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November 2006

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Strier, Karen B.; Boubli, Jean P.; Pontual, Francisco B.; and Mendes, Sergio L., "Human Dimensions of Northern Muriqui Conservation Efforts" (2006). *Ecological and Environmental Anthropology (University of Georgia)*. 6.

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*Articles***Human Dimensions of Northern Muriqui Conservation Efforts****Karen B. Strier^{1*}, Jean P. Boubli², Francisco B. Pontual³, and Sérgio L. Mendes⁴**

*The northern muriqui (*Brachyteles hypoxanthus*) is endemic to Brazil's Atlantic Forest, and it ranks among the most critically endangered primates in the world. Roughly 25% of the species is found in the 957 ha forest at the Estação Biológica de Caratinga/RPPN-Feliciano Miguel Abdala, in Minas Gerais, Brazil. The long-term research and conservation efforts at this site have received considerable attention, and public awareness and educational campaigns about northern muriquis have been highly effective. Nonetheless, very little about the human dimensions of these efforts have been explicitly described. In this paper, we focus on three distinct, but interconnected dimensions: i) the role of training Brazilian students on the research to build local capacity; ii) the multiple levels of interactions among researchers and different spheres of the local farming community, which have extended over time from the family that owns the farm on which the forest is situated, to the families that work on this farm, to the farmers who live and work in the surrounding community; and iii) the development of partnerships involving national and international nongovernmental organizations and the Brazilian government. We conclude by describing the synergist interactions between each of these human dimensions, which have contributed to both the research and conservation of northern muriquis at this site. We also consider the ways in which some of the specifics of this particular "case study" might be applicable to other species of primates elsewhere.*

KEYWORDS: Northern muriqui, *Brachyteles hypoxanthus*, human dimensions, primate research, conservation, capacity building, local farmers

Introduction

The northern muriqui (*Brachyteles hypoxanthus*) once ranged throughout the Atlantic forest of Minas Gerais, Espírito Santo, and southern Bahia (Aguirre, 1971). Today, there are fewer than 1,000 individuals distributed among about a dozen populations, and the northern muriqui is considered to be one of the most critically endangered primates in the world. International conservation efforts to increase public awareness and protect muriquis have been underway since the late 1970s (Mittermeier, et al., 1982), and field studies of northern muriquis are now being conducted at multiple sites (Mendes, et al., In press). One of these sites, the Estação Biológica de Caratinga RPPN-FMA, is a 957 ha forest that today supports some 226 muriquis, or roughly 25% of the species. An ongoing field study of one group of northern muriquis in this forest was initiated in 1982 (Strier, 1999), and the entire population has been monitored since 2003 (Strier, et al., 2002; 2006; Strier and Boubli, In press).

Most presentations and publications from the Muriqui Project of Caratinga have emphasized the scientific discoveries about the monkeys' behavioral ecology, reproduction, and demography, and how these discoveries inform conservation efforts on their behalf. With a few exceptions (e.g., Strier, 1999, 2000; Strier and Mendes, 2003; Strier and Boubli, In press), little has been written about the human dimensions of this field project or the vital roles these dimensions have played in establishing and maintaining the positive synergy between basic research and conservation concerns over time (Figure 1).

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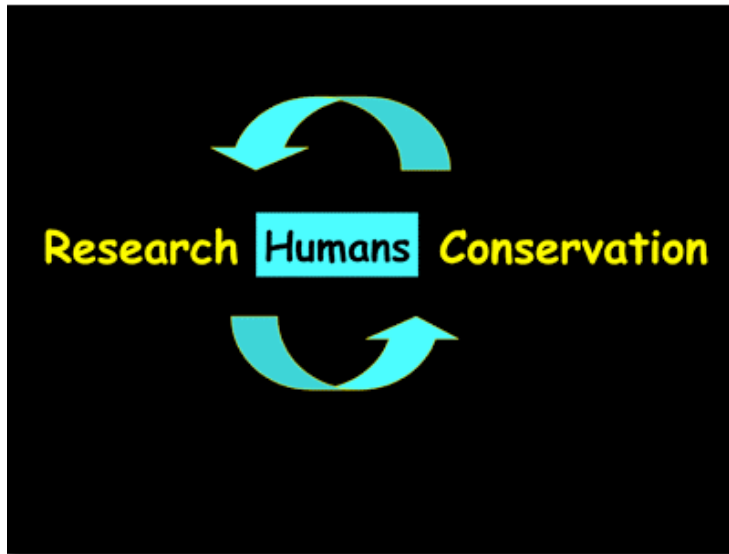


