

CONSERVATION RESEARCH ON THE SOUTHERN MURIQUI (*BRACHYTELES ARACHNOIDES*) IN SÃO PAULO STATE, BRAZIL

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Abstract

In this paper we present an overview of the past and current conservation research on southern muriquis, *Brachyteles arachnoides*, in the state of São Paulo, most particularly in the forests of the Serra de Paranapiacaba, in four connected protected areas, which comprise the so-called Paranapiacaba Ecological Continuum: the state parks of Carlos Botelho, Intervales, and Alto Ribeira and the Xitué Ecological Station. These areas are the major stronghold for this species, and we discuss particularly the history of research on the muriquis of the Carlos Botelho State Park and the importance of statewide surveys and the establishment of further long term research sites to understand better its status and for the elaboration of management plans for its conservation.

Key Words – primates, southern muriqui, *Brachyteles*, Serra da Paranapiacaba, ecology, field studies, conservation

Introduction

Among the best-preserved and largest remnants of Brazil's Atlantic forest are found on the slopes of steep mountain ranges in São Paulo, a state which is also the most industrialized and populous in the entire country (Mittermeier *et al.*, 1987). The forests run parallel to the coastline and in the south turn inland. Most are officially protected, being part of the protected area system administered by the São Paulo State Forestry Institute (Morellato and Haddad, 2000). The single largest forest tract, known as the Paranapiacaba Ecological Continuum (PEC) (see Table 1; Fig .1), is of major biological importance and comprises 140,000 ha of continuous forest of numerous types and in all stages of ecological succession. It consists of four protected areas, and is the core of a World Heritage Site, "The Southeast Reserves of Atlantic Forest" (UNESCO, 1999).

The maintenance of large expanses of natural habitat underlies any broad biodiversity conservation strategy (Piscotta, 2002). In the case of the Atlantic forest, the Paranapiacaba Ecological Continuum is probably the last natural area for numerous endemic species and provides, besides, the potential to harbor the largest remnant populations of the southern muriqui.

Threats

The geographical distribution and status of the southern muriqui populations in São Paulo are still poorly known. Although it would appear that they occur naturally at lower densities in large expanses of forest than in smaller, fragmented forests, these wild muriqui populations are quickly declining. The following are the current principal threats to the muriquis.

Forest loss. Less than 7% of the muriqui's forests remain, and much of what does is highly fragmented. Deforestation has occurred as a result of logging, intensive land-use for subsistence and commercial farming (for example, coffee), timber plantations (eucalyptus and pine) and cattle ranching, through urban expansion, and highway construction and general infrastructure development, both regional and national, such as dams and the leisure industry. Despite its protected status, the Paranapiacaba Ecological Continuum will always be under threat from developmental pressures such as these.

Hunting for sport. Historically, and even today in some areas, the muriqui is hunted for sport, a cultural trait that has remained from the earliest days of the colonization of São Paulo State by Europeans.

Mining in the buffer zones of protected areas. This refers particularly to bauxite, sand, clay, and granite. These activities result in deforestation, erosion, flooding, and the silting and pollution of rivers and streams.

Lack of an adequate captive breeding program. Captive breeding has been problematic due to low levels of reproduction and poor infant survival. Some zoos in São Paulo (for example, Sorocaba and Santos) receive wild-born muriqui pets every year, originating mostly from palm-harvesters and hunters who have killed the mother. Investment in a well-managed breeding program would greatly enhance our understanding of the primates and provide a backstop for population extinctions in the wild.

Illegal palm-harvesting in large areas of forest. The palm tree, *Euterpe edulis*, is endemic to the Atlantic Forest, and an economically important forest product. Palm tree

harvesters, *palmiteiros*, camp in the forest and transport and process the palm hearts in glass jars, while still in the forest. Thousands of palm trees can be felled in just a few days. Populations of *E. edulis* are declining everywhere in areas where they used to be the dominant understorey tree. *Palmiteiros* hunt game, including mureiquis, during their sojourns in the forest.

