Where Have All the Titis Gone? The Heterogeneous Distribution of Callicebus moloch in Eastern Amazonia, and Its Implications for the Conservation of Amazonian Primates

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Where Have All the Titis Gone? The Heterogeneous Distribution of *Callicebus moloch* in Eastern Amazonia, and Its Implications for the Conservation of Amazonian Primates

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Abstract: Primate populations were surveyed quantitatively at three sites in the Xingu-Tocantins interfluvium in southeastern Amazonia, the easternmost limit of the distribution of the red-bellied titi, *Callicebus moloch*. At least 101 km was walked at a given site, and total transect length was 812 km. Despite the typical abundance of other species, no sightings (or vocalizations) of *C. moloch* were recorded at any site. This contrasts with other studies in the same interfluvium, and surveys in other areas of southeastern Amazonia. While the determinants of the absence—or marked rarity—of *C. moloch* from the sites remain unclear, it does appear to be a natural phenomenon, possibly related to specific local conditions. The identification and evaluation of such determinants will be important for understanding the ecology and zoogeography of the genus. In the meantime, these results highlight potential problems for the conservation and management of wild populations, not only of titis, but possibly many other species of Amazonian primates.
Key Words: *Callicebus moloch*, population density, zoogeography, ecology, Amazonia, conservation

Resumo: Populações de primatas foram levantadas quantitativamente em três sítios do interflúvio Xingu-Tocantins, no sudeste da Amazônia, no limite oriental da distribuição do zogue-zogue de ventre vermelho, *Callicebus moloch*. Foi percorrido um mínimo de 101 km em um dado sítio, e o percurso total foi de 812 km. Apesar da abundância típica de outras espécies, nenhum avistamento (ou vocalização) de *C. moloch* foi registrado em qualquer sítio. Estes resultados contrastam com outros estudos no mesmo interflúvio e em outras áreas do sudeste da Amazônia. Os determinantes da ausência—ou escassez acentuada—de *C. moloch* dos sítios permanecem desconhecidos, mas parecem ser um fenômeno natural, possivelmente relacionados a condições locais específicas. A identificação e avaliação destes fatores serão importantes para o entendimento da ecologia e zoogeografia do gênero. Neste meio tempo, os resultados destacam problemas em potencial para a conservação e manejo de populações silvestres, não somente de zogue-zogues, mas possivelmente várias outras espécies de primatas amazônicas.
Palavras-chave: *Callicebus moloch*, densidade populacional, zoogeografia, ecologia, Amazônia, conservação

Introduction

The geographic ranges of Amazonian primates have traditionally been defined on the basis of the distribution of major river systems, which play a fundamentally important role in the zoogeography of most genera (Ayres and Clutton-Brock 1992). This tradition was reinforced by the fact that, until very recently, the vast majority of recorded localities were clustered along the banks of major rivers (see for example, Hershkovitz 1977, 1990). It has also reinforced the implicit assumption that primate populations are distributed more or less uniformly within the limits defined by these rivers.

In recent years, the more systematic exploration of Amazonian interfluvia, facilitated in many cases by the construction of highways, has updated our knowledge not only of the zoogeography, but also of the diversity of many platyrrhine genera, most notably *Mico* (see Van Roosmalen *et al*. 2000) and *Callicebus* (see Van Roosmalen *et al*. 2002; Wallace *et al*. 2006). Detailed surveys have also revealed local variations in distribution and abundance, related primarily to ecological factors such as habitat characteristics, in particular differences between flooded or floodplain and terra firma forests, and interspecific competition (Ferrari and Lopes 1990, 1996; Peres 1993, 1997a; Iwanaga and Ferrari 2002; Ferrari 2004).

The Tocantins and Xingu rivers are the principal barriers to the dispersal of primates in southeastern Amazonia, where they delimit the distribution of a number of platyrrhine taxa, including four genera (Ferrari and Lopes 1996). The Tocantins forms the easternmost limit of the distribution of Amazonian titis, and the red-bellied titi, *Callicebus moloch*, is known from a total of ten localities east of the Xingu (Mascarenhas and Puorto 1988; Ferrari and Lopes 1990; Hershkovitz 1990). However, detailed surveys at three sites in the Xingu-Tocantins interfluvium, presented here, indicate that *C. moloch* is either extremely rare in or absent from large tracts of forest within this area. The patchy distribution of the species appears to be a natural phenomenon, rather than a result of habitat disturbance or hunting pressure, but the factors involved remain unclear.