Figure 1. Centrality of humans in the dynamic interactions between research and conservation.

international ecotourism. While the researchers have collaborated in these various educational and outreach activities, we do not discuss them in this paper because they tend to be ubiquitous on research projects that are centered on charismatic species located in accessible parts of the world. Instead, we restrict our review to the human dimensions that are most unique to this primate-focused project, and that might therefore serve as both a case study for other primatologists seeking new ways to develop the human dimensions of their own research and conservation endeavors elsewhere.

Local Capacity Building

Many primatologists employ local people as field assistants, and the Muriqui Project of Caratinga is no exception. From the outset we have hired local people to help with specific tasks, such as opening and maintaining trails, and some are now contracted to follow the murequis on some of the specific projects presently underway. The multiple benefits of these arrangements are important because they contribute to the continuity of the research, as well as to the local economy through the competitive salaries we pay, and to the ownership that local employees feel toward the research and conservation activities of which they are a part.

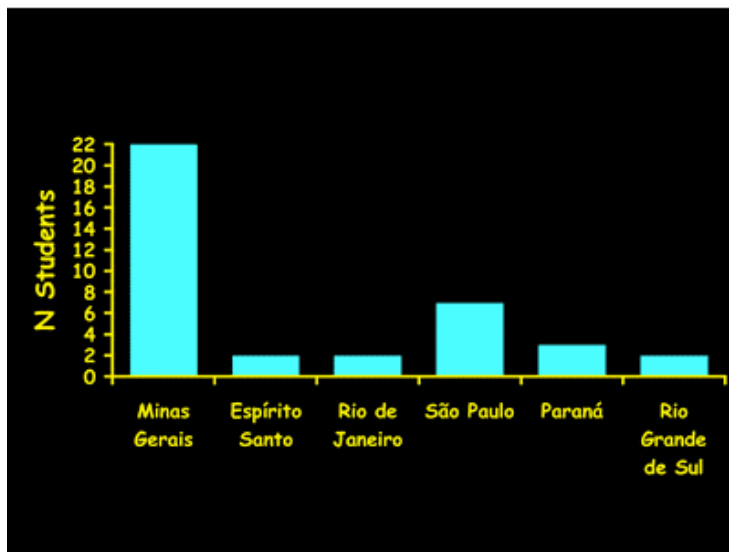


Figure 2. Distribution of pre-doctoral student participants on the Muriqui Project of Caratinga, 1983-2005.

What has distinguished this project from the outset, however, has been our deliberate effort to also contribute to the training of future Brazilian scientists and conservationists. This commitment to building local capacity includes

providing guidance in the field so that students can develop their own independent research projects while participating on the long-term studies, and post-fieldwork advising to help them analyze and publish their data for their professional advancement.

This tradition was initiated during 1983-1984, when Strier worked with a Brazilian undergraduate, Eduardo Veado, who returned after completing his university degree in biology to administer the Biological Station of Caratinga and its activities until 2005. From 1983 through the current (2005-2006 research year), a total of 38 Brazilian pre-doctoral students have been involved in the miqui research projects (Figure 2). These students have come from 14 colleges and universities in six different states. Twenty-one have completed or are currently completing graduate degrees. Some of the original students now hold faculty positions at Brazilian universities, and others are now employed by Brazilian conservation NGOs or coordinating their own research projects as independent investigators. Women account for more than 50% of all participants to date.

