

STATUS OF THE MURIQUI (*BRACHYTELES*) POPULATIONS REMAINING IN THE STATE OF RIO DE JANEIRO, BRAZIL: PROJETO MURIQUI-RIO

Vânia Luciane Alves Garcia

Seção de Mastozoologia, Departamento de Vertebrados, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil. E-mail: <vanialagarcia@yahoo.com.br>

Abstract

In his study of the status and geographic distribution of the mureiqui, *Brachyteles arachnoides*, of the Atlantic forest, Aguirre (*O mono Brachyteles arachnoides* (É. Geoffroy). *Situação atual da Espécie no Brasil*, Acad. Brasil. Ciênc., Rio de Janeiro. 1971) documented its widespread disappearance from the state of Rio de Janeiro, identifying only six localities where it could still be found, and estimating a population of only 650 to 840 individuals. In this paper, I report on 25 survey expeditions carried out from 1999 to 2003 to verify the continued presence of mureiquis in six localities in the state of Rio de Janeiro: the Serra dos Órgãos National Park, Desengano State Park, Paraíso Ecological Station, the Cairuçu Environmental Protection Area (adjoining the Serra da Bocaina National Park), the region of Macaé de Cima and the Itatiaia National Park. A total of 55 mureiquis were seen in Serra dos Órgãos, Cairuçu, and Desengano. Local inhabitants reported that mureiquis were now very rare in the region of Macaé de Cima and the Paraíso Ecological Station. No mureiquis were seen in the Itatiaia National Park, but three specimens on show in the museum indicate that it is the northern mureiqui (*B. hypoxanthus*) which occurs there, rather than the southern mureiqui (*B. arachnoides*) known from the rest of the state.

Key Words – mureiquis, *Brachyteles*, conservation, distribution, Atlantic forest, Rio de Janeiro

Introduction

In his study of the status and geographic distribution of the mureiqui, *Brachyteles arachnoides* (É. Geoffroy, 1806), of the Atlantic forest, Álvaro Coutinho Aguirre (1971) documented its widespread disappearance from the state of Rio de Janeiro, identifying only six localities where it could still be found, and estimating a population of only 650 to 840 individuals. Over the last 35 years, we have witnessed an accelerated destruction of the Atlantic forest, not just in the state of Rio de Janeiro, but in all of eastern and southern Brazil. Forest covered 97% of the state in 1500, but with the various economic cycles, based largely on the exploitation of natural resources, today the forest is entirely fragmented, and has been reduced to 7,346.29 km², about 17% of its original extent (42,940 km²) (Fundação S.O.S. Mata Atlântica / INPE, 2001).

Hunting has also been a major factor in the disappearance of mureiquis from the state and, although today minimal in terms of its volume compared to the past (Lane, 1900), is no less significant in its depredation of the tiny and isolated populations remaining. According to Silva (1987), more than 10 mureiquis were shot in 1980 in the Serra do Subaio, in the municipality of Guapimirim, and Martuscelli (1994) recorded that five mureiquis were killed by local hunters in the vicinity of the Pico do Cairuçu, municipality of Paraty, in 1990.

Very little is known about the numbers or the location of the remaining populations of mureiquis in the state of Rio de Janeiro. Morphological, genetic and social differences have led a number of researchers to argue for the existence of two subspecies of mureiqui, one southern and the other northern, divided by the Serra da Mantiqueira (Lemos de Sá *et al.* 1990). Populations in Minas Gerais and Espírito Santo (*B. hypoxanthus* [Kuhl, 1820]), have spotty, partially depigmented faces and genitalia, and a vestigial thumb, but those in São Paulo (*B. arachnoides*) have darkly pigmented faces and genitals, and lack the vestigial thumb (Lemos de Sá and Glander, 1993). Coimbra-Filho *et al.* (1993), Rylands *et al.* (1995, 2000) and Groves (2001) consider them to be distinct species.