Methods

Primate populations were surveyed at three sites in the Tocantins-Xingu interfluvium (Fig. 1, Table 1) in 1996 and 1997. All three sites present relatively large tracts of primary Amazonian terra firma forest, but also patches of both secondary forest and distinct ecosystems such as inundated, or *igapó* forest (especially at the Ferreira Penna Scientific Station [ECFPn], in the Caxiuanã National Forest). Detailed descriptions of sites 1, 2 and 3 are given, respectively, in Lisboa (1997, 2001), Bobadilla (1998) and Emidio-Silva (1998). The principal difference between the sites is related to their location within the interfluvium, which can be divided into a lowland floodplain to the north, and the Brazilian Shield to the south, with associated differences in forest structure and composition (Brazil, MME-DNPM Projeto RADAM 1974; Ferrari and Lopes 1990, 1996; Lisboa *et al*. 1997). Site 1 represents the lowland floodplain, whereas sites 2 and 3 are located on the Brazilian Shield.

As in previous studies in southeastern Amazonia (for example, Johns 1986; Ferrari and Lopes 1996; Lopes and Ferrari 2000; Ferrari *et al*. 2003), primate populations were surveyed using standard line transect methods (see Brockelman and Ali 1986). A straight-line trail system was established in the terra firma forest at each location, with a total length of 65, 15.5 and 9.5 km, respectively, at sites 1, 2 and 3. Trails were cleared causing a minimum of impact, swept clean of debris and marked with flagging at 100 m intervals. During surveys, in 1996 and 1997, trails were walked at an average speed of 1–1.5 km per hour and, at each encounter with a primate group, the species and composition of the group were recorded, in addition to other information not relevant here (see Bobadilla and Ferrari 2000).

Results

A total of 292 sightings of primates were recorded during the 812 km surveyed at the three study sites (Table 2), at an average rate of 3.6 sightings per 10 km of transect. This sighting rate compares favorably with those recorded at other sites in southeastern Amazonia (Lopes and Ferrari 2000; Ferrari *et al*. 2002, 2003). Four species, *Alouatta belzebul*, *Cebus apella*, *Chiropotes satanas*, and *Saguinus niger*, were recorded at all three sites, and provided the vast majority (287) of sightings. A fifth species, *Saimiri sciureus*, was not seen at site 1 during the present study, but it has been observed within the study area. The overall lack of records of *Saimiri* may have been at least partly due to its specific habitat preferences and ranging behavior (Terborgh 1983).

One other species, *Mico argentatus*, has a limited distribution in the Xingu-Tocantins interfluvium, where it is restricted to the lowland floodplain (Ferrari and Lopes 1990), and is thus absent from sites 2 and 3. The species occurs at site 1 (Ferrari and Lopes 1996), but is found exclusively in secondary forest habitats, where it may reach relatively high densities (Veracini 1997). It has never been observed within the present study area.

The total lack of records of *Callicebus moloch* from all three sites is less easily accounted for. Titis appear to be at least as abundant at other sites in this interfluvium (Mascarenhas and Puorto 1988; Ferrari and Lopes 1990) as they are west of the Xingu (Martins *et al*. 1988; Ferrari *et al*. 2003) or elsewhere in the Amazon basin (Peres 1997a; Ferrari *et al.* 2000).

Ferrari *et al.* (2003) recorded *C. moloch* in both continuous and fragmented forest east of the Rio Tapajós, normally at median densities, although the species was absent from some sites, possibly due to the effects of habitat fragmentation. Even if local conditions at the present study sites were to reduce the visibility of the species during surveys for some reason, it seems unlikely that they would also suppress the characteristic vocal duetting that is typical of all titi species (Emmons *et al*. 1998). Audible over distances of more than one kilometer, and normally performed on a daily basis, the duet is a sure sign of the presence of titis at most sites.

