caatinga forest on the upper Guacayasi Creek in Guainía, Colombia. *C. albifrons* is widely syntopic with *C. apella.*

Group size. In eastern Vichada, Colombia, near the type locality, *C. a. albifrons* is found in very large groups of around 35 animals. A study group at this site contained 10 adult females, four adult males, three subadult males, five juvenile females, four juvenile males, one unclassified juvenile, four infant females, three infant males and one unclassified infant (Defler, 1979a). To the south, in the closed rainforest of Peru, *C. albifrons* groups are smaller, with an average of about eight members at one site, and 15 per group at another (Soini, 1986; Terborgh, 1983), perhaps because of competition from *C. apella.* The groups are multi-male and multi-female. In Vichada the sex ratio is 2.5 females per male.

C. albifrons has been seen to form large transient congregations when seasonal conditions of food availability are favorable. Hernández-Camacho and Cooper (1976: 59) reported an instance in August, 1956 where a congregation of several hundred monkeys was observed in a few hectares along a newly opened road through a secondary forest association of "guamo" or "guamera" (*Inga* sp.) with a rather dense 8–12 m canopy connected to two areas of primary forest. This was on the road from El Centro to Quebrada Lísama (Antioquia). There were also, along a distance of about 300 m on both sides of the road, considerable numbers of parrots (*Amazona amazonica*, *A. ochrocephala* and *A. farinosa*).

Density. At the type locality, the species is present in gallery and isolated small forests surrounding local inselbergs, at densities of about 30 individuals/km² (Defler, 1979a). Where *C. albifrons* is sympatric with *C. apella* it often occurs in greatly reduced densities, making its detection difficult. North of the lower río Apaporis in the Colombian Department of Vaupés around the Estación Biológica Caparú (1°5'33"S, 69°30'48"W), for example, the density is around 1 or less individuals/km² (Defler, unpublished data). In the Pacaya-Samiria National Park in Peru, densities are 4.2–6.2 individuals/km² (Soini, 1986) and in the Manu National Park, Peru, densities are much higher, around 35 individuals/km² (Terborgh, 1983).

Home range. A group home range of more than 150 ha was calculated in the Manu study (Terborgh, 1983), while at least 120 ha were used in the study area in northern Colombia (Defler, 1979a).

Day range. An average day range of 1820 m was calculated in the Manu study (Terborgh, 1983).

Activity (time) budget. Terborgh (1983) estimated a time budget for the species as follows: 18% resting, 21% traveling, 22% feeding on plant material, and 38% foraging and feeding on insect material (total feeding time 61%).

Diet. The diet of *C. albifrons* includes fruits, small invertebrates, their eggs and larvae, small mammals, lizards, and bird's eggs. They especially like to eat ant and wasp larvae, and are adept at robbing beehives for honey. Defler (1979a) observed them hunting frogs (*Hyla* sp.) in the interstices of the large fleshy plant *Phenakospermum guianense*, which forms a water reservoir between the leaf bases and the main stem. This water reserve shelters frogs, and is also used by the monkeys for drinking when other sources are scarce. The monkeys obtain these resources by biting out chunks of the plant tissues that cover the water reservoir.

During the dry season, when there are few fruits, they spend more than half the day on the forest floor, searching for live prey. Terborgh (1983) observed *C. albifrons* exploiting 73 species of plants from 33 families, of which by far the most important was Moraceae, with 17 species included in the diet. Near the type locality, the palm species *Maximiliana (Attalea) regia* is a key species, being used more than any other plant resource. The palm nuts provide a nutritious food during the dry season when little other plant food is available. At the Manu National Park, *Astrocaryum* and *Scheelea* palms are the most important plants for these monkeys. Ants, ant eggs and small beetles are searched for incessantly in rolled leaves and around the leaf bases of palms.

Reproductive behavior. Copulation by the dominant male lasts several minutes with the male mounting the female, grasping her hind legs with his hind feet. The gestation time is unknown, but it is probably similar to *Cebus apella,* at about 160 days.

Infant development. Usually one infant is born. During the first 1–2 days it tries various positions for holding onto the mother, including clasping the tail, hind leg, and arms, until it discovers a position over the neck and shoulders that is typical for the species. After some weeks of riding oriented crossways over the shoulders the baby is able to ride lengthwise on her back as do most primate babies. All members of the group are interested in the newborn infant and wish to be close to it. The genitals are of particular interest to the other females in the group. As the infant matures, various group members try to entice the baby onto them for carrying, and, eventually, the mother allows others, including adults and young monkeys, males and females, to help carry the baby. Even the alpha male carries infants.

Social behavior. Males are very friendly to each other and seem very unassertive. Nevertheless, the sub-alpha males are constantly aware of the position and activities of the alpha. Males are very aggressive towards males of neighboring groups, and aggressive chasing bouts occur where two territories overlap. All members of the group, and especially the alpha male, break branches over predators or over perceived danger, causing noisy crashes through the forest vegetation and much excitement. Near the type locality, boas (*Boa constrictor*) and tayras (*Eira barbara*) have been observed stalking the capuchins, but these predators were usually detected and then ignored. *Cebus albifrons* showed great fear towards a raptor, *Spizaetus ornatus*, which attempted to attack them, causing all troop members to drop to the ground and flee.

White-fronted capuchins are sometimes associated with squirrel monkeys, *Saimiri sciureus*, brown capuchins, *Cebus apella*, and woolly monkeys, *Lagothrix lagothricha.* They can feed in trees occupied by red howling monkeys, *Alouatta seniculus* (Defler, 1979a). The general condition of sympatry between *C. albifrons* and *C. apella* is evidenced by the observation of both capuchin monkeys in 15 inventories of mammal species carried out in Amazonia (Voss and Emmons, 1996: 103–114).

Ecological niche. Terborgh (1983) studied the strategy of this species in closed-canopy forest when in sympatry with *C. apella. Cebus albifrons* travels widely, searching for patchy resources such as *Ficus*, which it exploits exhaustively before moving on. It seems probable that the strategy they use in the gallery forests near the type locality may be different, however, from the food-rich study site on the río Manu in southern Peru.

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Notes

[1] Von Humboldt and Bonpland's itinerary has often been described with the claim that they arrived for the first time on Colombian territory on 2 April, 1801 at Puerto del Zapote in the Bahía of Cispata, Córdova (formerly Córdoba) on the Caribbean coast of Colombia, The two scientists stayed there for three days before continuing their journey to Cartagena de Indias. However, the first day that von Humboldt arrived on Colombian territory was not the above date, but rather on 13 April, 1800, when they landed on the Playa de Guaripo or Guaripa (*ca.* 5°56'N, 67°30'W), above the Raudal de San Borja, Vichada (Dugand,1954: 210).

[2] Hershkovitz (1987a: 54) published the following pertinent remarks on von Humboldt's activities during his trip to tropical America: "Monkeys, however, absorbed more of Humboldt's attention than other animals. He carried with him a number of live simians captured in the upper Río Orinoco region for shipment to the Jardin des Plantes in Paris, via the Antillean island of Guadeloupe. The newly discovered bearded saki (*Chiropotes satanas chiropotes* Humboldt [= *Simia chiropotes* von Humboldt, 1812]…) died before transshipment, but its skin was saved and arrived in Paris. The type specimen of a red howler *Simia ursina* Humboldt (= *Alouatta seniculus arctoides* Cabrera) survived the journey, whereas the first-known douroucouli or night monkey (*Aotus trivirgatus* Humboldt [*Simia trivirgata* von Humboldt, 1812] succumbed in Guadeloupe". No mention is made by Hershkovitz of *Cebus albifrons*, but in any case the type of this species did not arrive in Paris, nor was it preserved.

[3] The "upper Orinoco" of von Humboldt is in effect the Orinoco above the rapids of Rabipelado, San Borja and Atures, which impede navigation and separate the upper from the lower Orinoco.

[4] "Matchi" is a name derived from *machín* of Quechua origin. "Machín" is a common name for *Cebus capucinus* in the Departments of Bolívar and Sucre in northern Colombia, and is also used in Colombia's middle Magdalena valley for *Cebus albifrons*, suggesting the early influence of Jesuit missionaries in disseminating Quechua names in various parts of Colombia.

[5] "Sajou" or "sapajou" (written with French phonetics) is of Tupi-Guaraní origin, attesting to the influence of early Portuguese explorers, who brought the pidgin Geral into the Amazonian region, undoubtedly disseminated by early Jesuit missionaries.

[6] "Saï" is a vernacular name of Tupi-Guarani origin that was used by von Humboldt (1812a; 1812b; 1824a) for

the weeper capuchin monkey, identified by him as *Simia capucina* [non *Simia capucina* Linnaeus (1758)].

[7] The *Warekena* Indians ("Guarekens" of Humboldt) belong to the *Maipure* linguistic group of the *Amazonian Arawak* family. They currently inhabit the banks of the Cassiquiare Canal (Estado Amazonas, Venezuela), as well as the upper rio Negro, adjacent to the Colombian and Venezuelan borders (Estado Amazonas, Brazil) (Lizarralde, 1993). Ferreira (1974: 69–73) found what he called the "Uerequena" in 1785 on the rios Içana and Xiê, northwest Amazonas, Brazil.

[8] Humboldt alluded to both the Atures and Maypures rapids.

[9] Santa Bárbara is an extinct mission that was located at the mouth of the rio Ventuari on the right bank of the río Orinoco, Amazonas, Venezuela (Hershkovitz, 1949: 370).

[10] Maipures (5°20'N, 67°45'W) (from "maypuri" meaning tapir [*Tapirus terrestris*] in the Maipures language) was a site originally established on the left bank (i.e. the Colombian side) of the Orinoco alongside the Maipures rapids, as a Jesuit cattle ranch, which was converted into a Jesuit Mission in the early 1700s. The town was founded by Don José Solano at the time of the expedition of the boundaries in 1754. Dugand and Phelps (1945) describe some of its history. "Maipures" was the name given by the Jesuits to the rapids as well as to a tribe of extinct Indians who spoke an Arawakan language which has left some toponyms in the region: i.e., "Matavén" = "black river" (Matavén River or Creek); "Amanavén" = "crocodile river" (Brazo Amanavén associated with the lower río Guaviare, Colombia). According to Humboldt (1852: 235) the "Maipures" Indians called the Maipures rapids "Quittuna" and the Atures rapids "Mapara".

Von Humboldt and Bonpland arrived for the first time with Father Zea on the night of 18 April, 1800, and left on the afternoon of 31 April. On their return downstream they arrived at Maypures on 29 May and stayed until 31 May (Dugand, 1956: 315). At that time the village consisted of fewer than 60 people living in only 7–8 huts surrounding a small church built of palm logs, but the village had a population of about 600 inhabitants during the time of the Jesuits, including several white families (von Humboldt, 1852: 297, 306). The location has become well-known as a collecting site, since von Humboldt and Bonpland collected several new species of plants there as well as closely observing and describing (although erroneously, so therefore requiring us to establish a neotype) *Cebus albifrons* for the first time. The two scientists ascended the Cerro de Manimi (near the El Tuparro National Natural Park cabaña, near the mouth of the río Tuparro) various times during their stay, where they enjoyed the magnificent landscape of the Maypures rapids, and additionally collected plants on the Cerro, particularly the type collection of *Cyperus mainimi.* Many new taxa of birds have also been collected at Maypures by Dugand, Cherrie, and others. Fortunately Maypures rapids, and the savanna where the village stood, along with the many granitic hills and huge boulders, are now protected in El Tuparro National Park (Colombia), which is gazetted as an International Biosphere Preserve.

[11] The Mission de San Juan Nepomuceno de los Atures was founded in 1748 by the Jesuit missionary Padre Francisco González.

[12] "Parmi les singes que nous vîmes à la mission d'Aturès, nous en trouvâmes une nouvelle espèce de la tribu des *Saïs* et de *Sajous,* que les Espagnols-Américaines appellent vulgairment *Machis.* C'est l'Ouavapaví à pelage gris et a face bleuâtre. Il a les orbites et la front blancs de neige; ce quí le distingue, au premier abord, du *Simia capucina*, du *Simia apella*, du *Simia trepida*, et des autres singes pleureurs si confusément decris jusquíá. Ce petit animal est aussi doux quíl est laid. Il saisissoit tous les jours, dans la cour du missionaire, un cochon sur lequel il restoit monté, du matin au soir, en parcourant les savanes. Nous l'avons vu aussi sur le dos d'un gros chat qui avoit été élevé avec lui dans la maison de père [Bernardo] Zea."

The text of the mentioned footnote 1 is as follows: "Voyez ma monographie des singes de l'Orenoque, dans le Red[ueil] d'obs[ervations de] Zool[ogie et d'Anatomi comparée], Tom[e] I, p. 324 et 563 (éd[ition] in -4°). L'Ouavapavi (mot de la Langue guareken) est mon *Simia albifrons*, ex albo cinerascens, vertice nigro, facie caerulea, fronte et orbitis niveis, cruribus et brachiis fuscescentibus."

[13] There is no record of the occurrence of *Cebus albifrons* on the Venezuelan bank of the Orinoco below San Fernando de Atabapo or the neighborhood of Atures. *Cebus nigrivitattus* is known on the east bank by only one specimen, collected 32 km south of Puerto Ayacucho at 135 m (Handley, 1976: 42; see also Bodini and Perez-Hernández, 1987; Bodini, 1989). Further research is needed to clarify the Venezuelan distribution of the species.

[14] A karyotype of an *Aotus* captured on the banks of the río Orinoco showed a diploid number of 50, but the chromosomes were organized in a manner that suggests that it was not *A. brumbacki.* Hershkovitz (pers. comm.) felt that the specimen might be *A. trivirgatus* (Defler and Bueno, in prep.).

[15] In the original description of *Cebus flavus* É. Geoffroy Saint-Hilaire (1812: 111) *Simia flavia* Schreber (1774. p.xxxi.-b) is mentioned as a validly proposed name based on a color plate which illustrates a pale brown specimen with an almost white coronal cap. The origin of that specimen is unknown and it is not certainly identifiable as a *Cebus.* The citation of *Simia flavia* Schreber in the account of *Cebus flavus* by É. Geoffroy Saint-Hilaire implies that the latter author identified *C. flavus* with *S. flavia*; thus the epithet *flavia* was retained and emended to *flavus* when transferred

to the genus *Cebus* to fit the required grammatical concordance. For this purpose the *–i* before the termination *–us* was deleted, so that *flavia* became *flavus*. Both epithets are homonyms under article 58.15 of the 4th edition of the International Code of Zoological Nomenclature.

Simia flavia Schreber (1776: pl.) was regarded as unidentifiable by Cabrera (1917a: 233; 1958: 170) and Hershkovitz (1949: 336, 345), and *Cercopithecus flavus* Goldfuss 1809 (non *Cercopithecus flavus* Boddaert 1784) is based on the Schreber color plate as indicated by Hershkovitz (1949: 336) and thus is an absolute synonym of *Simia flavia.* The fact that É. Geoffroy Saint-Hilaire (1812: 111) mentioned *Simia flavia* Schreber (1776) in his description of *Cebus flavus* implies that the latter could be regarded as a nomenclatural amendment. However, according to Article 58 of the International Code of Zoological Nomenclature (ICZN, 1999: 60–61) the amended form *flavus* would not fall into homonymy of *flavia* (or *flavius*).

Cebus flavus is, therefore, a valid name based on a mounted specimen (with skull inside) said to be from Brazil and designated by Rode (1938: 231) as a "type" preserved in the MHNP (no. 362 of the types catalogue, and 458 of the general collection), which according to Hershkovitz (1949: 342) "is extremely faded with considerable portions of hair of the underparts, head and face missing". The specimen is part of the collection made by the Brazilian naturalist Alexandre Rodrigues Ferreira (1974) during his "Viagem Filosófica", through the states of Amazonas, Mato Grosso, Pará and Rondônia, Brazil. The collection was in the Museu Real d'Ajuda in Lisbon, until it was taken to Paris as war booty by Napoleon's troops under the care of É. Geoffroy Saint-Hilaire. Wagner (1855: 90) suggested that *Cebus flavus* was identical to *Cebus gracilis* Spix (1823), a possibility that Hershkovitz [1949: 341] accepted, writing: "In any case, the question remains whether the specimen determined as *flavus* by [É.] Geoffroy [Saint-Hilaire] is to be regarded as a specimen referring to the amended form of the name [*Simia*] *flavia* Schreber". In summary, therefore, *Cebus flavus* É. Geoffroy Saint-Hilaire 1812 would be the earliest available name for the Amazonian populations of *Cebus albifrons* if our interpretation of the nomenclatorial rules is correct. In order to preserve *Cebus flavus* it would be necessary to reinstate the validity of the former epithet. However, *unicolor* gained wide acceptance after Hershkovitz' publication in 1949. Groves (2001: 148) concurs that the type *Cercopithecus flavus* Goldfuss is indeed probably *albifrons.*

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SHORT ARTICLES

PRIMATES OF THE JAÚ NATIONAL PARK, AMAZONAS, BRAZIL

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Rebecca L. Shapley

Introduction

The Jaú National Park is some 220 km north of Manaus (see Fig. 1) in the state of Amazonas, Brazil. At 2,272,000 ha it is one of the largest rainforest national parks in the world (Borges *et al.* 2001). Bordered on the north by the Rio Uniní and to the south by the Rio Carabinani, the park comprises the complete drainage basin of the Rio Jaú. In addition to primary lowland tropical rainforest (70%), it has the following natural habitat types: black-water inundated forest (*igapó*) (12%), *aningal* and *Mauritia* palm (*buritizal*) swamps (approx. 0.5%), and white-sand forest (*campinarana*) and scrub (*campina*) (>0.1%) (FVA, 1998; FVA-IBAMA, 1998; FVA, unpubl. data). Dwellings and associated agricultural areas comprise a disturbed habitat estimated to cover less than 0.5% of the park's area. The vegetation types in the remainder of the area (some 18%) have yet to be classified. About 800 people live in the park (0.04 people/ha: FVA-IBAMA, 1998). This is a low density, some 25% the average human population density for rural Amazonia (Chapman and Peres, 2000).

Although primate research is a priority under the park's management plan (FVA-IBAMA, 1998), there has been little published work with the exception of on-going studies of the golden-backed uacari, *Cacajao melanocephalus ouakary* (see Barnett *et al.*, 2000; Barnett *et al.*, submitted). A number of unpublished reports exist, but there is no published summary of information of all the primates known to occur within the park. In the hope of stimulating further studies, we here bring together information from the following documents relating to primates within the Jaú basin (the location of the study sites for each of the surveys appears in Figure 2).

1. A brief survey by Anthony B. Rylands (17–21 April 1992) of the lower Rio Jaú, including fieldwork and interviews (Rylands, 1992)

2. A series of interviews conducted by Sérgio Borges and Fernanda Neri on the hunting practices and the inhabitant's knowledge of primates along the Rio Uniní (17 March–15 April 1998) (Neri and Borges, 1998). Fourteen long-term park inhabitants in seven villages were interviewed. This data was supplemented by short field surveys, walking trails around villages where interviews were made.

3. Information collected during two short field surveys of golden-backed uacaris (late August 1999, wet season, and 20 October–7 November 2000, dry season) by Barnett (1999) and Barnett and Castilho (2000) on the lower Rio Jaú in the region of Lake Miratucú (1999) and above the village of Seringalzinho (2000). Data was collected by direct observation and through interviews with nine people living in the park.

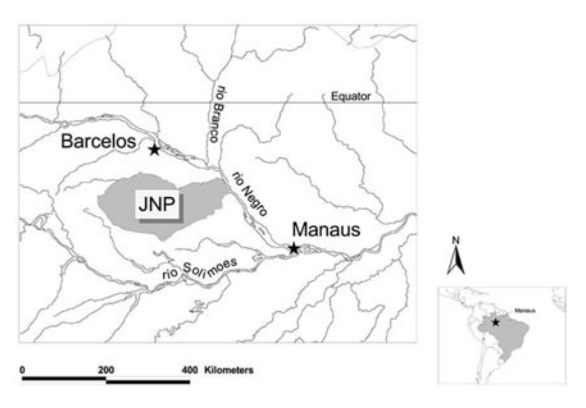

Figure 1. Location of Jaú National Park in Central Amazonia.

4. Observations made by Yuri L. R. Leite, James L. Patton, Maria Nazareth da Silva and Vera Vidigal during a small mammal survey of Jaú in May–June 1996 (see Silva and Patton, 1996).

Nine primate species are known from the park. The available information on them is summarized below. Trinomial nomenclature follows Rylands *et al.* (2000).

Primates in the Jaú National Park

***Saguinus inustus*, mottle-faced tamarin, soim**
Reported as possibly present by Rylands (1992) on the basis of interviews with local people on the lower Rio Jaú, who, however, considered it rare. Neri and Borges (1998) received similar reports at four of the seven communities they visited on the Rio Uniní. All the people along the Rios Jaú and Uniní indicated that it is restricted to the middle course of the rivers to their headwaters. This being true, *Saguinus inustus* would be restricted to the western part of the park, a pattern also detected for a number of bird species (Borges *et al.*, 2001). Confirmation would represent a range extension to the east in the interfluvial basin between the Rios Negro and Japurá-Solimões (see Emmons and Feer, 1997). The most easterly locality to date is the Lago Amanã, north bank of the Rio Japurá (A. B. Rylands, pers. obs.).

***Aotus* sp., night monkey, owl monkey, macaco-da-noite**
A pair of *Aotus* was seen near the locality of Macaco by the 1996 Mammal Survey (Y. L. R. Leite, pers. comm.). Carlos Durigan, Park Director, also saw a single individual one evening in August 1999 in *igapó* near the park headquarters at the mouth of the Rio Jaú. According to data in Emmons and Feer (1997), the species in the region should be *A. vociferans (sensu* Hershkovitz, 1983). Based on interviews with local inhabitants, Rylands (1992) had also reported

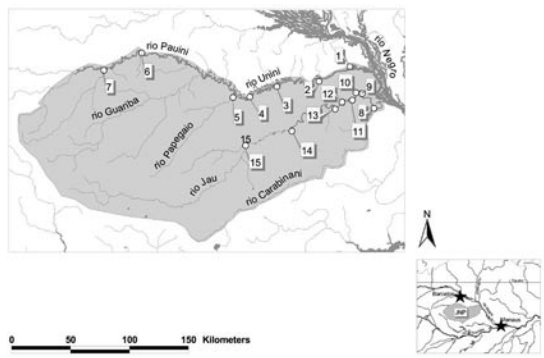

Figure 2. Primate survey sites in Jau National Park.

this species for the park, though he did not see it. It was reported as present to Neri and Borges (1998), with informants indicating group sizes of around six individuals (see Kinzey, 1997).

***Saimiri sciureus cassiquiarensis*, squirrel monkey, macaco-de-cheiro**

The 1996 mammal survey team recorded the species near Macaco (Y. L. R. Leite, pers. comm.). Neri and Borges (1998) saw a 20-strong group in terra firme on the Rio Uniní and reported that local inhabitants considered the species common in both terra firme and *igapó*. In August 1999 a group of 30+ was seen in the trees among the ruins of the abandoned town of Velho Airão, just outside the park and another group was seen in still-flooded *igapó* in the dry season of 2000. Squirrel monkeys are reported to sometimes travel with groups of *C. m. ouakary*. Rylands (1992) and Neri and Borges (1998) both reported that squirrel monkeys are widely hunted, and locally-caught animals are kept as pets by park inhabitants.

***Cebus albifrons albifrons*, white-fronted capuchin, caiarara**

In the dry season, *C. albifrons* is reported to enter unflooded *igapó* to eat the eggs of *Podocnemis* turtles, raiding nests at nesting beaches. Raided nests were seen, apparently excavated by small primate-like hands. But no direct observations of oöphagy have yet been made by us. It may also eat the fruits of the palm *Leopoldinia pulchra* at this time. Like *C. apella*, *C. a. albifrons* is reported to forage for the large earthworms that live in the fiber and frass enclosed by the remnant frond bases on *Leopoldinia* palm trunks when the *igapó* is inundated. Such earthworms have been observed by one of us (C. de Castilho), though their predation has not. *C. albifrons* has not been recorded from *igapó* in the flooded season. At this time it is seen in *campinarana* and terra firme forest (Barnett and Castilho, 2000). Sérgio Borges recorded *C. albifrons* on six occasions in the Park in the last two years; four of these were in *campinarana* forest. White-fronted capuchins have not been reported to be white-sand specialists (see Kinzey, 1997), but it is suspected that, at Jaú, it frequently enters *campinarana*, perhaps for specific food resources not exploited by *C. apella*, though more field data is needed to confirm this. Neri and Borges (1998) reported a locally-caught animal being kept as a pet. Along with *Saimiri sciureus, C. a. albifrons* was considered the second-most common primate by inhabitants interviewed by Neri and Borges (1998). It was reported as present by Rylands (1992).

***Cebus apella apella*, brown capuchin monkey, macaco-prego**

A group of four was seen in *igapó* near Seringalzinho, and a locally caught juvenile was being kept as a pet on a riverboat moored near Lago Miratucú. Local people reported that it forages for the large earthworms that live in the fiber and frass enclosed by the remnant frondbases on *Leopoldinia* palm trunks when the *igapó* is inundated. *C. a. apella* eats the seeds from the woody fruits of *Couratari* sp. (Lecythidaceae), banging the pyxidium on a branch until the operculum comes free and the seeds can be extracted, a behavior Peres (1991) has reported for *C. apella* elsewhere in Amazonia. In doing this, it may well be in competition with *C. m. ouakary*, which opens the fruits with its teeth. Neri and Borges' informants considered *C. a. apella* to be the park's most common primate.