As Rio de Janeiro marks the supposed range limits of the two species, there are doubts even as to the taxonomic identity of the mureiquis there. The “Projeto Mureiqui-Rio” was created in 1999 to obtain information regarding the whereabouts, identity, and population sizes of mureiquis in the state of Rio de Janeiro as well as to assess the threats they are facing. This paper reports on the findings from a series of surveys, including numerous interviews of local people, carried out by a team led by the author from 1999 to 2003 specifically to address these questions.

Methods

From January 1999 to December 2003, we visited six protected areas in the potential range of the mureiqui in Rio de Janeiro. Each field trip lasted from 7 to 30 days and our survey methodology included: 1) interviews with the staff of the protected areas and people in nearby villages; 2) consultation of topographic maps at different scales to locate and demarcate sites to be surveyed; 3) the hiring of local guides in each locality; 4) daily walks along trails in search of mureiquis; 5) use of 'play-back' — playing a recording of mureiqui vocalizations ('long-calls') using a speaker, walkman tape-recorder, a 200W amplifier and battery; and 6) use of a Geographic Positioning System (GPS) Garmin 12XL) to map the trails we walked and to pinpoint the locations of primate sightings. When seeing mureiquis, we recorded the time and duration of the encounter, GPS coordinates and altitude, group size, sex and age of the individuals seen (adults, juveniles and infants), the vegetation type and height in the forest, and made descriptions of their appearance and behavior (for example, their reactions to us). We always accompanied the mureiquis for as long as we could. In general, we used already existing trails, but in some cases it was necessary to open up new ones.

Results

We carried out 25 expeditions from 1999 to 2003. We were able to verify the presence of mureiquis in three of the six protected areas we visited: the Serra dos Órgãos National Park, Desengano State Park, and the Cairuçu Environmental Protection Area (adjoining the Serra da Bocaina National Park).

Serra dos Órgãos National Park

The Serra dos Órgãos National Park of 11,800 ha (elevations ranging from 300 to 2,263 m above sea level) is marked by precipitous terrain, with steep cliffs rising above the dense submontane forest typical of the Serra do Mar. We identified four vegetation types in the park: dense evergreen submontane forest (*floresta ombrófila densa submontana*), montane evergreen forest (*floresta ombrófila montana*), high altitude evergreen forest (*floresta ombrófila alto montana*), and high altitude grassland (*campos de altitude*).

The first expedition to the park in 1999 involved 30 days of fieldwork. No mureiquis were seen then, but we succeeded in finding them during intense fieldwork there over 10 months in 2002 (see Garcia and Andrade Filho, 2002; Garcia, 2005). Groups were seen in four locations: forest near to the Dedo de Deus ("Finger of God", a notable rock formation), and in the vicinity of the headwater springs of three rivers: the Rio Paquequer, Rio Soberbo (Garrafão), and Rio Santo Aleixo. The first three locations are close to each other, and were quite possibly sightings of the same group. The maximum number of individuals seen in the three areas was 22. At Santo Aleixo we saw another group

of at least 15 animals. As such, the minimum number of mureiquis seen was 37, we believe in two separate groups.

The mureiquis in the Serra dos Órgãos National Park had the appearance of *B. arachnoides*; all with dark faces. They were very shy, and intolerant of our presence. On seeing us, one of the adults would face us, apparently trying to intimidate us, grimacing, shaking branches, and vocalizing loudly while the other mureiquis would slip away silently.

Three other primates were seen in the park: the horned capuchin (*Cebus nigrinus*), the brown howler monkey (*Alouatta guariba*), and the black-tufted-ear marmoset (*Callithrix penicillata*) (introduced). Cunha (2003) has also registered the black-fronted masked titi (*Callicebus nigrifrons*) in the region, but we never saw it in the park.

A number of hunter's hideouts (*ranchos*) were found in the park, one of them (found by the team in 1999) near the home range of the mureiquis, with many shotgun traps (*trabucos*) and rifles. At Santo Aleixo we found a capuchin monkey in a trap for large animals. There are two other threats to the mureiquis in the park besides hunting: loss of forest due to occasional wildfires, especially in the dry season, and, as argued by Cunha (2004), adventure tourism.

