

anterior. Halter com haste castanha e capítulo preto. Propleura, anepisterno e catatergito com pêlos delgados castanhos. Pernas castanhas, sub-brilhantes, sendo as tíbias e tarsos mais escuros devido a pilosidade preta mais densa. Coxas com pêlos pretos maiores medianamente na face anterior e distalmente na face ântero-lateral. Asa (Figura 1). Abdômen castanho com pêlos pretos dorsalmente e castanhos lateral e ventralmente. Terminália: hipoprocto (Figura 3). Forquilha genital (Figura 4) em forma de Y com apódema bifido, côncavo. Tergitos 9, 10 e cercos (Figura 2).

Tamanho: 6,8mm.

Macho: desconhecido.

Distribuição: Brasil (Roraima).

Material examinado: BRASIL, Roraima, Serra Pacaraima, BV-8, 27.viii.1987, col. A.L. Henriques, em cabeça de cavalo (Holótipo ♀ – INPA); idem, 25.vi.05.vii.1988, col. Equipe J.A. Rafael, armadilha de Malaise (Parátipo ♀ – INPA).

Variações: o parátipo é levemente maior que o holótipo e apresenta quantidade maior de cerdas nas coxas.

Etimologia: o nome específico refere-se ao local onde foram coletados os espécimes, Serra Pacaraima.

Diagnose diferencial: *S. pacaraima*, sp.n. difere das outras espécies do gênero no Novo Mundo pela combinação dos seguintes caracteres: pernas castanhas, margem posterior do tergito 9 sinuosa e margem anterior do apódema cefálico da forquilha genital côncavo.

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A SURVEY OF PRIMATES IN CENTRAL PARÁ

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ABSTRACT – The distribution of primates between the lower Tocantins and Xingu Rivers in central Pará was surveyed. In addition to the seven species known to exist in this area, the occurrence of *Callithrix argentata* was confirmed. Sympatry between *C. argentata* and *Saguinus midas niger* was also recorded, although mixed-species associations were not observed. The results of the study indicate that the distribution of *C. argentata* may be restricted to the relatively flat lowland forest in the north of the region.

KEY WORDS: Primates, Callitrichidae, Distribution, Tocantins River, Xingu River.

RESUMO – A distribuição de primatas entre o baixo rio Tocantins e o baixo rio Xingu no centro do Pará foi revista. Além das sete espécies já conhecidas para a região, foi confirmada a ocorrência de *Callithrix argentata*. *Sympatry* entre *C. argentata* e *Saguinus midas niger* também foi registrada, embora associações mistas não tenham sido observadas. Os resultados do estudo indicam que a distribuição de *C. argentata* pode estar restrita às matas de terras baixas relativamente planas do norte da região.

PALAVRAS-CHAVE: Primatas, Callitrichidae, Distribuição, Rio Tocantins, Rio Xingu.

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INTRODUCTION

The major tributaries of the Amazon represent substantial geographic barriers to the dispersal of flightless arboreal mammals such as primates. In their lower reaches, for example, both the Tocantins and the Xingu attain a width of 10 km or more and these two rivers play an important role in the zoogeography of the platyrrhine genera *Callicebus*, *Chiropotes*, *Saguinus* and *Saimiri* in southeastern Amazonia (Hershkovitz 1977, 1984, 1985, 1988).

In Pará, seven primate species (*Alouatta belzebul*, *Aotus infulatus*, *Callicebus moloch*, *Cebus apella*, *Chiropotes satanas*, *Saguinus midas* and *Saimiri sciureus*) occur throughout the region between the Tocantins and the Xingu. The distribution of an eighth species, the silvery marmoset (*Callithrix argentata*, Figure 1), appears to be less extensive. The majority of the geographical range of *C. argentata* lies to the west of the Xingu (see Figure IX.36 in Hershkovitz 1977), although the type locality is Cametá, on the left bank of the Tocantins (Figure 2). The species has also been collected at three sites on the right (east) bank of the Xingu (Vilarinho do Monte, Tapará, Recreio). *C. argentata* was not recorded during studies at Carajás (Egler 1985) or Tucuruí (J.M.C. Ayres personal communication), however.