There is also little evidence of hunting pressure at any site, not least because titis are almost never targeted because of their small body size. The relative abundance of the larger species (*Alouatta*, *Cebus* and *Chiropotes*) at all three sites also indicates that primates suffer little pressure. The Parakanã do hunt primates, but very rarely, and only *Alouatta* and *Cebus*—coincidentally, the two species recorded most frequently at site 3.

Additional evidence confirms that *C. moloch* is absent from large areas of continuous forest at sites 1 and 3. Perhaps the most reliable evidence is that provided by experienced Parakanã hunters, who unanimously confirm the absence of *Callicebus* from site 3. However, as more than half of the Parakanã territory is still uninhabited (Emidio-Silva 1998), it is probably premature to exclude *C. moloch* from the whole of the reservation. Similarly, while the sum of the evidence from site 1 (ECFPn)—which now includes a number of long-term studies of primate ecology (Veracini 1997; Jardim and Oliveira 1997; Pina *et al*. 2001; Tavares and Ferrari 2001) and additional surveys (Martins *et al*. 2005)—leaves little doubt as to the absence of *Callicebus*, some local residents have reported its presence in areas neighboring the Caxiuanã

Table 1. Characteristics of the sites surveyed in southeastern Amazonia (see Figure 1).

Site	Coordinates	Characteristics
1. Ferreira Penna Scientific Station (ECFPn)	1°42'S, 51°28'W	33,000 ha, in a much larger (>300,000 ha) area of primary forest (Caxiuanã National Forest), unlogged primary forest, negligible hunting pressure
2. Fazenda Arataú	3°50'S, 50°20'W	7,500 ha, isolated forest fragment, moderately logged, negligible hunting pressure
3. Parakanã Indigenous Territory (T.I. Parakanã)	4°28'S, 49°56'W	351,697 ha, partially isolated, no logging, primates rarely hunted

Table 2. Main results of primate surveys at the three study sites.

Site	Km surveyed	Sightings of primates (sightings/10 km surveyed)	Species most sighted (n records)	Species least sighted (n records)
1	533	202 (3.8)	*Alouatta belzebul* (112)	*Chiropotes satanas* (6)
2	101	58 (5.7)	*Chiropotes satanas* (21)	*Saimiri sciureus* (4)
3	178	32 (1.9)	*Alouatta belzebul* (11) *Cebus apella* (11)	*Saimiri sciureus* (1)