Paraíso Ecological Station

The Paraíso Ecological Station of 5,000 ha is in the municipalities of Guapimirim and Cachoeiras de Macacú (22°26'–22°32'S and 42°50'–42°56'W). Altitudes range from 60 m to 1,350 m (Serra do Subaio) above sea level. The vegetation there is typical submontane and montane forest. We worked for seven days in the area, but no mureiquis were located. The people there informed us that they were very difficult to see, having been, for too long, a favored target of hunters. Silva (1987) reported that more than 10 mureiquis were killed in the Serra do Subaio in 1980.

Region of Macaé de Cima

Part of the 46,350 ha of forests that today make up the Três Picos State Park, this region (22°21'–22°28'S and 42°27'–42°35'W) is covered by typical montane evergreen forest at altitudes ranging from 880 m to 1,720 m (Lima and Guedes-Bruni, 1997a). It is one of the most important areas of montane forest remaining in the state of Rio de Janeiro. Botanically rich, the flora includes representatives of 122 families, and 1,103 species of vascular plants have been recorded there. Predominant are Lauraceae, Myrtaceae, Melastomataceae and Leguminosae (Lima and Guedes-Bruni, 1997b). We spent 15 days in the area but no mureiquis were seen. Local inhabitants told us they were there, but very rare. The primates we did see were the buffy-tufted-ear marmoset (*Callithrix aurita*), horned capuchin monkey (*C. nigrinus*) and the brown howler monkey (*A. guariba*). The forest was well preserved, and the rarity of the mureiquis could only be due to hunting. Four hunter's hideouts

were found with shotgun traps (*trabucos*) and traps for medium-sized animals.

Desengano State Park

In the municipalities of Santa Maria Madalena, São Fidélis, and Campos, this park of 22,400 ha protects the last remnant of the Atlantic forest in the northern part of the state. The vegetation there is dense evergreen submontane (up to 500 m) and montane (between 500 and 1,500 m) forest and high altitude grasslands (above 1,600m).

We carried out four expeditions to the park. The first was for 20 days in June and July of 1999, when we surveyed the forests of Morumbeca (*Matas da Morumbeca*) cited by Aguirre (1971). We found a group of 17 murequis (15 adults and 2 infants) on 12 July 1999 at 13:00 h, at a place called "Boqueirão da Mata na Serra Grande" (21°52'90"S, 41°52'93"W), about three hours walking from Morumbeca (base camp). Other locations in the park were visited between November 2002 and March 2003. In January 2003, again at Morumbeca, our team found two murequis crossing a trail going up to the Pedra do Desengano, 200 m away. It was not possible to be sure of the identity of the murequis as either *B. hypoxanthus* or *B. arachnoides*. Howler monkeys (*A. guariba*) and capuchin monkeys (*C. nigritus*) were also seen within the park boundaries. There are people living, illegally, within the park. They have some livestock and cultivate small garden plots, and hunt. According to informants there, murequi meat is much appreciated.

Cairuçu Environmental Protection Area (APA)

The APA Cairuçu (33,800 ha) is in the far south of the municipality of Paraty (23°10'–23°23'S and 44°30'–44°51'W). The continental portion begins at the Rio Mateus Nunes and ends at the state border with São Paulo, and the island portion (63 islands) extends from the Ilha do Algodão in Mambucaba (see Vaz, 1998) to the Ilha da Trindade in Trindade. It adjoins the Serra da Bocaina National Park in São Paulo. The relief is mountainous with altitudes ranging from sea level to 1,320 m (Pico Cairuçu). Marques (1997) reported the following vegetation types there (in order of importance): Dense evergreen forest; secondary forest, rocky outcrops and rocky shorelines; mangroves and *restinga* (coastal scrub and forest on sand soil). There are cultivated areas, beaches and urban areas such as the town of Paraty itself and the Condomínio Laranjeiras (a housing estate).