Cametá has also been designated the type locality for the white-fronted spider monkey, *Ateles belzebuth marginatus* (Kellog & Goldman 1944), although it seems unlikely that its natural range extends to the east of the Xingu (Egler 1985, Ayres et al. in press).

In addition to a general survey of primate populations between the Tocantins and the Xingu, the principal aims of the present study were the delineation of the distribution of *C. argentata* in this region and the confirmation of possible sympatry with the black-handed tamarin, *S. midas niger* (Figure 1).

STUDY AREA AND METHODS

The present study took place in November, 1989, in central Pará (Figure 2). Surveys were undertaken along the Trans-Amazon highway (BR-230, Marabá-Altamira) and the Pará state highways PA 156 (Tucuruí-Cametá) and PA 167 (Belo Monte do Pontal-Senador José Porfirio). The study was based on standardised interviews with local residents at a number of points along each of the three highways, concentrating in areas where the occurrence of *C. argentata* was reported. An attempt was made to maximise the reliability of the information collected during the interviews by both the avoidance of direct prompting and the questioning of all available informants at each location.

In addition to general observations at a number of sites, detailed observations of the primate fauna were carried out at two locations where informants reported the existence of *C. argentata*. Simple censuses, similar to those described in Ayres & Milton (1981), were carried out along existing trails. Once located, primate groups were observed for as long as conditions allowed and basic data on variables such as feeding behaviour, habitat use and group composition were collected. Most observations took place during the early part of the day, when primates tend to be most active.