***Callicebus torquatus lugens*, yellow-handed titi, zogue-zogue**

Seen by Adrian Barnett and Sérgio Borges on the trail near Seringalzinho on the morning of 26 August 1999. A single individual was seen in a *Mauritia* palm in *campinarana* close to a large squirrel. Though a clear view was not obtained of the diagnostically-yellow hands, it was considered to be this species based on colour, shape and behaviour. This sighting confirmed the reports of local inhabitants to Neri and Borges (1998). The record is a slight westward range extension, within the Negro-Solimões/Japurá interfluvial basin (see Emmons and Feer, 1997). Local people informed Neri and Borges (1998) that it is uncommon in the park.

***Pithecia pithecia chrysocephala*, golden-faced saki, parauacú or macaco velho**

Reported as present by Rylands (1992), based on interviews. It was considered rare by all the people interviewed by Neri and Borges (1998) and by Adrian Barnett in 2000. The species was generally reported to occur only well away from river margins, deep in the terra firme forest of interfluvial basins. It was seen by Hilton Nascimento and Antenor Anicácio in March 2000 (pers. comm.) in terra firme forest, and by Sérgio Borges in May 1997 in campinarana vegetation, and by Maria Nazareth Silva in June 1996. All three sightings occurred at points adjacent to the Rio Jaú. Though the subspecies has long been known from the region (see Hershkovitz, 1987), according to maps in Emmons and Feer (1997), this record represents a slight range extension, and the westernmost known population of *P. p. chrysocephala*. Since species of *Pithecia* have never been recorded in sympatry (see Kinzey, 1997), the presence of

P. pithecia in Jaú confirms that the range of the buffy saki (*P. albicans*) does not extend into the inter-fluvial area between the northern bank of the Rio Japurá and the southern bank of the Rio Negro (see Hershkovitz, 1987).

***Cacajao melanocephalus ouakary,* golden-backed uacari, bicó**

Rylands (1992) reported seeing a band of approximately 10 individuals in April 1992 in both *igapó* and *campinarana*. The group included a female with a 4–5 month-old offspring. A group of 15+ was seen by Neri and Borges (1998) in *igapó*. Barnett and Castilho (2000) observed bands of 5 to 100+, also in *igapó* as well as in the terra firme, *campina* and *campinarana*. Observations, supplemented by information from local informants, indicate that *C. m. ouakary* eats parts of some 70+ plant species at Jaú. These include the soft mesocarp of *Astrocaryum jauari* and *Oenocarpus bataua* palms, the seeds from hard shelled fruits such as *Eschweilera tenuifolia* and *Couroupita* spp. (Lecythidaceae) and whole soft-shelled fruits (e.g., *Salacia* sp. [Hippocrataceae]). In the dry season, when little fruit is available (Ashton, 2001; Barnett and Castilho, 2000), the diet is supplemented by leaves (*Mabea taquari* [Euphorbiaceae], *Buchenavia oxycarpa* [Combretaceae] and *Eschweilera tenuifolia*). They also raid nests of *Polistes* wasps to eat the larvae.

Around half of the known fruits that *C. m. ouakary* eats are soft-skinned, and most are also eaten by *Cebus* and *Saimiri*. The woody fruits are also eaten by macaws (*Ara chloroptera* and *A. ararauna).* Unlike populations of *C. m. ouakary* on the upper Rio Negro, those at Jaú are not reported to raid the nests of freshwater turtles and eat the eggs (see Barnett, in press). Reports indicate that they do descend to the ground in the late dry season to eat beetle larvae and, to a lesser extent, germinating sapotaceous seeds as has been reported for *C. c. calvus* (see Ayres, 1986). The field observations of Barnett and Castilho support interview-based reports of Neri and Borges that *C. m. ouakary* spends the wet season in inundated *igapó*, and migrates to terra firme when it is dry and lacking fruit (see also Barnett and da Cunha, 1991; da Cunha and Barnett 1990, for the upper Rio Negro).

It is interesting to compare the observed pattern of habitat use by *C. melanocephalus ouakary* at Jaú, with those reported for *C. m. melanocephalus* from the upper Rio Negro (Boubli, 1999). Though *C. m. ouakary* has been observed by us in white-sand vegetation (*campinarana*), it is much more commonly seen in terra firme forest and flooded *igapó* forest. This is in contrast with Boubli's studies, which recorded intensive use of white sand soil vegetation, and negligible use of *igapó* or terra firme.

***Alouatta seniculus,* red howler monkey, guariba vermelho**

Two adults were seen on 24 August 1999 in *igapó* at Lake Miratucú. Howlers were also seen in terra firme at four sites on the Rio Uniní and once in *igapó* by Neri and Borges (1998). They are considered common by locals, who report group sizes of up to 30. They were seen in terra firme forest during the 1996 survey of Leite, Patton, Silva and Vidigal. They were not seen by Rylands (1992), but reported as present based on interviews.

***Ateles belzebuth,* white-bellied spider monkey, macaco aranha, and *Lagothrix lagothricha,* woolly monkey, macaco barrigudo?**

The possibility remains that *Ateles belzebuth* and *Lagothrix lagothricha* may occur in the park (see maps in Eisenberg and Redford [1999] and in Kinzey [1997]), but none of the short surveys summarized here were able to obtain any evidence of this. The map in Fooden (1963), still the most authoritative account for *Lagothrix*, extends the range to the entire interfluvium of the Rios Japurá and Negro, but there are no collecting localities confirming this. The easternmost localities are on the Rio Uaupés, some 600 km north-west.

Information obtained by Sérgio Borges from a reliable informant of Barcelos (upstream of Jaú, see Fig. 1), indicated that, south of the Rio Negro, *A. belzebuth* may have its current eastern limit defined by a small river just north of the town. Some palm species (e.g., *Leopoldinia piassaba* and *Barcela odora*) also show this pattern of limited eastern extension into the Negro-Solimões/Japurá interfluvium (Henderson, 1995). This may reflect the former distribution for *A. belzebuth*, so that it has never occurred in the area covered by the current national park. Queries to the managers of the mammal collections of the American Museum of Natural History, Field Museum (Chicago), Museu Goeldi (Belém), Natural History Museum (London), and the Smithsonian Institution (Washington, DC) found no recorded specimens of either *Ateles* or *Lagothrix* from the lower reaches of the Rio Negro, nor from the Japurá-Solimões/Negro interfluvium.

However, the collection of the Museu Nacional Rio de Janeiro (MNRJ) has eight specimens of *Ateles belzebuth* (MNRJ-1702, 2491, 2456 to 59, 2499, 2500) from Paraná do Maiana, Amazonas. This locality is situated on the Solimões-Japurá, a little north of Fonte Boa, close to a village called 'Jacaré'. Paraná do Maiana lies between the tributary rivers Auatí-Paraná and Mamirauá and is close to the headwaters of the Rio Jaú.

The Museu de Zoologia da Universidade de São Paulo (MZUSP) has the following specimens of *Lagothrix l. lagothricha*: MZUSP-19674 "AM, Rio Negro, 200 km acima de Manaus", collected by A. Vertematti (no date); "AM, Manaus" MZUSP-11232, 11233, collected by A. Vertematti, August 1973; "AM, Manaus" MZUSP-19676, collected by José Hidasi, January 1962.

These tantalizing records indicate that both *Ateles* and *Lagothrix* might have occurred in the Jaú region (or at least on the lower Rio Negro) in the recent past. However, as José de Sousa e Silva Júnior (pers. comm.) has suggested, it would seem likely that both these species may now be extinct in the Jaú region of the lower Rio Negro. Both these large primates are favored by hunters Amazon-wide, and both are extremely susceptible, having low reproductive rates (Chapman and Peres, 2000). It is possible that they were extirpated from the Jaú river basin in the early decades of this century when the human population of the area was very much higher than today (see Leonardi, 1999; FVA-IBAMA, 1998). However, their existence in the park is stoutly denied by all interviewees, even those of considerable age. Rylands (1992) believes both *A. belzebuth* and *L. lagothricha* may (still) occur in the far west of the park where there are some regions uninhabited by people (see Neri and Borges, 1998).

Other primates?

Both Neri and Borges (1998) and Adrian Barnett received reports from well-informed local inhabitants of a small black monkey with reddish markings on the face and chest. This indicates the possibility that a titi monkey besides *Callicebus torquatus* (see above) may occur there. The Negro-Solimões/Japurá interfluvium lies to the north and east of the known ranges of the *moloch* group titi monkeys (*sensu* Hershkovitz, 1988, 1990; Kinzey, 1997) and visual confirmation is needed. Both Neri and Borges (1998) and Adrian Barnett received reports of a second form of *Pithecia*, the 'gogó-de-sola', described as similar to *P. pithecia* but with a naked throat. In both 1999 and 2000, Barnett received several reports of a rarely-seen large completely black primate that fits no known taxon. Further investigation is required to assess the meaning of these reports. It is possible that the 'gogó-de-sola' may be the mustelid *Eira barbara* or a hitherto undescribed form of *Pithecia*.

Threats and Impacts

Monkeys are hunted in the Jaú National Park (Neri and Borges, 1998) as they are in most parts of the tropics (Cowlishaw and Dunbar, 2000). We have little information on the effects of such hunting practices on the populations of monkeys in Jaú. However, surveys suggested that they are not a principal source of game. Data on hunting and fishing practices in nine families in Jaú indicate that more than half of the meat in the diet of these families was supplied by fishes and turtles, and the principal sources of mammalian meat were ungulates and caviomorph rodents (FVA, 1998). Neri and Borges (1998) reported that monkey meat was generally not preferred. Tapir and peccary were favoured. Nevertheless, one household was personally observed (Rebecca Shapley) to eat *Cebus* in 2000 and both *Cebus* species were reported as being hunted on the Rio Uniní by Neri and Borges (1998). Uacaris are hunted (Rylands, 1992), but according to Neri and Borge (1998) are not preferred because they have little meat, they move fast and, in flooded forests, they tend to be lost after having been shot. Howler monkeys, widely hunted elsewhere, are reported to taste and smell bad. *Pithecia* are considered to move too fast and too high to be worth hunting.

Compared to Asia and Africa (Cowlishaw and Dunbar, 2000), crop raiding by primates is an infrequent phenomenon in the Neotropics (see Jiminez, 1970; Warren *et al.*, 1988); at Jaú such incursions appear to be minimal and primates are not hunted punitively. Lack of financing prevents full policing of the park, and there is no permanent conservation presence on two of the rivers (Caribinani and Uniní). Hence, it is impossible to assess the impact of hunting by day and weekend trippers, who are known to make frequent excursions to the area. There is no commercial logging in Jaú, and the extent of human-mediated habitat destruction appears generally slight (FVA-IBAMA, 1998; Ferreira and Prance, 1999). Regionally, *Cebus* and *Saimiri* are quite commonly kept for pets and *Cacajao* rarely so. However, such animals are often traded and it is currently unclear how this effects the park's primates. Older inhabitants favor the use of a suitably trimmed *Cebus* humerus as a restraining wedge during the construction of fibre baskets.

Primate Research in Jaú

Nine species of primate are confirmed for Jaú, with the possibility of another five species (and two odd reports requiring further investigation). This is a rich and representative primate fauna for the middle Amazon (see Mittermeier, 1987). Further research is clearly a priority. Studies are underway on the ecology and behavior of *C. melanocephalus* (Barnett *et al.*, submitted), and on primate densities, as part of a more general survey on the impacts of hunting by Carlos Peres and Hilton Nascimento. We suggest that the following studies need to be carried out to obtain a better understanding of the primate populations in the park.

1) Continued inventories of primates in Jaú National Park, especially in the headwaters and in remote areas such as the uninhabited regions of the Rio Papagaio, Rio Uniní and Rio Guariba (see Fig. 2).

2) Food and habitat preferences for all primate species in the park.

3) Studies of seasonality of habitat use in primate species other than *C. melanocephalus.*

4) Impacts of hunting on the primates of the Rio Carabinani (Jaú's third largest river).

5) The dynamics of egg predation by *C. albifrons* and nesting success of *Podocnemis* spp. and other Chelonia in the Park.

Field survey work should also answer the following questions: Are *Ateles belzebuth* and *Lagothrix lagothricha* really absent from the park, are there any historical records of their presence there or in the immediate region? Does a member of the *Callicebus moloch* group titi monkeys occur in the park? If confirmed, this would be an eastward range extension of an extent similar to those reported by Borges and Carvalhaes (2000) and Borges *et al.* (2001) for several bird species otherwise considered confined to the upper Rio Negro. Do the reports of forms such as the 'gogó-de-sola' represent new species or merely variants of existing species? Given the large number of newly-discovered Amazonian primates in recent times this possibility should certainly be investigated.

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CUIDADO BIPARENTAL EN EL MONO DE NOCHE (*AOTUS AZARAI*) DE FORMOSA, ARGENTINA

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Marina Giménez

Introducción

Los monos de noche (*Aotus* spp.) viven usualmente en grupos que incluyen de 2 a 5 individuos (Aquino y Encarnación, 1994; Fernandez-Duque *et al.*, 2001). El género, que se encuentra distribuído desde Panamá al noreste de Argentina, es el único que presenta hábitos nocturnos en el nuevo mundo (Wright, 1989). Los grupos son aparentemente monógamos con una única hembra reproductiva que produce un infante por año (Fernandez-Duque *et al.*, 2002). Algunos estudios con animales en cautiverio demostraron una gran participación del macho en el cuidado del infante recién nacido (Dixson y Fleming, 1981; Wright, 1984).

A partir de esas observaciones de *Aotus spp.* en cautiverio y de otras especies de primates socialmente monógamas con intensivo cuidado paternal (Fragaszy *et al.*, 1982; Hoffman *et al.*, 1995; Mendoza y Mason, 1986), se ha hipotetizado que el cuidado intenso del infante por parte de los machos operaría como una fuerza selectiva que podría favorecer la evolución de la monogamia. Los machos, al colaborar con el cuidado del infante, obtendrían un mayor éxito reproductivo que si trataran de aparearse poligínicamente (Clutton-Brock, 1989).

Hasta el presente no se disponía de información sobre el cuidado biparental en poblaciones silvestres de *Aotus spp.* Esto probablemente se deba a que existen dos características del género que limitan la obtención de información sobre el comportamiento social de machos y hembras. En primer lugar, el mono de noche no presenta un dimorfismo sexual detectable en el campo haciendo casi imposible la identificación de machos y hembras. A esto se suman los hábitos estrictamente nocturnos del género en la mayor parte de su distribución geográfica.

El objetivo de este trabajo fue describir el cuidado biparental del infante de *Aotus azarai* a partir de observaciones de individuos identificables realizadas durante el día. Esto fue posible gracias a que, en el extremo austral de su distribución, el género es catemeral (Tattersall, 1987), presentando actividad tanto durante el día como la noche (Arditi, 1992; Rotundo *et al.*, 2000; Sloan y Fernandez-Duque, 1999; Wright, 1989).

Métodos

Área y población de estudio

El estudio se llevó a cabo en la Estancia Guaycolec, al sudeste de la provincia de Formosa en el Gran Chaco Argentino (25°54'S, 58°13'O; Fig. 1). El primer estudio sobre

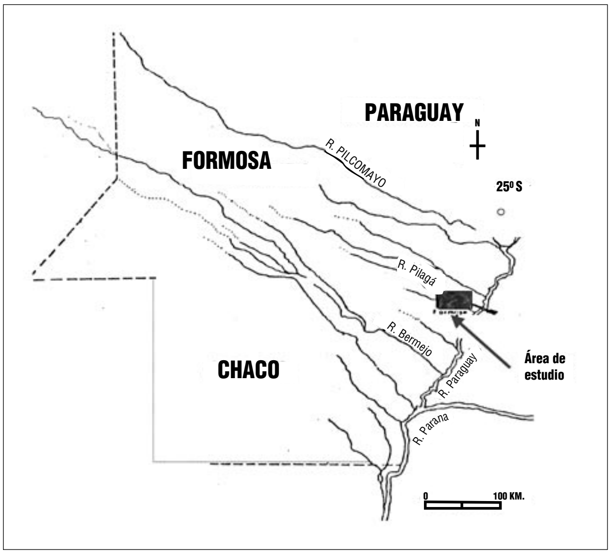

Figura 1. Área de estudio.

A. azarai en dicha estancia se realizó en 1977 (Rathbun y Gache, 1980). Durante la siguiente década, hubo otros estudios realizados por investigadores argentinos (Arditi, 1992; Arditi y Placci, 1990; Zunino *et al.*, 1985).

En 1996, se dio inicio al Proyecto Mirikiná (nombre común que recibe *Aotus* en dicha zona) con el objetivo de llevar adelante estudios a largo plazo sobre la ecología, comportamiento y genética de dicha especie (Fernandez-Duque y Bravo, 1997; Fernandez-Duque *et al.*, 2002; Fernandez-Duque *et al.*, 2001; Huntington y Fernandez-Duque, 2001; Rotundo *et al.*, 2000; Sloan y Fernandez-Duque, 1999).

La población de estudio incluye 15 grupos sociales que habitan las selvas en galería del Riacho Pilagá. Durante 1999, se estudió el desarrollo de 9 infantes hasta los seis meses de vida (Rotundo y Fernandez-Duque, datos no publicados) y el cuidado biparental de una de esas crías. Aquí se presentan los resultados concernientes al cuidado biparental.

Observaciones

Los datos sobre cuidado biparental fueron tomados de un grupo compuesto por un macho y una hembra adulta, un juvenil del año anterior y el infante nacido durante el estudio. En dicho grupo se había identificado inequívocamente al macho y a la hembra a partir de observaciones previas de cópula y amamantamiento. El macho tenía la cola significativamente más corta que los demás individuos en el grupo, lo que también facilitó su identificación. Se pudo confirmar luego el sexo del individuo cuando fue capturado, marcado y liberado con radio-collar. El grupo, acostumbrado a la presencia de observadores, fue monitoreado regularmente cada tres a cinco días a partir del comienzo de octubre para establecer con exactitud la fecha del nacimiento del infante. Se realizaron entre dos y tres observaciones semanales durante las primeras 18 semanas de vida del infante entre octubre de 1999 y marzo del 2000. Se obtuvieron 47 horas de observaciones. Durante dichas horas, se realizaron observaciones focales del infante y del individuo más cercano a éste. Cada dos minutos, al sonar de un indicador sonoro, se registró si el infante se hallaba dependiente o independiente. Se consideró al infante como dependiente cuando el mismo tenía dos o más extremidades apoyadas sobre otro individuo. A su vez, el infante estaba independiente cuando tenía una o ninguna extremidad en contacto con otro individuo. En caso de estar independiente se registró la distancia que separaba al infante del individuo más cercano, así como la identidad de este último. Si el infante estaba dependiente se registró la identidad del individuo que lo llevaba a cuestas. Los períodos de amamantamiento y de compartir comida se registraron de manera contínua. Aunque los resultados son presentados como "tiempo", en realidad se trata de número de puntos muestrales, a excepción del amamantamiento que fue medido en tiempo absoluto.

Resultados y Discusión

Los resultados indican un cuidado intenso del infante por parte del macho. A excepción de la primer semana de vida, durante el resto del tiempo el infante fue transportado principalmente por el macho, quien lo transportó en el 87% de las observaciones en las que el infante estuvo dependiente (398 de 456 observaciones, Fig. 2). Durante la primer semana de vida la hembra lo llevó a cuestas la mayor parte del tiempo transportandolo durante el 67% de las observaciones (31 de 46). Nuestras observaciones coinciden plenamente con los datos obtenidos en cautiverio (Dixson y Fleming, 1981).

Cuando el infante comenzó a independizarse y a desplazarse por sí mismo, siguió prefiriendo mantenerse próximo al macho. En el 70% de las observaciones (145 de 207), el individuo más cercano al infante fue el macho, independientemente de cual fuera la distancia a dicho individuo (Fig.3).

Observaciones cualitativas refuerzan la noción de un fuerte vínculo entre el macho y la cría. En general el infante

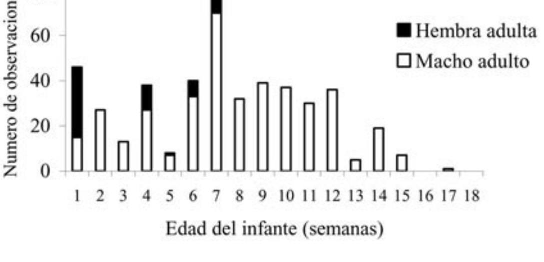

Figura 2. Número de puntos de muestreo ("observaciones") en los que el infante fue observado transportado por el macho o la hembra durante las primeras 18 semanas de vida.

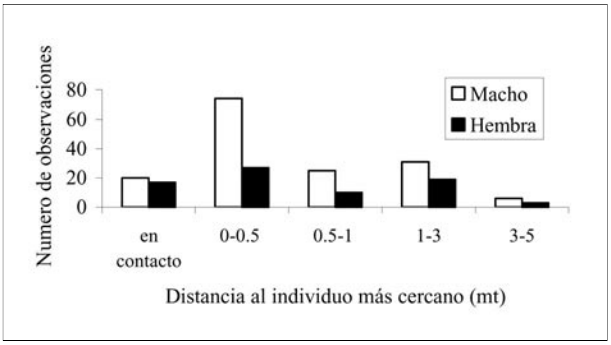

Figura 3. Número de puntos de muestreo ("observaciones") en los que el macho y la hembra fueron los individuos más cercanos al infante para las diferentes distancias.

fue responsable de mantener una corta distancia con el macho, ya que lo seguía en sus desplazamientos. Cuando se agrupaban para dormir, el macho casi siempre llevó al infante en forma dorsal y el juvenil nacido en el año anterior se acomodaba en contacto con éste. Por el otro lado, la hembra a veces descansaba separada en el mismo árbol o en otro árbol cercano. El alejamiento de la hembra de a momentos es particularmente notable. En una oportunidad, durante dos horas y media sólo se pudo observar al macho junto al infante y al juvenil del año anterior pero en ningún momento se observó a la hembra. Los eventos de amamantamiento (n = 9) fueron relativamente cortos (media ±d.s. = 74 ±34 seg.) y el infante, luego de mamar, por lo general volvió junto al macho.

El elevado porcentaje de tiempo que el infante pasó en cercanía física con el macho adulto sugiere un importante rol del mismo en el desarrollo del comportamiento de forrajeo del infante. Por ejemplo, en las cuatro ocasiones que se observó al infante compartir comida lo hizo con el macho; es posible que el macho sea el modelo a imitar.

La relativamente alta sobrevivencia de infantes en esta población hasta los seis meses de vida (96%, n = 27 infantes) sugiere que el cuidado paternal puede ser una estrategia exitosa para maximizar el éxito reproductivo del macho (Fernandez-Duque *et al.*, 2002). Si bien los resultados aquí presentados están referidos a un único grupo, constituye éste el primer trabajo que evalúa el cuidado biparental en un grupo silvestre de *Aotus* y por lo tanto proporciona una base para trabajos futuros. Por ejemplo, es imperativo confirmar la eventual relación genética entre el macho y el infante, para lo cual durante los próximos años se capturarán y obtendrán muestras de material genético de todos los individuos en la población.

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BEHAVIOR OF SQUIRREL MONKEYS (*SAIMIRI SCIUREUS*) - 16 YEARS ON AN ISLAND IN FRENCH GUIANA

Benoît de Thoisy, Olivier Louguet
Françoise Bayart, Hugues Contamin

Introduction

Squirrel monkeys (*Saimiri* spp.) are small frugivore-insectivores widely distributed in the Amazon basin and through the Guiana Shield. They occur in a number of different habitats: primary and secondary forests, mangroves, and remnant forests (Baldwin and Baldwin, 1981). The main features of their ecology are similar throughout their range, although Boinski (1999) correlated some differences in key aspects of the social organization with biogeographic variations in fruit availability.

Since the late seventies, the Pasteur Institute of French Guiana has used the squirrel monkey as an experimental model for the study of human malaria. In addition to the captive colony, the Institute manages an island where 150 wild squirrel monkeys originating from French Guiana and Suriname were introduced in 1981. There were several reasons for the establishment of this free-ranging population: (i) as a supply of animals for experimental needs which could be easily trapped; (ii) to accommodate older and post-experimental animals; (iii) since a part of the area can be visited, this site is an opportunity to educate people about primates and medical research; and (iv) the population is isolated from major infectious risks, allowing for a rapid re-establishment of the captive colony in the case of an epidemic (de Thoisy and Contamin, 1998).

Field work was conducted on the island in 1997 in order to assess the status of the population 16 years after the first release. Our goal was firstly to assess the potential of the island in fulfilling the objectives outlined above, but also to study the main eco-ethological patterns of these insularized monkeys. A report on their feeding behavior will be provided in a second paper.

Methods

The "Ilet-La-Mère" is a 56-ha, island offshore from Cayenne (4°54'N, 52°12'W), French Guiana (de Thoisy and Contamin, 1998). The island is covered by dense secondary forest with numerous lianas and epiphytes, and the tree community is dominated by *Spondias mombin* (Anacardiaceae), *Schefflera morototoni* (Araliaceae), *Cecropia obtusa* (Cecropiaceae), *Ficus* spp. (Moraceae), and such introduced species as *Mangifera indica* (Anacardiaceae) and *Carica papaya* (Caricaceae).

The study was carried out during the rainy season, from April to July 1997. Two free-ranging populations live on the island: wild monkeys (throughout), and food-provisioned monkeys in a 2-ha area around the camp. The wild population was censused through *ad libitum* observations and subsequently through direct observations of one focal troop (T1) and by radio-tracking two other troops (T2 and T3). One adult female of each group was trapped and radio-collared (Telonics®, model 1A), and located three times a day by triangulation (Harris *et al.*, 1990). The fourth troop (T4) was located and censused just once. The provisioned population is about 90 monkeys, all in a single troop, but the composition was not determined.