Compared to many other primate habitat countries, Brazil has no shortage of dedicated students interested in primate field research and conservation. This pool of participants is a product of an established tradition in Brazil in which scientists and conservationists have stimulated interest in field studies of animals, including primates, and conservation through their own field research and specialized field courses (Thiago de Mello, 1984, 1995). There has also been an active community of Brazilian and international NGOs concerned specifically with conservation and the basic field research upon which conservation priorities are established. Together, these traditions, which precede our own efforts on behalf of miquis, have sustained a highly talented pool of students from which we have been able to recruit. Many of the original students are now actively engaged in stimulating and recruiting their own students for other research projects on miquis and other endangered species elsewhere in Brazil. Some have maintained continuing commitments and have expanded the scope of the Miqui Project of Caratinga.

Local Farming Community

Being permitted to conduct research on private land anywhere in the world is a privilege, and the researchers on our projects have understood and respected our place as visitors in the area from the start. Interactions between our research groups and members of the local farming community have occurred at multiple levels, which have expanded in scope over time (Figure 3). This radiation of contact reflects a

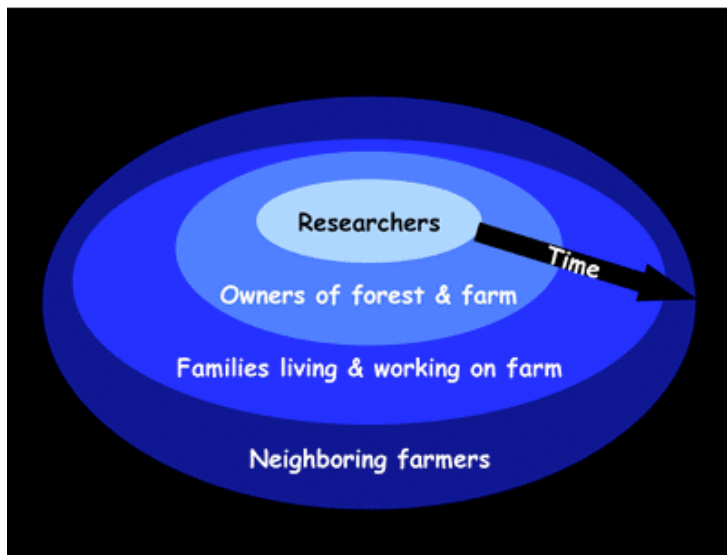


Figure 3. Spheres of local interactions between researchers and local residents over time.

combination of the particular conditions of this forest, which is privately owned and situated within the boundaries of the owner's farm, and surrounded by other private farms and ranches. It also reflects changes in the logistics of the projects, such as the limited transportation available during the early years that restricted encounters between researchers and local residents to those whose homes or work on the farm brought these two sets of people into contact.

Initially, most research-resident interactions were focused on the owner of the forest and his family, and the few local families that lived within the farm's boundaries and whose homes

were located near the research house or situated along the researchers' routes through the forest or the dirt roads inside the farm that connect with the public roads into town. Other local residents passed the research house and the researchers on their way to and from the coffee fields and pastures along the perimeters of the forest. Encounters along the dirt road that bisects the central valley of the forest within the original miqui study group's home range were frequent and, because everyone was on foot, there were ample opportunities to converse. As the project expanded to include another miqui group occupying the northern part of the forest, and improved access to vehicles permitted researchers to approach that part of the forest from another set of roads, the radius of researcher-resident interactions also increased to encompass residents of other farms and ranches in the surrounding community.

Owners of the forest and farm

When the long-term miqui study was initiated, the owner of the forest, Senhor Feliciano Miguel Abdala, was in his early 70s, and his farm, Fazenda Montes Claros, was an active coffee plantation and cattle ranch that employed more than 20 families who also lived within the boundaries of the farm. Sr. Feliciano had preserved the core of the forest on his lands, and although selective logging still occurred within its borders, the primates had been protected from hunters for decades.