In spite of little official concern, palm tree harvesting is today one of the main threats to wild mureiqui populations. The presence of palmiteiros in São Paulo state's protected forests is reported by villagers, but few arrests result. We cannot afford to ignore these long-term anthropogenic pressures on the remaining populations of wild mureiquis in São Paulo (Talebi, 2004). Due mainly to hunting, it is probable that wild mureiqui populations are declining everywhere.

Research on the Southern Mureiqui in São Paulo

Following the distribution-wide survey of Aguirre (1971), the first behavioral and ecological studies on the genus were begun in the early 1980s. Torres de Assumpção (1983a, 1983b) and Milton (1984, 1985a, 1985b, 1986) established a field site for the southern mureiqui at the Fazenda Barreiro Rico in São Paulo (Fig. 3), and Strier, following the initial studies by Nishimura (Nishimura *et al.*, 1988), began her research on the northern mureiqui at the Fazenda Montes Claros, subsequently the Caratinga Biological Station, in Minas Gerais in 1982 (Strier, 1999). Both sites were small forest fragments in regions otherwise heavily farmed but where, perchance, the landowners had provided for the survival of the mureiquis by prohibiting hunting. The terrain in both was favorable for the typically arduous work involved. Strier and Fonseca (1996–1997) listed 19 sites where mureiquis were known to occur, 10 of them in the state of São Paulo. Of these, all but one (the Fazenda Barreiro Rico in east-central São Paulo) were in large expanses of remote forests in the Serra do Mar, where mureiquis naturally occurred

Table 1. Protected areas of the Paranapiacaba Ecological Continuum (see Fig. 1).

	Official denomination	Area (ha)	Main Features	Reference
A	Carlos Botelho State	37,432	Largest population of mureiquis in Brazil	Mittermeier <i>et al.</i> (1987)
B	Intervales State Park	45,000	Highest diversity of flora of São Paulo State	Petroni (2000)
C	Alto Ribeira State Park	55,000	Large caves, ecotourism infrastructure	UNESCO (1999)
D	Xitué Ecological Station	3,095	High levels of disturbance, regenerating forest	Gonzalez-Solis <i>et al.</i> (2001)