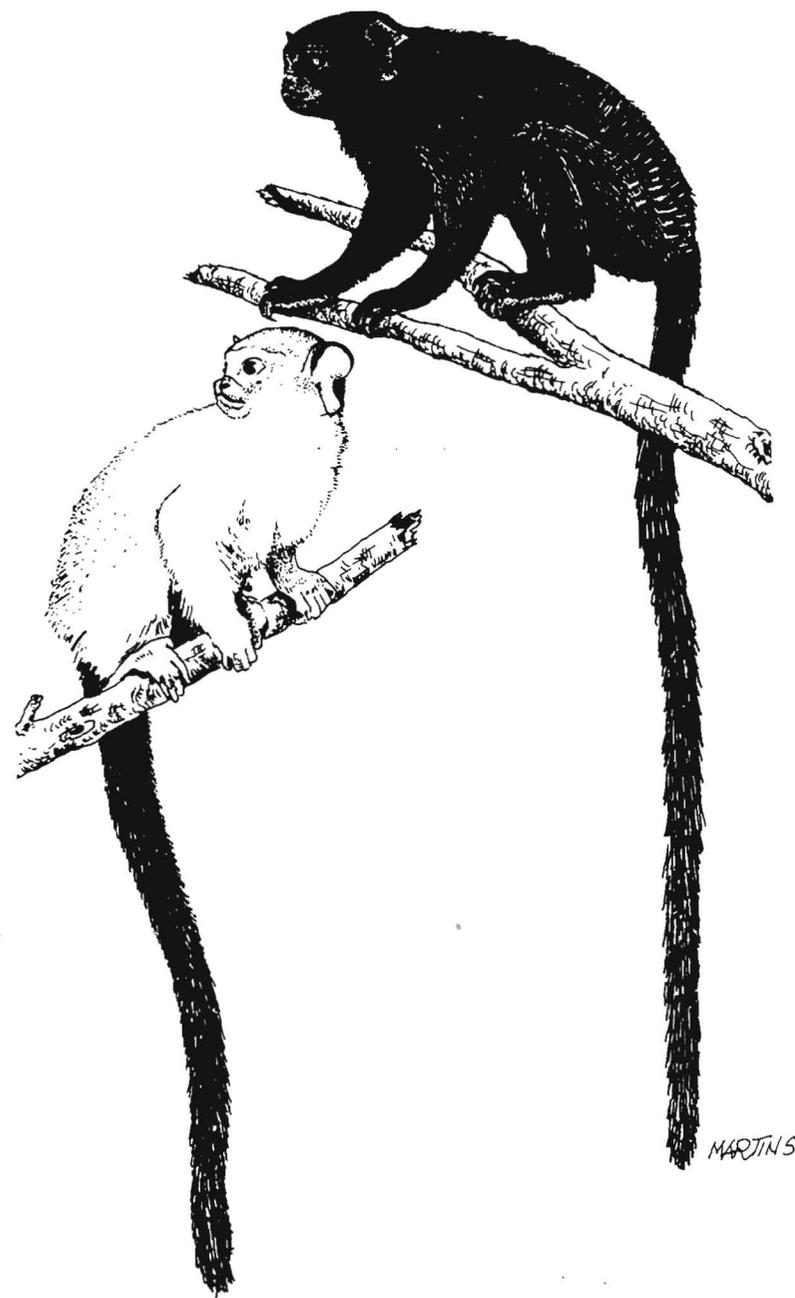


Figure 1 – The silvery marmoset, *Callithrix argentata* (on the left) and the black-handed tamarin, *Saguinus midas niger*.

RESULTS

Interviewees reported the occurrence of *Alouatta belzebul*, *Aotus infulatus*, *Callicebus moloch*, *Cebus apella*, *Chiropotes satanas*, *Saguinus midas* and *Saimiri sciureus* at all locations. The three largest primates, *Alouatta*, *Cebus* and *Chiropotes*, are commonly hunted for their meat and *Cebus* is frequently shot by local farmers when caught raiding crops such as maize, a type of behaviour also attributed to *Saimiri* by one informant. In broad terms, the information collected on variables such as group size, habitat use and population density corresponded with established data from ecological studies. The use of riverine habitats was universally reported for *Saimiri*, for example, as was the preference of *Callicebus* and *Saguinus* for disturbed forest.

Reports of *C. argentata* were far less widespread than for the other seven primates, in accordance with the distribution of recorded collecting localities, although the species was encountered much further to the south than expected. Going northwards and westwards, respectively, from Tucuruí, the occurrence of *C. argentata* was first reported at the village of Anilzinho, on PA 156 (49°52'W, 3°21'S), and at Belo Monte, on BR 230 (51°46'W, 3°04'S), Figure 2.

The two callitrichids were the most frequently sighted of the seven diurnal primate species observed during five days of survey at Anilzinho (Table 1). *C. argentata* was observed in both disturbed primary and remnant forest habitats, including areas in which the presence of *S. m. niger* was also confirmed. The two species were sighted on a total of twelve separate occasions, but were never observed in proximity to one another. In addition, while local informants reported what are presumably systematic associations (Terborgh 1983) between *Cebus* and *Saimiri*, they did not indicate similar behaviour for the two callitrichids.

Food plant species utilised by five primates were identified at Anilzinho (Table 2): *C. argentata* was observed feeding on the gum of *Tapirira guianensis* and extensive bark-gouging, like that associated with gum feeding, was observed on a neighbouring *Eschweilera ovata*, a species of the family Lecythidaceae. While trees of this family are known to produce gum, this is the first record of its exploitation by a *Callithrix* species.

While the existence of *C. argentata* was reported by a number (but not all) of informants at Belo Monte, the species was not sighted during six days of survey and its occurrence in this region thus remains unconfirmed by direct observation. Only two primate species were in fact observed at this site (Table 3), although the vocalisations of both *Alouatta* and *Callicebus* were frequently heard. Food plant species recorded for *Cebus* and *Saguinus* are given in Table 4.