The word 'cairuçu' translates in Tupi-Guarani to "cai" = monkey and "ruçu" = big, which makes us believe that murequis were common in the region at least in the past. We spent 33 days in the area in August and September 1999, and later in February and December 2000. We visited the following locations: Toca do Ouro (adjoining the Serra da Bocaina National Park), Pico do Cairuçu (Vargem Grande and the coastal area of the beach of Martin de Sá, Juatinga Ecological Reserve) and Saco do Mamangá. Only

one murequi was seen; at the Toca do Ouro, identified as *B. arachnoides*.

Protected by local legislation, the local people, called caçaras, are fisher communities but also hunt, even though local informants told us that there was little wildlife left. With regard to habitat loss and degradation, the impact of the caçara communities is not yet serious, but is increasing markedly. Specimens of murequis in the mammal collection of the Museu Nacional of the Federal University of Rio de Janeiro (UFRJ) were collected in Pedra Branca (Paraty) in 1941 and 1943 and Mambucaba, Angra dos Reis in 1942 (Vaz, 1998).

Itatiaia National Park

The Itatiaia National Park is in the southwest of the state of Rio de Janeiro (22°19'–22°45'S and 44°45'–44°50'W), in the municipalities of Resende and Itatiaia, extending into southern Minas Gerais, in the municipalities of Alagoa, Bocaina de Minas and Itamonte. With an area of 28,267 ha, the park takes in the highest elevations of the Serra da Mantiqueira, and is characterized by mountains and rocky outcrops at altitudes of 650 m to 2,787 m (Pico das Agulhas Negras). According to the phytocological classification of Veloso *et al.* (1991), the vegetation of the Itatiaia National Park includes: Dense evergreen montane forest at altitudes ranging from 650 m to 1,500 m; high altitude evergreen forest, above 1,500 m; mixed montane evergreen forest with *Araucaria angustifolia* at altitudes around 1,200 m; seasonal semideciduous montane forest along the leeward slopes at 500 m; and high altitude grasslands in rocky and precipitous regions above 1,600 m (IBDF, 1982).

We visited the park twice—in October 1999 and in December 2002. We did not see any murequis on either occasion. Câmara (1995) and Marriog and Sant'Anna (2001) however, have registered their presence there. We examined three taxidermized murequis on show in the museum of the park; an adult male, adult female and infant collected by Elio Gouveia in 1950 at a location called Maromba that is within the park boundaries. All three had the vestigial pollex, which would characterize it as the northern murequi, *B. hypoxanthus* (Lemos de Sá and Glander, 1993). We saw the black-fronted masked titi (*Callicebus nigrifrons*) and the horned capuchin monkey (*C. nigritus*) during our field surveys there.

It would appear that there is little hunting in the area, even though there are some private properties within the park (Rocha *et al.*, 2003). There is some adventure tourism which could be affecting the use of the forest by the murequis, as was observed by Cunha (2005) in the Serra dos Órgãos National Park.

Discussion

Distribution and abundance of mureiquis in the state of Rio de Janeiro

Montane forests at elevations above 500 m in Rio de Janeiro and other regions of southeast Brazil are evidently good habitat for the mureiqui (Aguirre, 1971). The largest areas of forest remaining in the state of Rio de Janeiro are in these mountainous regions, and many are in protected areas (Rocha *et al.*, 2003). Of the six surveyed by the Projeto Mureiqui-Rio, we were able to confirm mureiquis in three (Serra dos Órgãos National Park, APA Cairuçu, and Desengano State Park); observing a total of 55 individuals. Although this is a small number, much lower than was estimated for the state by Aguirre (1971) in the 60s (between 650 and 840), it is patent that much more research and field work are needed. Their long history of being hunted means that mureiquis are not just scarce but also extremely wary and shy, and they now reside in areas of extremely difficult access. Further work needs to be done in the areas we have visited, as well in the four protected areas we have yet to survey, all of which are reported to contain mureiquis: Tinguá Biological Reserve (26,000 ha), APA Mangaratiba (22,936 ha), Três Picos State Park (46,350 ha), and the Serra da Bocaina National Park (110,000 ha). The region around Pedra Branca (Paraty) is also a priority for further surveys, considering the historical (1941 and 1943) records of mureiquis occurring there.