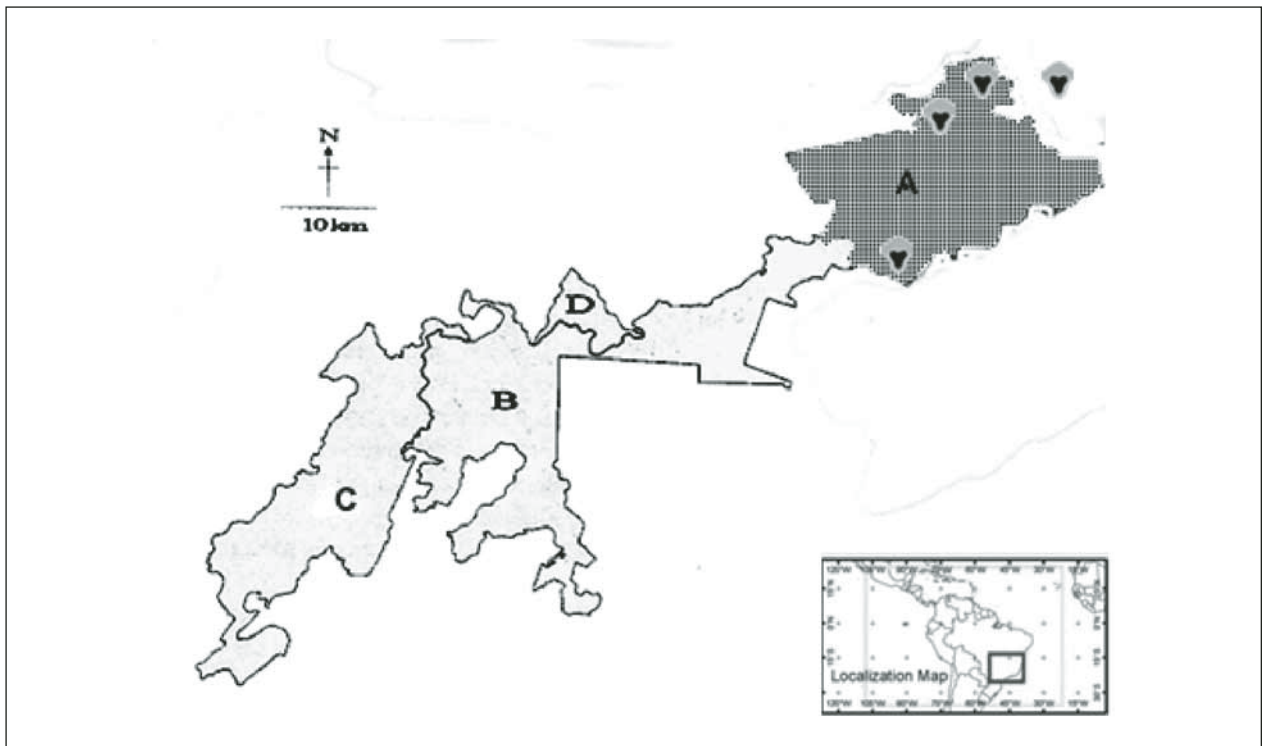


Figure 1. Map showing the protected areas of the “Paranapiacaba Ecological Continuum” and the study areas (▼) of wild southern mureiquis in the Carlos Botelho State Park. A = Carlos Botelho State Park, B = Intervales State Park, C = Alto Ribeira State Park, and D = Xitué State Ecological Station (see Table 1).

at very low densities. Surveys and field studies of muriquis in these montane habitats, however, were, and still are, severely hampered by the rugged topography (Pinto *et al.*, 1993; see Fig. 2), and attempts to establish field sites in the Serra do Mar in both Rio de Janeiro and São Paulo have severely tested the endurance of many (see, for example, the difficulties in even finding the muriquis as related by Garcia, 2005).

Following initial surveys by Paccagnella (1991), the Carlos Botelho State Park in São Paulo began to emerge as the best option for field studies in these montane habitats. Strier (1999) set up a field base there in 1986 (see below), establishing the only long-term site for muriquis in less-disturbed and continuous rather than fragmented forest—providing information which is vital for comparative studies and a full understanding of their demography and ecological needs (Rylands *et al.*, 1998).

Southern Muriqui Research Field Sites in São Paulo

There are five important field sites in the state of São Paulo where research has been carried out on the behavior and ecology of *B. arachnoides* (Fig. 3). We have characterized them according to 1) *Forest condition*—forest fragments (FF) or more extensive (continuous) forest (CF), 2) *Duration of studies*—Short-term (2–3 years at most) (ST), or Long-term (LT), and 3) *Current status of field research*—Discontinued (Dis) or Ongoing (On).

Fazenda Barreiro Rico (FF, ST, Dis) (22°41'S, 48°06'W)

While the other muriqui field study sites are all in mountainous areas of the Serra do Mar, the Fazenda Barreiro Rico is a cattle ranch in the central plateau at the juncture of the Rios Piracicaba and Tietê, in the municipalities of Anhembi and Santa Maria da Serra. Altitude ranges from 450 to 586 m above sea level. Milton and de Lucca (1984) described five fragments of semideciduous forest there, covering 3,259 ha, and surrounded by pasture and agriculture. Today the forest is reduced to three fragments totalling

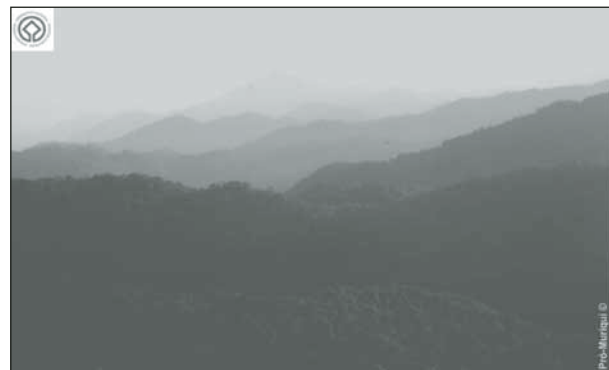


Figure 2. Aerial view of Parque Estadual Carlos Botelho (37,644 ha), part of the “The Southeast Reserves of Atlantic Forest” UNESCO World Heritage Site, the largest and most extensive single tract of Atlantic forest in Brazil (UNESCO, 1999).