Troop T1 was studied for 101 hours spread equally during the day, using the scan-sampling method (Altmann, 1974). The locations of the individuals, both in terms of the height in the forest and where they were in the home range, and their behavior (foraging and feeding, locomotion, resting, and social behavior (including agonistic and affiliative interactions) were recorded every 10 minutes. Vertical use of space and the different behaviors were correlated using a Factors Correspondence Analysis. Home range use was determined using the 50 x 50 m grid-cell method. Daily travel distances were calculated by measuring the distance between the centers of successive grid-cells crossed. The home ranges of T2 and T3 were determined using the convex polygon technique (White and Garrott, 1990).

Results

The spatial distribution of the squirrel monkey population is shown in Figure 1. The home range sizes of T1, T2 and T3 were 12.3, 17.5, and 20 ha, respectively. T1 was comprised of two adult males, two subadult males, eight adult females, five juveniles and six infants. T2 was comprised of 12 adults and subadults, and five infants; T3 of 27 adults and subadults, and three infants; T4 of 15 adults and subadalts, and five infants. The total population was 90, equivalent to a density of 164 individuals/km².

The core area of T1 was 3 ha, that is 24.5% of its home range with 60% of recorded locations (Fig. 1). Feeding and foraging took up 63% of their daily activity, while 20.5% was given over to locomotion, 12.5% to resting and 4% to social behaviors. The daily travel distance was 4.5 km. They spent most time in the lower levels of the forest, with 41.7% of records during scans in the undergrowth, 31.5% in the low canopy, and only 26.8% in the upper levels (chi-square = 7.04, df = 2, $p<0.05$). They traveled more in the lower canopy and fed more in the upper levels. Resting and social behaviors were more frequent in the undergrowth (Fig. 2, φ = 0.28, horizontal axis contribution = 79%, vertical axis contribution = 21%). In troop T1, males tended to be peripheral. Fifteen agonistic behaviors were recorded, nine involving a male and a female, one involving two males, and five involving females. Once, a coalition of females was observed pursuing a male. Twenty-six affiliative coalitions were observed, 16 involving adult females. Five infants were born at the end of the rainy season, and one later at the beginning of the dry season. Male fatting and sexual behavior were not seen

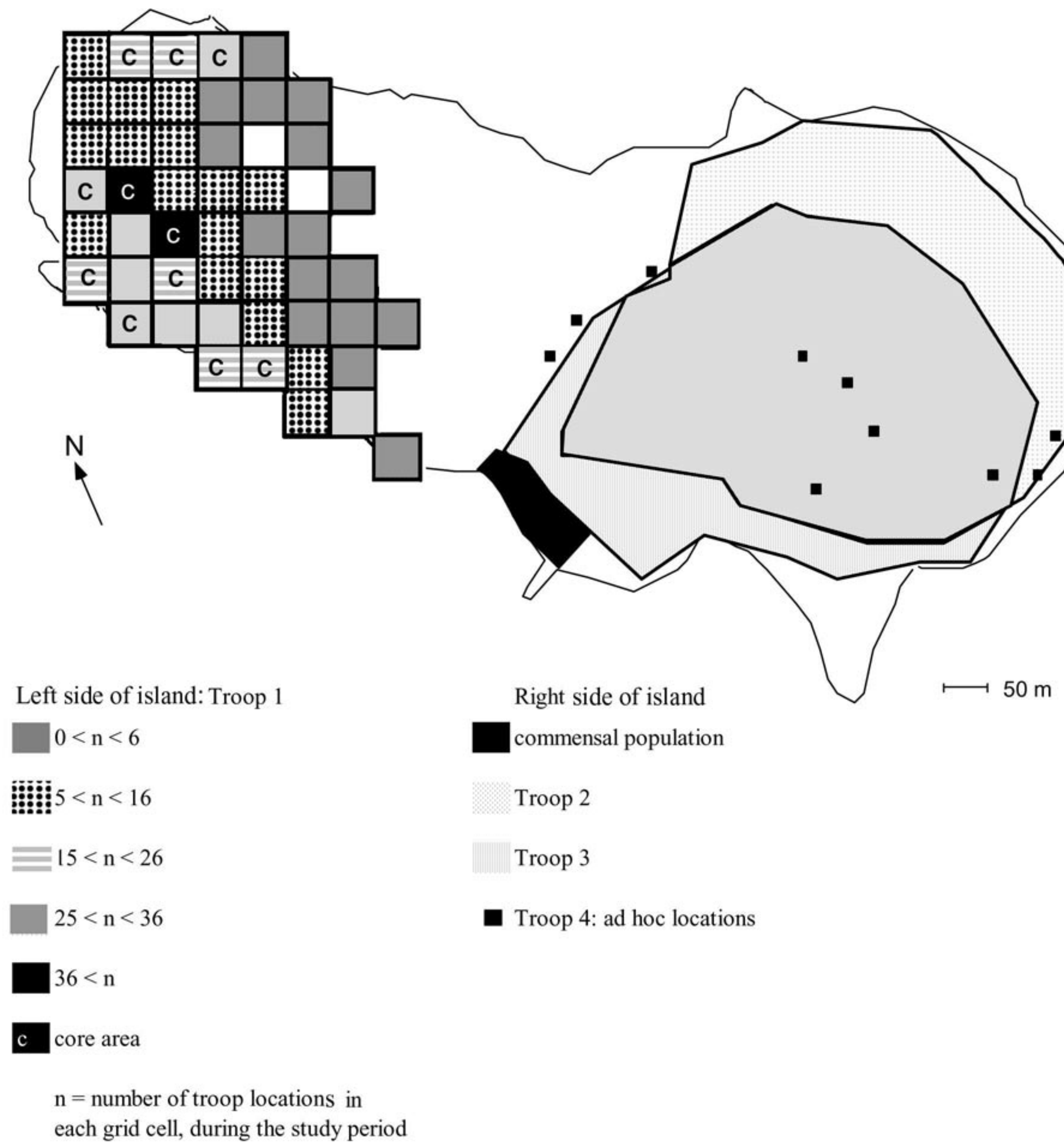

Figure 1. Spatial organization of the squirrel monkey population *(Saimiri sciureus)* on the Ilet-la-Mère, French Guiana.

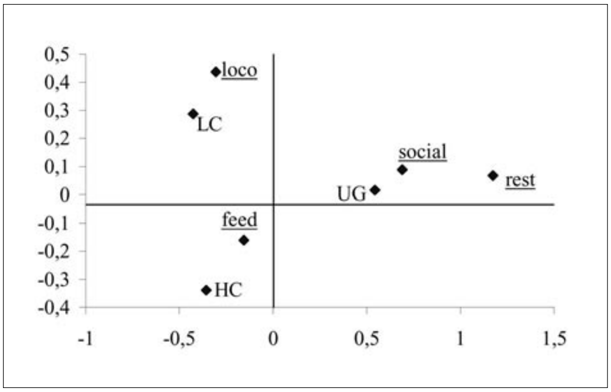

Figure 2. Vertical use of space by squirrel monkeys (*Saimiri sciureus*) on the Ilet-la-Mère, French Guiana. UG = undergrowth; LC = lower canopy level; HC = higher canopy level.

during the study period. No interactions between troops were recorded.

Discussion

Over the years, approximately 300 monkeys have been released on the island, and the free-ranging population today is close to 100 individuals. Newborns are numerous, suggesting that fertility is certainly not a limiting factor. There are no predators, and carrying capacity of the island should therefore be the limiting factor to population size, although infectious diseases and the survival rate of newly-released animals are also important in controlling population increase. Consequently, the initial objectives of Ilet-la-Mère of both the capture of naive animals for experimentation and the release of old animals as "retirement", probably need to be reevaluated.

The habitat preferences, locomotory behavior, foraging techniques and food preferences, are similar to those observed for *Saimiri oerstedii* (Costa Rica), *S. boliviensis* (Peru), and *S. sciureus* (Suriname) (Janson and Boinski, 1992; Boinski, 1999). The population density of 164 individuals/km² in our study area is close to those observed in other secondary forests in Peru (Neville *et al.*, 1976), Panama (Balwin and Baldwin, 1972) and Colombia (Thorington, 1968). The small size of the troops can be explained by the size of the island and the secondary forest (Baldwin and Baldwin, 1971). Small home ranges have been reported in other secondary forest areas (Thorington, 1968). The sleeping sites of the four troops were on the southern coast of the island, which provided protection against rain and wind. Activity patterns and the vertical use of space observed in our study troop are comparable to those of *S. oerstedii* in secondary forests (Boinski, 1987 and 1999). Group compositions are also similar to those reported from other study areas (Baldwin and Baldwin, 1981); social behavior traits, characterized by female coalitions and female aggression, and males being peripheral to troops of adult female troops, are typical also of *S. boliviensis* in Peru (Mitchell *et al.*, 1991). Interspecific differences in the social behavior of squirrel monkeys, especially in female bonding patterns, can be correlated with the abundance and distribution of fruit resources, and essentially to food competition (Boinski, 1999). In the Peruvian study area (*S. boliviensis*) fruit patches harvested were typically large and moderately dense, differing from the Surinamese study site of *S. sciureus*, where smaller and more dispersed patches were exploited (Boinski, 1999). On the Ilet-la-Mère, fruit patches are also large and dense. Our preliminary results suggest that, despite genetically-based variations of social organization in squirrel monkeys (Boinski, 1999), habitat constraints can also modify social organization, indicating considerable plasticity (Johns and Skorupa, 1987). *Saimiri* has rarely been studied in isolated habitats (Johns and Skorupa, 1987), and this island population is of great interest for furthering our understanding of their behavior, ecology and demographics in these circumstances.

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ESTUDO PRELIMINAR DO MONITORAMENTO DO BUGIO RUIVO, *ALOUATTA GUARIBA CLAMITANS*, ATRAVÉS DA CONTAGEM DE BOLOS FECAIS NO PARQUE ESTADUAL DE ITAPUÃ, RIO GRANDE DO SUL, BRASIL

Gerson Buss
Helena P. Romanowski

Introdução

Existe uma necessidade imediata de incremento nos estudos ecológicos e comportamentais de campo, em busca de dados que nos forneçam uma base concreta para um melhor conhecimento e que permita o manejo e a conservação de nossos primatas (Cullen Jr. e Valladares-Pádua, 1997). O bugio-ruivo, *Alouatta guariba*, distribui-se pela mata Atlântica, estendendo-se do sul da Bahia até a porção mais ao sul desse bioma, atingindo Missiones, no norte da Argentina (Fonseca *et al.*, 1994, Printes *et al.*, 2001). Trata-se de uma espécie ameaçada (Brasil, IBAMA, 1989) e a principal causa de seu desaparecimento tem sido a destruição do hábitat (Neville *et al.*, 1988).

A presença de vestígios pode ser utilizada em estudos de animais silvestres como indicador de sua ocorrência (Romanowski *et al.*, 1998) e uso de hábitat (Welch *et al.*, 1990). No caso das fezes, também fornece importantes informações sobre o estado de saúde do animal e dieta (Prates *et al.*, 1990; Stuart *et al.*, 1998; Santos e Hartz, 2000). Adicionalmente, a detecção de mudança no número de bolos fecais pode ser satisfatória para fins de manejo (Davis e Winstead, 1987; Mitchell *et al.*, 1985; McIntosh *et al.*, 1995). Destaca-se como uma forma de coleta de dados que não provoca distúrbio aos animais, e que pode ser utilizada com espécies de difícil visualização (Palomares *et al.*, 1991; Soldateli e Blacher, 1996). Apesar dos primatas serem considerados animais de fácil visualização, pelo hábito diurno da grande maioria das espécies, certas espécies são mais difíceis de serem encontradas devido ao seu comportamento. Esse é o caso de *Alouatta*, pois apesar do ronco que facilita a localização do grupo, são animais difíceis de serem localizados devido a existência de períodos prolongados de inatividade diária, comportamento típico desse gênero de primatas (Mendes, 1985; Marques, 1989; Fortes, 1999).

No Parque Estadual de Itapuã, o monitoramento, através da contagem de bolos fecais é facilitado por esta ser a única espécie de primata não-humano presente na área e devido a geomorfologia de Itapuã, em geral, e do Morro do Campista, em particular, que apresenta grande número de afloramentos graníticos no interior da mata, facilitando a localização visual dos mesmos. Além disso, o aspecto e o odor característico do bolo fecal do bugio-ruivo são bastante peculiares, o que facilita sua identificação e localização.

O objetivo desse trabalho é verificar a eficácia da contagem de bolos fecais para monitoramento das populações de bugio-ruivo, *Alouatta guariba clamitans* Cabrera, 1940 no Parque Estadual de Itapuã, Viamão, Rio Grande do Sul, bem como, trazer informações relativas ao uso do hábitat. Este trabalho é parte integrante do "Programa Macacos Urbanos para Pesquisa e Conservação do Bugio-ruivo (*A. g. clamitans*) no Rio Grande do Sul".

Métodos

Área de Estudo

O Morro do Campista (30°23′S, 51°02′W), também conhecido como Ponta de Itapuã, localiza-se no Parque Estadual de Itapuã, Viamão, Rio Grande do Sul (Fig. 1). O "Campista" caracteriza-se como um complexo orogênico, granítico, cujo cume principal possui 182 m de altura, e apresenta uma área aproximada de 300 ha. Estão presentes afloramentos rochosos no topo, enquanto suas encostas encontram-se praticamente todas cobertas por mata. O clima local se classifica como Cfa pelo sistema de Köppen, descrito como subtropical úmido, com média do mês mais quente superior a 22°C (janeiro), média do mês mais frio entre -3 e 18°C (julho), sendo a temperatura média anual de 17,5°C. A precipitação média anual situa-se em torno de 1.300 mm (Brasil, Rio Grande do Sul, 1997).

A classificação fisionômica da vegetação das unidades amostrais foi realizada utilizando-se a classificação proposta por Brack *et al.* (1998), sendo a que segue:

(A) Mata higrófila - formação florestal que ocorre nos fundos dos vales e encosta sul dos morros, constituindo-se algumas vezes em comunidades relictuais com forte influência da Floresta Pluvial Tropical Atlântica (Floresta

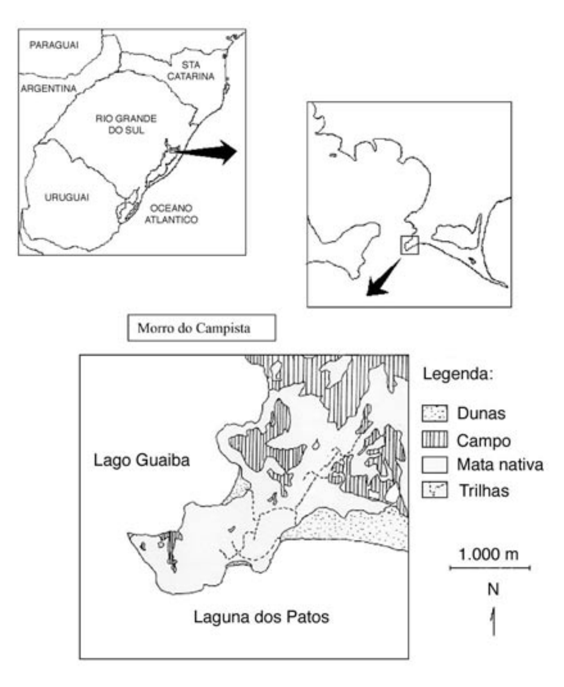

Figura 1. Localização do Morro do Campista (30º23'S, 51º02'W), Parque Estadual de Itapuã (1), Viamão, Rio Grande do Sul, Brasil, apresentando as áreas de mata e a rede de trilhas.

Ombrófila Densa). As condições de relevo, que permitem uma maior umidade relativa do ar, a maior profundidade dos solos e a maior capacidade de armazenamento de água, proporcionam condições mais seletivas para o crescimento de uma vegetação de grande porte e maior riqueza florística que as demais comunidades florestais. A mata higrófila contém espécies que se destacam pela ampla superfície foliar (latifoliadas). Em relação a estrutura da floresta, verifica-se a presença de três ou quatro estratos arbóreos.

(B) Mata mesohigrófila - constituída por uma comunidade florestal que ocupa a porção média ou baixa dos morros, ou mesmo em terrenos mais ou menos planos, onde as condições ambientais não sejam extremadas. Seus elementos florestais não apresentam grande seletividade e têm ampla distribuição no Estado, estando presentes ainda na maior parte das matas secundárias do município. A altura da mata é de 10 a 15 m, sendo encontrados 2 a 3 estratos arbóreos.

(C) Mata subxerófila - matas baixas ou capões encontrados nos topos ou encostas superiores dos morros, onde o solo é muitas vezes raso (litossolo), sendo sua textura grosseira com feições próprias de solos com baixa retenção hídrica. Com respeito ao mesoclima, estes locais de topo de morro estão sujeitos a maior exposição solar e ventos mais intensos. A denominação de mata subxerófila é adotada para caracterizar este tipo de vegetação de ambientes mais secos, onde morfologicamente a vegetação também evidencia tendência de redução da superfície foliar e escleromorfismo. A altura média do dossel é de 6 a 12 m. A estratificação é mais simplificada do que a mata higrófila, com presença de 2 ou 3 andares arbóreos. Pode ocorrer algumas vezes um estrato de indivíduos emergentes, chegando a alcançar 15 m.

(D) Mata psamófila – também conhecida como mata de restinga, sendo uma mata característica de terrenos arenosos (paleodunas) entremeadas por banhados e outras áreas úmidas correspondentes as margens de antigas transgressões e regressões do Lago Guaíba e Laguna dos Patos. Tem uma altura que varia de 6 a 10 m, sendo que as espécies emergentes podem chegar a 15 m. Evidencia-se alguma tendência xeromórfica nas folhas de muitas espécies através da consistência coriácea, do reduzido tamanho e superfície lustrosa. Possui muitos elementos florísticos que são comuns às matas subxerófilas.

Amostragem

A presença de bolos fecais frescos de bugio-ruivo foi registrada em trilhas previamente demarcadas no Morro do Campista, Parque Estadual de Itapuã (vide Fig. 1). Um bolo fecal foi definido como uma ou mais pelotas de fezes agrupados, num raio de aproximadamente um metro, e que estivessem sobre a trilha. As trilhas podem ser um local preferencial para defecação, considerando que são livres de vegetação de sub-bosque (Gilbert, 1997).

Considerou-se cada trecho de 50 m de comprimento de trilha como uma unidade amostral. Em cada unidade amostral foi identificada a formação florestal predominante. Nos 5.350 m. de rede de trilhas, foram demarcadas 107 unidades amostrais, sendo 41 de mata mesohigrófila, 37 de mata higrófila, 18 de subxerófila e 10 de psamófila. Os registros foram realizados com um intervalo mínimo de 5 dias. Em cada registro anotou-se o horário e a unidade amostral em que foram encontrados. Em uma unidade amostral era registrado no máximo um bolo fecal por dia de amostragem. Foram realizados 13 dias de amostragem, no período de novembro de 1999 à maio de 2000, totalizando 1.391 unidades amostrais vistoriadas em aproximadamente 69,5 km de trilhas percorridas.

Os dados foram analisados no programa SPSS for Windows. Para verificar a relação entre as distintas formações florestais e a presença de bolos fecais foi utilizado o teste de associação através da análise de "maximum likelihood" (Sokal e Rohlf, 1981).

Resultados e Discussão

Em treze dias de amostragem foram registrados 48 bolos fecais frescos em 34 unidades amostrais; destes, 24 (50%) em mata higrófila, 21 (43%) em mata mesohigrófila e 3 (6,2%) em subxerófila. Não houve registro na mata psamófila (Fig. 2).

A presença de bolos fecais de *A. g. clamitans* nas unidades amostrais foi significativamente associada com a formação florestal (G = 12,40; gl = 3; P = 0,006) (Tabela 1). Ao considerarmos as visualizações de bugio-ruivo por unidade amostral, de acordo com os dados do censo realizado

Tabela 1. Número de unidades amostrais por formação florestal relacionado com o registro de bolos fecais de *Alouatta guariba clamitans,* Morro do Campista, Parque Estadual de Itapuã (30º23’S, 51º02’W), Viamão, RS, Brasil, entre novembro de 1999 e maio de 2000.

	Formação Florestal				
Bolos fecais	**Higrófila**	**Mesohigrófila**	**Subxerófila**	**Psamófila**	**Total**
Presença	15	16	3	0	34
Ausência	22	25	16	10	73
Total	**37**	**41**	**19**	**10**	**107**

Tabela 2. Unidades amostrais com visualização de bugio-ruivo *(A. g. clamitans)* em relação ao número total de unidades amostrais nas formações florestais do Morro do Campista, Parque Estadual de Itapuã (30º23’S, 5º02’W), Viamão, RS, Brasil, entre novembro de 1999 e maio de 2000 (adaptado de Buss, 2001).

	Formação Florestal				
Visualização	**Higrófila**	**Mesohigrófila**	**Subxerófila**	**Psamófila**	**Total**
Ausência	19	26	17	10	72
Presença	18	15	2	0	35
Total	**37**	**41**	**19**	**10**	**107**

por Buss (2001), estas também estão significativamente associadas com a formação florestal (G = 17,36; gl = 3; P = 0,0005) (Tabela 2).

Esses resultados indicam que a presença de bolos fecais mostrou ser um bom indicador de ocorrência, podendo fornecer importantes informações relativas ao uso do hábitat. Indicam também, um uso diferenciado das formações florestais presentes no Morro do Campista. Considerando que essas formações apresentam diferenças na estrutura e composição de espécies arbóreas (Brack *et al.*, 1998), bem como, nos aspectos relacionados a fenologia das espécies arbóreas, supõe-se que essas características resultem em diferenças no uso do hábitat pelo bugio-ruivo.

Este trabalho foi desenvolvido dentro de um estudo mais abrangente sobre densidade e caracterização do hábitat do bugio-ruivo no Parque Estadual de Itapuã, cujos resultados estão sendo preparados para publicação.

O Parque Estadual de Itapuã esteve fechado à visitação pública de 1990 à 2002. Dentro desse contexto, o monitoramento pela contagem de bolos fecais, devido a sua facilidade de implementação, pode colaborar no controle da situação populacional do bugio-ruivo no Parque, contribuindo, portanto, na avaliação do impacto da visitação sobre essas populações. Além disso, associado com outros procedimentos, como por exemplo, a análise de parasitas presentes nas fezes, pode trazer valiosas informações sobre a saúde dessas populações (Stuart *et al.*, 1998), e direcionar ações de manejo (Davis e Winstead, 1987) visando a conservação dessa espécie.

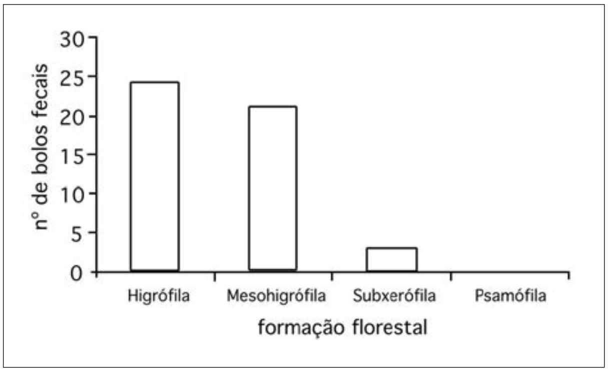

Figura 2. Número de bolos fecais encontrados nas formações florestais do Morro do Campista, Parque Estadual de Itapuã (30023’S;51002’W), Viamão, RS, Brasil, entre novembro de 1999 e maio de 2000.

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BDGEOPRIM – DATABASE OF GEO-REFERENCED LOCALITIES OF NEOTROPICAL PRIMATES

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Introduction

One of the main problems for the conservation of the Neotropical primates is that our understanding of their geographical distributions is still poor. This is underlined by the fact that many new forms are still being discovered: 31 species and subspecies since 1960 (three from the Atlantic forest and the remainder from Amazonia), 13 of them since 1990 (Rylands *et al.*, 2001). Many of the Neotropical primates are now threatened (Rylands *et al.*, 1995, 1997), and a database documenting their past and present distributions is a vital tool for an understanding of their conservation status (degree of reduction in their range), for priority-setting, and for planning conservation strategies, allowing for information to be made available in a timely fashion to field researchers, conservation organizations and government institutions. In more dire situations, it is essential to have access to the maximum information on the past and present ranges of critically endangered species for their management and the translocation of populations from areas suffering strong human impacts to locations where they can be guaranteed greater protection (see for example, Garcia-Orduña *et al.*, 1987; Kierulff and Procópio de Oliveira, 1994). Only recently was it possible to identify the extent of the historic occurrence of the red-handed howling monkey (*Alouatta belzebul*) in the north-east of Brazil through some very few and obscure locality records; a species now largely extinct in the region (Bonvicino *et al.*, 1984; Coimbra-Filho *et al.*, 1995). The need for an understanding of historic and recent distributions for the conservation of primates in regions where forests have been largely destroyed also became evident during surveys in the Rio Doce basin in the state of Minas Gerais (the "Steel Valley"), as well as when drawing up conservation priorities and strategies for the Atlantic forest in the south of the state of Bahia, Brazil (CI and IESB, 1997; Hirsch, in prep.).

The goal of the BDGEOPRIM, the Database of Georeferenced Localities for Neotropical Primates, is to organize the scattered information available in gazetteers, in the scientific literature (much of it grey), and from field studies, of the locality records of all Neotropical primate species, and to make it available for use in libraries and museums, and by professionals in primatology, conservation, biogeography, and taxonomy.

Although we have checked the entire database three times, the users will undoubtedly find errors, and we would be very grateful for comments and suggestions, as well as leads regarding sources of information that we have missed. In some parts of the Database and in the maps, the foreign users will find some terms in Portuguese because we began tabulation of the information in Brazil's native language. As a next step, we will make the BDGEOPRIM available in Portuguese, Spanish and English.