In Rio de Janeiro, the mureiquis are confined to montane forests at high elevations, difficult to reach and difficult to survey, which also means that we are undoubtedly underestimating their numbers. In the Serra dos Órgãos National Park, for example, they were found at altitudes ranging from 800 m to 1,500 m (Garcia, 2005). Mureiquis may also occur in naturally lower densities in the larger forest tracts, as has been noted for the southern mureiqui in São Paulo by Strier (2000). In spite of these difficulties, it is vital that we obtain better and more precise information on the number and extent of mureiquis remaining in the state if we are ever to draw up a realistic conservation plan for the species.

Based on the absence of the vestigial pollex and the presence of dark pigmentation in the bare skin of the face and genitals of the mureiquis that we observed in Serra dos Órgãos National Park, and on the presence of the thumb and the freckled pigmentation of the three stuffed specimens on show in the museum in the Itatiaia National Park, it is evident that both species occur in the state—*B. arachnoides* in the Serra do Órgãos and *B. hypoxanthus* in Itatiaia. The southern mureiqui (*B. arachnoides*) evidently occurs along the Serra do Mar, from northern Paraná, through São Paulo into Rio de Janeiro, passing as such through the southern (APA Cairuçu and Serra da Bocaina National Park) and central (Serra dos Órgãos National Park) regions and probably extending into the north of the state (Desengano State Park). The northern mureiqui (*B. hypoxanthus*) then would be in the southwest (Itatiaia National Park), following the

Serra da Mantiqueira. These roughly delineated distributions require further research.

Threats to the mureiqui in Rio de Janeiro

Although occurring in a number of protected areas, we found that mureiquis were under pressure from hunting, habitat loss and degradation, and disturbance from human activities of all sorts everywhere we went. In the Serra dos Órgãos National Park, for example, both adventure tourism (perhaps restricting the area that the mureiquis will use) and hunting were evidently serious enough to be prejudicial to the small number of mureiquis surviving there (Cunha, 2005). We found evidence of hunting throughout the park. In the APA Cairuçu, the Paraíso Ecological Station, and in the region of Macaé de Cima hunting is also the key factor, both from the evidence we found and the reports of Silva (1987) and Martuscelli (1994). Both hunting and deforestation by squatters are threats in the Desengano State Park. The Itatiaia National Park would seem to be comparatively free of hunting, and habitat loss is probably the key issue with the constant presence of people living in the park, of tourists, the threat of fires, and the illegal exploitation of plants such as palms for palm hearts (Rocha *et al.*, 2003).

Mureiquis are large, they travel in large groups, and are quite noisy, which makes them easy prey to the patient hunter. We were informed in the APA Cairuçu and the Desengano State Park that mureiqui meat is considered a delicacy. As they have a slow reproductive rate (one infant every three years: Strier, 1993–1994) and possibly naturally low densities in the larger areas of forest (Strier, 2000), killing just a few individuals each year can have serious consequences in determining a gradual decline in numbers. Besides increasing vigilance, it is important that environmental education programs be put in place in the vicinity of these parks.

Future research

There are long-term programs in conservation and research in most of the states where mureiquis occur. Rio de Janeiro is one, however, where activities of this sort are unfortunately still incipient. We still lack basic information on the numbers and location of the surviving populations of mureiquis, besides many other threatened species. In 2005, André A. Cunha and Jean P. Boubli launched the Projeto Mureiqui-Rio Fase II, with the specific objective of determining how many mureiqui populations are remaining in the state and their size. This project has received financial support from Conservation International, The International Newcomers Club of Rio de Janeiro, the Zoological Society of San Diego, the Serra dos Órgãos National Park and the Brazilian Institute for the Environment (IBAMA), and the Instituto Terra de Preservação Ambiental. The Projeto Mureiqui II will visit further sites and also collect fecal samples of mureiquis in order to begin genetic studies examining the genetic diversity and structure of the remaining populations. Two sites will be selected to set up long-term ecological, behavioral and demographic studies, including

phenological and floristic monitoring of the vegetation, to examine the ecological diversity of the mureiquis.