2,325 ha. Muriqui research started at this location with the work of Torres de Assumpção in 1979–1980 (Torres de Assumpção *et al.* 1982, Torres de Assumpção 1983a, 1983b) followed by Milton from 1980 to 1989 (see references) and, after a hiatus, Martins who investigated population parameters of the primates there (Martins, 2005a), along with feeding strategies and seed dispersal by *Alouatta guariba* and *B. arachnoides* (Martins, 2003a, 2003b, 2005b, 2006). The future of this important area is undetermined, as logging continues and the ranch-owners are unwilling to discuss its future in terms of conservation research. Access is currently restricted even to conservationists.

Region of São Francisco Xavier (FF, ST, Dis) (23°12'S, 45°52'W)

In the east of São Paulo, municipality of São José dos Campos, in the Rio Paraíba valley, near the state boundary with Rio de Janeiro, this is a region of steep forested hills of the Atlantic escarpment of the Serra da Mantiqueira. Altitudes range from 800 to 2,000 m. Antonietto and Mendes (1994) reported the presence of muriquis in this region, estimating a population of at least 15 animals. The Instituto de Pesquisas Ecológicas (IPÊ), initiated a research program there (1997–2001), resulting in a study by Silva (1999) on their habitat and population structure. Silva (1999) estimated 70–90 individuals. At the present time, a program is underway, with the participation of local communities, universities and private foundations, to promote increased awareness and continued research activities in the region, with an overall focus on muriquis as the flagship species (Vale Verde Associação do Meio Ambiente, 2006).

Fazenda São Sebastião do Ribeirão Grande (FF, ST, On) (22°45'S, 45°28'W)

This is a private reserve in eastern São Paulo, municipality of Pindamonhangaba, in the Rio Paraíba valley, near the state boundary with Minas Gerais, and neighbouring the Campos de Jordão State Park in the Serra da Mantiqueira. It is administered by VCP Florestal. Oliveira and Manzatti (1995) reported on the presence of at least 22 muriquis there, and a research program began in early 2006. The initial aims were to establish the size of the population of southern muriquis there and to habituate them. Currently, the minimum number of southern muriquis there is 32.

Intervales State Park (CF, LT, Dis) (24°12'–24°25'S, 48°03'–48°13'W)

Created in 1995, the Intervales State Park (49,000 ha) is narrowly connected to the Carlos Botelho State Park (Figs. 1 and 3). It is administered by the Fundação Florestal of São Paulo State (<http://www.ffflorestal.sp.gov.br>). This area has hosted southern muriqui research for about a decade through the work of Petroni (1993, 2000). In addition to the seasonal data on habitat use, muriqui research in Intervales has provided the most thorough and detailed study of the vegetation composition and structure of their habitat for these continuous forests. Intervales has the highest diversity of plant species recorded for the Atlantic forest