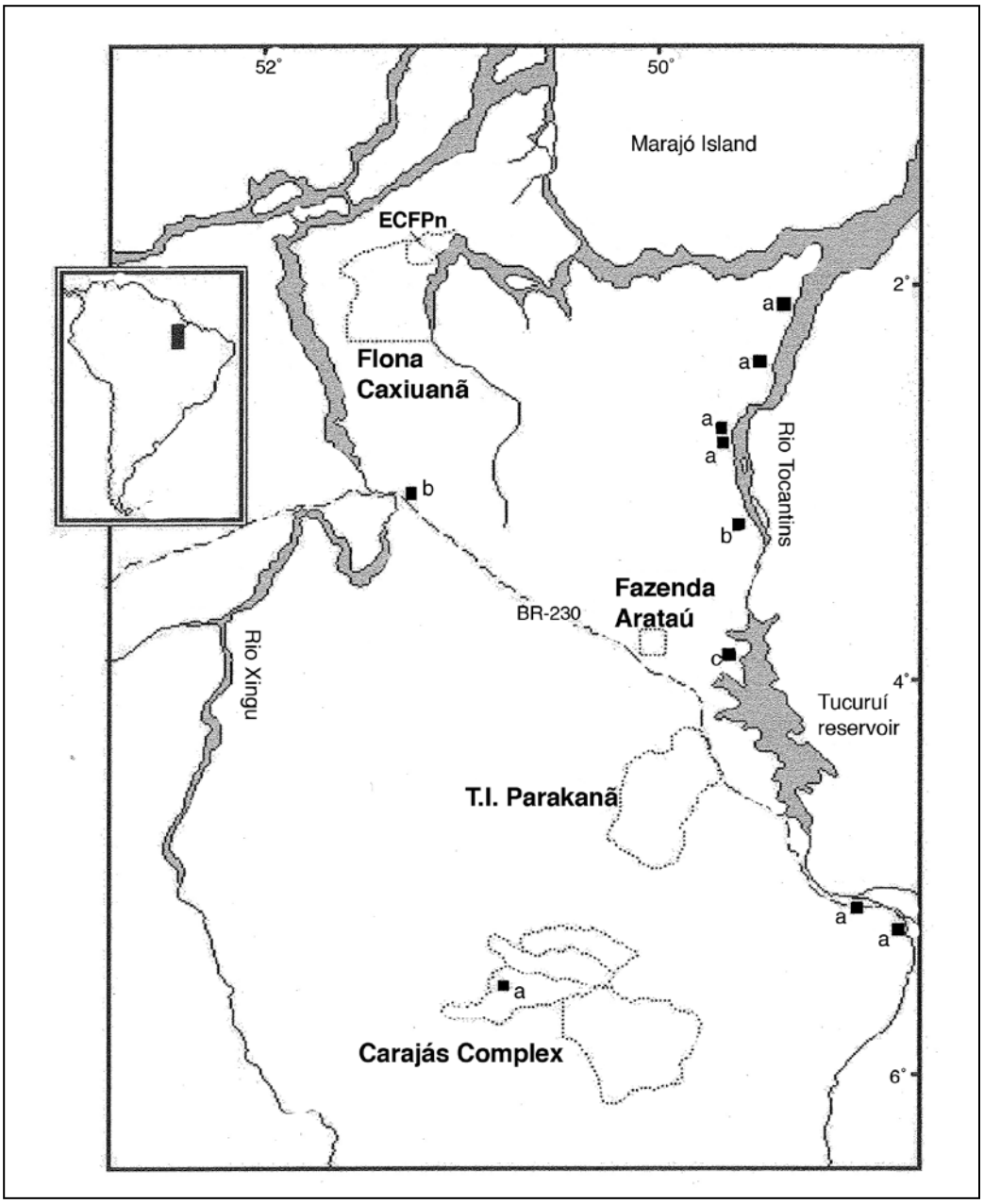

Figure 1. The Xingu-Tocantins interfluvium in southeastern Amazonia showing the sites surveyed in the present study (see Table 1), and collecting and sighting localities of *Callicebus moloch*, according to: (a) Hershkovitz (1990), (b) Ferrari and Lopes (1990), and (c) Mascarenhas and Puorto (1988).

National Forest. The results from both sites 2 and 3 also contradict considerably those of the rescue operation in the area of the Tucuruí reservoir (Mascarenhas and Puorto 1988), less than 50 km to the east (Figure 1), where *Callicebus moloch* was the third most frequently captured species, after *Alouatta belzebul* and *Cebus apella*.

Discussion

The results of the surveys indicate that titis are naturally absent (or extremely rare) from extensive tracts of continuous terra firma forest within the Xingu-Tocantins interfluvium. Exact limits are unclear, but if the sites surveyed here are typical, the species may be absent from a large portion of the forest between the two rivers. Obviously, any estimate of population size based on the assumption of a homogeneous distribution within this area would require substantial revision. There are few clues to the determinants of the observed pattern, although it seems likely that ecological factors are involved, as in the case of the silvery marmoset, *Mico argentatus*, a second species with a heterogeneous distribution in this interfluvium (Ferrari and Lopes 1990, 1996). In this case, however, *M. argentatus* is present at site 1, but is absent from Tucuruí, where *Callicebus* is apparently abundant. So, even if similar ecological factors are involved, they clearly have different effects on the distribution of the two species.

One pattern apparent from the distribution of sites (Fig. 1) is a possible association with riparian habitats, given that most of the localities are distributed along the Tocantins. This may be a sampling artifact, but it could also reflect specific habitat preferences. As the Tocantins has a long history of human colonization, it may even be that *C. moloch* prefers anthropogenic habitats over pristine terra firma forest. This may include the ECFPn, where human impact is negligible. Interestingly, Wallace *et al*. (1998, 2000) identified a possibly similar situation in eastern Bolivia, where *Callicebus donacophilus* was absent from large preserves of primary terra firma forest close to the Brazilian border, but abundant in the anthropogenic landscape further south.

While *Callicebus moloch* is not under any immediate threat of extinction at the present time, the results of this study highlight a number of potential problems for the conservation of both this and other Amazonian primates. To begin with, the species is apparently absent from two of the sites (1 and 3) with the best potential for the long-term conservation of the region's primates (Ferrari *et al*. 1999).