Acknowledgments

My sincere thanks to Admiral Ibsen de Gusmão Câmara for his encouragement, inspiration and help in setting up the Projeto Muriqui-Rio. I am grateful to Russell A. Mittermeier and the Margot Marsh Biodiversity Foundation, the Fundação O Boticário de Proteção à Natureza, and the John D. and Catherine T. MacArthur Foundation for financial support. The Brazilian Institute for the Environment (*Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* – IBAMA) and the Forestry Institute of Rio de Janeiro (*Instituto Estadual de Florestas* – IEF-RJ) kindly provided the permits to work in the protected areas under their jurisdiction. Sr. Tatico, Ricardo, M. Rocha, Guilherme and Jorginho were invaluable in their help in setting up the expeditions to search for mureiquis in Rio de Janeiro, and I am especially grateful to Jean P. Boubli for his participation in the trips to Macaé de Cima and Desengano State Park. My thanks also to the photographer José Caldas for his participation in some of the trips and for allowing me the use of his photos.

References

- Aguirre, A. C. 1971. *O mono Brachyteles arachnoides* (É. Geoffroy). *Situação atual da Espécie no Brasil*. Academia Brasileira de Ciências, Rio de Janeiro. 53pp.
- Câmara, I. de G. 1995. Muriquis in the Itatiaia National Park, Brazil. *Neotrop. Primates* 3(1): 19.
- Coimbra-Filho, A. F., Pissinatti A. and Rylands, A. B. 1993. Breeding mureiquis *Brachyteles arachnoides* in captivity: The experience of the Rio de Janeiro Primate Centre (CPRJ-FEEMA). *Dodo, J. Wildl. Preserv. Trusts* 29: 66–77.
- Cunha, A. A. 2003. Primates in the Serra dos Órgãos National Park: New records. *Neotrop. Primates* 11: 49–51.
- Cunha, A. A. 2004. Conservação dos mamíferos na Serra dos Órgãos: Passado, presente e futuro. In: *Anais do IV Congresso Brasileiro de Unidades de Conservação, Vol. 1 – Trabalhos Técnicos*, pp.213–224. Fundação O Boticário de Proteção à Natureza, São José dos Pinhais, Paraná.
- Cunha, A. A. 2005. The dark side of “ecotourism” in a hotspot national park of the Atlantic forest of Brazil. In *Abstracts: XIX Annual Meeting for Conservation Biology, Vol. 1*, p.50. Society for Conservation Biology, Universidade de Brasília, Brasília, DF, 15 to 19 July of 2005.
- Fundação S.O.S. Mata Atlântica/INPE. 2001. *Atlas dos Remanescentes Florestais da Mata Atlântica no período 1995–2000*. Fundação SOS Mata Atlântica, São Paulo, and Instituto Nacional de Pesquisas Espaciais (INPE), São José dos Campos, São Paulo.
- Garcia, V. L. A. and Andrade Filho, J. M. de. 2002. Muriquis no Parque Nacional da Serra dos Órgãos. *Neotrop. Primates* 10(2): 97.
- Garcia, V. L. A. 2005. Survey and status of the mureiquis (*Brachyteles arachnoides*) in the Serra Dos Órgãos National Park, Rio de Janeiro. *Neotrop. Primates* 13(suppl.): 79–84.
- Groves, C. P. 2001. *Primate Taxonomy*. Smithsonian Institution Press, Washington, DC.
- IBDF. 1982. *Plano de Manejo do Parque Nacional de Itatiaia*. Instituto Brasileiro de Desenvolvimento Florestal (IBDF), Brasília.
- Lane, F. 1990. A hunt for “monos” (*Brachyteles arachnoides*) in the foothills of the Serra da Paranapiacaba, São Paulo, Brazil. *Primate Conserv.* (11): 23–25.