This database has not yet been published, but we decided to put it on an Internet homepage (see <http://www.icb.ufmg.br/~primatas/home_bdgeoprim.htm>), because there have been so many enquiries and requests for information and analyses from numerous people and institutions from Brazil (Rio Grande do Sul, Minas Gerais, Paraiba, Conservation International, the Brazilian Institute for the Environment - IBAMA) and other countries such as Argentina, Paraguay.

Our initial objectives were to a) tabulate all the localities for Neotropical primates listed in the current literature; b) arrange the information in a database format; c) georeference all the tabulated localities; d) check the veracity of the information by crossing all the data with maps of primate geographical distributions, hydrography, topography, vegetation (biomes and ecosystems), conservation units, and political divisions, and e) plot the records by taxa on maps generated through a Geographic Information System (GIS).

Methods

The taxonomy of Neotropical primates is still far from definitive. Most especially the application of molecular genetics and cytotaxonomy, along with the findings of new species and subspecies, over the last two decades, has resulted in numerous revisions and a far better understanding of the true diversity of the Platyrrhini, based increasingly on the Phylogenetic Species Concept (see Groves, 2001). A number of genera (for example the woolly monkeys, *Lagothrix*) and groups of species (for example, the red howling monkeys, *Alouatta seniculus*) are in need of a modern revision of their component taxa, while some particularly tricky genera are still subject to dispute (for example, the capuchin monkeys, *Cebus*, the night monkeys, *Aotus*, and the squirrel monkeys, *Saimiri*). For BDGEOPRIM, we adopted the taxonomic arrangement proposed by Rylands *et al.* (2000).

To start, we made an extensive bibliographical review to check the information already available. We first tabulated all the records listed in the published gazetteers of such as Hershkovitz (1977), Kinzey (1982), Torres de Assumpção (1983) and Oliver and Santos (1991). We then searched for more recent scientific papers, including all those published in *Primate Conservation* and *Neotropical Primates*. We also checked some classic works from the 18th century, such as Wied-Neuwied (1821) and von Spix and von Martius (1981). To this, we added unpublished records of primate localities from museum collections and from the field, obtained by the authors of BDGEOPRIM and by a number of researchers who spontaneously contributed information from surveys.

The information associated with each record (locality) was standardized, even if it was a type locality. This was necessary for two reasons: 1) to sort and classify all the records in alphabetical order, and 2) to avoid duplicating records from the same place and/or the same taxon. When we confirmed that information was erroneous, we assigned the correct data and stored the original information in the "Observations" field. When the information for a specific field was lacking (a "missing value"), we completed it, when possible, with the correct information. To give an example of the standardization of references for the same "locality", "right bank of Amazon River, Santarém, PA, Brazil", "Amazon River, right bank, Santarém, Brazil", and "Santarem, right bank, Amazon River" were all recorded as:

Locality	Municipality	State	Country
Amazon River, right bank	Santarém	PA	Brazil

Many abbreviations were used - geographic names, Brazilian states, categories of protected areas, IUCN categories of threatened status, museum acronyms, and so on. For easy identification, we drew up specific tables for each set.

All the information associated with each record (locality) was tabulated in a Database with 58 fields (see Table 1). In this way, it is possible to consult the Database using different combinations of information fields, and the output report can be viewed either as a simple table (list) or as a more complex matrix, crossing the fields one by one, or one for several fields.

Almost all the geopolitical data which was not available in the original scientific papers consulted, we obtained from official publications, multimedia products and online services released by government agencies, non-governmental organizations and other institutions, including:

IBGE (<www.ibge.net/home/default.php>),
SURAPA CD-Rom (<http://csf.colorado.edu/mail/elan/may99/msg00799.html>),
ESRI ArcData Online (<www.esri.com/company/free.html>),
Expedia.com Maps Online (<http://www.expedia.com/pub/>),
USGS (<http://edc.usgs.gov/geodata/>),
UNEP/GRID (<http://grid2.cr.usgs.gov/>),
Garmin MapSource World Atlas (<www.garmin.com/cartography/>),
GEOMinas (<www.geominas.mg.gov.br/>), and other printed world atlases.

After tabulating all the records, we linked the Database with a Geographic Information System, using three information fields: the record identification number (N_ID) and the geographic coordinates (longitude and latitude). Georeferenced, it is possible to plot any field of information

Table 1. Database information fields and abbreviations associated with the locality records. Y = yes, N= no.

Field	Abbreviation
1. Record Identification No. (# primary key)	N_ID
2. Date	DATE
3. Operator	OPERATOR
4. Family	FAMILY
5. Genus	GENUS
6. Species	SPECIES
7. Subspecies	SUBSPECIES
8. Description (Author)	DESCRIPTIO
9. Description (Year)	YEAR
10. Common Name	COMMON_NAM
11. Type Locality (Y or N)	TYPE_LOCAL
12. Survey Area of Hirsch Ph.D. Thesis (Y or N)	THESIS_FRA
13. IUCN (1996) Category	IUCN_1996
14. Present Population Status and Risk of Threat	POPUL_STAT
15. Biome	BIOME
16. Ecosystem or Habitat Type	ECOSYSTEM
17. Conservation Unit Category	CU
18. Locality	LOCALITY
19. Municipality or "City"	MUNICIPAL
20. State, "Departamento" or "Província"	STATE
21. Country	COUNTRY
22. Geog. Coord. (Latitude, dd)	LAT_DD
23. Geog. Coord. (Latitude, mm)	LAT_MM
24. Geog. Coord. (Latitude, ss)	LAT_SS
25. Geog. Coord. (Longitude, ddd)	LONG_DDD
26. Geog. Coord. (Longitude, mm)	LONG_MM
27. Geog. Coord. (Longitude, ss)	LONG_SS
28. Geog. Coord. (Longitude, decimal format)	LONGITUDE
29. Geog. Coord. (Latitude, decimal format)	LATITUDE
30. Altitude Minimum (m)	ALT_MIN
31. Altitude Maximum (m)	ALT_MAX
32. Altitude Average (m)	ALT_AVG
33. Area (ha)	AREA
34. Year of Creation (ha), if it was a CU	YEAR_CREAT
35. Administration	ADMINISTRA
36. Reference	REFERENCE
37. Type of Record	TYPE_REC
38. Collector	COLLECTOR
39. Year of Collection	COL_YEAR
40. Museum	MUSEUM
41. Number of Museum Collection	COL_NUM
42. Original Record Number from Gazetteer	N_ORIG
43. Change or Attributed of Genus (Y or N)	ATB_GENUS
44. Change or Attributed of Species (Y or N))	ATB_SP
45. Change or Attributed of Subspecies (Y or N)	ATB_SSP
46. Change or Attributed of Cons. Unit (Y or N)	ATB_UC
47. Change or Attributed of Locality (Y or N)	ATB_LOCAL
48. Change or Attributed of Municipality (Y or N)	ATB_MUNIC
49. Change or Attributed of State (Y or N)	ATB_STATE
50. Change or Attributed of Country (Y or N)	ATB_COUNTR
51. Change or Attributed of Altitude (Y or N)	ATB_ALT
52. Change or Attributed of Area (Y or N)	ATB_AREA
53. Change or Attributed of GCs (Y or N)	ATB_CGS
54. Change or Attributed of GCs with ArcGIS (Y or N)	ATB_ARCGIS
55. Change or Attributed of GCs with Garmin (Y or N)	ATB_GARMIN
56. Change or Attributed of GCs with Expedia (Y or N)	ATB_EXPED
57. Change or Attributed of GCs with SURAPA (Y or N)	ATB_SURAPA
58. Observations	OBS

on a projected map, showing the records in their actual geographic position. Unfortunately, it was not possible to locate 39 records that had no geographic coordinates, so that we were unable to find their exact location. These records were stored in the Database but are not visible on the maps.

Because the distributions of the Neotropical primates embrace South America (southern hemisphere) and Central America (northern hemisphere), we used a World Geographic Coordinate System and WGS84 Datum (World Geographic System 1984). As such, we avoided some problems with displacement and data matching, and facilitated the combination of "overlays" from different sets of data.

All the maps were generated using ArcGIS v. 8.1 (ESRI, 2001). Initially, we produced maps for all 18 genera, showing the records (points) only for the species. The next step will involve the production of species maps which show the records for each subspecies.

At this stage, we decided not to trace lines delimiting the distributions of the different species in each genus. This is because for some the limits remain unclear, this kind of delimitation is laborious and is, besides, often guesswork, using inferences from natural boundaries, such as rivers, mountain ridges, and vegetation types and, an often inadequate, knowledge of historic changes in vegetation.

Summary Results

At the present stage, the BDGEOPRIM consists of 5,631 locality records, embracing all of the 18 Neotropical primate genera, 110 species and 205 subspecies in 21 countries from Central and South America (see Fig. 1).

- A total of 487 bibliographical references were reviewed, naturally including the classic works (gazetteer) of Hershkovitz (1977) with 807 records, Kinzey (1982) with 679 records, and Oliver and Santos (1991) with 516 records. A further 45 references provided more than 50 records. Besides Hershkovitz' (1977) gazetteer for callitrichids, a further 655 records were cited for the first time and 472 records are exclusive citations.
- The map of localities, recorded in a 25 x 25 km grid, shows that they are not uniformly distributed. The highest density is concentrated in one continuous area in the southeast region of Brazil, in the Atlantic forest. In Amazonia, locality records are highly clumped, distributed along the major rivers. The Cerrado has a uniformly low density of records, while in Mesoamerica the records show a patchy distribution as in Amazonia (see Fig. 1).
- The genera with the highest numbers of records are: 1,166 for the howling monkeys (*Alouatta*); 894 for the capuchin monkeys (*Cebus*); 665 for the marmosets (*Mico* and *Callithrix*); 616 for tamarins (*Saguinus*); and 545 for the titi monkeys (*Callicebus*).

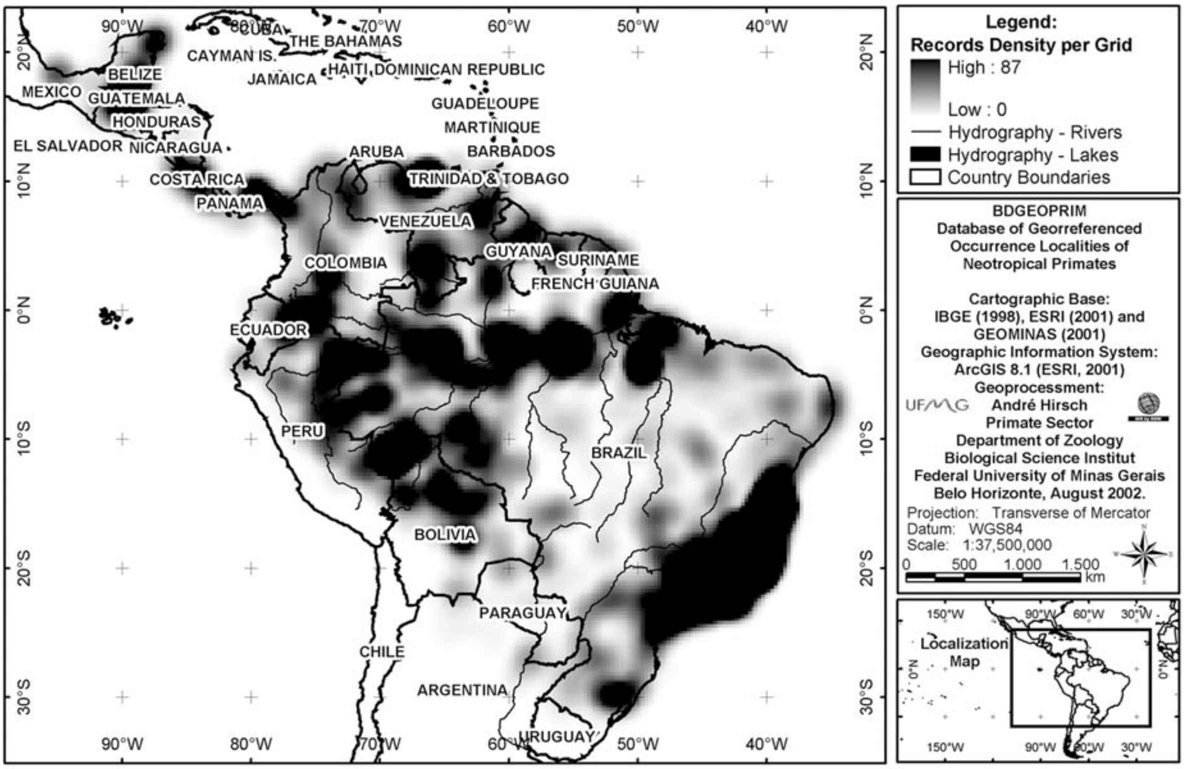

Figure 1. Distribution of Neotropical primate locality records. Density per 25 x 25 km grid.

- All the Central and Mesoamerican countries with primates are included. Those with the highest numbers of records are: Brazil with 3,680; Bolivia with 431; Venezuela with 379; Peru with 299; and Colombia with 227.
- Regarding threatened species, 304 records are of Critically Endangered (CR) primates, 632 records of Endangered (EN), 1,078 of Vulnerable (VU), 2,922 records are of the Low Risk (LR) category, and 20 records are from those classified as Data Deficient (DD).
- Considering only the Brazilian biomes, 2,429 records are from the Amazon, 1,843 from the Atlantic forest, 367 from the Cerrado, 84 from the Caatinga and 23 from the Pantanal Matogrossense.
- A total of 1,746 records (31%) are from protected areas, the majority National Parks, according to the base maps provided by SURAPA (1999).
- Records from museum collections are not well-represented in the database. A more comprehensive survey of the key museums has still to be done. At this time, 1,003 records are from museum specimens, representing 17.8% of the total records.

Future Products

We hope that the BDGEOPRIM will be released in three different languages (Portuguese, Spanish and English) over the next year, as a CD-ROM, and/or in a form which will allow for on-line interactive access, structured in such a way that information stored in the Database will be easily and quickly available. The BDGEOPRIM will eventually include biological and ecological data on the Neotropical primate species, with a picture of each.

A Dedication

The database is dedicated to Philip Hershkovitz 1909–1997 (*in memoriam*), Emeritus Curator of Mammals at the Field Museum of Natural History, Chicago, and one of the world's most distinguished mammalogists and prominent primatologists of the Neotropical region. Over 50 years, he described 75 new species and subspecies, and published more than 160 scientific papers and 100 non-technical publications. His book, *Living New World Monkeys* (1977), along with numerous accompanying papers, put our knowledge of platyrrhine systematics and distributions years ahead of other primate groups.

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BIRD PREDATION AND PREY-TRANSFER IN BROWN CAPUCHIN MONKEYS (*CEBUS APELLA*)

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Introduction

In the last decade capuchin monkeys, *Cebus*, have received growing attention in the primatological literature due to some striking convergences between them and chimpanzees, *Pan*, such as: large brain size relative to body size, long life span, tool use skills, and food-sharing among group members (Fragaszy *et al.*, 1990; Visalberghi and McGrew, 1997). These similarities make capuchin monkeys an attractive model for validating hypotheses about the evolution of social life and cognition that are heavily based upon Old World primates (Parr *et al.*, 1997).

Food-sharing tendencies are of interest due to the view that cooperative hunting with subsequent meat sharing was a key factor in the adaptation and organisation of early human societies (Butynski, 1982; Anderson, 1986; McGrew and Feistner, 1992), and many studies have focused on the cooperative hunting and meat sharing of wild chimpanzees (Boesch, 1994). Some authors (e.g., Newcomer and De Farcy, 1985; Fragaszy, 1986) have reported predation on vertebrates by capuchin monkeys in different environmental conditions. However, the relation between predation and prey sharing has only been analysed for wild *C. capucinus.*

Rose (1997) reported predation on birds, coatis (*Nasua narica*), and squirrels (*Sciurus variegatoides*) by two groups of *C. capucinus* at Santa Rosa National Park, Costa Rica. She concluded that, although predation is a common event, food sharing is infrequent. Meat is the most commonly shared food, and the only food shared between adults (usually through falling scraps or abandoned carcasses). Perry and Rose (1994) analysed the sharing of captured coatis in three groups of *C. capucinus* at two sites in Costa Rica. They concluded that: a) among the species normally predated by capuchins, coatis are riskier because adults are larger than adult capuchins and normally defend their pups; and b) coati pups scream while being eaten, so it is impossible for a monkey to be rapid and furtive when eating them, giving plenty of opportunities for other monkeys to beg from the carcass owner.

The possible social value of food-sharing in captive groups of *C. apella* has been emphasised by de Waal (1997; 2000; de Waal *et al.*, 1993) who observed that the occurrence of this behavior is: a) related to affiliative relations and social tolerance between pairs of individuals, b) linked to previous events of food-sharing between the pair (even after a delayed period) and, c) is more frequent when cooperation is needed for predation or the acquisition of scraps from other individuals.

Here we describe predation on birds and prey-sharing by a semi-free group of brown capuchin monkeys (*C. apella*). Predation of this sort is rare, but when it does happen, prey transfer is frequent. Due to the small number of observations, the predation and particularly the prey-transfer events are analysed only qualitatively, while examining any relation between the occurrence of transfers and the hierarchical and affiliative relationship between the individuals involved.

Study Site, Group and Data Collection

The capuchin monkey group lives in an area of 18 ha in the Tietê Ecological Park (São Paulo, Brazil). The area was reforested and has two important features: 1) there are no natural predators of *Cebus,* such as *Harpia harpyja*, *Felis pardalis*, *Boa constrictor* or crocodiles (Freese and Oppenheimer, 1981), and 2) the group is provisioned daily with plentiful fruits and vegetables (see Ottoni and Mannu, 2001). Besides the provisioning, the group forages for other foods available in the area, taking up about 50% of an individual's daily activities (RF, unpubl. data). The wet season is from October to March, and the dry season is from April to September (mean monthly rainfall is 178 mm and 69.3 mm, respectively) (São Paulo, DAEE, 2001). The group varied in size from 15 to 25 individuals: five adult males (two castrated), five adult females, three subadult males, one subadult female and 10 juveniles and infants.

Our observations cover a period of five years, and were collected on an *ad libitum* basis during the course of other studies by MM (January 1996 to December 1999, see Ottoni and Mannu, 2001), and BR and RF (2000/2001). The total time of contact with the group was 2768 hours.

Results and Discussion

Table 1 summarises the occurrences of predation and prey-transfers. The data are somewhat biased toward the years 2000/2001 due to an increase in observation hours per week relative to the previous years. For the purposes of calculating the rates of prey sharing we consider two types of predation data: a) the events when predation was actually observed, and b) the predation event was not seen, the animal merely being observed with a carcass.

Twenty-four predation events were recorded; a rate of 0.86 events per 100 observation hours. This is much lower than the bird predation frequency described for *C. capucinus* in a natural environment by Rose (1997); predatory behaviour, however, did not constitute the focus of the studies in this capuchin group as it did in Rose's study. Ten of the events were observed in the first three years of observation (rate of 0.6 every 100 hours) and 14 in the remaining period when the weekly hours of observation of the group were increased (1.13 every 100 hours). This and the fact that predation, and in many cases the consumption of the prey, is a very fast and almost noiseless behaviour suggests that the frequency is underestimated.

Predation frequency was the same between seasons: Dry season - 0.8 events every 100 hours, wet season - 0.9 every 100 hours. Rose (1997) however, found a higher frequency in the wet season (3.09 per 100 hours) when compared to the dry season (2.04 per 100 hours). The lack of any seasonal difference and the lower predation rates may be a result of provisioning, but also to a reduced availability of prey with our group ranging over a smaller, confined area when compared to the *C. capucinus* of Rose (1997).

The 10 predation events recorded were all by males: six by adults (four of these by the dominant male), three by subadults and one by a juvenile. Of the 14 events in which individuals were found with a carcass, the possessor was a male (adult, subadult or juvenile) in 10 and an adult female in three. In one case an adult male and an adult female eat from the same carcass. Overall, the age/sex predation biases are similar to those described for *C. capucinus*, where adult males (especially the dominant) were the most efficient predators (Perry and Rose, 1994; Rose, 1997).

Some sort of food transfer occurred in 18 of the 24 predation events. The transfers are classed as: *co-feeding* - two individuals eat different prey near to each other (event nº 20); *delayed scrounging* - one individual eats the leftovers of another (events nº 4, 5, 6, 8, 9, 17, 19, 20, 22 and 23); *tolerated scrounging* - the possessor allows another to come near and retrieve dropped scraps (events nº 4, 5, 7, 8, 16, 17 and 19); *facilitated scrounging* - the possessor moves towards an individual, drops food scraps and allows the other to retrieve them (event nº 10); *passive food-sharing* - the possessor permits another to retrieve food items from his/her hands or mouth (events nº 3, 5, 13, 14, 17, 21 and 24); and *theft* - one individual seizes the food from another (event nº 13). Note that different types of food transfer can occur during the same predation event, sometimes involving different individuals. (For a discussion of terms and definitions see Ottoni *et al.*, in prep.) The proportion of prey sharing (in 18/24 predation events) may be even greater if we consider that some of the 'carcass' events may be the result of a previous non-witnessed food-transfer. The predominant type of prey transfer observed in this study was also the most common type observed in *C. capucinus* by Rose (1997), that is, the transfers were generally relaxed involving the collection of leftovers or scraps.

Again, this high rate of prey-sharing that we observed may be related to the food-abundance of the study site. A similar phenomena was described in *C. capucinus*: higher rates of prey-sharing were found in a rich environment (Lomas Barbudal) than in an environment with marked seasonality in food abundance (Santa Rosa, Costa Rica) (Perry and Rose, 1994; Rose, 1997).

Table 1: Events and participants of predation and prey-transfer between individuals in a capuchin monkeys groups, *Cebus apella*, in the Tietê Ecological Park, São Paulo.

	Date	Predation		Prey-transfer	Individuals
		Observed	Carcass		
1.	Sep/97		Juvenile male		Jq or Qz
2.	Sep/97		Juvenile male		Jq
3.	Jun/ 98		Adult male and sub-adult female	Passive sharing of a bird.	Med – Jan
4.	Jan/99		Adult male	Subadult male collects scraps nearby and then remains with the carcass	Mc –Ped
5.	Apr/99	Dominant male		(Encaged bird). Adult male collects scraps nearby. Adult female and infant eating the carcass minutes later.	Bq – Joao– Fis – Man
6.	Oct 99	Dominant male		Juvenile eating the carcass minutes later.	Bq – Frk
7.	Oct/99		Adult female	Subadult male collects falling scraps nearby.	Fis – Eli
8.	Nov/99		Dominant male	Adult male collecting scraps nearby after it remains with the carcass.	Bq – Med
9.	Nov/99		Dominant male	Subadult male collected the discarded carcass. Adult male collecting scraps nearby.	Bq- Qz – Med
10.	Dec/99	Adult male		Adult male discarded carcass in front of adult female.	Med-Jan
11.	Jun/00		Juvenile male	Juvenile male interested.	Frk- Edu
12.	Jul/00	Subadult male			Ped
13.	Jul/00		Adult male	Allows an infant but not a juvenile to take some pieces of the carcass. Later the infant remains with the carcass. Its mother steals the carcass from him.	Med – Joa – Lob - Jan
14.	Aug/00	Subadult male		Avoids an adult male that follows him. After 15 min the carcass' owner approaches and permits a subadult female to take a piece of the carcass.	Qz – Kk – Jq
15.	Sep/00		Adult female		Fis
16.	Oct/00	Adult male		Avoids a juvenile but allows an infant to eat falling scraps nearby.	Sus – Lob – Dw
17.	Nov/00		Subadult male	Subadult avoided adult male, who later collected the carcass. Then subadult female takes pieces of meat from the carcass, collects scraps nearby and eats in contact with adult male.	Qz – Jq – Kk
18.	Nov/ 00	Juvenile male		(Leaves the bird uneaten).	Frk
19.	Jan 01	Subadult male		Allows a juvenile to eat falling scraps. Juvenile collects abandoned carcass.	Ped – Frk
20.	Feb 01	Dominant male		(Predation on nestling birds). Adult male cofeeding. Juvenile collects abandoned carcass.	Bq – Med – Joa
21.	Mar/01		Juvenile male	Infant takes pieces of meat from the carcass.	Man – Dw
22.	Apr 01		Adult female	Dominant male collects the discarded carcass.	Fis – Bq
23.	May/01		Juvenile male	Dominant male collects the discarded carcass.	Edu- Bq
24.	Jun/01		Dominant male	Adult female and juvenile taking pieces of the carcass.	Bq – Fis – Man

Prey transfers occurred 12 times between adults or subadults: five from a male to a female (5, 10, 14, 17, 24); two from a female to a male (7, 22); six between males (4, 5, 8, 9, 17, 20) and none between females. In seven events the transfer was from an adult or subadult to a juvenile or infant (5, 6, 13, 16, 19, 20, 24), and in two events in the opposite direction (13, 23). One food transfer event was between juveniles (21). As such, the frequency of sharing between adults is greater than that between adults and youngsters, and sharing occurs mainly between males or from males to females. This contrasts with the observations for *C. capucinus*, in which prey transfer was rarely observed between adults and occurred mainly from mother to infants or between immatures (Perry and Rose, 1994; Rose, 1997).

In 15 events the transfer was from a high to a low ranking individual. In *C. capucinus* the rank of the possessor was either unrelated to the direction of sharing or merely facilitated the theft of the subordinate's prizes by the more dominant individuals. Dominance relationships were inferred by aggression, chasing, cowering, and avoidance, and affiliative relationships were inferred by spatial proximity and grooming (RF and PI, in prep.).

