

THE SOUTHERN MURIQUI, *BRACHYTELES ARACHNOIDES*, IN THE STATE OF PARANÁ: CURRENT DISTRIBUTION, ECOLOGY, AND THE BASIS FOR A CONSERVATION STRATEGY

Alexandre B. Koehler¹, Luiz César M. Pereira², Patrícia A. Nicola³, Alessandro C. Ângelo⁴ and Karla S. Weber⁴

¹Pontifícia Universidade Católica do Paraná, e-mail: <alexandre.koehler@pucpr.br>

²Universidade Federal do Vale do São Francisco, e-mail: <machado.luiz06@yahoo.com.br>

³Pontifícia Universidade Católica do Paraná, e-mail: <patricia.nicoll@pucpr.br>

⁴Universidade Federal do Paraná, e-mails: <angelo@floresta.ufpr.br>; <caweber@pop.com.br>

Abstract

Primatologists have suspected the existence of remnant populations of the southern miqui, *Brachyteles arachnoides* (É. Geoffroy, 1806), in the state of Paraná since the early 1970s. Only in 2002, however, was this confirmed, with the discovery of a group in the upper Rio Ribeira valley. Here we report on some observations of this group, which totals 23 individuals living in a tiny remnant of the primary dense broadleaf forest that formerly extended in a continuous belt into Paraná's first planalto along the valleys of the rios Ribeira and Açungui. We also discuss possibilities for the occurrence of miquis elsewhere, and our ongoing efforts for the conservation of this threatened species in the state of Paraná.

Key Words – southern miqui, *Brachyteles arachnoides*, Atlantic forest, conservation, state of Paraná, Brazil

Introduction

The possibility of the continued presence of the southern miqui, *Brachyteles arachnoides* (É. Geoffroy, 1806), in the state of Paraná was reported by Aguirre (1971). He believed that they might still occur in the region of Guaraqueçaba, because there could be found the largest expanses of well-conserved forest in the state. This idea was subsequently reinforced by Lange and Jablonski (1986) and confirmed by Martuscelli *et al.* (1994).

Koehler *et al.* (2002) reported on a new locality for the occurrence of *B. arachnoides* in the municipality of Castro, Paraná; a region with very few remaining patches of intact forest. This unexpected discovery gave rise to renewed research and conservation measures for the protection of the southern miqui in the state of Paraná. It established a new southern limit to the present-day range of the species and drew the attention of primatologists and conservationists to the middle valley of the Rio Ribeira where it had been found. Besides initiating research on the group discovered by Koehler *et al.* (2002), efforts were made to find other groups surviving in the area, and two more were discovered. Here we summarize our research and findings since the discovery of the first group, and provide some suggestions for a conservation strategy for a region that unfortunately has a long history of environmental abuse.

Current range of *Brachyteles arachnoides* in the State of Paraná

According to Aguirre (1971), *Brachyteles arachnoides* was to be found in climax montane forests at altitudes of 600 to 1,800 m above sea level, in well-preserved remnants of seasonal and evergreen forests in the states of Bahia, Espírito Santo, São Paulo, Minas Gerais and Rio de Janeiro. Based on a reference of Krieg, cited by Hill (1962, pp.252–356), Aguirre (1971) considered the southern limit of the range of the species to be about 25°S, in the region of the Rio Ribeira in Paraná. He concluded that the distribution center of the species was the Serra do Paranapiacaba in São Paulo, well known for its richness of plants in the Lauraceae family. The Serra do Paranapiacaba today has the largest remaining southern populations of *Brachyteles* in a continuous stretch of forest covering some 100,000 ha, including the Intervalos and Carlos Botelho state parks, Xitúé Ecological Station and the Alto Ribeira State Tourism Park, together now known as the “Paranapiacaba Ecological Continuum” (Talebi and Soares, 2005).

The integrity of the “continuum” in the state of Paraná was broken several decades ago. Wachowicz (2002) recorded that the valley of the Rio Ribeira, the headwater springs of which are on Paraná's Second Planalto, draining into the Atlantic on the coast of São Paulo, was one of the principal routes for miners and prospectors entering the Planalto in the middle of 17th century.

Maack (1950) mapped the vegetation of the state and classified the forests in the Rio Ribeira valley as secondary along

the initial one-third and middle sections of the river. The section known as the Rio Ribeirinha and, to the east, the section in the Serra do Paranapiacaba, known regionally as the Serra da Canha, are within the domain of tropical and subtropical coastal rain forests. The primary forests have been gradually destroyed, the only fragments remaining being in the remotest and most inaccessible areas.