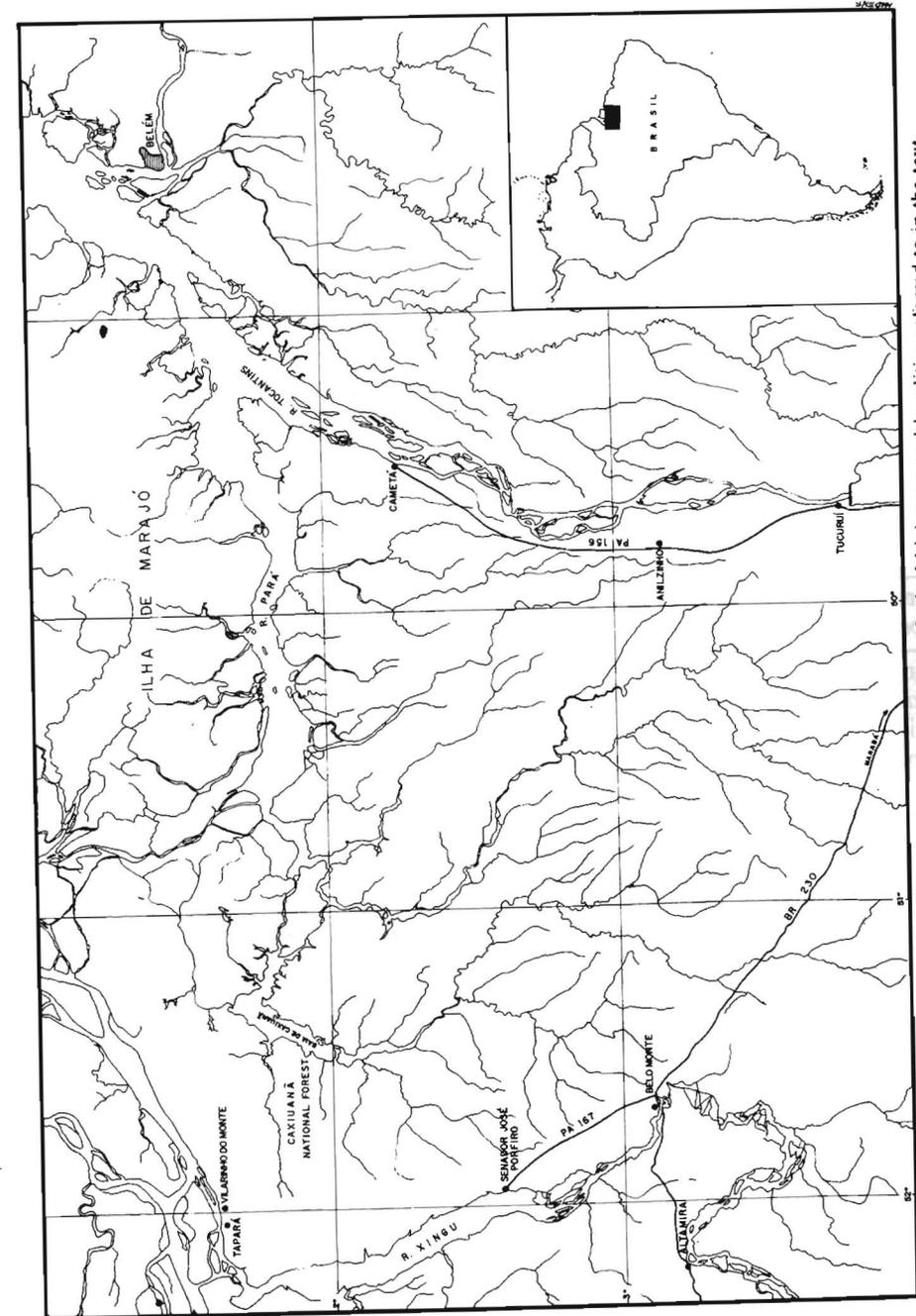


Figure 2 — Map of the study area in central Pará, showing the principal highways and localities referred to in the text.

Table 1 – Records of primates at Anilzinho (Km-70 on state highway PA-156, Tucuruí-Cametá). Approximately 40 km of trails walked, including forest edge.

Species	Sightings	Individuals sighted ¹	Habitat types used ²	Vocalisations heard
<i>Alouatta belzebul</i>	1	3	TF	frequently
<i>Callicebus moloch</i>	1	3 (3)	RTF	frequently
<i>Callithrix argentata</i>	6	1-3	RTF, DTF	–
<i>Cebus apella</i>	2	3	TF, DTF	–
<i>Chiropotes satanas</i>	1	2	TF	–
<i>Saguinus midas</i>	6	3-7 (4, 5, 7)	TF, DTF, SF	–
<i>Saimiri sciureus</i>	1	53 (53)	RF	–

¹ The numbers in parentheses are the reliable group counts, in which all group members were recorded.