Sr. Feliciano was welcoming and responsive to the first Brazilian biologists who contacted him. His generosity extended to the Brazilian students that began to accompany their professors to the forest, and to the international conservationists that later joined them. He was equally welcoming toward Brazilian and foreign researchers, who he accommodated in his own farmhouse until a small vacated house at the edge of the forest had been renovated with funds from Brazilian and international NGOs. This house, which Sr. Feliciano dedicated to the researchers, was inaugurated as the *Estação Biológica de Caratinga* (EBC) in May 1983, and the first cohort of resident researchers (including two of us, Strier and Mendes, who was studying the brown howler monkeys at the time) moved into it the following month.

Sr. Feliciano drove past the EBC on his daily trips to and from the coffee fields and pastures at either ends of the forest. He frequently encountered the researchers along the dirt road where our trails into the forest originated. Most of Sr. Feliciano's family, including his wife and sons, were based in the city of Caratinga, about 60 km from the farm, but they often joined him for weekends and vacations, and would accompany him during his rounds.

The EBC was supported by a combination of the daily fees that all residents paid to cover the costs of food and maintenance, and by subsidies, in the form of grants, from various NGOs (Table 1). The EBC employed a local woman who cooked for the researchers, and a local man who tended the vegetable garden, maintained the house and its water supply from the forest, and assisted with various aspects of the fieldwork. They were distantly related to one another, and between the two of them, had kinship or marriage bonds with almost all of the other families that lived and worked on Fazenda Montes Claros.

In the 1980s, there was no electricity at the field station, and the nearest telephone was located 26 km away in the town of Ipanema, Minas Gerais. Food and fuel for cooking and running the refrigerator were brought in by bus when the roads were passable, or by catching a ride in the back of the milkman's truck when the rains had rutted up the roads. Occasionally, we caught rides into town with Sr. Feliciano or his workers, and we counted on their help in the event of emergencies. By 1991, Strier's miqui research project had purchased an old VW for local transportation, and by 1992, the Brazilian NGO *Fundação Biodiversitas* arranged and paid for the installation of electricity at the house.

In 2001, a year after Sr. Feliciano passed away, his family made a dedicated commitment to conserving their forest by transforming it into a federally-recognized private nature reserve, or *Reserva Particular do Patrimônio Natural*, now known as the RPPN-Feliciano Miguel Abdala, or RPPN-FMA.

The Abdalla family (curiously, spelled differently from Sr. Feliciano's last name) also established an NGO, called the Sociedade para a Preservação do Muriqui, or Preserve Muriqui, led by Sr. Feliciano's grandson, Ramiro Passos, to support their conservation activities. The researchers have maintained good relationships with Sr. Feliciano's family, and two of us (Strier and Pontual) currently serve as Research Director and Technical Director, respectively, for the Reserve.

Table 1. Infrastructure and Research Support*.

Years	Infrastructure Support	Field Research Support
1982-1987	<ul style="list-style-type: none"> • Sr. Feliciano • World Wildlife Fund • FBCN • Fundação Biodiversitas 	<ul style="list-style-type: none"> • World Wildlife Fund • National Science Foundation • Fulbright Foundation • Sigma Xi • Joseph Henry Fund, National Academy of Science • L.S.B. Leakey Foundation
1987-1992	<ul style="list-style-type: none"> • Sr. Feliciano • World Wildlife Fund • FBCN • Fundação Biodiversitas 	<ul style="list-style-type: none"> • National Science Foundation • University of Wisconsin-Madison • Liz Claiborne & Art Ortenberg Foundation • National Geographic Society • Chicago Zoological Society
1992-1997	<ul style="list-style-type: none"> • Sr. Feliciano • Fundação Biodiversitas • Liz Claiborne & Art Ortenberg Foundation (to E.M. Veadó) • Conservation International 	<ul style="list-style-type: none"> • National Science Foundation • University of Wisconsin-Madison • Liz Claiborne & Art Ortenberg Foundation • Scott Neotropical Fund, Lincoln Park Zoo
1997-2002	<ul style="list-style-type: none"> • Sr. Feliciano • Liz Claiborne & Art Ortenberg Foundation (to E.M. Veadó) • Conservation International • CI-Brasil 	<ul style="list-style-type: none"> • National Science Foundation • University of Wisconsin-Madison • National Geographic Society • Margot Marsh Biodiversity Foundation
2002-present	<ul style="list-style-type: none"> • Conservation International • CI-Brasil • San Diego Zoological Society • Sociedade para a Preservação do Muriqui 	<ul style="list-style-type: none"> • University of Wisconsin-Madison • Liz Claiborne & Art Ortenberg Foundation • National Geographic Society • Margot Marsh Biodiversity Foundation • San Diego Zoological Society • Rufford Foundation (to C.B. Possamai) • Primate Action Fund-CI (to C.B. Possamai) • PROBIO - MMA/BIRD/GEF/CNPq