According to Roderjan *et al.* (2002), the dense evergreen forest (*Floresta Ombrófila Densa*) extends into the Paraná planalto, a region otherwise characterized as "Campos Gerais" (grasslands), accompanying the courses of the rios Ribeira and Açungui, and being increasingly delimited by the *Araucaria* pine forest at altitudes of 700 m above sea level. This penetration of the Atlantic forest, following the courses of the principal rivers of the region, and invading, so to speak, the open vegetation of the Planalto, is referred to in Brazil as an Area of Ecological Tension (*Área de Tensão Ecológica*). This floristic mixture continues until it reaches elevations where *Araucaria* begins to appear and eventually predominate; a characteristic of mixed evergreen forest (*Floresta Ombrófila Mista*) (see Fig. 1).

The mureiqui group found in the Fazenda Lagoa Alegre, municipality of Castro, Paraná (Koehler *et al.*, 2002) was in a tiny remnant of dense evergreen forest, within the domain of the mixed forest along the courses of the rios Ribeira and Açungui. The other two groups discovered later (L. M. Pereira *et al.*, unpublished) were in similar vegetation on the banks of the Rio Turvo (Fig. 1).

Martuscelli *et al.* (1994) informed of two localities where they found mureiquis in Paraná. One was in the municipality of Jaguariáiva, the other in the Guaraqueçaba Environmental Protection Area (APA), near to 25°S, and corroborating the southern limit of Aguirre (1971). According to the coordinates provided by the authors, the first locality is in the municipality of Sengés, on the banks of the Rio Jaguaricatu, and the second is in the south of the state of São Paulo. The mixed forest types we have described as being typical of the valleys of the Rios Ribeira, Açungui and Turvo disappear at this point, and the species which occur with *Araucaria*, and *Araucaria* itself, are lost in the dense evergreen forest typical of the coastal Atlantic forest, even at altitudes above 600 m. It is possible that *B. arachnoides* could still be found in small remnant forests in the valleys of the rios Jaguaricatu (Martuscelli *et al.*, 1994) and Itararé to the north, in the region of Jaguariáiva and Sengés, where landscapes today are dominated by extensive pine plantations, *estepes* (wooded grasslands), and a small area of open savanna, besides secondary forests with *Araucaria*.

The Mureiqui Group at the Fazenda Lagoa Alegre

Group size

This group was found by chance, during a forest inventory along power transmission lines. They were first seen

on 29 June 2002. After three further sightings in the same area (Fazenda Lagoa Alegre), we were able to count only eight individuals in the group (Koehler *et al.*, 2002). By the beginning of our systematic study in March 2003, however, we had registered 15 individuals, and after intensive efforts to habituate the mureiquis, in September 2003 we registered 18, due to three dependant infants we had not seen earlier, two of them still riding dorsally and the third ventrally. In September the older two would occasionally leave the mother to explore, and the third could sometimes be seen on the mother's back. A new count in November 2003, recorded 22 mureiquis; three adult females, four adult males, three subadults, four infants and eight other individuals we were unable to classify by sex or age. At the end of 2004, another infant was born, and in April 2005 there were 23 mureiquis in the group.

Home range

We studied the home range of the group from January 2004 to September 2005. The points of observation and travel paths were plotted using a Geographic Positioning System (GPS). The data obtained from 246 hours of *ad libitum* observation lead us to conclude that the group used a core area of 38.14 ha, in four forest fragments of 24.69 ha, 3.44 ha, 5.96 ha, and 4.05 ha. The area covered by the mureiquis was estimated at 128.65 ha. The maximum travel distance observed was 1,862 m (September 2004; 20.3 hours of observation), and the minimum was 146 m (March 2005; 18.5 hours of observation) (Pereira, 2006).

Milton (1984) and Dias and Strier (2003) concluded that the home range of mureiqui groups varies according to differences in forest structure and floristic composition, the availability and abundance of food, and the presence or otherwise of other groups. The home range of a group of 23–26 northern mureiquis *Brachyteles hypoxanthus* at the Caratinga Biological Station, Minas Gerais, increased from 168 ha to 309 ha due simply to an increase in the amount of habitat available (regeneration at the forest borders) (Dias and Strier, 2003).