One other key site is the Carajás complex (Fig. 1), which includes a fully-protected area (the 103,000-ha Tapirapé Biological Reserve), national forests and indigenous lands (Companhia Vale do Rio Doce 2007). *Callicebus moloch* is known to occur in this area, although little is known of its exact distribution and abundance, and Toledo *et al*. (1999) report that a population of the exotic *Callicebus brunneus* may have been established in the area, derived from animals released from captivity. Otherwise, the interfluvium is characterized by widespread deforestation, promoted by a number of "mega-projects", including the Carajás Mining Project, existing (Tucuruí) and planned (Belo Monte) hydroelectric dams, and the Trans-Amazon highway (BR-230), which bisects the region.

On a broader scale, these findings underscore a problem that may become increasingly important as the Amazon basin is colonized. Many species—not only of primates, but also of many other groups of organisms—are known from a very small sample of localities within an apparently vast geographic range. In most cases, it is assumed that the species occupies all the available habitat between localities or river barriers (Ayres and Clutton-Brock 1992), but there is increasing evidence of major lacunae in the distribution of many species (Ferrari 2004), a prime example being the red howler (*Alouatta seniculus*) in southwestern Amazonia (Peres 1997b; Iwanaga and Ferrari 2002). In the case of one other eastern Amazonian endemic, the Ka'apor capuchin (*Cebus kaapori*), an apparently very patchy distribution, combined with extremely low population densities almost certainly determined the delay in the discovery of the species until the end of the twentieth century (Queiroz 1992). These same characteristics have also contributed decisively to the current status of *C. kaapori* as one of the most endangered of Amazonian primates (Ferrari and Queiroz 1994; IUCN 2006).

Clearly, more reliable data are needed for many, if not most species of Amazonian primates, especially those with relatively large geographic ranges. In the meantime, it may be necessary to revise conservation parameters for some species, including their status, where estimates are based on potentially problematic data. As shown here, such caution may be especially important for the planning of protected areas.

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Literature Cited

Ayres, J. M. and T. H. Clutton-Brock. 1992. River boundaries and species range size in Amazonian primates. *Am. Nat.* 140: 531–537.

Bobadilla, U. L. 1998. Abundância, Tamanho de Agrupamento e Uso do Hábitat por Cuxiús de Uta Hick *Chiropotes satanas utahicki* Hershkovitz, 1985 em Dois Sítios na Amazônia oriental: Implicações para a Conservação. Masters dissertation, Universidade Federal do Pará, Belém.

Bobadilla, U. L. and S. F. Ferrari. 2000. Habitat use by *Chiropotes satanas utahicki* and syntopic platyrrhines in eastern Amazonia. *Am. J. Primatol.* 50: 215–224.

Brazil, MME-DNPM Projeto RADAM. 1974. *Projeto RadamBrasil, Folha SA 22. Belém: Geologia, Geomorfologia, Solos, Vegetação e Uso potencial da Terra*. Ministério de Minas e Energia (MME), Departamento Nacional de Produção Mineral (DNPM), Rio de Janeiro.

Brockelman, W. Y. and R. Ali. 1986. Methods of surveying and sampling forest primate populations. In: *Primate Conservation in the Tropical Rainforest*, C. W. Marsh and R. A. Mittermeier (eds.), pp.21–62. Alan R. Liss, Inc., New York.

Companhia Vale do Rio Doce. 2007. Conservation units and reserves. http://www.cvrd.com.br/cvrd_us/cgi/cgilua.exe/sys/start.htm?sid=427

Emidio-Silva, C. 1998. A Caça de Subsistência Praticada pelos Índios Parakanã (Sudeste do Pará): Características e Sustentabilidade. Masters dissertation, Universidade Federal do Pará, Belém.

Emmons, L. H., B. M. Whitney and D. L. Ross. 1998. *Sounds of Neotropical Rainforest Mammals: an Audio Field Guide*. Chicago University Press, Chicago.

Ferrari, S. F. 2004. Zoogeography of Amazonian primates. In: *A Primatologia no Brasil – 8*, S. L. Mendes and A. G. Chiarello (eds.), pp.101–122. Sociedade Brasileira de Primatologia, Santa Teresa, Espírito Santo.