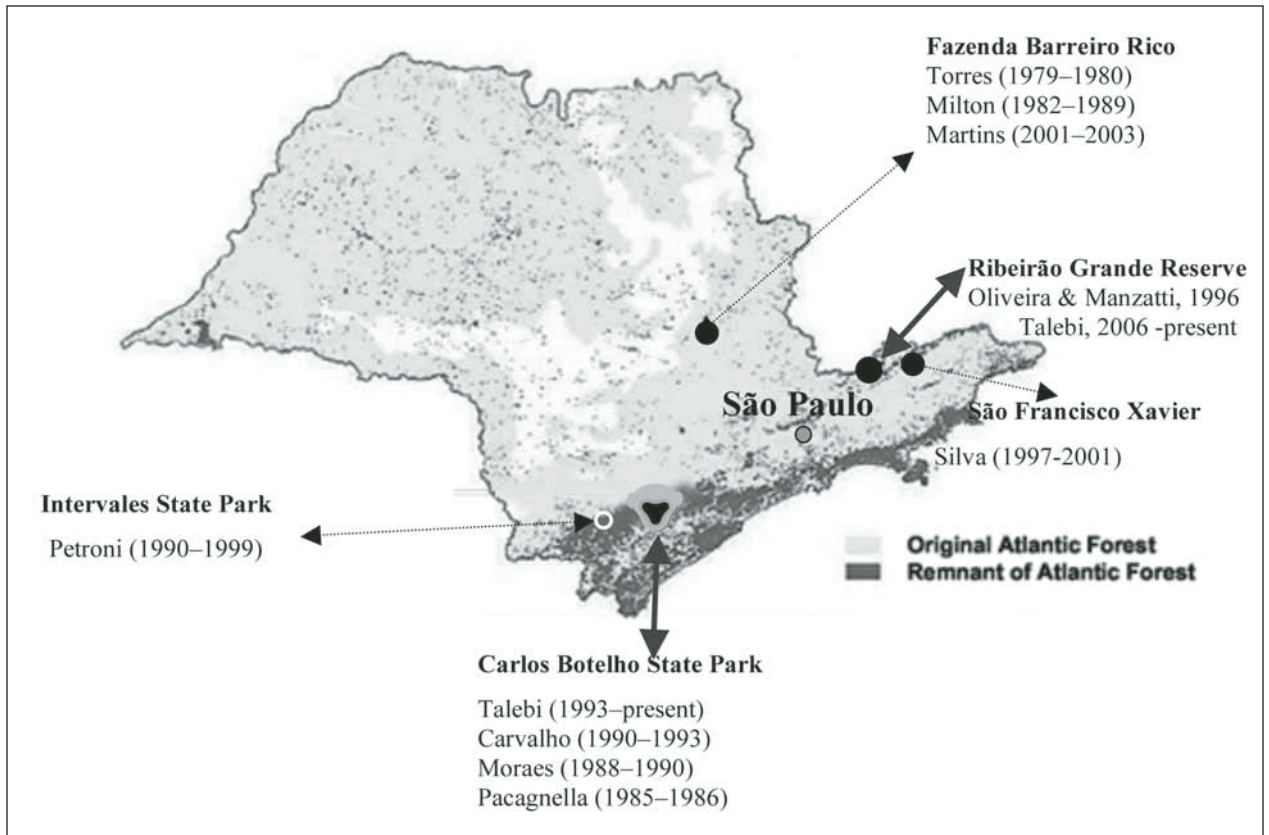


Figure 3. Field sites for research on the southern murrelet in the state of São Paulo. Solid arrows represent ongoing studies.

in São Paulo: 55 families, 114 genera and 190 species, with a predominance of Myrtaceae, Lauraceae, and Leguminosae (Petroni, 2000).

Carlos Botelho State Park (CF, LT, On) (24°15'–24°44'S, 47°46'–48°10'W)

The Carlos Botelho State Park (37,644 ha) was created in 1982 in the municipalities of São Miguel Arcanjo, Sete Barras, Capão Bonito and Tapiraí, and, like Intervales is administered by the Instituto Florestal of São Paulo (<http://www.iflorestal.sp.gov.br/>). The mountains and steep valleys are covered by dense montane forests; altitudes range from 500 to 1,000 m above sea level (Custódio-Filho *et al.*, 1992; Talebi, 1996). Capuchin monkeys (*Cebus nigrinus*) and howler monkeys (*Alouatta guariba*) also occur there (Talebi, 2005). For additional information on this field site and the murrelet groups under study, see Pacagnella (1991), Moraes (1992a, 1992b), Talebi (1996), Carvalho *et al.* (2004), and Talebi *et al.* (2005).