² TF=Terra firme forest; RTF=Remnant terra firme forest; DTF=Disturbed terra firme forest; SF=Secondary forest; RF=Riverine forest.

Table 2 – Tree species exploited by primates at Anilzinho.

Tree species	Part eaten	Habitat type ¹	Primates observed feeding
Anacardiaceae:			
<i>Tapirira guianensis</i>	gum	DTF	<i>Callithrix argentata</i>
Dilleniaceae:			
<i>Dolioscarpus</i> sp.	fruit	RF	<i>Saimiri sciureus</i>
Guttiferae:			
<i>Vismia guianensis</i>	fruit	SF	<i>Saguinus midas</i>
Leguminosae:			
<i>Hymenaea</i> sp.	mesocarp	TF	<i>Alouatta belzebul</i>
Lecythidaceae:			
<i>Eschweilera ovata</i>	gum	DTF	<i>Callithrix argentata</i>
Myrtaceae:			
<i>Eugenia schomburgkii</i>	fruit	TF	<i>Saguinus midas</i> , <i>Cebus apella</i>
Sapotaceae:			
<i>Franchetella</i> sp.	fruit	SF	<i>Saguinus midas</i>

¹ Key as in table 1.

Interviews in Belo Monte and along PA 167 indicated that the distribution of *C. argentata* is restricted to the relatively narrow floodplain of the Xingu and that the species is absent from the higher terrain which separates Belo Monte from Senador Porfirio. If *C. argentata* is strictly limited to the flat ground bordering the Xingu, much of the survey, which took place in hilly forest at least 2 km from the river, may be redundant with regard to this species.

Table 3 – Records of primates at Belo Monte do Pontal (Km-412 on federal highway BR-230, Marabá-Altamira). Approximately 45 km of trails walked, including forest edge.

Species	Sightings	Individuals sighted ¹	Habitat types used ²	Vocalisations heard
<i>A. belzebul</i>	–	–	–	frequently
<i>Callicebus moloch</i>	–	–	–	frequently
<i>Cebus apella</i>	10	1-7 (7)	TF, DTF	regularly
<i>S. midas</i>	9	2-8 (5, 8)	TF, DTF, SF	–

¹ The numbers in parentheses are the reliable group counts, in which all group members were recorded.

² Key as in table 1.

Table 4 – Tree species exploited by primates at Belo Monte.

Tree species	Part eaten	Habitat type ¹	Primates observed feeding
Lecythidaceae:			
<i>Gustavia poeppigiana</i>	fruit/ immature seeds?	TF	<i>Cebus apella</i>
Leguminosae:			
<i>Inga alba</i>	mesocarp	TF, DTF, SF	<i>Saguinus midas</i> , <i>Cebus apella</i>
Moraceae:			
<i>Cecropia</i> sp.	fruit	SF	<i>Saguinus midas</i>

¹ Key as in table 1.

One reliable informant reported seeing *C. argentata* on his land, which borders the Xingu, during the period of the survey, although only one sighting (of a group of five *S. m. niger*) was recorded on four separate visits to this site. Contact with this *S. m. niger* group was maintained for more than four hours, but no indication of any form of interaction with *C. argentata* was observed. The same informant also reported that the two callitrichid species visit his orchard together and that he had recently seen a marmoset being preyed on by a raptor, possibly *Spizaetus* sp.

While the data from Belo Monte are somewhat inconclusive, they do correspond with those from the survey along PA-156. Anilzinho lies on a flat lowland plain which gives way to the steep foothills of the Trocará range some 15 km further south. This region is sparsely populated, and the first knowledgeable informant was only found some 20 km south of Anilzinho. He was not only

familiar with marmosets, however, but also confirmed that they did not occur in this area, an absence which was corroborated by all other interviewees to the south.