- Lemos de Sá, R. M. and Glander, K. E. 1993. Capture techniques and morphometrics for the woolly spider monkey, or mureiqui (*Brachyteles arachnoides* E. Geoffroy, 1806). *Am. J. Primatol.* 29: 145–153.
- Lemos de Sá, R. M., Pope, T. R., Glander, K. E., Struhaker, T. T and Fonseca, G. A. B. 1990. A pilot study of genetic and morphological variation in the mureiqui (*Brachyteles arachnoides*). *Primate Conserv.* (11): 26–30.
- Lima, H. C. and Guedes-Bruni, R. R. 1997a. Introdução. In: *Serra de Macaé de Cima: Diversidade Florística e Conservação em Mata Atlântica*, H. C. Lima, and R. R. Guedes-Bruni, R. R. (eds.), pp.15–25. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro.
- Lima, H. C. and Guedes-Bruni, R. R. 1997b. Diversidade de plantas vasculares na Reserva Ecológica de Macaé de Cima. In: *Serra de Macaé de Cima: Diversidade Florística e Conservação em Mata Atlântica*, H. C. Lima and R. R. Guedes-Bruni (eds.), pp.29–39. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro.
- Martuscelli, P., Petroni, L. M. and Olmos, F. 1994. Fourteen new localities for the mureiqui (*Brachyteles arachnoides*). *Neotrop. Primates* 2(2): 12–15.
- Marques, M. C. M. 1997. Mapeamento da cobertura vegetal e listagem das espécies ocorrentes na Área de Proteção Ambiental de Caiuru, Município de Paraty, RJ. *Série Estudos e Contribuições* 13: 1–96.
- Marroig, G. and Sant’Anna, A. B. C. 2001. The occurrence of mureiquis (*Brachyteles arachnoides*) in the Itatiaia National Park, Brazil. *Neotrop. Primates* 9(2): 75.
- Rocha, C. F. D., Bergallo, H.G., Alves, M. A. S. and Sluys, M. V. 2003. *A Biodiversidade nos Grandes Remanescentes Florestais no Estado do Rio de Janeiro e nas Restingas da Mata Atlântica*. Universidade Estadual do Rio de Janeiro (UERJ), Instituto BIOMAS and Conservation International do Brasil, Rima, São Carlos.
- Rylands, A. B., Mittermeier, R. A. and Rodríguez-Luna, E. 1995. A species list for the New World primates (Platyrrhini): Distribution by country, endemism, and conservation status according to the Mace-Lande system. *Neotrop. Primates* 3(suppl.): 113–160.
- Rylands, A. B., Schneider, H., Langguth, A., Mittermeier, R. A., Groves, C. P. and Rodríguez-Luna, E. 2000. An assessment of the diversity of New World primates. *Neotrop. Primates* 8(2): 61–93.
- Silva, M. S. 1987. A fauna da Serra do Subaio, Guapimirim. *Bol. FBCN*, Rio de Janeiro 22: 71–78.

- Strier, K. 1993–1994. Viability analyses of an isolated population of miquiqui monkeys (*Brachyteles arachnoides*): Implications for primate conservation and demography. *Primate Conserv.* (14–15): 43–52. Published 1996.
- Strier, K. 2000. Population viabilities and conservation implications for miquiquis (*Brachyteles arachnoides*) in Brazil's Atlantic Forest. *Biotropica* 32(4): 903–913.
- Vaz, S. M. 1998. Sobre a ocorrência do miquiqui, *Brachyteles arachnoides*, em Mambucaba, Rio de Janeiro, Brasil. *Neotrop. Primates* 6(2): 49–50.
- Veloso, H. P., Filho, A. L. R. R. and Lima, J. C. A. 1991. *Classificação da Vegetação Brasileira, Adaptada a um Sistema Universal*. Departamento de Recursos Naturais e Estudos Ambientais, Fundação Instituto Brasileiro de Geografia e Estatística (IBGE), Rio de Janeiro.
-