It is noteworthy that in 10 of 18 food transfers there was a close affiliative relationship between the individuals involved: in events 3 and 10, the female and male adults were preferential partners in grooming, sleeping and allocare (see Izar [1997] for descriptions on preferential partnerships in *C. apella*); in events 5, 22 and 24 the transfers were between dominant male and female and their offspring; in event 17 between an adult male and subadult female that belonged to a small subgroup; in event 19, transfer was between subadult and juvenile males which were preferential partners in play. As affiliated individuals stay close to each other, spatial proximity may be the factor influencing the occurrence of transfers in these 10 events. However, in another three events (described in greater detail below) spatial proximity could not have been the only factor, as there were at least three individuals close by, and the possessor shared the prey with only one of them.

(Event 13) 00': Medeiros, an adult castrated male, is seen eating a bird carcass. 10': Joana, an 11-month old infant often carried and groomed by Medeiros, watches him, collecting some scraps nearby. Lobato, a 3-year old juvenile approaches, Medeiros chases him away. Joana bites pieces of the carcass from Medeiros' hands. Medeiros leaves, Joana remains with the carcass. 22': Janete (Joana's mother) steals the carcass from Joana, who then suckles. [Medeiros and Janete are the preferential partners already described in the events 3 and 10].

(Event 16) 00': Noises indicating a fight are heard, and Suspeito (a castrated adult male) leaves the area carrying a bird in its mouth. 02': Suspeito eats the bird in a tree. Lobato, a juvenile, approaches. Suspeito turns his back on Lobato. Lobato approaches Suspeito again. Suspeito pushes Lobato's head away from the carcass. 04': Lobato is nearby, making some attempts to approach Suspeito. Suspeito repeatedly turns his back or avoids Lobato. 07': Darwin approaches Lobato and tries to play with him. Darwin sees Suspeito. 07'30": Darwin approaches Suspeito and collects some scraps. 09': Darwin takes a small piece of the carcass and eats it. Suspeito moves higher in the tree. 11': Darwin approaches Suspeito, takes another piece of the carcass, and eats it. 12': Darwin starts playing with Lobato, Suspeito remains with the carcass. 25': Suspeito leaves the carcass. [In this event, there is social affinity between Suspeito and Meire (Darwin's mother), similar to that observed between Medeiros and Janete, that is, Suspeito and Meire are preferential partners for sleeping and grooming, although Suspeito does not allocare Darwin as much as Medeiros allocares Joana.]

(Event 14) 00': Quinzinho, a subadult male, catches a bird. Joaquim, an adult male, witnesses the predation. 01': After eating the head of the bird, Quinzinho walks carrying the prey in his mouth. Joaquim follows him for about 50 m. Kika, a subadult female, also begins to follow him. 03': Quinzinho stops in a tree and eats the bird for about 15 minutes. After some failed attempts to approach Quinzinho, Joaquim leaves the area. Meanwhile, Kika remains foraging about 20 m from Quinzinho. 18': Quinzinho, still holding the carcass, approaches to 1 m from Kika. She approaches him, makes an aggressive display (not towards him) and then takes a big piece of the carcass. They both eat in close proximity for another 5 minutes. 23': they leave. [Again, the social relationships data show that Quinzinho and Kika are "preferential partners". In contrast, Quinzinho and Joaquim were seen fighting several times (Joaquim is dominant over Quinzinho)].

In the first two events the carcass owner clearly tolerated the approach and begging of an individual with which it is affiliated but not from another with which it is less affiliated. In the third event, the possessor avoided the approach attempts of one individual and actively approached another, with which it is affiliated, and shared the meat.

We are not sure whether the observed differences between *C. apella* and *C. capucinus* in predation rates and prey transfer rates and directions are due to the type of prey, to the study site or to the species under study. Predation on birds differs from predation on coatis because birds may be easily caught and eaten secretively by the individuals. Robinson (1986) reported that capuchins successfully foraging on nestling birds were discrete in finding a nest, and frequently moved away from the rest of the group. The particular characteristics of this study site make the results difficult to generalise. However, other studies have shown differences in territorial behaviours and hierarchical rigidity of *C. apella* and other capuchins (*C. apella* is a non-territorial and more despotic species) (Janson, 1986; Perry, 1998) which suggests the possibility of specific differences in the dynamics involving social relationships and food sharing.

Recently, Mitani and Watts (2001) compared three hypotheses about the hunting and sharing of meat in wild chimpanzees. Their data did not support the ecological (i.e., in periods of food shortage) or hunting-for-sex hypothesis, but did support the hypothesis that the sharing of meat is used as a social tool to enhance bonding between adult males.

Although the bird predation events described here did not involve cooperative hunts by the group members, sharing does seem to be influenced by the affiliative relationships in the group. There are indications that individuals of *C. apella* are capable of distinguishing and behaving differentially towards other group members. Janson (1984) described non-tolerance by the dominant males towards another males' offspring in feeding trees. The work of de Waal (1997, 2000; de Waal *et al.*, 1993) also suggests this capacity. Overall, the analysis of prey transfer described here, and most especially in three events, suggest that, in *C. apella*, highly valuable food items are preferentially shared with more affiliated individuals.

The drawbacks in data collection and analysis and the many possible proximate variables interfering in these events of meat sharing (for example, recent fights between the individuals involved or how hungry the carcass owner is), do not allow us to be conclusive about the dynamics involving affinity and food sharing. Nevertheless, the apparent refusal to share with some individuals and tolerance towards others in three events raises two questions: to what extent are these tripartite events of food transfer indicative of the social complexity and social knowledge of the capuchin monkeys? Likewise, is preferential prey sharing a tool for improving and maintaining valuable relationships within the *C. apella* groups? Experiments on food transfer in situations involving three individuals, and further observations of other tripartite relations, such as coalitions, could help to answer these questions.

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THE BLACK HOWLER MONKEY (*ALOUATTA PIGRA*) AND SPIDER MONKEY (*ATELES GEOFFROYI*) IN THE MAYAN SITE OF YAXCHILÁN, CHIAPAS, MEXICO: A PRELIMINARY SURVEY

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Introduction

The black howler monkey of Mesoamerica, *Alouatta pigra*, has a restricted geographic distribution in Belize, Guatemala and Mexico. The majority of its range (*c.* 80%) is in Mexico in parts of the states of Tabasco and Chiapas, and it is the only *Alouatta* species present in the Yucatán peninsula (Smith, 1970; Horwich and Johnson, 1986; Watts and Rico-Gray, 1987). Spider monkeys (*Ateles geoffroyi*) coexist with *A. pigra* in many areas, but because of hunting for food and to obtain pet infants, and the destruction and fragmentation of their forests, they are among the most endangered primates in Mesoamerica (Kinzey, 1998).

Information on population parameters and conservation status for *A. pigra* are available from only a few localities, namely, two sites in Belize in the Bermuda Landing and Cockscomb Wildlife Reserve (Horwich, 1998; Silver *et al.*, 1998; Ostro *et al.*, 1999, 2000), in Tikal, Guatemala (Coelho *et al.*, 1976), in the Muchukux forest in Quintana Roo, Mexico (González-Kirchner, 1998) and in Palenque, Chiapas, Mexico (Estrada *et al.*, 2002). A similar situation prevails in the case of *A. geoffroyi*, with information available only from few localities in Mexico, namely Los Tuxtlas, Veracruz (Estrada and Coates-Estrada, 1996; Silva-López and Jímenez-Huerta, 2000) and the Muchukux and Naji Tucha forests in Quintana Roo, Mexico (González-Kirchner, 1999). Some information is available on populations of *A. geoffroyi* from Tikal, Guatemala (Coelho *et al.*, 1976). Such paucity of information and the rapid fragmentation and conversion of the natural habitat of *A. pigra* and *A. geoffroyi* to pasture lands and agricultural fields in northern Mesoamerica, coupled with intensive hunting pressure and trafficking of infants as pets, makes the task of protecting these primate species particularly difficult (Estrada and Coates-Estrada, 1988; Rylands *et al.*, 1995). Data on group size, density, and age and sex composition for populations of *A. pigra* and *A. geoffroyi* in large forest tracts and in landscapes modified by man may provide information on the variability of population parameters, and may also improve our understanding of their tolerance of habitat loss and fragmentation (Estrada and Coates-Estrada, 1996; Estrada *et al.*, 1994; Crockett, 1998; Cuarón, 2000).

In this paper we provide preliminary data on group size, population density and demographic structure for populations of *A. pigra* and *A. geoffroyi* in the protected forest surrounding the ruins of the Mayan site of Yaxchilán, Chiapas, Mexico. The data we present are part of a series of surveys of primate populations inhabiting the protected forests surrounding major Mayan archeological sites in southern Mexico (Estrada *et al.*, 2002; in prep.).

Methods

Study area and sites

The study was carried out at the Mayan site of Yaxchilán, Chiapas, Mexico (16°53´N, 90°57´W, 250 m above sea level), near the Río Usumacinta, that marks the international boundary between Mexico and Guatemala (Fig. 1). There is a protected forest of about 2700 ha surrounding the Mayan site, of which 1100 ha are contained within an omega-shaped area by the river, while the rest extends inland (Fig. 1). This forest is connected to 35,000 ha of protected rain forest in the Community Reserve "La Cojolita". The climate is hot and humid, and average annual precipitation is 1951 mm, with a dry season from December to April (average monthly rainfall = 42.4 ±12.7) and a wetter period from May to November (average monthly rainfall = 256.0 ±100.1 mm). Mean annual temperature is 25.5 ±2.2°C (range 21–28°C).

Tall evergreen rain forest (tree heights between 15–45 m) is the dominant vegetation at the study site (<www.conabio.gob.mx>). Abundant trees in this forest are *Brosimum alicastrum*, *B. costaricanum*, *Poulsenia armata*, *Ficus glabrata* (Moraceae), *Manilkara zapota*, *Pouteria sapota* (Sapotaceae), *Bursera simaruba* (Burseraceae), *Lonchocarpus* sp. (Fabaceae), and *Spondias* spp. (Anacardiaceae) (Meave, 1990).

The Mayan site dates back to about 500 AD (Coe, 1998). Only about 5% of the ruins of the site have been excavated, the rest are covered by rain forest vegetation, and vestiges of buildings can be easily observed amidst the vegetation or roots of trees. Several of the Mayan structures were built at the top of the many hills, while the majority of the largest buildings and plazas are found close to the edge of the Río Usumacinta (Figs. 1, 2).

Primate surveys

Primate surveys were conducted in November 2001 and in April 2002 in a 100 ha area around the Mayan ruins of Yaxchilán. We triangulated early morning (0500 hrs) choruses to determine the presence and location of howler monkey troops. Vocalizations emitted by spider monkeys were also recorded for the same purpose. An existing system of trails was used to gain access to different parts of the 100 ha area. To triangulate monkey vocalizations in the early morning, we climbed to the top of the tallest (50 m) Mayan structures (Temples 39, 40 and 41) from which we could monitor vocal exchanges between troops in the 100 ha area. The direction from which vocalizations were heard were determined with a compass and plotted on a detailed map of the site.

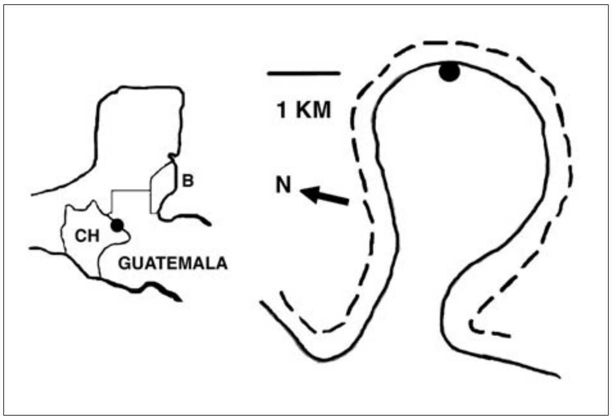

Figure 1. Location of Yaxchilán by the Río Usumacinta demarcating the international boundary between Mexico and Guatemala. The omega-shaped area comprises the protected forest of the Mayan site, about 1100 ha, with an additional 1600 ha inland. The black dot is the area where the ruins are located. The dotted line around the omega shape shows the route followed during the river survey of howler and spider monkeys. CH = Chiapas, B = Belize.

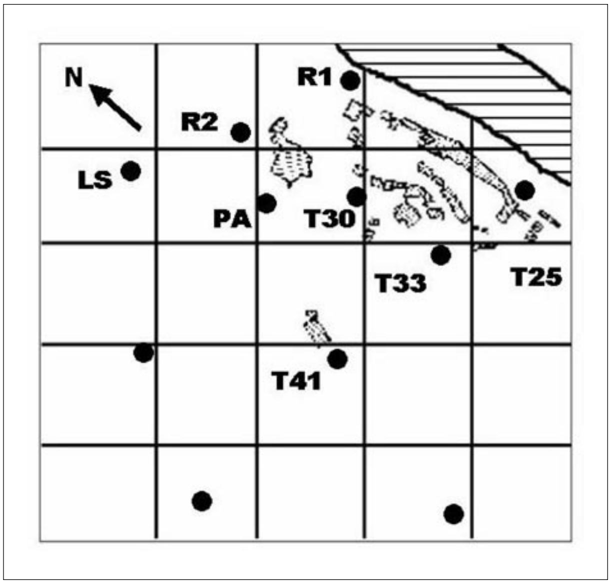

Figure 2. Study area (100 ha) where the Mayan ruins of Yaxchilán are located. The shaded area in the upper right corner is the Río Usumacinta. Codes refer to howler monkey troops detected. The three dots without code are three troops that were heard howling, but could not be located. Grid cells are 200 x 200 m.

Two teams searched for the monkeys. An average of 8.0 ±2.0 hrs/day was spent exploring different sections of the study area by walking slowly (1.0 km/hr) through the forest or along the existing system of trails. When a troop of howler monkeys or a subgroup of spider monkeys was sighted we noted its location on a detailed map of the archeological buildings. A GPS (Garmin GPS III, Kansas, USA) was used to obtain precise georeference points. We completed 200 man/hours and walked 62.3 km surveying howler and spider monkeys in the study area.

Contacted howler and spider monkey groups were followed for several hours and repeatedly counted by each team to confirm identification and age and sex composition. Individuals were classified as adults, juveniles and dependant infants. Accurate identification of the sex was only possible for the adults and juveniles. All groups detected were found and followed on consecutive days, further aiding in confirmation of their size and composition and identity. We carefully examined consistency in the age and sex composition of each group, their location in relation to the trail system and topographical and archaeological features of the terrain, and their relative location with other troops. Trees in which howler and spider monkeys were sighted were measured (height and diameter at breast height - dbh). Average weights of *A. pigra* and *A. geoffroyi* available in the literature (Coelho *et al.*, 1976) were used to estimate the biomass (kg/ha) represented by the monkeys in the study area.

Two additional surveys of howler and spider monkeys were conducted from a boat by navigating 13.7 km along the Río Usumacinta, following the contour of the omega-shaped area where the site of Yaxchilán is located (Fig. 1). They started at 0530 hrs and were conducted down river (S-N direction) with the outboard motor off, allowing for a gentle and silent flow of the boat. Vocalizations and sightings were located using the GPS. A GPS reading was taken every 500 m to obtain an estimate of the length and width of the omega-shaped study area.

Results

Howler monkeys

Vocalization surveys resulted in the detection of 11 troops of howler monkeys in the 100 ha area surrounding the Mayan buildings. Eight were in the forest and repeatedly counted on consecutive days, yielding a total 54 howler monkeys and one solitary male. The other three troops could not be found, but were heard howling on other days in the same general location (W-SW of the ruins) (Fig. 2).

Forty-one percent of the individuals counted were adult males, 30% were adult females, 8% were juvenile males, 6% were juvenile females and 15% were infants (Table 1). Average troop size was 6.6 ±2.1 individuals, ranging from 4 to 10. Troops had an average of 2.8 ±1.6 adult males, 2.0 ±0.5 adult females, 0.8 + 0.4 juvenile males, 1.0 ±0.0 juvenile females and 1.3 ±0.5 infants (Table 1).

Adult male to adult female ratio was 1:0.73, and in juveniles the sex ratio was 1:0.75. Adult to non-adult ratio was 1: 0.40, and adult female to immature ratio was 1:0.97 (Table 1). Using the average troop size calculated for the eight counted, and the total number of troops detected, howler monkey density in the 100 ha study area was estimated at 0.72 ind/ha or 72.6 ind/km^2. Total biomass represented by the eight troops and the solitary male was estimated at 367 kg, and mean biomass per troop was 44.8 ±15.0 kg. Using this last figure, we estimated howler monkey biomass at 492.8 kg/km^2 or 4.9 kg/ha.

Spider monkeys

We confirmed the existence of three subgroups of spider monkeys in the 100 ha study area with a total of 17 individuals. They were observed several times in different locations, and sometimes in the same trees as howler monkeys. Their identity was confirmed by the size of the subgroup and by its age and sex composition. Adult males accounted for 35.3% of individuals counted, adult females for 29.4%, juvenile males for 5.9%, juvenile females for 11.8% and infants for 17.6% (Table 1).

Mean subgroup size was 5.67 ±3.06 individuals, and mean sex and age composition of these subgroups was 2.00 ±1.00 adult males, 1.67 ±1.15 adult females, 1.50 ±0.71 juveniles and 1.50 ±0.71 infants. The adult male to adult female sex ratio was 1:0.83 and in juveniles it was 1:2.0; the adult female to immature ratio was 1:1.20. Density was estimated at 0.17 ind/ha or 17 ind/km^2 and spider monkey biomass at 106.45 kg/km^2 or 1.06 kg/ha (Table 1).

Vegetation types used by howler and spider monkeys

All sightings of howler and spider monkeys were in tall evergreen rain forest. The mean height and dbh of trees used by howler monkeys were 11.07 ±6.9 m (range 4-30 m) and 63.4 ±28.5 cm (range 45-120 cm), respectively. In the case of spider monkeys, mean height and dbh of trees used were 19.6 ±7.3 m (range 4-30 m) and 78.7 ±28.3 cm (range 45-120 cm), respectively. Spider monkeys preferred taller trees than howler monkeys (U test, P<0.01) (Fig. 2).

River survey

The survey down the Río Usumacinta along the contour of the omega-shaped study area resulted in the auditory detection of 17 troops of howler monkeys and one subgroup

Table 1. Results of the survey of howler and spider monkeys in a 100 ha area around the Mayan site of Yaxchilán, Chiapas, Mexico, located at the edge of the Río Usumacinta.

	Adult		Juvenile			Total
	Males	Females	Males	Females	Infants	
Alouatta pigra						
T25	5	2	0	1	2	10
T33	3	2	1	1	2	9
T30	2	2	1		1	6
R1	1	2		1		4
R2	5	2			1	8
PA	2	1	1		1	5
T41	1	3			1	5
LSTRIP	3	2	1			6
Total	22	16	4	3	8	53
Mean	2.8	2.0	0.8	1.0	1.3	6.6
+ sd	1.6	0.5	0.4	0.0	0.5	2.1
Solitary males	1					1
Total howler monkeys						54
Ateles geoffroyi						
Subgroup						
1	1	1			1	3
2	3	1	1			5
3	2	3		2	2	9
Total spider monkeys	6	5	1	2	3	17
Mean	2.00	1.67	1.00	2.00	1.50	5.67
± sd	1.00	1.15	0.00	0.00	0.71	3.06

of spider monkeys, along a stretch of 13.7 km. Sixty-five percent of the howler monkey troops (n = 11) and the single spider monkey subgroup were detected on the Mexican side of the river. Howler monkey troops were detected at a rate of 0.80 troops/km surveyed on the Mexican side and 0.48 troops/km surveyed on the Guatemalan side.

Discussion

The results of the primate surveys presented here should be viewed as preliminary. Further field work will provide information on the consistency and variability of the demographic traits we have observed for *A. pigra* and *A. geoffroyi* at Yaxchilán. Our surveys showed that howler troops and *Ateles* subgroups were detected at a rate of 0.18 troops/km and 0.048 subgroups/km surveyed, respectively, confirming that *A. pigra* is more numerous than *A. geoffroyi* at Yaxchilán. The 13.7 km river survey along the edges of the omega shape area in which Yaxchilán is located, also showed a predominance of howler monkeys, with spider monkeys present in lower numbers.

Howler monkeys

The density of 72.6 individuals/km² we estimated for *A. pigra* in Yaxchilán is significantly higher than those reported for this species in other large rain forest tracts in Mexico, such as Muchukux, Quintana Roo (15.1 ind/km²; González-Kirchner, 1998) and Calakmul and Palenque, Chiapas (15.2 ind/km² and 23 ind/km², respectively; Estrada *et al.,* 2002, in prep.). Coelho *et al.* (1976) and Schlichte (1978) reported a density of 5-9 individuals/km² (1978) at Tikal, Guatemala.

High densities of *A. pigra* have been reported from Belize, ranging from 47–178 individuals/km² in fragmented strips of riparian vegetation and small forest patches, which authors have indicated may be due to overcrowding (Silver *et al.*, 1999; Ostro *et al.*, 1999, 2000; Horwich *et al.*, 2001). However, the high densities found in Yaxchilán and in other large tracts of rain forest such as Calakmul, Campeche (Estrada *et al.*, in prep.), Palenque, Chiapas (Estrada *et al.*, 2002), and in Muchukux, Quintana Roo (González-Kirchner, 1998), seem to contradict such an assumption.

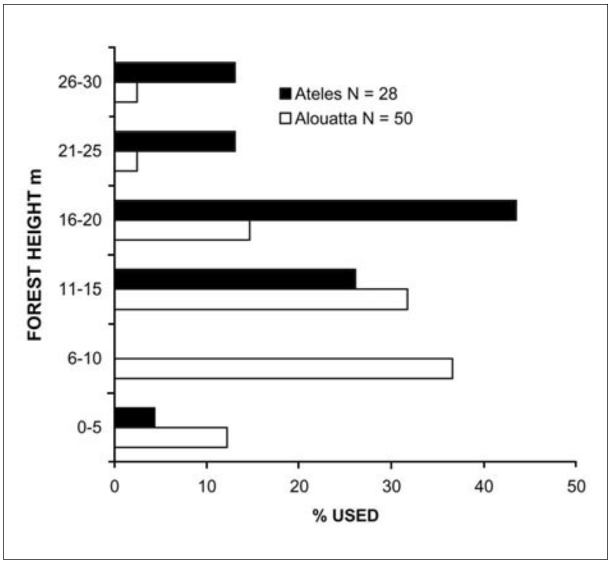

Figure 3. Distribution of heights of trees used by spider and howler monkeys at the site of Yaxchilán. Note the preference by spider monkeys for tall trees (>10 m), whereas howler monkeys preferred trees >4 and < 25 m).

Mean troop size in Yaxchilán (6.6 ±2.1 individuals) compares to troop sizes reported for *A. pigra* in Calakmul, Campeche (7.5 ±2.3 individuals; Estrada *et al.*, in prep.) and Palenque, Chiapas (7.0 ±2.8 individuals; Estrada *et al.*, 2002), but they are higher than those reported in Belize and Guatemala, where mean troop size varies from 4.4 to 6.3 individuals (Coelho *et al.*, 1978; Bolin, 1981; Horwich and Gebhard, 1983; Ostro *et al.*, 1999), and the small troops averaging 3.16 individuals reported for *A. pigra* in central Quintana Roo, Mexico (González-Kirchner, 1998).

Seventy-five percent of the troops detected in Yaxchilán had more than one adult male, as was found in Palenque, Chiapas, and in Calakmul, Campeche, where 75% and 60% of the troops, respectively, were multimale (Estrada *et al.*, 2002, in prep.). However, at Tikal, Guatemala, troop surveys by different authors consistently reported unimale troops (Coelho *et al.*, 1976; Schlichte, 1978; Horwich and Johnson, 1986). In Yaxchilán, Calakmul, and in Palenque the overall adult sex ratio was 1:0.73 to 1:0.90 (Estrada *et al.*, 2002, in prep.). Data from Belize showed most recorded troops to be unimale, and the adult sex ratio was 1:1 to 1:1.63 (Bolin, 1981; Ostro *et al.*, 1999; Horwich *et al.*, 2001).

Spider monkeys

The density (17 ind/km²) we report for *A. geoffroyi* in Yaxchilán falls within the range reported for the species in other extensive tracts of rain forest in Quintana Roo, Mexico, such as Najil Tucha (14.5 ind/km²) and Muchukux (27.1 ind/km²) (González-Kirchner, 1999), and in Calakmul (25 ind/km²), Campeche, Mexico (Estrada *et al.*, in prep.). In Tikal, Guatemala, densities for *A. geoffroyi* were found to range from 26 to 45 ind/km² (Coelho *et al.*, 1976; Cant, 1978), while in Costa Rica population densities ranged from 6-9 ind/km² (Freese, 1976; Chapman, 1988). In fragmented landscapes in Los Tuxtlas, Mexico, *A. geoffroyi* is found at densities of 0.22 ind/km² (Estrada and Coates-Estrada, 1996), but in more extensive forest in the same region, the density was reported at 0.66 ind/km² (Silva-López and Jímenez-Huerta, 2000).

Spider monkey subgroup size (5.6 ±3.06 individuals) in Yaxchilán is similar to that reported for *A. geoffroyi* in Calakmul, Campeche (6.6 individuals) (Estrada *et al.*, in prep.), in Chiapas, Mexico (5.0 individuals) (Eisenberg, 1966) and in Los Tuxtlas, Veracruz at 0.66-6.2 individuals (Silva-López *et al.*, 1988, 2000). It is higher than that reported for the Muchukux and Najil Tucha forests in Quintana Roo, where subgroup sizes averaged 4.5 and 3.8 individuals, respectively (González-Kirchner, 1999), as well as in Belize and Guatemala (4.5 and 2.6 individuals, respectively) (Coelho *et al.*, 1976; Cant, 1978, 1990),

The adult sex ratio detected in Yaxchilán (1:0.83) strongly favoring adult males, contrasts with the ratio reported for the same species in Calakmul (1:1.96) (Estrada *et al.*, in prep.) and in Muchukux and Najil Tucha forests in Quintana Roo (1:1.26) (González-Kirchner, 1999). A sex ratio of 1:1.56 was reported for spider monkeys in disturbed forest areas in Los Tuxtlas, Veracruz (Silva-López *et al.*, 1988), while a ratio of 1:3.25 was reported for a population of spider monkeys in an undisturbed forest site in the same region (Silva-López and Jímenez-Huerta, 2000). The adult sex ratio for *A. geoffroyi* reported in Tikal, Guatemala was 1:2.23 (Coelho *et al.*, 1976). The 1: 1.20 adult female to immature ratio in Yaxchilán suggests a population with a capacity to sustain itself and grow (Clarke *et al.*, 2002).