Ferrari, S. F., C. Emidio-Silva, M. A. Lopes and U. L. Bobadilla. 1999. Bearded sakis in southeastern Amazonia – back from the brink? *Oryx* 33: 346–351.

Ferrari, S. F., S. Iwanaga, M. R. Messias. E. M. Ramos, P. C. S. Ramos, E. H. Cruz Neto and P. E. G. Coutinho. 2000. Titi monkeys (*Callicebus* spp., Atelidae: Platyrrhini) in the Brazilian state of Rondônia. *Primates* 41: 191–196.

Ferrari, S. F. and M. A. Lopes. 1990. A survey of primates in central Pará. *Bol. Mus. Para. E. Goeldi, Zool.* 6: 169–179.

Ferrari, S. F. and M. A. Lopes. 1996. Primate populations in eastern Amazonia. In: *Adaptive Radiations of Neotropical Primates*, M. A. Norconk, A. L. Rosenberger and P. A. Garber (eds.), pp.53–67. Plenum Press, New York.

Ferrari, S. F., R. Ghilardi Jr., E. M. Lima, A. L. C. B. Pina and S. S. Martins 2002. Mudanças a longo prazo nas populações de mamíferos da área de influência da Usina Hidrelétrica de Tucuruí, Pará. In: *Resumos do XXIVº Congresso Brasileiro de Zoologia*, Sociedade Brasileira de Zoologia, pp.540–541. Editora e Gráfica Berger, Itajaí, SC.

Ferrari, S. F., S. Iwanaga, A. L. Ravetta, F. C. Freitas, B. A. R. Sousa, L. L. Souza, C. G. Costa and P. E. G. Coutinho. 2003. Dynamics of primate communities along the Santarém-Cuiabá highway in southern central Brazilian Amazônia. In: *Primates in Fragments*, L. K. Marsh (ed.), pp.123–144. Kluwer Academic, New York.

Ferrari, S. F. and H. L. Queiroz. 1994. Two new Brazilian primates discovered, endangered. *Oryx* 28: 31–36.

Hershkovitz, P. 1977. *Living New World Monkeys (Platyrrhini), with an Introduction to Primates.* Vol. 1. Chicago University Press, Chicago.

Hershkovitz, P. 1990. Titis, New World monkeys of the genus *Callicebus* (Cebidae, Platyrrhini): a preliminary taxonomic review. *Fieldiana Zool.* 55: 1–109.

Iwanaga, S. and S. F. Ferrari. 2002. Geographic distribution of red howlers, *Alouatta seniculus* (Platyrrhini, Alouattini), in southwestern Brazilian Amazonia, with notes on *Alouatta caraya*. *Int. J. Primatol*. 23: 1245–1256.

Jardim, M. M. A. J. and L. F. Oliveira. 1997. Uso do espaço de *Alouatta belzebul* (Primates, Cebidae) em função da temporalidade de recursos. In: *Caxiuanã*, P. L. B. Lisboa (ed.), pp.417–436. MCT/CNPq, Belém.

Johns, A. D. 1986. Effects of Habitat Disturbance on Rainforest Wildlife in Brazilian Amazonia. Unpublished report to WWF–US, Washington, D. C.

Lisboa, P. L. B. 1997. *Caxiuanã*. MCT/CNPq, Belém.

Lisboa, P. L. B. 2001. *Caxiuanã*, *Populações Tradicionais, Meio Físico e Diversidade Biológica.* MCT/CNPq, Belém.

Lisboa, P. L. B., A. S. Silva and S. S. Almeida. 1997. Florística e estrutura dos ambientes. In: *Caxiuanã*, P. L. B. Lisboa (ed.), pp.163–193. MCT/CNPq, Belém.

Lopes, M. A. and S. F. Ferrari. 2000. Effects of human colonization on the abundance and diversity of mammals in eastern Brazilian Amazonia. *Conserv. Biol.* 14: 1658–1665.

Martins, E. S., J. M. Ayres and M. B. R. do Valle. 1988. On the status of *Ateles belzebuth marginatus* with notes on other primates of the Iriri river basin. *Primate Conserv.* (9): 87–91.