*Grouped into 5-year periods for practical purposes; sources of infrastructure and research support are shown for the general periods in which support was initiated or carried over from previous period.

Families living and working on the farm

The high level of activity on the farm when the muriqui project began meant that most of the local residents were employed in Sr. Feliciano's ranching activities or coffee production. It was unusual for anyone to be idle, and people traveled within the farm almost exclusively on foot or by bicycle. The

proximity of the research house to the dirt road that connected the local residents' homes and the fields and pastures where they worked created many opportunities for almost daily encounters.

The friendly relations that developed early on between the researchers and their neighbors increased over time, and also as a consequence of both improved transportation and communication. Some of the students also became regular participants in local community activities, which ranged from Sunday afternoon lunches and evening soccer games, to teaching high school-level evening classes in Santo Antonio, the nearest town located some 12 km north of the EBC. Excursions to Santo Antonio were further stimulated by a few of the EBC researchers who chose to live there, and have increased since telephones were installed in the town and the projects purchased cars or motorcycles to get them there. In 2003, Santo Antonio once again became a base for the researchers who were working on projects coordinated by Boubli in the northern part of the forest.

Along with the long-term personal friendships among individual researchers and local residents, a strong sense of mutual interdependence has also developed and grown. When a part of the forest caught fire at the end of the dry season in 1990, many of the local men risked their lives to cut a firebreak and ultimately brought the fire under control before it could spread beyond the 30-hectare slope that was burning. Many of the young men who now work with the students in the forest or on the reforestation project were small children when the muriqui project began, and have therefore matured along with us.

Neighboring community

The expansion of research to include the muriqui group inhabiting the northern-most part of the forest extended the range of interactions among researchers and local farmers well beyond the boundaries of Fazenda Montes Claros. The most efficient access to the northern part of the forest is from the dirt roads that pass along its perimeter and near other farms. In fact, there are some 47 farms in the vicinity of Fazenda Montes Claros, and several still have small pockets of forest that are directly connected and utilized by the muriquis, or either tenuously connected to the Reserve, or else close enough for connections to be rapidly reestablished through recovery and conservation efforts.

The idea of recovering fields and pastures to expand the area of forest available to muriquis here was initiated in the early 1990s, when data demonstrated that the expansion of the muriqui population could be expected to continue provided there was sufficient habitat available to them (Strier, 1993-1994). The past-administrator of the EBC, Eduardo Veado, launched two important initiatives at this time, both of which have subsequently been expanded with great success by Boubli and Pontual. First, Veado commissioned a consulting firm to conduct interviews with the neighboring farmers, nearly all of whom lamented the declining productivity of their lands, which they attributed to lack of water. Although our daily rainfall data showed that annual rainfall in the region had not actually declined, the loss of forest cover led to run-off and evaporation with negative impacts on local farming and ranching activities, and may even have contributed to a lowering of the region's water table.