Spider monkeys in Yaxchilán preferred the tall trees of the upper canopy (70% used were 16- > 30 m in height), as has been noted in other localities in Mexico, such as Quintana Roo (González-Kirchner, 1999) and Calakmul (Estrada *et al.*, in prep.), besides other Neotropical sites (Van Roosmalen and Klein, 1988; Symington, 1988; Yoneda, 1990). They can, however, be seen at all levels of the forest when traveling and will often forage in low trees bearing ripe fruit. The howler monkeys in Yaxchilán preferred lower strata than spider monkeys, spending much more time in the middle and lower canopy. This was similar to our observations in Calakmul (Estrada *et al.*, in prep.).

General comments

The differences in population parameters for *A. pigra* and *A. geoffroyi* between Yaxchilán and other sites, may be within the natural variation in their populations, due to hunting or to the lack of data on both species in Mexico, Belize and Guatemala. Clearly, more sites need to be surveyed to document the range of variation in density, group size and other demographics for *A. pigra* and *A. geoffroyi* within the range of their current geographic distribution in northern Mesoamerica.

In this vein of thinking, it has been indicated that *A. pigra* is typically found in riparian forests at elevations below 400 m, and that the population in Tikal, Guatemala (Ostro *et al.*, 2000) is exceptional. However, our survey in Yaxchilán showed no concentration of howler troops along the Río Usumacinta; the majority of the troops detected were distributed inland. In Palenque, Chiapas and Calakmul, Campeche in Mexico, *A. pigra* populations are common in the non-riparian habitats dominating these sites, and in Palenque they occur in forests at 500 m above sea level (Estrada *et al.*, 2002; Estrada *et al.*, in prep.).

While discriminating separate howler monkey groups is relatively easy, it is more difficult for spider monkeys. The members of relatively large groups or communities travel in small temporary subgroups of unstable composition (Van Roosmalen and Klein, 1988; Kinzey, 1996). Because of the fission-fusion nature of their social organization it is rare to see all members of the community together, and group sizes are difficult to estimate (Coelho *et al.*, 1976; Klein and Klein, 1977). The surveys conducted along the Río Usumacinta in Yaxchilán detected more howler and spider monkeys on the Mexican side than on the Guatemalan side of the river. During our surveys we noted much deforestation (slash and burn), as well as hunting (rifle shots heard several times) on the Guatemalan side. Although preliminary, these observations suggest the need for further surveys to better assess and monitor the status of *A. pigra* and *A. geoffroyi* along the international border formed by the Río Usumacinta.

The presence of the important Mayan ruins at Yaxchilán has resulted in the permanent protection of the surrounding rain forest, and its populations of *A. pigra* and *A. geoffroyi.* Yaxchilán. This is also true of sites such as Palenque (Estrada *et al.*, 2002) and Calakmul (Estrada *et al.*, in prep.), and together they constitute important foci for the conservation of *A. pigra* and *A. geoffroyi* in this area of Mesoamerica.

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A POSSIBLE EXAMPLE OF COERCIVE MATING IN MANTLED HOWLING MONKEYS (*ALOUATTA PALLIATA*) RELATED TO SPERM COMPETITION

Clara B. Jones

Introduction

If females with internal fertilization mate more than once during a reproductive cycle, the potential exists for sperm from more than one male to compete for access to eggs inside her reproductive tract. This phenomenon, termed "sperm competition," has received increasing attention in the mammalian, including primate, literature in recent years (e.g., Harcourt, 1997; Gomendio *et al.*, 1998; Dixson, 1998). Several studies have demonstrated that coercive mating ("coercive copulations," "forced copulations," "rape") may be associated with multiple mating by female insects (Moller, 1998), and Smith (1984; also see Thornhill and Palmer, 2000) suggested that human rape might have evolved as an adaptation to sperm competition, although there is no necessary or sufficient relationship between rape and sperm competition. The present short communication describes an apparent case of coercive mating in the context of sperm competition for mantled howling monkeys (*Alouatta palliata*), a species in which coercive mating has not been reported. Attempts to force copulations by male mantled howlers are generally rebuffed successfully by females with a bared-teeth, open-mouth display, sometimes accompanied by vocalizations (Jones, 1985). Such behavior may implicate coercive mating in the evolutionary history of this species. A reanalysis of the raw data for the 1985 report revealed one case of apparently coercive mating in association with multiple mating by a female.

Methods

The study was conducted in 1976 and 1977 at Hacienda La Pacifica, Cañas, Guanacaste, Costa Rica (10°28'N, 85°07'W). Details on the research, including group composition (Group 5), methods (focal), habitat (riparian), social organization (multimale-multifemale), sexual behavior, and life history can be found elsewhere (Jones, 2000 and references therein).

Results

On 5 March 1977 (late dry season), the focal animal was male R, the third and lowest-ranking male in the study group. He was observed to lie and rest in a tree along the Rio Corobici with female PY who demonstrated evidence of estrus –2 (a few days subsequent to "peak" estrus [see Jones, 1985]). A sub-adult/young adult male who had not yet joined the male hierarchy rested approximately 50 feet downriver, and several adult females and young were nearby. No other adult males were sighted. Male R vocalized continuously with high intensity guttural barks to female PY, the young male, and/or (an)other individual(s). While the functions of vocalizations in mantled howlers have not been investigated, these barks have been interpreted to communicate motivation (Jones, 2000).

At 1:04 pm, male R initiated the stereotyped lingual gesture (tongue moving rapidly in and out of mouth, a sexual signal characteristic of the genus *Alouatta* [Carpenter, 1934]) with female PY, who responded in kind. Reciprocal lingual gesturing continued for 3 min. Male R subsequently lay rear-present to female PY, a posture that has been interpreted as submissive (Jones, 2000). At 1:20 pm, male R sat up and mounted female PY, thrusting 40 times in 37 sec with an ejaculatory pause. Subsequent to copulation, the pair rested. During the resting period, male R occasionally emitted high guttural barks.

At 2:21 pm, female PY initiated lingual gesturing with male R. The male, lying on a branch with the female, failed to reciprocate the female's lingual gestures and shifted posture in apparent vigilance. At 2:30 p.m., male R initiated lingual gestures with female PY and subsequently sat up, looking downriver in the direction of the young male. At 2:33 pm, female PY moved 30 ft upriver past male R, sitting rear-present to the male. Male R moved towards the female and sat 10 ft behind her. Female PY continued to move upriver. Male R continuously vocalized at low intensity.

At 2:37 pm., male G, the second-ranked male of Group 5, moved rapidly upriver past male R, mounted female PY without preliminaries to copulation, and thrusted approximately 37 times with an ejaculatory pause. The female did not resist intromission, did not exhibit the open-mouth bared-teeth display, or emit vocalizations. Male R moved downriver (away from male G and female PY), continuously emitting low intensity vocalizations, began feeding at 2:42 pm ("sham feeding"? [Carpenter, 1934]), and continued to feed, sit, and mingle with other group members (including sexual inspection of several adult females) until 4:50 pm when this day's record ended.

Discussion

Multiple mating by mantled howler females has been previously documented (Carpenter, 1934; Jones and Cortés-Ortiz, 1998). The case reported here, however, provides evidence that sperm competition may occur in mantled howlers, combined with apparently coercive mating by the second male to copulate, and may exemplify cases of coercive mating in primate species in which females mate multiply (e.g., *Pongo*: Rodman and Mitani, 1987; Dixson, 1998). The above copulation by male G was judged to be coercive because there were no preliminaries, because this male appeared to intercept female PY from the male guarding her (male R), and because male G's mount appeared to be executed hastily and with some degree of force since intromission occurred in association with rapid movement. In this situation, it might be expected that there would be potential for an escalated conflict situation between the two males, possibly explaining female PY's failure to resist male G's advances, as well as explaining male R's vocalizations. The present report, however, cannot completely exclude the possibility that some visual or auditory signal was exchanged between female PY and male G which might have communicated receptivity by this female to the male. Nonetheless, it may provide direct evidence for Smith's (1984; also see Thornhill and Palmer, 2000) idea that coercive mating may operate in relation to sperm competition in primates. Future studies of primate reproductive behavior should consider the likelihood that coercive mating is beneficial to males, and possibly to females (Moller, 1998, p. 72), in some ecological and social conditions.

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NEWS

PRIMATE OBSERVATIONS IN SURINAME

Brownsberg Nature Park

I visited Brownsberg Nature Park (4°57'06.8"N, 55°10'45.5"W) from 2–7 February, 2002 to assist in expanding a camera-trapping monitoring program. Located in the state of Broko-Pondo, north-central Suriname, the park is a 2½ hour drive from the capital city of Paramaribo and hence is Suriname's most heavily visited protected area. It is a long and narrow, flat-topped plateau (504 m elevation) with heavily forested, steep slopes and gullies on all sides. The forest is strongly dominated by *Hevea guianensis*, *Terminalia dichotoma*, *Cecropia* spp. and several guava species (Family Myrtaceae).

I observed primates on a number of occasions while setting up camera traps to record large mammals and terrestrial birds. All observations were within 6 km of the visitor's center and were made from or near established park trails. I observed red howler monkeys (*Alouatta seniculus*) each day and heard their loud and long (30 seconds or more) pre-dawn chorus beginning at 5:45 am. Black spider monkeys (*Ateles paniscus*) were heard daily, their calls emanating from the forest below the plateau. A single, male white-faced saki (*Pithecia pithecia*) was observed for several minutes near the visitor center on the plateau. Golden-handed tamarins (*Saguinus midas*) were seen from a trail at 12:20 pm. Bearded saki monkeys (*Chiropotes satanas*) were observed at 2:20 pm in a tree nearby feeding red howler monkeys. Common squirrel monkeys (*Saimiri sciureus*), wedge-capped capuchins (*Cebus olivaceus*), and brown capuchins (*C. apella*) were not observed but are listed in the management plan as being present in the park.

Central Suriname Nature Reserve

I also visited the Central Suriname Nature Reserve from 8–16 February, 2002, to establish a camera trapping monitoring program. The reserve headquarters is located at Raleighvallen (4°43'39.4"N, 56°12'34.3"W) where a permanent grass airstrip is maintained. During my daily excursions to place camera traps between the headquarters and the Voltzberg, 6 km distant, I observed red howler monkeys (*Alouatta seniculus*), brown tufted capuchins (*Cebus apella*), black spider monkeys (*Ateles paniscus*), bearded saki monkeys (*Chiropotes satanas*), and common squirrel monkeys (*Saimiri sciureus*) with young nearly every day during my stay. Less frequently, I also observed wedge-capped capuchins (*Cebus olivaceus*), golden-handed tamarins (*Saguinus midas*) and, on three occasions, separate single groups of one to three white-faced saki monkeys (*Pithecia pithecia*). Red howler monkeys and bearded saki monkeys were observed once in the same fruiting tree.

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MURIQUIS NO PARQUE NACIONAL DA SERRA DOS ÓRGÃOS

Um estudo sobre os muriquis no Parque Nacional da Serra dos Órgãos, Teresópolis, Rio de Janeiro (Programa de Conservação do Muriqui), está sendo realizado desde janeiro de 2002 com a finalidade de localizar os grupos ainda existentes e determinar o número de indivíduos observados, assim como a composição sexo etária dos mesmos.

O Parque Nacional da Serra dos Órgãos possui cerca de 11.800 ha, apresentando um relevo bastante acidentado com escarpas íngremes que se elevam acima da floresta ombrófila densa da Serra do Mar. Quatro tipos de vegetação são presentes dentro da área do parque: floresta ombrófila densa submontana, floresta ombrófila montana, floresta ombrófila alto montana e campos de altitude. Além do muriqui, ocorrem três outras espécies de primatas no parque: *Callithrix aurita*, *Cebus nigritus* e *Alouatta guariba.*

Até o momento foram realizadas três expedições, sendo que os muriquis foram encontrados em duas delas. Ao todo, encontramos dois grupos e contamos 17 animais (sete indivíduos num grupo e 10 em outro). Acreditamos que sejam *Brachyteles arachnoides*, a forma sulina do muriqui, pois alguns indivíduos que foram observados durante mais tempo tinha a face bem negra. Os grupos estavam compostos por fêmeas e machos adultos e alguns indivíduos jovens. Informações sobre as características da vegetação na qual os muriquis estão sendo encontrados, bem como coleta de amostras de plantas das quais foram observados comendo, e fezes de indivíduos que por ventura defecarem, também estão sendo registrados e coletadas. As fezes estão sendo armazenadas a fim de serem estudadas as características genéticas da população do muriqui no parque (estudo a ser realizado pela Dr. Valéria Antunes da Universidade Federal do Espírito Santo) e também para serem feitas análises parasitológicas. Sementes encontradas nestas fezes serão colocadas para germinar, para que no futuro possam ser plantadas em áreas que precisem ser recuperadas dentro do parque.

A reação dos animais com relação a presença dos pesquisadores foi bastante hostil, o que prejudicou uma melhor observação e contagem mais correta de todos os indivíduos. Estressados, os animais fugiram rapidamente e, devido as dificuldades de se andar nesta área não foi possível acompanha-los por muito tempo. Mas, quando os animais ficam nervosos, geralmente eles defecam e neste momento aproveitamos a oportunidade para coletar as suas fezes.

Um outro registro interessante que nos foi passado por um excursionista foi o fato de um muriqui ter sido visto e fotografado numa área do parque, cuja a vegetação predominante é de campos de altitude a mais de 2.000 m de altitude. Era apenas um indivíduo que passou correndo pelo chão e depois se embrenhou num mosaico arbustivo de altura baixa. Isto eleva um pouco mais o limite altitudinal da espécie de 1.800 metros registrada por Aguirre (1971) para 2.000 metros. As razões pelas quais este indivíduo tenha usado este tipo de ambiente podem estar baseadas em três suposições: ou ele estava fugindo das matas que se encontram nas altitudes mais baixas de algum predador ou caçador; ou ele estava a procura de outras fontes de alimento não encontradas nas matas de altitude mais baixa; ou estava apenas atravessando de uma mata para outra usando o campo de altitude.

Paralelamente a este estudo, um trabalho de educação ambiental está sendo realizado no entorno do parque com a finalidade de conscientizar e aumentar o conhecimento das pessoas que vivem nesta região sobre o próprio muriqui e a importância de preservar a ele e seu ambiente.

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FUNCTIONAL ANATOMY OF THE CALLITRICHID FORELIMB AND LONG BONES

Lesa C. Davis defended her Ph.D. dissertation entitled "Functional Morphology of the Forelimb and Long Bones in the Callitrichidae (Platyrrhini, Primates)" at the Department of Anthropology, Southern Illinois University at Carbondale on 3 May, 2002. Her doctoral advisor was Dr. Susan M. Ford. Financial support for this study was provided by the National Science Foundation (DBS 92-03884), a Smithsonian Institution Short-Term Research Grant, and a Sigma Xi Scientific Research Society Grant-In-Aid of Research. The following is an abstract of the dissertation.

The small-bodied callitrichids use a diversity of positional behaviors in negotiating their habitat and procuring food. The primary goal of this study was to identify species-level anatomical correlates to locomotor, postural, and foraging behaviors in the forelimb and long bones in callitrichids. Nine callitrichid species, representing five of the six recognized genera, were included in the study: *Cebuella pygmaea*, *Callithrix jacchus*, *C. penicillata*, *Saguinus fuscicollis*, *S. midas*, *S. geoffroyi*, *S. mystax*, *Leontopithecus rosalia*, and *Callimico goeldii*. An extensive comparative outgroup of select strepsirhine and non-callitrichid platyrrhine species was used to help determine which morphological attributes of callitrichids may be 'universal' consequences of specific activities, which are the result of heritage, and which are uniquely callitrichid. Quantitative osteological data from the scapula, humerus, radius, ulna, hand, and hindlimb long bones were analyzed using univariate and multivariate statistical methods. In addition, these data were tested for significant correlations with positional behavioral frequencies for each species.

Results indicate that callitrichids are distinguished from the outgroup on the basis of scapular morphology. Within the Callitrichidae, *Leontopithecus rosalia* has a uniquely elongated and gracile forelimb, built, at least in part, for manipulative foraging. Tamarins, *Saguinus midas, S. geoffroyi*, and *S. mystax* share a suite of elbow and forearm adaptations for quadrupedalism while their close relative *S. fuscicollis* is more similar to *L. rosalia* in many features. *Callimico* exhibits several significant adaptations for vertical clinging, some of which are exclusive of another platyrrhine vertical clinger, *Cebuella*. Morphofunctional analysis of *Callithrix jacchus* and *C. penicillata* was limited due to the lack of locomotor and postural data available for these taxa, but a few features in the scapula and radius unite the marmosets. This study supports growing evidence that body size and behavior do not form a predictable relationship and that standard indices, such as the intermembral index, are limited in their usefulness as predictive tools. These, and additional morphofunctional correlations, are crucial for understanding the evolutionary radiation of this primate family, and become even more critical in importance as new species, both extant and extinct, continue to be discovered in the wild.

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Reference

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DIET, ACTIVITY AND HOME RANGE OF *ALOUATTA BELZEBUL DISCOLOR* (PRIMATES, ATELIDAE) IN PARANAÍTA, NORTHERN MATO GROSSO

On 28 January, 2002, Liliam Patrícia Pinto defended her master's thesis entitled "Dieta, padrão de atividades e area de vida de *Alouatta belzebul discolor* (Primates Atelidae) em Paranaíta, norte do Mato Grosso" for the Graduate Program in Ecology, Department of Zoology, Universidade Estadual de Campinas (UNICAMP), São Paulo, Brazil. Her supervisor was Eleonore Z. F. Setz, and the study was supported by the Fundação de Amparo a Pesquisa do Estado de São Paulo (FAPESP). The following is an abstract of the thesis.

This study examined the feeding ecology of seven to nine red-handed howlers (*Alouatta belzebul discolor*) in primary forest in the north of the state of Mato Grosso, southern Amazonia. The red howler, *Alouatta seniculus*, also occurred in the area, and the interactions between the species are described. Diet, activity patterns, day range, and home range in *A. b. discolor* were recorded by instantaneous scan sampling over 10 months, between October 1999 and October 2000. During 45 complete days, howlers fed on 67 plant species (n = 2039 feeding records) from 24 families. *Dialium guianense* (Leguminosae, Caesalpinioideae) was the species with the most records. Fruits were predominant in the diet (55.6% of records), followed by new leaves (19.8%) and flowers (5.7%). Mature leaves formed only a small part of the diet (5.0%). Bark, live wood, dead wood, and woody branches together comprised 10.2% of the diet. During the study period, the group spent 58.7% of the day resting and sleeping, 20% feeding, 14.2% traveling, 4.0% moving around within trees, and only 2.1% in social interactions. Although there were no significant differences in time budget between the rainy and the dry seasons, there were slight changes in activity patterns. In the rainy season there were fewer activity peaks and they retired to their sleeping trees earlier than in the dry season. Home range, calculated by superimposing a grid of quadrats, was 50.1 ha. The group used all of the three habitat types in their range; 23 ha terra firme forest, 4 ha of açaí (*Euterpe*) palm forest, and 23.1 ha of seasonally flooded forest (*igapó*). The

convex polygon method gave a home range of 63.2 ha. The home range was larger than has been reported for any other species of *Alouatta* except in Central America. Average day range length was 761 m (n = 45) and did not differ significantly between seasons. *Dialium guianense* fruits were abundant during the dry season, and their intensive use contributed to the absence of significant seasonal variation in fruit consumption, activity patterns and day range.

DIETA, PADRÃO DE ATIVIDADES E ÁREA DE VIDA DE *ALOUATTA BELZEBUL DISCOLOR* (PRIMATES, ATELIDAE) EM PARANAÍTA, NORTE DO MATO GROSSO

Este estudo aborda aspectos da ecologia de um grupo de bugios-de-mãos-vermelhas (*Alouatta belzebul discolor*) composto por sete a nove indivíduos, em mata primária no norte do estado do Mato Grosso, sul da Amazônia. É relatada a presença de mais uma espécie de bugio na área, *Alouatta seniculus*, com descrição das suas interações. A dieta, o padrão de atividades diárias e a área de vida de *A. b. discolor* foram investigadas durante dez meses, entre outubro de 1999 e outubro de 2000, através do método de varredura instantânea. Durante 45 dias completos, os bugios se alimentaram de 67 espécies de plantas (n = 2039 registros de alimentação) de 24 famílias. *Dialium guianense* (Leguminosae, Caesalpinioideae) foi a espécie mais utilizada na alimentação. Os frutos foram os itens mais consumidos (55,6%), seguidos de folhas novas (19,8%) e flores (5,7%). A participação de folhas maduros na dieta foi pequena (5,0%). Casca de árvores, lenho de tronco vivo, madeira em decomposição e ramos lenhosos, juntos perfizeram 10,2% da dieta. Durante todo o período, o grupo gastou 58,7% do tempo em repouso, 20,0% em almentacão, 14,2% em viagem, 4,0% em movimentação, e somente 2,1% em interações sociais. Não houve diferenças significativas entre as estacões chuvosa e seca no tempo dedicado às principais atividades. No entanto, a distribuição das atividades ao longo do dia foi diferente nas duas estações. Na estação chuvosa, o recolhimento para a árvore de dormir se deu mais cedo e houve um número menor de picos de atividades do que na estação seca. Os bugios utilizaram três tipos de ambiente: terra firme, igapó, e açaizal (*Euterpe*). A área de vida, calculada pelo método de quadrículas, foi de 50,1 ha, sendo 23,0 de floresta de terra firme, 4,0 ha de açaizal, e 23,1 ha de igapó. Com o método de polígono convexo, obteve se 63,2 ha. Áreas de vida maiores que a observada neste estudo só têm sido encontrados em bugios na América Central. O percurso diário médio do grupo foi de 761 m (n = 45) e não variou significativamente entre as estações. Frutos de *Dialium guianense* foram abundantes durante a estação seca. A utilização intensiva deste item contribuiu para a ausência de variação sazonal significativa no consumo de frutos, nos padrões de atividade e de uso de espaço.

Líliam Patrícia Pinto, Programa de Pós-graduação em Ecologia, Departamento de Zoologia, Instituto de Biologia, Universidade Estadual de Campinas, Caixa Postal 6109, 13083-970 Campinas, São Paulo, Brazil.

Reference

Pinto, L. P. 2002. Dieta, padrão de atividades e área de vida de *Alouatta belzebul discolor* (Primates, Atelidae) em Paranaíta, norte do Mato Grosso. Master's thesis, Departamento de Zoologia, Universidade Estadual de Campinas (UNICAMP), São Paulo.

LISTA DAS ESPÉCIES DA FAUNA AMEAÇADAS DE EXTINÇÃO NO RIO GRANDE DO SUL, BRASIL

A iniciativa de elaborar a primeira lista das espécies da fauna ameaçadas de extinção no Rio Grande do Sul surgiu de forma independente em dois grupos de pesquisadores gaúchos. No final de 1999, a associação ambientalista PANGEA, com o apoio da Fundação Biodiversitas, estabeleceu contatos com a Secretaria Estadual do Meio Ambiente (SEMA) e com alguns pesquisadores gaúchos no sentido de dar início ao processo de elaboração de uma lista a ser sancionada por decreto governamental.

Paralelamente, em agosto do mesmo ano, teve início o projeto Livro Vermelho da Fauna Ameaçada de Extinção no Rio Grande do Sul, do Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul (MCT-PUCRS), com a proposta mais ampla de elaborar, além de uma lista, também um livro sobre as espécies ameaçadas no Estado, gerenciando as informações através de uma base de dados permanentemente atualizável.

Para evitar a duplicidade de esforços e elaborar uma lista única, as equipes foram unidas sob coordenação geral do "Projeto Livro Vermelho", contando com apoio da SEMA através da Fundação Zoobotânica do Rio Grande do Sul. A lista aqui apresentada resulta do trabalho desenvolvido desde então. Ela foi elaborada a partir do esforço conjunto de 43 zoólogos diretamente vinculados ao projeto, representando 18 instituições de pesquisa, e 128 colaboradores.

Com o propósito de formalizar o apoio da Secretaria Estadual do Meio Ambiente ao Projeto Livro Vermelho e encaminhar o processo de homologação da lista pelo Governo do Estado, um convênio entre o MCT-PUCRS e a SEMA foi firmado em agosto de 2001. Posteriormente, em 5 de dezembro do mesmo ano, os resultados de dois anos de trabalho do projeto foram sinteticamente apresentados à sociedade gaúcha em uma audiência pública organizada pela SEMA. Participaram representantes do poder público estadual e federal, organizadores da lista, zoólogos vinculados ao projeto, colaboradores, pesquisadores, técnicos e representantes de organizações não governamentais, além da comunidade.

Ao final, 261 espécies foram classificadas como efetivamente ameaçadas de extinção no Rio Grande do Sul, enquadrando-se nas categorias de ameaça descritas no texto do decreto (Tabela 1).

Tabela 1. Número de espécies ameaçadas no Rio Grande do Sul por grupo e categoria de ameaça. As siglas seguem recomendação da IUCN, utilizando a grafia inglesa para facilitar a consulta por pesquisadores de diferentes nacionalidades.

