Short Articles

Primates of the Jaú National Park, Amazonas, Brazil

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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 A number of unpublished reports exist, but there is no published summary of information of all the primates known to occur within the park.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.

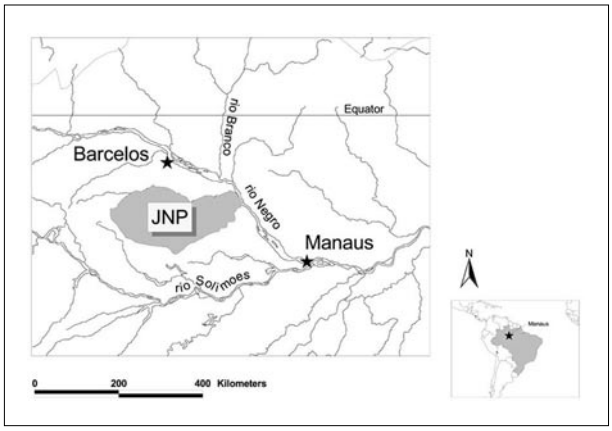

Figure 1. Location of Jaú National Park in Central Amazonia.

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

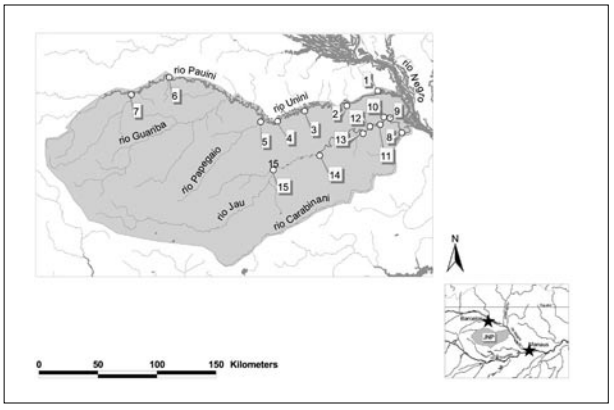

Figure 2. Primate survey sites in Jau National Park.

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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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