Research on the Southern Murrelet at the Carlos Botelho State Park

Strier (1999) set up the long-term project on the ecology and behavior of the murrelets at the Carlos Botelho State Park in 1986 with the proposition of obtaining comparative data for her findings at the Caratinga Biological Station, as well as promoting the development and training of Brazilian conservationists. A number of researchers worked

at Carlos Botelho from that time (see Talebi, 1996; and Fig. 3). By 1996, two groups had been fully habituated, and three years later an NGO, the Associação Pró-Murrelet, was founded to provide for the continuity of the research on the murrelet and its habitats in the park, as well in other locations in the Southeast Reserves of Atlantic Forest World Heritage Site. The last 18 years of research at this site have resulted in the habituation of four murrelet groups in all, with 15 individuals now identified and named. An extensive trail system of 210 km has been established and mapped. The box presents a brief summary of southern murrelet research at the Carlos Botelho State Park.

Of concern is that, although research has been carried out at other sites in the past (Fig. 3), the systematic study in the Carlos Botelho State Park is the only one still active, apart from one that concentrates on environmental education in the private reserve at the Fazenda São Sebastião do Ribeirão (Fig. 3). Our field team receives frequent requests to help farm owners and researchers interested in developing the logistics needed for starting murrelet research in other sites. As a result, over the last four years the Associação Pró-Murrelet has established a volunteer field-training program for young conservationists and newly-graduated students. More than 30 Brazilian and international students have participated, for periods ranging from two to six months.

Additional activities with southern murrelets in São Paulo include a three-year survey (in progress) of remnant

Research on the southern muriqui at the Carlos Botelho State Park (PECB), São Paulo (see Talebi [1996] for further details).

1985 – Sandra G. Paccagnella carried out the first population survey of the muriquis at the PECB (Paccagnella, 1991).

1986 – Karen B. Strier began a research program at PECB to compare northern and southern muriquis, their behavior and ecology in fragmented and large forests, and the possible differences related to forest habitats in different stages of succession.

1996 – Maurício Talebi took over the field research at PECB (had been field-coordinator since 1993).

2000 – The Associação Pró-Muriqui was created to ensure the maintenance and growth of research activities at PECB. The NGO counts on the participation of scientists, and students, working within the administrative structure of the Carlos Botelho State Park and the Forestry Institute of the state of São Paulo.

2002 onwards – Internship program was initiated and logistical/research capacity within the Associação Pró-Muriqui was increased. To date we have had about 30 national and international students complete the field internship program (minimum six months), with a number staying on to continue work in the project.

2005 – A survey of southern muriquis in the park was begun. Although still underway, initial findings indicate that there are fewer muriquis than had been estimated by Paccagnella in 1985 (1991).

2006 – One more group of muriquis was fully habituated for systematic observations.

southern populations. The survey was begun in 2005, and is investigating the most important areas in the state where muriquis are expected to occur. The Associação Pró-Muriqui is working to carry out long-term monitoring along an altitudinal gradient from southern to northern São Paulo, to update their geographical distribution and understand better their conservation status. To date, we have set up three field sites in different habitats so as to provide comparative data on demography, feeding ecology, reproduction, health, and behavioral plasticity. Target populations have been identified, and preliminary arrangements for long-term fieldwork have already been made at a location in the Serra do Mar (Parque das Neblinas, Instituto Ecofuturo). Systematic field work has been underway since 2006 in the Serra da Mantiqueira, at the Fazenda São Sebastião Ribeirão Grande (VCP Florestal), and there exists

an agreement with VCP Florestal for a long-term study of muriquis there.

The Associação Pró-Muriqui has established links with governmental and non-governmental agencies in both Brazil and abroad in order to expand the operational logistical basis at the field site in Carlos Botelho. A Muriqui Conservation Research Plan for São Paulo State has been designed and proposed within the Action Plan of Muriqui Conservation endorsed by the International Committee for the Conservation and Management of the Atlantic Forest Atelids of the Brazilian Institute for the Environment (IBAMA). Initial discussions are in progress for designing a Muriqui Management Plan for São Paulo, to optimize the use of the academic, logistical, and financial resources available in the state.

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