Apparently common at Anilzinho, *C. argentata* seems to disappear abruptly further south. Given the lack of any major river or other geographic barrier, the sudden nature of this change appears to be related to the transition from the flat Tertiary or Quaternary lowlands of the Amazon basin to the hilly topography of the Precambrian Brazilian Shield (Putzer 1984). According to Projeto Radam (1974), this also corresponds with a change in habitat, from the dense lowland forest lying in the north to montane or sub-montane forests in the south (Figure 3). The distribution of the former habitat type suggests that the range of *C. argentata* may extend further south on the left bank of the Tocantins, possibly as far as the Trocará reservation.

A similar situation is apparent in the region of Belo Monte, although in this case the distribution of *C. argentata* would coincide with that of the "mixed open forest" bordering the Xingu. This habitat type is more extensive further south (Figure 3), suggesting that the limit of this species' range on the right bank of the Xingu may be further to the south than could be confirmed during the present study.

The results of the survey indicate, then, that the distribution of *C. argentata* between the Tocantins and Xingu rivers corresponds with that of the dense lowland forests of the north of the region and may also include the mixed open forest to the south of Altamira. Detailed information on the forest habitats of this region are not available at the present time, however, and the evaluation of the variables which determine the distribution of this marmoset species will only be possible after further study.

DISCUSSION

The present study confirms the existence of eight primate species in the region dividing the lower Tocantins and Xingu Rivers in central Pará. Seven of the species are probably universal, although the distribution of the eighth, *C. argentata*, is less extensive, apparently correlating with that of the relatively flat, lowland forest in the north of the region. The presence of a ninth species, *A. belzebuth*, was neither reported nor observed, adding to the evidence that this primate does not occur in the region.

Why *C. argentata* should be restricted to the lowlands is unclear, although resource competition with *S.m. niger* may be an important factor, given that *C. argentata* is far more widespread to the west of the Xingu (Hershkovitz 1977), where it is the only callitrichid. Equivocally, the gum-feeding adaptations of *C. argentata* would be expected to give this species a competitive advantage (Ferrari & Lopes Ferrari 1989). In support of this, *C. argentata* forms part of the reduced primate fauna occurring in savanna-type habitats to the west of the Xingu (personal observation), for example, whereas *S.m. niger* is absent from the similarly reduced primate fauna of the gallery forests in eastern Marajó Island (Peres 1989).