Martins, S. S., J. S. Silva Jr., E. M. Lima and R. R. Santos. 2005. Primatas da Estação Científica Ferreira Penna, Floresta Nacional de Caxiuanã, Pará. *Programa e Livro de Resumos: XI Congresso Brasileiro de Primatologia*, p.124. Pontifícia Unversidade Católica do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul. 13–18 February 2005.

Mascarenhas, B. M. and G. Puorto. 1988. Nonvolant mammals rescued at the Tucuruí dam in the Brazilian Amazon. *Primate Conserv.* (9): 91–93.

Peres, C. A. 1993. Structure and organization of an Amazonian terra firme primate community. *J. Trop. Ecol.* 9: 259–276.

Peres, C. A. 1997a. Primate community structure at twenty western Amazonian flooded and unflooded forests. *J. Trop. Ecol.* 12: 1–25.

Peres, C. A. 1997b. Effects of habitat quality and hunting pressure on arboreal folivore densities in Neotropical forests: a case study of howler monkeys (*Alouatta seniculus*). *Folia Primatol.* 68: 199–222.

Pina, A. L. C. B., L. L. Souza and S. F. Ferrari. 2001. Spacing patterns of *Alouatta belzebul* groups at ECFPn. In: *Caxiuanã*, *Populações Tradicionais, Meio Físico e Diversidade Biológica*, P. L. B. Lisboa (ed.), pp.687–697. CNPq/MCT, Belém.

Queiroz, H. L. 1992. A new species of capuchin monkey, genus *Cebus*, Exrleben, 1777 (Cebidae: Primates) from eastern Amazonia. *Goeldiana Zool.* 15: 1–13.

Tavares, L. I. and S. F. Ferrari. 2001. Diet of the silvery marmoset (*Callithrix argentata*) at ECFPn: seasonal and longitudinal variation. In: *Caxiuanã*, *Populações Tradicionais, Meio Físico e Diversidade Biológica*, P. L. B. Lisboa (ed.), pp.707–719. CNPq/MCT, Belém.

Terborgh, J. 1983. *Five New World Primates: A Study in Comparative Ecology*. Princeton University Press, Princeton.

Toledo, P. M., H. M. Moraes-Santos and C. C. S. Melo. 1999. Levantamento preliminar de mamíferos não-voadores da Serra dos Carajás: grupos silvestres recentes e zooarqueológicos. *Bol. Mus. Para. Emílio Goeldi, sér. Zool.* 15: 141–157.

Veracini, C. 1997. O Comportamento alimentar de *Callithrix argentata* (Linnaeus 1771) (Primata, Callitrichinae). In: *Caxiuanã*, P.L.B. Lisboa (ed.), pp.437–446. MCT/CNPq, Belém.

Van Roosmalen, M. G. M., T. van Roosmalen, R. A. Mittermeier and A. B. Rylands. 2000. Two new species of marmoset, genus *Callithrix* Erxleben, 1777 (Callitrichidae, Primates) from the Tapajós/Madeira interfluvium, south central Amazonia, Brazil. *Neotrop. Primates* 8: 2–18.

Van Roosmalen, M. G. M., T. van Roosmalen and R. A. Mittermeier. 2002. A taxonomic review of the titi monkeys, genus *Callicebus* Thomas, 1903, with the description of two new species, *Callicebus bernhardi* and *Callicebus stephennashi*, from Brazilian Amazonia. *Neotrop. Primates* 10(suppl.): 1–52.

Wallace, R. B., R. L. E. Painter and A. B. Taber. 1998. Primate diversity, habitat preferences, and population density estimates in Noel Kempff Mercado National Park, Santa Cruz Department, Bolivia. *Am. J. Primatol.* 46: 197–211.

Wallace, R. B., R. L. E. Painter, D. J. Rumiz and A. B. Taber. 2000. Primate diversity, distribution and relative abundances in the Rios Blanco Y Negro Wildlife Reserve, Santa Cruz Department, Bolivia. *Neotrop. Primates* 8: 24–28.

Wallace, R. B., H. Gómez, A. Felton and A. M. Felton. 2006. On a new species of titi monkey, genus *Callicebus* Thomas (Primates, Pitheciidae), from western Bolivia with preliminary notes on distribution and abundance. *Primate Conserv.* (20): 29–39.

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