Diet

The mureiqui diet is very diverse, including fruits, leaves, flowers, lianas and epiphytes (Milton, 1984; Nishimura *et al.*, 1988; Petroni, 2000); the contribution of each varying according to their availability and the time of year (Dias and Strier, 2003). We examined the diet of the mureiqui group at the Fazenda Lagoa Alegre by collecting feces and by direct observation. Between January 2004 and July 2005 we registered 27 species of plants of 20 families in their diet, including Myrtaceae, Annonaceae, Aquifoliaceae, Rubiaceae, Euphorbiaceae, and, most especially, Lauraceae (six species). They also eat fruits and leaves of epiphytes, especially cactuses and bromeliads. The most commonly eaten items were leaves, fruits and flowers. Once we saw an individual pulling an orchid off a branch and eating its bulbs (P. A. Nicola, unpublished data).

Our observations on the diet of the Fazenda Lagoa Alegre group indicate that they are using the same plant families and many of the same genera and species recorded in the diets of miquis elsewhere, in forests with similar physiognomies, structure, and floristic composition (see, for example, Moraes, 1992) (remembering, however, the ecotonal

nature of the forest arising from the gradual transition to mixed evergreen forest [P. A. Nicola, unpublished data]).

Habitat quality

The forest cover in the home range of the miquis is not uniform. The forests there are reduced to fragments