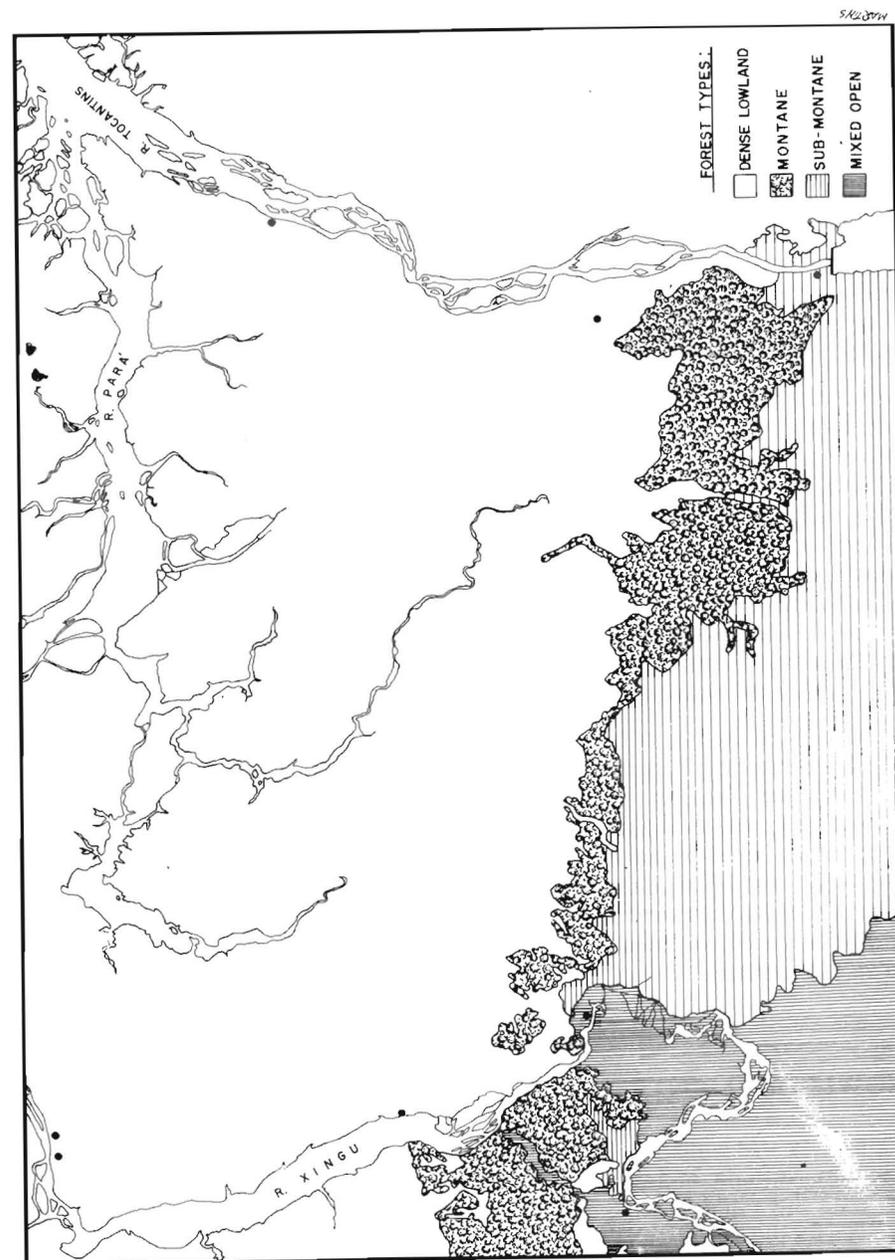


Figure 3 - Map of the study area showing the four main vegetation types referred to in the text (following Projeto Radam, 1974).

A number of hypotheses can be proposed to account for the present-day distribution of these two callitrichids. Assuming that *C. argentata* is a recent arrival, it is possible that its distribution is still expanding and that the observed correlation with lowland habitats is temporary, although a number of factors (the absence of key plant species, topography, etc.) may be impeding its expansion further south, in either the short or the long term. Some specific characteristic(s) of the upland forest may even prohibit the co-existence of two callitrichids in this habitat, implying that *C. argentata* would have to displace *S.m. niger* in order to colonise it.

If the two callitrichids are seen as being at least contemporaries in this region, on the other hand, their present distribution would suggest that *S.m. niger* has some significant competitive advantage over *C. argentata* which has allowed it to colonise the southern uplands either exclusively or by displacing the latter. The evidence suggests that this is unlikely, although far more data are required.

While the present study has confirmed that the distributions of these two callitrichid species do overlap, no direct evidence for the regular formation of associations between them was collected. This contrasts with data from Samuel, in Rondônia, which show that Snethlage's marmoset, *Callithrix emiliae*, and Weddell's saddle-back tamarin, *Saguinus fuscicollis weddelli* systematically form mixed troops (Martins et al. 1987, Lopes Ferrari in preparation). While one informant at Belo Monte did report seeing *C. argentata* and *S.m. niger* together, this was not confirmed during the survey and may represent random encounters at feeding trees. It is hoped that more detailed information on the degree of association between these two callitrichids will be collected at the Goeldi Museum research station recently established at Caxiuanã (Figure 2).

Up to now, there has only been one other study at a site, in Una, Bahia, where *Callithrix* occurs in sympatry with a second callitrichid species (Rylands 1982). At this site, *Callithrix penicillata* and *Leontopithecus chrysomelas* co-exist without forming associations. All the regular associations between callitrichid species recorded to date have in fact involved *S. fuscicollis* (Hernández-Camacho & Cooper 1976; Castro & Soini 1977; Pook & Pook 1982; Terborgh 1983; Garber 1988; Martins et al. 1987) and the evidence now appears to suggest that the formation of polyspecific associations is a behavioural specialisation peculiar to this tamarin.

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