Veado's second initiative was to collect seeds of forest plants, particularly those eaten by the muriquis, to develop a nursery that could supply seedlings for a reforestation project. In 2004, what had been a fairly small-scale project was transformed into a 1-hectare nursery capable of producing some 100,000 seedlings per year. The nursery was situated on land loaned by one of the neighboring farmers, and the reforestation project employed many of the young men who grew up on Fazenda Montes Claros alongside the research base there.

The evolution of the expanded nursery and reforestation projects, as well as popular courses on efficient husbandry, planting, and projects to protect the region's watersheds, merit a much longer discussion than space permits here (Boubli, et al., 2005; Pontual, et al., In prep.). What we emphasize

here is that this much wider, community-scale participation in conservation was facilitated by both the basic research results about the importance of increasing habitat, and the relationships that have developed among local residents in the region and both past and present researchers.

Non-Governmental and Governmental Partnership

The research and conservation activities of the Muriqui Project of Caratinga have always relied on support from local and international NGOs (Table 1). This support has taken many different forms over the years, and has sometimes, but not always, involved funds to finance new or ongoing initiatives. The most constant and critical role of the NGOs has been in providing the essential infrastructure needed to develop our research and conservation projects at this site. This has included periodic renovations and expansions to the research house, and improvements such as electricity and a well to insure a constant water supply.

Many NGOs have also been involved in supporting particular research and other projects at this site, but only a few have made long-term commitments to sustaining the maintenance of the EBC and its non-research staff. The Fundação Brasileira para a Conservação da Natureza, (FBCN), and the World Wildlife Fund, largely through the efforts of Russell Mittermeier, were the first NGOs with a major presence. These NGOs were soon followed by others, including Fundação Biodiversitas, Conservation International and Conservation International-Brasil, and the Associação Pró-EBC (ApEBC). More recently, the Sociedade para a Preservação do Muriqui has assumed an increasingly important role in administering the EBC and all of the research and conservation-related activities in the Reserve.

The Brazilian government has also made increasingly important contributions to research and conservation efforts on behalf of muriquis at this site and elsewhere. In 2002, the Brazilian equivalent of the U.S. Fish and Wildlife Service, known as IBAMA, established a 12-member advisory committee for the conservation of muriquis, on which two of us (Strier and Mendes) currently serve. The committee meets annually, and has been charged with evaluating new research initiatives and management proposals for both southern and northern muriquis, and developing a conservation management plan for these species (Mendes et al., In press).

The Brazilian government also established a competitive fund to support conservation efforts on behalf of endangered species. This fund was generated through The Project for the Conservation and Sustainable Use of Biodiversity, abbreviated as PROBIO. It represents an agreement made nearly a



Figure 4. Mutualistic interactions across human dimensions along research and conservation axes.

decade ago between the Brazilian government, the Global Environment Facility, and the International Bank for Reconstruction and Development. It is linked to various departments and secretariats of the Brazilian government, including the General Coordinator of Biological Diversity and the Brazilian Research Council, or CNPq. One project involving northern muriquis in the state of Espírito Santo, coordinated by Mendes, was among the proposals approved during the first round of funding. By the second round of PROBIO funding, northern muriquis were the focus of three of the 10 projects approved. In addition to continued

funding for the muriqui project Mendes coordinates in Espirito Santo, there were also two awards to support work with northern miquis in the state of Minas Gerais, including one focused at the EBC and coordinated by Boubli. All of the PROBIO projects were run through different NGOs, which administered the more than \$140,000 each of the projects received from the Brazilian government.

Synergism across Human Dimensions

There has always been tremendous synergism across the various human dimensions that have positively impacted research and conservation efforts associated with the Muriqui Project of Caratinga (Figure 4). For example, the Brazilian students recruited into the research have, through their work and friendships, stimulated interest and participation in both the research and conservation activities at the Reserve, and together the students and local residents have facilitated the conservation efforts of Brazilian and international NGOs and attracted support from the government. Equally important, the NGOs and Brazilian government have facilitated conservation efforts through their support of projects aimed at the local farming community and the research and conservation activities of the students. The mutually beneficial interactions at all levels have helped to protect this forest and the muriquis it supports, and provide hope for their future.