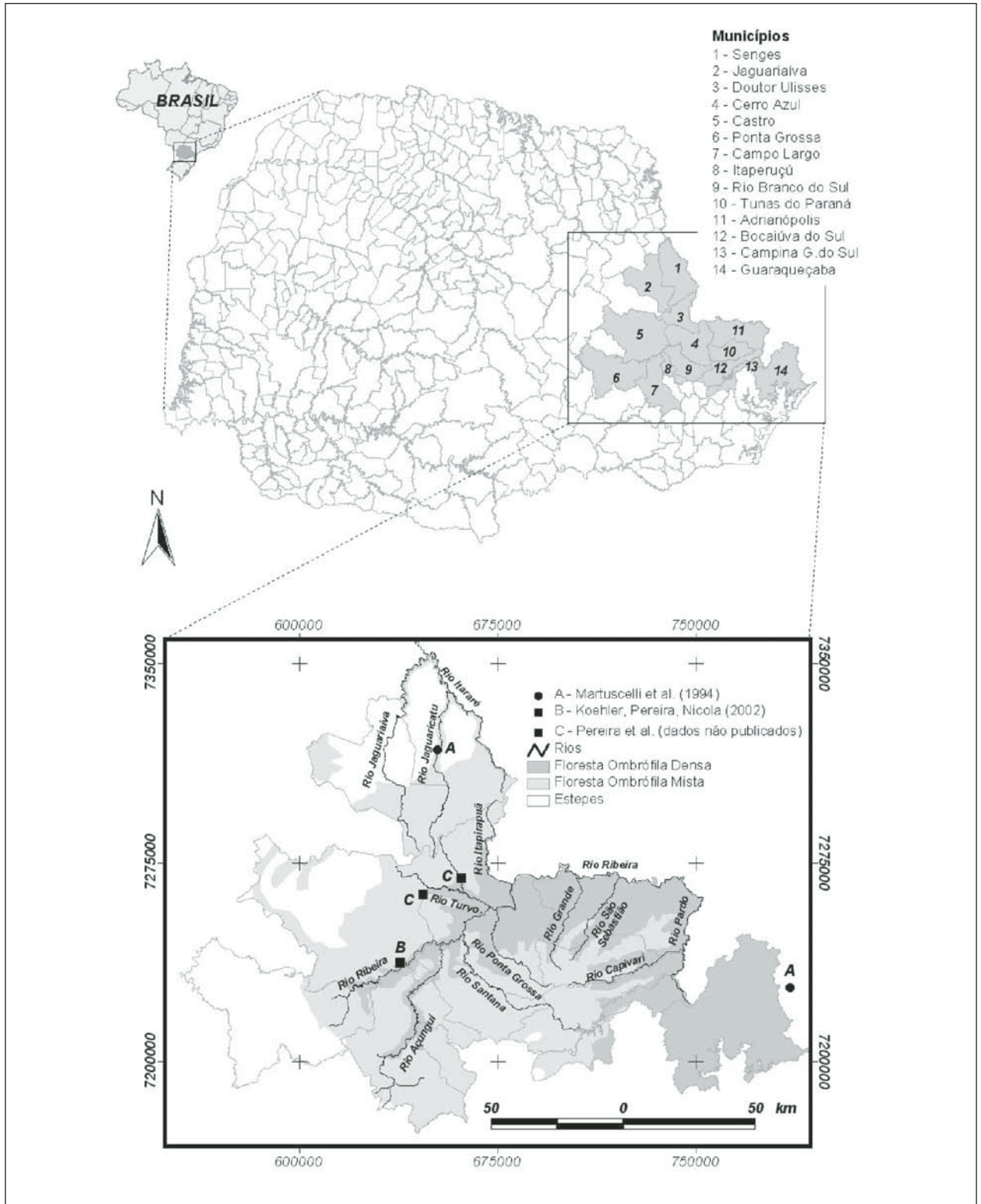


Figure 1. Geographic distribution of *Brachyteles arachnoides* in the state of Paraná.

surrounded by pasture, tree plantations (*Pinus*), and crops. The fragment where the muriquis live, although intact structurally, shows signs of past logging in some places. Although only 50 ha, it is one of the best-preserved forests of the region. Most of the forest in the valley is secondary, resulting from abandoned farming plots and pasture, with small patches of degraded primary forest in the valley bottoms and steeper slopes, and, rarely, in areas even of easier access.

The proximity of some of the better-conserved secondary forest patches to the 50-ha forest of the muriquis allows them to use them for shelter, passage and food. Alone we believe they would be inadequate to support muriquis; nowhere in the literature have we been able to find evidence that muriquis could live in secondary forest only. The advance in succession and growth of these forests, however, are no doubt vital for the long-term survival and growth of the muriqui population there.

The secondary formations differ considerably from the primary forest, most markedly in the understorey, which is very dense, and of course in the floristic composition. Bromeliads, orchids, epiphytic cacti, and Araceae are all rare. On the other hand, *Araucaria angustifolia* is more abundant, with mature trees in the first stratum of the forest. There are floristic differences in the lower strata too, from the lower canopy to the understorey. In both the primary and secondary forests, gaps in the canopy favor the proliferation of native bamboos (*taquara*) along trails and in tree falls. The control of these *taquaras* is key to managing these forests to favor the dissemination and growth of trees. The edges of both primary and secondary forests are dominated by bracken, *Pteridium aquilinum*, locally called *samambaia das taperas*, which is prejudicial to regeneration, complicating the germination and survival of saplings which could otherwise gradually advance the forest into the abandoned fields and pasture. The control of bracken is very difficult, not only because of the often steep terrain, but also because it is an aggressive disperser, an invasive species with a strong regenerative capacity. As such, fire is the means most used, which is invariably destructive too for all other saplings and seeds that could contribute to the regrowth of the forest. Fire is also used to clear bracken for pasture, which is frequently unsuccessful because of the speed with which bracken recovers and takes over once again.

These aspects restrict the regenerative capacity of the forest patches. Many areas, farmed in the past and abandoned could well have returned to forest if it were not for the farming practices in neighboring areas. Increasingly predominant in the landscape are pine plantations, *Pinus taeda* and *Pinus elliottii*, which limit the native forests to few trees left standing and able to coexist. More and more land is being given over to these pine plantations, so the possibilities of forest regeneration are severely limited or nil. All existing native forest patches, primary and secondary, must, therefore, be protected.

Selective logging in the area also has serious impacts. The felling of some trees in small primary forest in a farm next to the Fazenda Lagoa Alegre completely altered the micro-environment, and after four years the proliferation of bracken in the understorey is still impeding any natural regeneration. Unfortunately, the landowners are quite unwilling to mitigate this process, even though it would so obviously be of advantage for them to facilitate the regeneration of the forest patches they find so useful as a provider of timber, especially for fences. The cost they find unjustified. Despite the patent degradation of these forests, lacking a continuous canopy of any sort, the muriquis are still able to travel through them, but predictably not for much longer.

The owner of the Fazenda Lagoa Alegre, the laborers and staff, and some of the neighboring families have supported our research in the region. All agree that the muriquis should be protected, and they are strong allies in our attempts to do this. There is a local cement company with a large property in the region that has a forest of 200 ha. Most is secondary, in the middle to advanced stages of succession, and allowing this forest to expand, promoting the establishment of a connection with the Fazenda Lagoa Alegre forest, would be enormously beneficial to the muriquis. Some other property owners have small forest patches which are accessible to, and used occasionally by, the muriquis, but their understanding of how important this is for the muriquis conflicts with their dependence on these forest patches as sources of timber and firewood. These marginal forest patches, potential habitat for muriquis, are gradually diminishing as a result.