Grupo	Categorias de Ameaça					
	RE	PE	CR	EN	VU	Total
Esponjas				1	2	3
Moluscos				6	11	17
Crustáceos					7	7
Insetos				7	11	18
Peixes			4	6	18	28
Anfíbios					10	10
Répteis				5	12	17
Aves	2	8	31	42	45	128
Mamíferos		1	8	5	19	33
Total	**2**	**9**	**43**	**72**	**135**	**261**

RE – Regionalmente extinto; PE – Provavelmente extinto;
CR – Criticamente em perigo; EN – Em perigo; VU - Vulnerável.

Com relação aos primatas, *Alouatta caraya* (Humboldt, 1812) e *Alouatta guariba clamitans* Cabrera, 1940 foram classificadas como Vulnerável (VU) e *Cebus nigritus nigritus* (Goldfuss, 1809) como Dados Insuficientes (DD). A destruição e descaracterização dos hábitats constituem as principais fatores que representam ameaça às populações de primatas no Estado. Como medidas para conservação desses táxons são sugeridas a proteção e recuperação do hábitat, juntamente com programas de educação ambiental e estudos de auto-ecologia.

Ana Alice B. de Marques, Universidade do Vale do Rio dos Sinos, Avenida Unisinos, 950, 93022-000 São Leopoldo, RS, Brasil, e-mail: <anaalice@cpovo.net>, **Carla S. Fontana**, Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Avenida Ipiranga, 6681, Caixa Postal 1429, 90619-900 Porto Alegre, RS, Brasil, **Eduardo Vélez**, Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Rua Dr. Salvador França 1427, 90690-000 Porto Alegre, RS, Brasil, **Glayson A. Bencke**, Laboratório de Ornitologia, Fundação Zoobotânica do Rio Grande do Sul, Rua Dr. Salvador França 1427, 90690-000 Porto Alegre, RS, Brasil, **Maurício Schneider**, Departamento de Zoologia, Universidade Federal do Rio Grande do Sul, Avenida Bento Gonçalves 9500, Bloco IV, pr. 43435, 90540-000 Porto Alegre, RS, Brasil, e **Roberto E. dos Reis**, Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Avenida Ipiranga, 6681, Caixa Postal 1429, 90619-900 Porto Alegre, Rio Grande do Sul, Brasil.

Reference

Marques, A. A. B., Fontana, C. S., Vélez, E., Bencke, G. A., Schneider, M. and Reis, R. E. 2002. *Lista das Espécies da Fauna Ameaçadas de Extinção no Rio Grande do Sul. Decreto nº41.672, de 11 de junho de 2002.* FZB/MCT-PUCRS/PANGEA, Porto Alegre. 52pp.

BRASIL TEM UM CENTRO DE PROTEÇÃO DE PRIMATAS

Para estudar e proteger as 95 espécies de primatas presentes em território nacional, o Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) criou um centro específico. O Centro de Proteção de Primatas Brasileiros foi criado através da Portaria No. 148 de 18 de outubro de 2001. A sede operacional do projeto será em Cabedelo, na região metropolitana de João Pessoa, no estado da Paraíba. O edifício é um antigo engenho de açúcar, onde já funcionam outras unidades de informação do Ibama e a semente do Centro de Proteção de Primatas Brasileiros. O biólogo do Ibama, Marcelo Marcelino, responsável pelo Centro, diz que os pesquisadores atuarão em todo o território nacional, coletando dados sobre os animais.

"Vamos estudar primatas de todos os tipos em todo o Brasil. Queremos sair a campo para coletar informações sobre definições geográficas, doenças que afetam os animais e ocorrências em unidades de conservação, além de ordenar os dados que já existem e organizar o material para que possa subsidiar políticas de conservação das espécies", disse. "Pretendemos ir ao campo já no ano que vem e queremos começar a trabalhar logo na Amazônia, que é nosso alvo preferencial pela riqueza do espaço geográfico e pelo número de espécies. Também temos urgência de pesquisar o material que já existe em unidades de conservação, para saber o que já está sendo protegido ou não".

O Centro vai investigar ainda a ocorrência de doenças entre as populações de primatas. Para isso a equipe de Marcelino deve recorrer aos arquivos públicos já existentes. "Tem muito material esquecido, que sequer foi publicado. Nós vamos buscar tudo o que há disponível na literatura e em arquivos públicos para fazer uma ordenação e geração de informações", anunciou o pesquisador.

A equipe do projeto deve ser composta inicialmente por cinco técnicos, e o Centro vai concentrar toda a atuação do Ibama em relação a primatas brasileiros: Conservação, pesquisa, comércio ilegal, transporte e a criação e manejo em cativeiro.

O Conselho Científico do Centro foi instituido através da Portaria MMA/IBAMA No. 846, 19 de julho de 2002, para analisar as questões apresentadas pelo Centro e oferecer subsídios técnicos e científicos para a tomada de decisões. É composto pelas seguintes especialistas: Júlio César Bicca-Marques (Universidade Católica do Rio Grande do Sul), Adelmar F. Coimbra Filho (Academia Brasileira de Ciências), Stephen F. Ferrari (Universidade Federal do Pará), Alfredo Langguth (Universidade Federal da Paraíba), Alcides Pissinatti (Centro de Primatologia do Rio de Janeiro – CPRJ), Anthony B. Rylands (Center for Applied Biodiversity Science, Conservation International, e a Universidade Federal de Minas Gerais) e Cláudio

Valladares-Padua (IPÊ – Instituto de Pesquisas Ecológicos e a Universidade de Brasília).

Marcelo Marcelino, Chefe, Centro de Proteção de Primatas Brasileiros, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA), BR-230 Km 10, Mata da AMEM, 58.310-000 Cabedelo, Paraíba, Brasil. E-mail: <primatas@ibama.gov.br>.

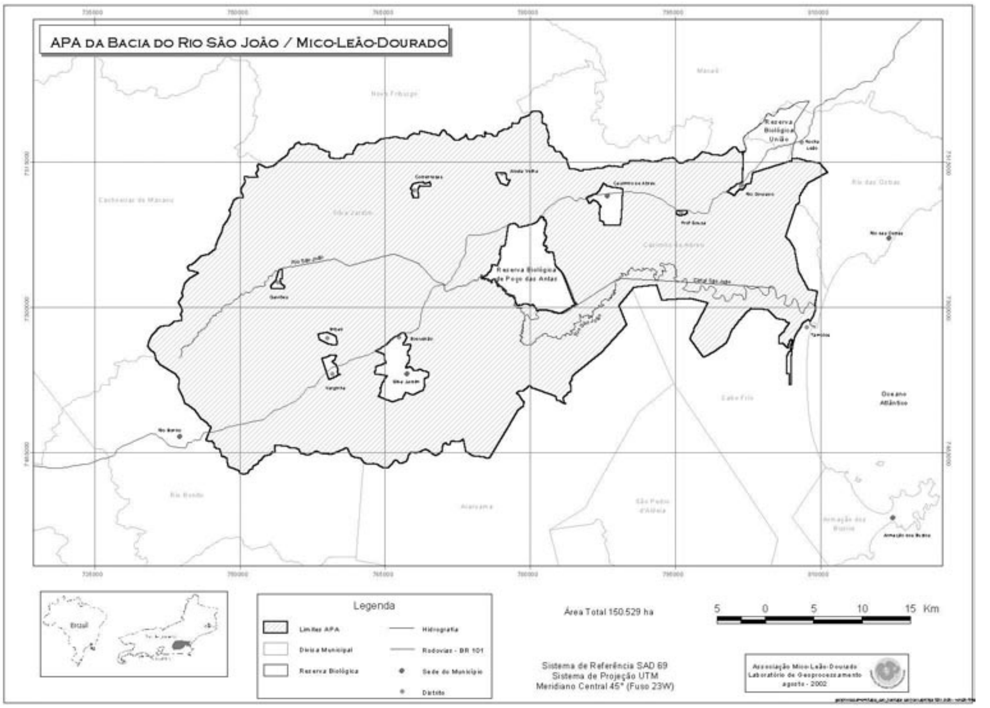
ÁREA DE PROTEÇÃO AMBIENTAL DA BACIA DO RIO SÃO JOÃO/MICO-LEÃO-DOURADO

No dia 26 de julho de 2002, foi criada a Área de Proteção Ambiental (APA) da Bacia do Rio São João/Mico-Leao-Dourado, com 150,529 ha, espalhados por seis municípios do estado do Rio de Janeiro. Engloba os principais remanescentes de Mata Atlântica, onde ainda habita o mico-leão-dourado, *Leontopithecus rosalia*, abrangendo o entorno das Reservas Biológicas de Poço das Antas e União, ambas gerenciadas pelo Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA). As duas reservas foram excluídas da APA por serem de categorias mais restritivas, e as principais áreas de atuação da Associação Mico-Leão-Dourado (AMLD) por meio do Programa de Conservação da espécie que vem desenvolvendo desde 1983. Com a APA, a região passa a ter critérios para a ocupação e o uso do solo que proíbem a degradação ambiental e promovem a gestão ambiental participativa e responsável por parte do poder público e da iniciativa privada. Com isso, fica assegurada a integridade da biodiversidade local e muitos outros serviços prestados pela bacia do Rio São João, sendo a única fonte hídrica para abastecimento público de toda a região dos Lagos Fluminenses, desde Saquarema até Rio das Ostras, passando por Cabo Frio, Búzios e Araruama.

Denise Marçal Rambaldi, Diretora Executiva, Associação Mico-Leão-Dourado (AMLD), Rodovia BR 101 Km 214, Caixa Postal 109.968, 28860-970 Casimiro de Abreu, Rio de Janeiro, Brasil.

THE LION TAMARINS OF BRAZIL FUND

The Lion Tamarins of Brazil Fund receives donations from zoos and captive breeding institutions which hold lion tamarins to support conservation activities in the wild: Brazilian field researchers, surveys, censuses, behavioral and ecological studies, translocations and reintroductions, public education, reforestation and land acquisition (*Neotropical Primates* 2(suppl.), pp.4–7, 1993). As reported by Jeremy J. C. Mallinson in *Tamarin Tales* (Volume 6, 2002), during the fiscal year (September 2000 – August 2001) the fund received a record US$46,841, currently being distributed directly to Brazilian conservation and research programs on lion tamarins. Thirty-nine zoos, three individuals, a regional zoo organization, and the Margot Marsh Biodiversity Foundation were the contributors. Since its creation in 1992, this fund has contributed enormously to the success of the *in situ* conservation programs for the four species, *Leontopithecus rosalia, L. chrysomelas, L. chrysopygus* and *L. caissara*, in Brazil's Atlantic forest.



Jeremy Mallinson has retired as Co-Custodian of the Fund. Bengt Holst, Vice-Director of the Copenhagen Zoo and mastermind behind a highly successful campaign (2001–2002) for the Atlantic forest and lion tamarin conservation by the European Association of Zoos and Aquaria (EAZA), has taken over the task as the European counterpart of Devra Kleiman and Jonathan Ballou who run the Fund on the other side of the pond.

Contributions from North and South America should be arranged with **Jonathan D. Ballou**, Department of Conservation Biology, National Zoological Park, Smithsonian Institution, Washington, DC 20008, USA, Tel: +1 202 673 4828, Fax: +1 202 673 4686, e-mail: <ballouj@nzp.si.edu>, and from Europe, Africa, Asia and Australasia with **Bengt Holst**, Copenhagen Zoo, Sdr. Fasanvej 79, DK-2000 Frederiksburg, Denmark, Tel: +45 72 200 220, Fax: +45 72 200 219, e-mail: <beh@zoo.dk>.

8TH EUROPEAN STUDBOOK FOR *SAGUINUS IMPERATOR*

With the help of Joana Lobo, and the Lisbon Zoo staff, Orlando Silva and Patricia Vilarinho, Eric Bairrão Ruivo, Animal Collections Coordinator of the Lisbon Zoo in Portugal, has released the 8th European Studbook for the emperor tamarin, *Saguinus imperator*. The data is current to 31st December, 2001, and records 158 (84.66.8) tamarins, all of the subspecies *S. i. subgrisescens*. No *S. i. imperator* remain in Europe, only a small, non-breeding population of eight hybrids (5.3.0). There were a total of 59 births during 2001, although unfortunately their survival was poor – 33 died. There were 20 adult deaths and as such the population remained quite stable, increasing by 7 from 2000. In his introduction, Eric Bairrão Ruivo credits the high birth rate to the cooperative management of the population. It is now spread through 54 institutions - 41 with *S. i. subgrisescens* and five with non-breeding hybrids. Besides European Zoos, the studbook also registers animals in Australia (currently, Perth – hybrids, 2.1.0; Sydney – 2.0.0; and Melbourne- 2.0.0) and Singapore (0.1.0). Aaalborg Zoo, Denmark, and Paris Zoo, France, received the species for the first time in 2001. In 2002 a further five institutions will enter the breeding programme. The studbook provides a full historical listing of the species, analyses of the demographics since 1964, age distribution, inbreeding coefficients, and founder representation and mean kinship. The recommendations for transfers and breeding during 2002 are also detailed. The studbook includes an extensive report on a study of sexual differences in behavioural patterns in captive *S. i. subgrisescens* carried out by Ruivo himself.

Eric Bairrão Ruivo, EEP Co-ordinator for Emperor Tamarin, Jardim Zoológico de Lisboa, Estrada de Benfica 158, 1549-004 Lisboa, Portugal.

References

Ruivo, E. B. 2001. *European Studbook for the Emperor Tamarin* Saguinus imperator *ssp.* 8th Edition, 2001. Lisbon Zoological Garden, Lisboa, Portugal. 182pp. (Data current through 31 December 2001)

Ruivo, E. B. 2001. Sexual differences of behavioural patterns in emperor tamarins (*Saguinus imperator subgrisescens*): A case study for science communication in the zoo community. In: *European Studbook for the Emperor Tamarin* Saguinus imperator *ssp.* 8th Edition, 2001, E. B. Ruivo (compiler), pp.21-49. Lisbon Zoological Garden, Lisboa, Portugal.

CONSERVATION INFORMATION SERVICE (CIS)

Primate-Science is pleased to announce the availability of a new site devoted to primate conservation and the management of primate habitats. The purpose of CIS is to promote communication between primatologists and funding sources. CIS will facilitate communication between individuals seeking funding and organizations or philanthropists that potentially could support their work.

Individuals or groups whose projects relate to primate conservation or the preservation of primate habitats are invited to provide descriptions of their projects for posting on the CIS site. These project descriptions will be available to potential donors via the Internet. Because it is important to understand primates in their ecological setting, the emphasis of CIS is on maintaining primates in their natural habitats, not on propagating endangered species in captivity. To be listed, proposed projects must be reviewed and endorsed by the Conservation Information Service (CIS).

We hope that public access to a combination of information and evaluation will encourage philanthropists and foundations to increase their support at this critical time when many primates face the threat of extinction. We especially encourage postings from Non-Governmental Organizations (NGO's), local organizations, and individuals in developing countries where conservation efforts are underway. We hope that facilitating direct contact between donors and recipients will insure that funds are used most efficiently.

Please visit the CIS web site where you will find instructions for submitting proposals <http://www.primate.wisc.edu/pin/cis/>. For questions or further information please contact: **Max Snodderly**, CIS Steering Committee Chair, Schepens Eye Research Institute and Harvard Medical School, e-mail: <cis@primate.wisc.edu>. *From: <primate-science@primate.wisc.edu>, 8 July, 2002.*

RE-INTRODUCTION SPECIALIST GROUP

The Re-introduction Practitioners Directory, a registry of reintroduction projects worldwide (both plants and animals) was compiled and edited by Pritpal S. Soorae and Philip J. Seddon in 1998 for the IUCN/SSC Re-introduction Specialist Group (RSG) in collaboration with the National Commission for Wildlife Conservation and Development, Riyadh, Saudi Arabia (ISBN 9960 614 08 5, 97pp.). It is now on the IUCN website <www.iucn.org> and can be accessed from the Members interest page: <http://iucn.org/themes/ssc/members.htm> or directly from: <http://iucn.org/themes/ssc/sgs/reintrddirect1998.pdf>. The project profiles for New World primates include *Callithrix geoffroyi*, *Leontopithecus rosalia*, *L. chrysopygus*, *Alouatta villosa* (*Alouatta pigra*) and *Brachyteles arachnoides*.

Pritpal S. Soorae, Programme Officer, IUCN/SSC Re-introduction Specialist Group (RSG), Environmental Research & Wildlife Development Agency (ERWDA), P.O. Box 45553, Abu Dhabi, United Arab Emirates (UAE), Fax: (971) 2 681-7361, e-mail: <psoorae@erwda.gov.ae>.

THE LINCOLN PARK ZOO NEOTROPIC FUND

The Lincoln Park Zoo Neotropic and Africa/Asia Funds support field research in conservation biology around the world. The Neotropic fund focuses on projects undertaken in Latin America and the Caribbean. Since 1986, the fund has awarded over 146 grants in 19 countries. The Africa/Asia fund, launched in 1997, focuses on projects throughout Africa, Asia, and the Pacific. The funds emphasize 1) the support of graduate students and other young researchers, 2) direct impact on wildlife conservation and/or conservation biology, 3) involvement by students and/or local field assistants from Latin America, Africa, or Asia at levels that engender appreciation for wildlife conservation, and 4) links to either the Lincoln Park Zoo animal collection or conservation activities of the zoo staff. Each fund typically supports between five and ten projects annually, including project renewals for a second year. Most awards fall into the range of $3,000–$6,000. Initial support is for up to 12 months from the date of award, and the maximum duration of support is two years. The current deadline for receipt of Neotropic and Africa/Asia proposals is October 1st. For additional information and application procedures go to <www.lpzoo.com/conservation>, e-mail: <conservation@lpzoo.org>, or write to: Lincoln Park Zoo NF/AA Funds, Department of Conservation and Science, Lincoln Park Zoo, 2001 N. Clark St, Chicago, IL 60614.

PRIMATE SOCIETIES

2003 IPS MARTHA J. GALANTE AWARD – CALL FOR APPLICATIONS

The Martha J. Galante Award is given annually by the International Primatological Society (IPS) to professional primatologists of primate habitat countries to support conservation training. The IPS Conservation Committee, chaired by Claudio Valladares-Padua, is soliciting applications for the 2003 Award. The deadline for applications is 1 May 2003. The award can be used for conservation training: Transportation to the course or event location, course or event fees, and expenses during the event period. People interested in receiving this award should:

- Be officially enrolled in an academic institution or a similar organization (either taking or giving courses or doing research or conservation work),
- send information about the program of interest (courses, congresses, symposia, field work, etc.),
- send a letter explaining his/her interests in participating in the course or event (in English),
- send a CV in English,
- send a letter of acceptance for the respective course, and
- send two recommendation letters (including information about referee).

The review of the application will be made by the Conservation Committee, and the results will be announced in August 2003. Grant proposals can be sent by post or e-mail to: Dr. Claudio Valladares-Padua, IPS Conservation Committee, IPÊ - Instituto de Projetos e Pesquisas Ecológicas, Caixa Postal 47, 12960-000 Nazaré Paulista, São Paulo, Brazil, E-mail: <cpadua@unb.br>.

RECENT PUBLICATIONS

TAMARIN TALES

Recently published was Number 6 (2002) of *Tamarin Tales*, the newsletter of the International Committee for the Conservation and Management of the Lion Tamarins (ICCM). It is distributed to all institutions which hold lion tamarins and participate in the captive breeding programs. The first article, "Status of the Lion Tamarins in the Wild", gives the current estimates for the populations sizes of the four species: The golden lion tamarin, *Leontopithecus rosalia* – 1000; the golden headed lion tamarin, *L. chrysomelas* - 6,000-15,500; the black lion tamarin, *L. chrysopygus* – 1000; and the black-faced lion tamarin, *L. caissara* – as few as 400. There follows a graphic illustration of the loss of forest in São Paulo, once covering about 80% of the state, and now reduced to about 3%! The third article discusses the problems of the fragmented habitats for the species and the establishment of the metatopopulation management programs for the golden and the black lion tamarins, including a breakdown of the current population of the former: about 220 individuals in the Poço das Antas Biological reserve, 140 resulting from animals translocated to the União Biological Reserve, about 400 in several separate populations resulting from the reintroduction program, and about 250 animals elsewhere, including the foothills of the Serra dos Órgãos. Paula Procópio de Oliveira, who will defend her doctoral thesis this year (Federal University of Minas Gerais, under the supervision of Gustavo A. B. da Fonseca) reports on her studies of golden lion tamarin ecology and the progress of the translocated population in the União Biological Reserve. She also reports on future activities of the program, which include the organization of a data base by Vanessa Puerta Veruli, with all the information collected during the translocation program since 1997 and, with Fabiana Godoy and Leonardo Vieira of the Information System Laboratory of the Associação Mico-Leão-Dourado (AMLD), the mapping of the trail system using satellite images and GPS. Mariana Janzantti Lapenta will be carrying out studies of seed dispersal in the reserve for a doctoral thesis at the University of São Paulo.

Kristel De Vleeschouwer, postdoctoral researcher at the Center for Research and Conservation of the Royal Zoological Society of Antwerp, provides a short story of her first impressions of the west side of the Una Biological Reserve where she will be carrying out a field study examining particularly the adaptations of golden–headed lion tamarins to degraded and fragmented forests. Patricia Matsuo also reports on the activities of the Conservation Education Program for the golden lion tamarin, run by the AMLD. They include teacher training for schools in the vicinity of the reserves where lion tamarins have been introduced, with numerous workshops being held in the Adelmar F. Coimbra-Filho Educational Center in the Poço das Antas Biological Reserve. Alex Howes of the Friends of the National Zoo writes on some curious aspects of tool use by free-ranging golden lion tamarins in the National Zoo, Washington, DC, Zoo Atlanta and Zoo Oregon, even though nothing of the sort has been observed in the wild. Finally there are reports on the retirement of the Jersey Zoo's long-time Director, Jeremy J. C. Mallinson, effulgent warrior of lion tamarin conservation, and the activities of the Lion Tamarins of Brazil Fund (see page 101).

The newsletter is edited by **Jonathan D. Ballou**, Department of Conservation Biology, National Zoological Park, Smithsonian Institution, Washington, DC 20008, USA, e-mail: <ballouj@nzp.si.edu>. Please send to him news and short articles concerning lion tamarins and their conservation and biology in the wild for the next issue.

SPECIAL ISSUE OF *BEHAVIOR* – SOCIAL BONDS IN PRIMATES

Volume 139, numbers 2–3 (February/March 2002) of *Behaviour* – an International Journal of Behavioural Biology (Brill, Leiden) - is a special issue dedicated to the theme "What are Friends For? – The Adaptive Value of Social Bonds in Primate Groups". The Guest Editor was Joan B. Silk (University of California, Los Angeles), and the papers result from a symposium held during the XVIIIth Congress of the International Primatological Society, in Adelaide, Australia, 7-12 January 2001. *Contents*: Introduction - J. B. Silk; Ecological models of female social relationships in primates: Similarities, disparities, and some directions for future clarity – L. A. Isbell & T. P. Young; How adaptive or phylogenetically inert is primate social behaviour? A test with two sympatric colobines – A. H. Korstjens, E. H. M. Sterck & R. Noë; An expanded test of the ecological model of primate social evolution: Competitive regimes and female bonding in three species of squirrel monkeys (*Saimiri oerstedii*, *S. boliviensis* and *S. sciureus*) – S. Boinski, K. Sughrue, L. Selvaggi, R. Quatrone, M. Henry & S. Cropp; Constraints on relationship formation among female primates – L. Barrett & S. P. Henzi; Friendship among adult female blue monkeys (*Cercopithecus mitis*) – M. Cords; Social dynamics of male muriquis (*Brachyteles arachnoides hypoxanthus*) – K. B. Strier, L. T. Dib & J. E. C. Figueira; Reciprocity and interchange in the social relationships of wild male chimpanzees – D. P. Watts; Affiliation and aggression among adult female rhesus macaques: A genetic analysis of paternal cohorts – A. Widdig, P. Nürnburg, M. Krawczak, W. J. Streich & F. Bercovitch; Relationship assessment through emotional mediation – F. Aureli & C. M. Schaffner; Using the 'F' word in primatology – J. B. Silk.

AMAZONIANA – A SPECIAL EDITION DEDICATED TO HARALD SIOLI

Volume 16(3/4), December 2001, of the journal *Amazoniana*, is dedicated to Prof. Dr. Harald Sioli, pioneer researcher, limnologist and conservationist of the Amazon, who enjoyed his 90th birthday in August 2000. His first studies began in 1945, and from the 1960s he collaborated closely with the National Institute for Amazon Research (INPA), Manaus. In 1965, he co-founded *Amazoniana* with Djalma Batista, then Director of INPA, and in 1966 he was appointed director of the Max-Planck Institute for Limnology in Plön, Germany, and director of its newly formed Department for Tropical Ecology. He retired in 1978. In a brief appraisal of his work, Wolfgang Junk (current director of the Department of Tropical Ecology) wrote the following: "The impact of Sioli's activities reaches far beyond the impact of his scientific publications. His very early warnings about the destruction of the Amazon rain forest and his appeals to protect the area for the benefit of nature, and the local populations including the Amerindian tribes, were heavily criticized by some politicians and development planners, but received endorsement from Brazilian scientists and were enthusiastically accepted by Brazilian students. This development fortified the ideas for the need for environmental protection in Brazil. Some of the students, influenced by his ideas during the sixties and seventies, are today leading scientists and administrators in Brazilian state and governmental organizations, and introduce ecological aspects into politics, planning and administration. Today Harald Sioli is Nestor of German tropical ecology and one of the great tropical ecologists in the world."(p.268).