Extrapolating to Other Field Studies

We realize that some of the human dimensions in our project may be difficult to develop at other field sites, or may require different approaches to those that we either deliberately took or that developed during the decades that the Muriqui Project of Caratinga has been underway. For example, the existing scientific and field-based ecological traditions in Brazil provided a reservoir of talented and interested university and graduate level students for our project that other countries with different academic traditions might lack. We were also fortunate that there was not a long established history of hunting muriquis in the Reserve. This not only made it feasible to rapidly habituate the muriquis to the presence of researchers, but also meant that the local economy was not dependent on hunted meat as it is in some other regions of Brazil and other parts of the world. Similarly, because muriquis have never been observed to raid the crops of local farmers the way that other species of primates often do, protecting the muriquis did not put us in direct conflict with the subsistence or income of local people.

The private ownership of this forest, and the receptivity of Sr. Feliciano and his family to our activities, also created an environment that was conducive to the research and conservation programs. We did not have to negotiate with local administrators or bureaucrats as the project developed. As the Abdalla family and their new NGO assume an increasingly vital role in these and their own conservation-related initiatives based at the EBC and within the Reserve, we anticipate greater opportunities to simultaneously advance the research, conserve the forest and its inhabitants, and work together to develop a sustainable ecological community that includes local farmers and ranchers. And, by involving us in their NGO, they have given us a voice in their decision-making processes during the current transitional period.

Other recent developments, such as the one initiated under the PROBIO project to expand the EBC forest with the participation of neighboring farmers and ranchers (Pontual, et al., 2005, Pontual & Boubli, In press), and an even larger scale plan being developed by Conservation International-Brasil to establish connectivity between this forest and another forest that also supports muriquis in the town of Simonesia, some 55 km (straight line) away, provide some examples of the ways in which conservation efforts on behalf of northern muriquis in this region are expanding. These projects are much larger in scale, but they will also rely on many of the same human dimensions that have contributed so directly to our research and conservation efforts on the Muriqui Project of Caratinga.

Although the human dimensions of our research and conservation efforts have been described as “charmed,” there have been ongoing challenges along the way. One challenge, for example, has been the

time and thorough documentation required for the evaluation and processing of requests for renewed research permission from the Brazilian government. Yet, the participation and sponsorship of a Brazilian counterpart required for any foreign researcher has also stimulated the long-term and mutually productive collaborations among us and our students, and has therefore contributed in the most positive ways to the human dimensions of the project.

While the renewal of research permissions is an episodic challenge, the maintenance of funding for our basic research and conservation activities is a perpetual and increasingly daunting concern. Our operating costs have risen rapidly in recent years due to a combination of inflation, new labor laws that affect project personnel, and the expenses associated with maintaining field vehicles necessary to access distant parts of the forest and equipment such as the walkie talkies, GPS devices, and computers that are now standard tools in the field. Like most of our colleagues with projects elsewhere in the world, a great deal of our energies are devoted to securing the funds that we need to continue to our work.

Finally, as the working frontier of this long term project has expanded to include the neighboring farms around the Reserve, new and possibly not so “charmed” challenges are expected to come along. Although the reforestation of degraded areas seems to be a common goal to both farmers and researchers, this is a delicate yet fundamental matter about which we are still learning how to deal (Pontual, et al., In prep.).

Acknowledgments

We thank CNPq and the Abdalla family for permission to develop our project at the RPPN-FMA, and the various organizations and funding agencies shown in Table 1 for their support over the years. We are grateful to Agustin Fuentes, Fred Anapol, and Trudy Turner for inviting us to participate in the Wiley-Liss Symposium at the 2005 meetings of the American Association of Physical Anthropologists, where a version of this paper was presented. We also thank the editors of Ecological and Environmental Anthropology and the anonymous reviewers for their comments on our manuscript.

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