Another important element is the management of the pine plantations. The plantation companies need to fulfill legal requirements in terms of the so-called "Legal Reserve" (protection of a fixed portion of native forest on their land), and the Areas of Permanent Preservation (areas that must be left as forest, and natural vegetation along watercourses and on steep slopes, according to the Forest Code). These legal instruments could well be brought to bear as a means of designing a forested landscape, which, with the collaboration of the companies, could be more favorable to muriquis (and the accommodation and dispersal of wildlife in general).

Although the muriquis enter the degraded and secondary forest patches, moving through them, resting there and even sometimes feeding, in the majority of our studies we have been watching them in the primary forest, which is evidently the habitat vital for their continued existence in the region.

Future Research and Conservation Strategies

University teaching staff and students of the postgraduate course in Forestry of the Universidade Federal do Paraná (UFPR), and also the Pontifícia Universidade Católica do Paraná, have been carrying out the research on the muriquis

of the Fazenda Lagoa Alegre. The Department of Zoology of the UFPR should also be involved, as should the Museu de História Natural do Capão da Imbuia (MHNCI) in Curitiba. We hope that other universities and research institutions may also be inspired to collaborate, besides the relevant non-governmental conservation organizations. The future of muriquis in the state of Paraná will undoubtedly depend on their participation. The creation of a protected area, or areas, is vital, but not a simple prospect considering the expense and the fragmentation of the remaining forest. The means would be through, perhaps, a series of Private Natural Heritage Reserves (RPPNs), combined with institutional programs for the socio-environmental development of the region, working to preserve and connect the forest patches and improving soil management and farming practices to promote their regeneration, would be the best plan for the short- to mid-term.

The search for more groups continues, with our expectations centered on the courses of the rios Açungui, Ribeira, Turvo, Santana and Ponta Grossa and, farther east, on the rios Grande and São Sebastião; all affluents of the Rio Ribeira marking the state limits of Paraná with São Paulo. Throughout the region, the only remnant forest of any considerable size is that of the Lauráceas State Park of 23,000 ha, in a montane region of the municipalities of Adrianópolis and Tunas do Paraná. It is quite probable that muriquis will be found there.

We believe that the establishment of a state committee for the conservation of the muriqui in Paraná and its integration with the national committee would be an important step, providing as it would the principal forum for guiding research on the animal, as well as promoting integration with other institutions working on the southern muriqui, most especially in São Paulo. The committee would be the point of contact and articulation among non-governmental organizations, universities and state and federal governments, besides dealing directly with landowners concerning the creation of private reserves.

Improved policing for environmental crimes and abuses and inappropriate land use and management in the Rio Ribeira valley in Paraná is urgent. If current practices do not change, the tiny remaining forests in any reasonable state of conservation will be lost, and with them the chances for survival of the muriqui there. Government measures to improve the livelihoods, education, and well-being of the local communities in the region are also urgently needed. Development in the region has been slow, but the introduction of activities oriented towards reforestation and the conservation of the forests there would undoubtedly be a viable option. A reforestation project of Bracatinga has already begun in the northern Paraná section of the Ribeira valley, an initiative of the Development Agency for the Middle Ribeira Valley (*Agência de Desenvolvimento Mesorregião Vale do Ribeira*), in partnership with the Brazilian Agricultural and Cattle-Breeding Research Company

(*Empresa Brasileira de Pesquisa Agropecuária – EMBRAPA*) and the State Company for Technical Assistance and Rural Extension (*Empresa Estadual de Assistência Técnica e Extensão Rural – EMATER*), financed by the Ministry of National Integration (*Ministério de Integração Nacional*), in the municipalities of Bocaiúva do Sul and Campina Grande do Sul.

In conclusion, this is the moment to think of the strategic re-establishment of wildlife corridors extending to the Paranapiacaba Ecological Continuum, using these isolated forest fragments of the Ribeira valley as stepping stones and bridges. Diversified agrosilvicultural projects could well be an excellent solution in the short- to medium term, besides the implementation of agricultural policies to improve farming practices, to end the predominant and pernicious traditional systems, which include itinerant farming (slash-and-burn) that has for years been degrading the soils and ruining the landscapes of the region.

Acknowledgment

The authors are most grateful to the Fundação O Boticário de Proteção à Natureza, São José do Pinhais, Paraná, for financing our research during 2003 and 2004.

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