Nothing on monkeys, but this edition of *Amazoniana* (only Part 1 of the dedication to Prof. Sioli) is replete with excellent review papers on Amazonian geology, geomorphology, paleohistory, geography, limnology, ecology and biodiversity, and includes three important reviews of the Amazonian refuge theory, and overviews of Amazon deforestation and development. *A sample of the contents*: Appraisal of the scientific work of Harald Sioli – W. J. Junk, pp.285-297; Birthday letter to Harald Sioli – L. Schmidt, pp.299-301; The prehistoric human geography of Brazil – A. N. Ab'Saber, pp.303-311; Holy Ganga and the mighty Amazon – B. Gopal, pp.337-348; Amazonia 2000: An evaluation of three decades of regional planning and development programs in the Brazilian Amazon region – G. Kohlepp, pp.363-395; Mangal communities of the "Salgado Paraense": Ecological heterogeneity along the Bragança peninsula assessed through soil and leaf analysis – E. Medina *et al.*, pp.397-416; The mystery of the Marajoara: An ecological solution – B. J. Meggers, pp.412-440; Comparative study of the litterfall in a primary and secondary terra firme forest in the vicinity of Manaus, State of Amazonas, Brazil – W. A. Rodrigues, K. Furch & H. Klinge, pp.441-462; Amazonian deforestation: Regional and global issues – E. Salati, C. A. Nobre & A. A. dos Santos, pp.463-481; Land use dynamics in the Amazon estuary and implications for natural resource management – N. J. H. Smith, pp. 517-537; Climatic forcing of evolution in Amazonia during the Cenozoic: On the refuge theory of biotic differentiation – J. Haffer & G. T. Prance, pp.579-607; A paradigm to be discarded: Geological and paleoecological data falsify the Haffer and Prance refuge hypothesis of Amazonian speciation – P. A. Colinvaux, G. Irion, M. E. Räsänen, M. B. Bush & J. A. S. Nunes de Mello, pp. 609-646; Ice age tropical South America: What was it really like? – T. van der Hammen, pp.647-652.

Amazoniana is edited by Wolfgang Junk and Joachim Adis (Max Planck Institute for Tropical Limnology, Plön), Francisco de Assis Esteves (Federal University of Rio de Janeiro) and Ulrich Saint-Paul (Bremen). ISSN 0065-6755. *For subscriptions or single issues, contact*: Kommissionsverlag Walter G. Mühlau, Holtenauer Str. 116, D-24105 Kiel, Germany, Fax: +49 431 800 9050, e-mail: <service@muehlau.de>.

GUIDELINES FOR NONHUMAN PRIMATE RE-INTRODUCTIONS

The IUCN/SSC Re-introduction Specialist Group (RSG) (Chair, Frederic J. Launay) was established in 1988 in response to an increasing number of plant and animal re-introductions worldwide. The *IUCN Guidelines for Re-introductions*, published in 1998, covers key issues and is a general policy document that applies to both animals and plants. In June 2002, the RSG published a special issue of *Re-introduction NEWS* dedicated to primates. In addition to seven short case studies on primate re-introductions and translocations, the special issue features a 29-page document: *Guidelines for Nonhuman Primate Re-introductions.*

Edited by Lynne R. Baker, the guidelines are based on current IUCN policy documents, a review of case histories, and consultation across a broad range of disciplines. Comments were solicited from a large group of experts and interested parties, and a thorough review was carried out by a Core Review Board with the following members: Benjamin Beck (National Zoological Park, Smithsonian Institution, Washington, DC), Thomas M. Butynski (Africa Section, IUCN/SSC Primate Specialist Group and Eastern Africa Biodiversity Hotspots, Conservation International, Washington, DC), Ardith Eudey (Asian Section, IUCN/SSC Primate Specialist Group), Elizabeth L. Gadsby (Pandrillus, Drill Rehabilitation and Breeding Center, Nigeria), Kenneth Glander (Duke University, Durham, NC), William B. Karesh (Wildlife Conservation Society, New York, NY), Devra G. Kleiman (National Zoological Park, Smithsonian Institution, Washington, DC), John Lewis (International Zoo Veterinary Group, London), Russell A. Mittermeier (Chair, IUCN/SSC Primate Specialist Group and Conservation International, Washington, DC), John F. Oates (Hunter College, City University of New York), Anthony B. Rylands (Neotropical Section, IUCN/SSC Primate Specialist Group, and Center for Applied Biodiversity Science, Conservation International, Washington, DC), Pritpal S. Soorae (Senior Conservation Officer, IUCN/SSC Re-introduction Specialist Group, Abu Dhabi, UAE), Shirley S. Strum (University of California, San Diego), Caroline Tutin (Centre International de Recherches Medicales de Franceville, Gabon, and University of Stirling, Scotland), Michael Woodford (Working Group on Wildlife Diseases, World Organisation for Animal Health, Office International des Epizooties, Paris).

The guidelines are divided into 11 sections: Executive Summary; Context of Guidelines; Introduction; Definition of Terms; Aims, Objectives, and Precautionary Principle; Planning for Re-introduction; Disease Transmission and Veterinary Requirements; Transport and Release Implementation; Post-Release Monitoring; Considerations for Translocation; and Acknowledgments. Four annexes follow: Key References, Husbandry References, Key Contacts, and Core Review Board. "Key Contacts" includes a useful list of the Primate Taxon Advisory Groups worldwide. The following is the Executive Summary:

"The *IUCN/SSC Re-introduction Specialist Group: Guidelines for Nonhuman Primate Re-introductions* is intended as a guide to re-introduction programs. The priority has been to develop standards that are of direct, practical assistance to those planning, approving, or implementing re-introductions. The primary audience of these guidelines is the re-introduction practitioner.

Because re-introduction projects are often restricted by location, resources, and other limitations, this document is a meant as a "best-practice" model, or an ideal code of conduct. Re-introduction managers are strongly encouraged to use this document as their principal guide to primate re-introductions.

Each re-introduction project should develop written guidelines that apply specifically to its taxon, region, legal structure, etc. These customized documents should be up-dated over time and eventually result in a re-introduction manual for the taxon of interest. They should also directly relate to this existing document, so that these guidelines can be regularly updated with new information and techniques.

Guidelines for Nonhuman Primate Re-introductions covers the main steps of a re-introduction effort. The steps are listed in a suggested order of execution, although some overlap with one another. It is realised that many projects have been operating for some time, so their managers should attempt to integrate the guidelines as soon as possible into their current operating procedures and protocol.

Before initiating any re-introduction project, managers must clearly define why that project is needed and do a rapid overall assessment to ensure that key requirements, such as habitat suitability, are likely to be met. *The main goal of any re-introduction effort should be to re-establish self-sustaining populations of primates in the wild and to maintain the viability of those populations.* Although exceptions to this, such as trial re-introductions of common species and rescue/welfare releases, should also adhere to these guidelines as much as possible, such projects are not considered true re-introductions or conservation approaches and are not specifically covered in these guidelines.

Re-introduction practitioners are strongly encouraged to contact the IUCN/SSC Re-introduction Specialist Group (RSG) and present and discuss their re-introduction proposals and results. As a result, a network of contacts can be developed and information from various projects shared.

Details regarding the care of animals held in captivity prior to release, such as enclosure enrichment, are not specifically covered in these guidelines. However, where appropriate, important points regarding these topics will be noted."

The special primate issue of *Re-introduction NEWS* includes an introduction by the RSG Primate Section Chair, Devra G. Kleiman, who discussed some divergence in the definitions of the key terms used when compared to the 1998 *IUCN Guidelines for Re-introductions.* She also reviewed the articles in the special issue and emphasized that the RSG provides guidance to those planning to re-introduce or translocate animals or plants mainly for conservation purposes and that, for a program to have significant conservation value, it must result in a significant increase in the numbers and genetic diversity of a threatened or endangered species in protected habitat, preferably within the species' historic range.

The articles in the special issue are as follows: Re-introduction and translocation as conservation tools for golden lion tamarins in Brazil – M. C. M. Kierulff, B. B. Beck, D. G. Kleiman, & P. Procópio de Oliveira, pp.7-10; Translocation of black howler monkeys in Belize – R. H. Horwich, F. Koontz, E. Saqui, L. Ostro, S. Silver, & K. Glander, pp.10-12; Translocation of three wild troops of baboons in Kenya – S. C. Strum, pp.12-15; Habitat ecologique et liberté des primates: A case study of chimpanzee re-introduction in the Republic of Congo – K. H. Farmer & A. Jamart, pp.16-18; The release of captive-bred black-and-white ruffed lemurs into the Betampona Reserve, eastern Madagascar – A. Britt, C. Welch, & A. Katz, pp.18-20; Preparing for re-introduction: 10 years of planning for drills in Nigeria – E. L. Gadsby, pp.20-23; Re-introduction of orang-utans in Indonesia – K. S. Warren & R. A. Swan, pp.24-26; Release of golden langurs in Tripura, India – A. K. Gupta, pp.26-28.

The special primate issue was supported by the American Society of Primatologists (ASP), International Primatological Society (IPS), the Margot Marsh Biodiversity Foundation, and the Primate Society of Japan. This issue of *Re-introduction NEWS* was edited by Pritpal Soorae and Lynne R. Baker.

To contact the RSG: Pritpal Soorae, Executive Officer, IUCN\SSC Re-introduction Specialist Group Secretariat, c/o Environmental Research & Wildlife Development Agency (ERWDA), P.O. Box 45553, Abu Dhabi, United Arab Emirates (UAE): Tel: (971) 2 693-4650, Fax: (971) 2 681-7361, E-mail: <PSoorae@erwda.gov.ae>. The guidelines are available on the RSG Website at http://iucn.org/themes/ssc/programs/rsg.htm.

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New Publications Regarding Reintroduction and the Placement of Confiscated Animals

The *IUCN Guidelines for the Placement of Confiscated Animals* (2002) were developed after an extensive review process, and became official IUCN Policy at the 51st Meeting of the IUCN Council in February, 2000. The guidelines are designed to provide options for the placement of animals confiscated from illegal or irregular trade. The Environmental Research and Wildlife Development Agency (EWRDA) supported the publication. *Copies (limited) are available from*: IUCN/SSC Re-introduction Specialist Group Secretariat, c/o Environmental Research & Wildlife Development Agency (ERWDA), P.O. Box 45553, Abu Dhabi, United Arab Emirates (UAE): Tel: (971) 2 693-4650, Fax: (971) 2 681-7361, e-mail: <PSoorae@erwda.gov.ae>. Website: <http://194.158.18.4/intranet/DocLib/Docs/IUCN735.pdf>.

The booklet *Quarantine and Health Screening Protocols for Wildlife Prior to Translocation and Release into the Wild* (2002) was edited by Michael H. Woodford. It describes many of the disease risks attending wildlife translocation projects. Suggestions are made for the development of systematic procedures for the reduction of these risks at both the source of the founder animals and at the release site, and covers the following taxa: Artiodactyla, Perissodactyla, Primates, Carnivora, Marine mammals, Rodentia, Lagomorpha, marsupials (New and Old World), Monotremata, Chiroptera, Aves, Reptilia and Amphibia, and fishes. *Available from*: Care for the Wild International, Ashfolds, Rusper, West Sussex RH12 4QX, UK, Tel: +44 1293 871596, Fax; +44 1293 8715022, e-mail: <info@careforthewild.com>.

Books

Diversidade Biológica e Cultural da Amazônia, edited by Ima Célia Guimarães Vieira, José Maria Cardoso da Silva, David Conway Oren and Maria Ângela D'Incao. 2001. Museu Paraense Émilio Goeldi, Belém, Pará, Brazil. 421pp. ISBN 85 7098 067 1. Price $25.00 (+ US$5.00 p&p outside of Brazil). In English and Portuguese. The results of a symposium celebrating the 130th anniversary of the Museu Paraense Émilio Goeldi, Belém, 23-27 October 1996 - "The Biological and Cultural Diversity of Amazonia in a World of Transformation". The book covers three basic questions: What is the origin of Amazonian biodiversity?; What is the origin of the region's cultural diversity?; and How to promote the sustainable use of biodiversity in the Amazon? *Contents*: Part I. Origin of Biodiversity in Amazonia. The Amazonian rainforest only some 6-5 million years old – N.-A. Mörner, D. Rosetti & P. M. de Toledo, pp.3-18; Paleoecology of Amazonia - T. Van der Hammen, pp.19-44; Hypotheses to explain the origin of species in Amazonia – J. Haffer, pp.45-118; Avian diversification in Amazonia: evidence for historical complexity and a vicariance model for a basic diversification pattern – J. Bates, pp.119-137; Molecular phylogenetics and the diversification of Amazonian mammals – J. Patton & M. N. F. da Silva, pp.139-164. Part II. Human and Cultural Diversity. Diversidade genética de populações humanas na Amazônia. – D. de F. Lobato da Silva, A. K. C. Ribeiro dos Santos & S. E. Batista dos Santos, pp.167-193; Amazônia socioambiental – sustentabilidade ecológica e diversidade social – D. Lima & J. Pozzobon, pp.195-251; Um aspecto da diversidade cultural do caboclo – R. H. Maués, pp.253-272; Science and the representation of nature in Amazonia: from La Condamine through Da Cunha to Anna Roosevelt – D. Cleary, pp.273-296. Part III. Sustainable Use of Biodiversity in Amazonia. As ciências, o uso de recursos naturais na Amazônia e a noção de desenvolvimento sustentável: por uma interdisciplinaridade ampla – F. de Assis Costa, pp.299-318; Natural vs. social science concepts in applied research on Amazônia: a critical assessment – M. Nitsch, pp.319-346; Domestication of Amazonian fruit crops – past, present, future – C. R. Clement, pp.347-367; Dinâmica evolutiva em roças de caboclos amazônicos – P. S. Martins, pp.369-384; Influence of habitat on the sustainability of mammal harvests in the Peruvian Amazon – R. Bodmer, P. Puertas, R. Aquino & C. Reyes, pp.385-402; Biodiversity: today's and tomorrow's importance – W. Kerr, pp.403-409. Part IV. Tributes. La Penha: gerador e gerenciador de ciência – L. M. F. Bassalo, pp.413-416; Paulo Sodero: mestre por excelência – I. C. G. Vieira, p.417; Jorge Pozzobon, agora no céu com diamantes, M. Meira, pp.419-421. *Available from*: Biblioteca, Museu Paraense Émilio Goeldi, Caixa Postal 399, 66040-170 Belém, Pará, Brazil. Website: <www.museu-goeldi.br>.

A Guide to Careers in Physical Anthropology, edited by Alan S. Ryan. 2002. Bergin and Garvey. Price: $69.95. ISBN 0-89789-693-9. Physical anthropology focuses on biological evolution of humans and their ancestors, the relationship of humans to other organisms, and patterns of biological variation within and among human populations. Physical anthropology is sometimes referred to by another name - biological anthropology. There are several specialties of physical anthropology including primate studies, paleoanthropology, and human variation. Because of its broad scope, physical anthropology has borrowed principles from evolutionary biology, comparative anatomy, genetics, medicine, paleontology, zoology, geology, and demography. The subject of this book is careers in physical anthropology. Most physical anthropology graduate students have traditionally aspired to a career as a college or university faculty member in an anthropology department. Because physical anthropology has a strong biocultural emphasis and its subject matter is enormously diversified, today's students of physical anthropology have a wealth of potential nontraditional career opportunities. Contents: Introduction - A. S. Ryan; 1. The meaning of physical anthropology - A. S. Ryan; 2. Teaching physical anthropology in a university: The traditional career - C. W. Wienker; 3. Teaching physical anthropology in the community college - P. L. Stein; 4. The practice of physical anthropology in a museum environment - D. H. Ubelaker; 5. Paleoanthropology at home and in the field - A. Kramer; 6. Primatology as a career - K. D. Hunt; 7. The post-doc experience: Is there a light at the end of the tunnel? - A. C. Stone; 8. Krogman, his cleft palate collection, and me: or, what can an auxologist do today? - E, J. Bowers-Bienkowski; 9. Teaching anatomy at a university – M. F. Teaford; 10. Research faculty in medical, nursing, and public health schools; S. T. McGarvey & G. D. James; 11. Physical anthropology, medical genetics, and research - B. B. Little; 12. Opportunities in public health and international nutrition - R. Martorell; 13. Having fun - A jock in two worlds: Kinesiology and human biology - R. M. Malina; 14. Government research: links to biomedicine and public health - R. M. Garruto; 15. Private industry: Research for profit - A. S. Ryan; 16. Independent consulting: Making your own rules - M. R. London; 17. Journalism: Bringing science to the public - K. Wong; 18. Forensic science as a new arena for a human biologist - M. S. Schanfield. *Where to order*: Greenwood Publishing Group, Inc., 88 Post Road West, Westport, CT 06881, USA, Tel: 800-225-5800, Fax: 203-750-9790. Website: <www.greenwood.com>.

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MEETINGS

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

19th Annual Conference of the European Association of Zoos and Aquaria (EAZA), 17–22 September 2002. Hosted by Barcelona Zoo, Spain. The main theme of the Conference will be Central and South America, with emphasis on their current fund-raising and awareness campaign – the Atlantic forest of Brazil, Argentina and Paraguay. The meeting will be held in the Pompeu Fabra University, next to Barcelona Zoo. Website: <http://www.eaza.net/index.html>.

III Congresso Brasileiro de Unidades de Conservação, 22–26 de setembro de 2002, Centro de Convenções Edson Queiroz, Fortaleza, Ceará. Realização; Rede Nacional Pró-Unidades de Conservação, Fundação O Boticário de Proteção à Natureza e Associação Caatinga. Patrocínio: The Nature Conservancy. O evento está organizado de maneira a permitir a apresentação e discussão de grandes temas do manejo de unidades de conservação através de conferências, palestras e das sessões paralelas: seminários e apresentação de trabalhos técnicos-científicos. Informações sobre Inscrições: Rowam Eventos, Telefax: 0** (41) 342-9078, e-mail: <3cbuc@brturbo.com>.

VIII Congreso Latinoamericano y II Congreso Colombiano de Botánica, 13–18 de octubre de 2002, Cartagena de Indias, Colombia. "Nuestros conocimientos al servicio de la sociedad". Informes: Enrique Forero, e-mail: <eforero@ciencias.unal.edu.co>, o <congrbot@ciencias.unal.edu.co>. Website: <http://www.icn.unal.edu.co/eventos/congrbot/>.

Colloque 2002 Société Francophone de Primatologie, 23–25 October, 2002. Doué-la-Fontaine. This 14th annual meeting of the Francophone Primate Society has the theme of "Reproduction of Primates", but also regular sessions on paleontology, anthropology, conservation, medical research, ethology, and ecology, as well as a round table on animal ethics. For more information visit the web site: <http://www.tourisme.fr/office-de-tourisme/doue-la-fontaine.htm>. For further information on the society visit: <www.sfdp.u-strasbg.fr>.

X$^{o\cdot}$ Congresso Brasileiro de Primatologia, 10–15 November 2002, Universidade Federal do Pará, Belem. Hosted by the Sociedade Brasileira de Primatologia (SBPr). For more information: Stephen Ferrari, Departamento de Psicologia, Universidade Federal do Pará, Campus do Guamá, Caixa Postal 8607, 66075-150 Belém, Pará, Brazil, e-mail: <ferrari@ufpa.br>. Note: On 8th July 2002, the organizing committee informed that the Congress had been moved forward to November from the previously announced dates of 25–30 August, 2002.

Foro de Primatologia 2002 - Estación de Biología "Los Tuxtlas", 21–22 de noviembre, 2002, Instituto de Biología 'Los Tuxtlas", Universidad Nacional Autónoma de México. El objeto de esta reunión es actualizar e intercambiar información acerca de investigaciones en curso con primates nativos (*Alouatta palliata*, *A. pigra* y *Ateles geoffroyi*) en el sureste de México y revisar los problemas de conservación de las poblaciones. Esto permitirá determinar cual es el estado de conocimiento acerca de la distribución actual de las poblaciones y su estado de conservación, así como conocer los tipos de investigaciones básicas y aplicadas que se llevan a cabo actualmente con primates silvestres en el sur de México. Tres áreas son de interés específico: *Poblacion y ecologia* - reconocimientos demográficos, relaciones primate-planta, recursos alimenticios, dispersión de semillas, y otros; *Conducta* - ecología del comportamiento, conducta social; y

Conservación - distribución actual de las especies, estado de conservación de las poblaciones, impacto demográfico de la fragmentación del hábitat, destrucción y fragmentación del hábitat, cacería y tráfico, proyectos de conservación. Se desea participar, comunicarse al correo <foro@primatesmx.com> ó al fax + (294) 942-4668. Indicar si participación es como asistente o como presentación de trabajo. Si es lo segundo, enviar resúmen (max 250 palabras) antes del 5 de Noviembre, indicando si se trata de presentación oral o tipo cartel. Número de asistentes al foro será limitado, por lo que se sugiere comunicar su participación con suficiente anticipación. Los participantes serán hospedados en las instalaciones de la Estación de Biología Los Tuxtlas. A los asistentes cuyos trabajos sean aprobados para presentación se les cubrirán gastos de estancia y alimentación en la Estación Los Tuxtlas del IB-UNAM.

Primate Society of Great Britain (PSGB) Winter Meeting 2002, 29 November, 2002, Zoological Society of London, Regent's Park, London, UK. The theme is "Primate Evolution and Adaptation". For information: Dr Sarah Elton, Department of Anthropology, University of Kent at Canterbury, Canterbury CT2 7NS, Kent, UK, Tel: +44 (0)1227 823232, Fax: +44 (0)1227 827289, e-mail: <s.e.elton @ukc.ac.uk>.

Dynamics and Conservation of Genetic Diversity in Forest Ecosystems, 2–5 December, 2002. Strasbourg, France. The conference will be divided into two main parts: Part A, processes and mechanisms promoting genetic diversity in forest ecosystems and Part B, implementations in conservation strategies. Speakers will be presenting information on forest trees and other short generation species. A webpage for the conference is available at: <http://www.pierroton.inra.fr/genetics/Dygen/>. For further information contact: DYGEN conference secretariat, Dr. Marie-Pierre Reviron, INRA , BP 45, 33610 Cestas, France, Tel: +33 5 57 12 28 32, Fax: +33 5 57 12 28 81, e-mail: <reviron@pierroton.inra.fr>.

XXIth Annual Conference of the Australasian Primate Society, 6–8 December, 2002, Melbourne Zoo, Melbourne, Australia. Organizers are Amanda Embury (Royal Melbourne Zoological Gardens) and Debbie Williams (CSL). For more details and to download a registration form, please visit <www.primates.on.net>, or contact: Amanda Embury, APS Conference Organizer, c/o Melbourne Zoo. Australia, e-mail: <aembury@zoo.org.au>.

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VI Congreso Internacional en Gestión de Recursos Naturales, 20 el 24 de enero de 2003, Hotel Villa del Rio, Valdivia, Chile. Este evento esta siendo organizado por el Centro de Estudios Agrarios & Ambientales (CEA) y cuenta con el auspício de importantes organizaciones nacionales e internacionales. Este VI Congreso esta estructurado en simposios: VIII Simposio de Manejo de Vida Silvestre y Conservación de la Biodiversidad, VI Simposio Iberoamericano de Educación y Comunicación Ambiental y VI Simposio de Desarrollo Sustentable, I Simposio de Humedales y Recursos Hidricos y I Simposio de Sistemas de Información Geográficos en la Gestión de Recursos Naturales. Toda la información relacionada con objetivos, programa, estadia, inscripciones, auspicios etc., esta en Internet en la dirección: <http://www.ceachile.cl/congresoVI.html>. Claudia Gil Cordero, Comite Organizador VI CIGRN, Casilla 164, Valdivia. Chile, Tel: 56-63-215846, Fax: 56-63-299065, e-mail: <congreso@ceachile.cl> o <cea@ceachile.cl>. Visite nuestra pagina institucional en <www.ceachile.cl>.

Student Conference on Conservation Science, 26–28 March, 2003, Conservation Biology Group, Department of Zoology, University of Cambridge. "Building links among young conservation scientists and practitioners". Plenary lectures: Elizabeth Bennett (Wildlife Conservation Society), Andrew P. Dobson (Princeton University), Bob Pressey (New South Wales National Parks and Wildlife Service) and Achim Steiner (Director-General, IUCN World Conservation Union). Web site: <http://www.zoo.cam.ac.uk/sccs/index.html>.

Primate Society of Great Britain (PSGB) Spring Meeting 2003, 10–11 April, 2003, School of Psychology, University of St. Andrews, Fife, Scotland. Abstracts for oral presentations, deadline: 10 January, 2003. Plenary talks will be on Primate Cognition. Invited speakers include: Andrew Whiten, Hannah Buchanan-Smith, Kevin Laland and Debbie Custance. For more information: Dr. Klaus Zuberbuhler, e-mail: <kz3@st-and.ac.uk>, or Gillian Brown, e-mail: <grb1000@cam.ac.uk>.

4th European Congress of Mammalogy, 27 July – 1 August, 2003, Brno, Czech Republic. Hosted by the Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic. Information and the pre-registration form are available on the website <http://www.ivb.cz>. Any questions about organization should be directed to Jan Zima, Organising Committee, e-mail: <ecm@IVB.cz>. The first information and the pre-registration form are now available on the website: < http://www.ivb.cz>.

28th International Ethological Conference, 20–27 August 2003, Costão do Santinho Resort, Florianopolis, Brazil. On behalf of the International Council of Ethologists and hosted by the Brazilian Society of Ethology. Deadline for submission of symposia: 31 January 2003. Deadline for submission of abstracts, financial aid applications, and standard reduced registration rate: 20 February 2003. For more information on the conference contact: Professor Kleber del Claro, e-mail: <delclaro@ufu.br>, or on the scientific program, contact Professor Regina Macedo, e-mail: <rhmacedo@unb.br>. Web site: <http://www.iec2003.org/home.htm>.