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Behavioral and Ecological Interactions between Reintroduced Golden Lion Tamarins (*Leontopithecus rosalia* Linnaeus, 1766) and Introduced Marmosets (*Callithrix spp,* Linnaeus, 1758) in Brazil's Atlantic Coast Forest Fragments

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ABSTRACT

*Marmosets (*Callithrix* spp.) have been introduced widely in areas within Rio de Janeiro state assigned for the reintroduction of the endangered golden lion tamarin (*Leontopithecus rosalia*). The objetives of this study were to estimate the marmoset (CM) population in two fragments with reintroduced golden lion tamarin to quantify the association and characterize the interactions between species. The CM population density (0,09 ind/ha) was higher than that of the golden lion tamarin (0,06 ind/ha). The mean association index between tamarins and marmosets varied among groups and seasons (winter=62% and summer=35%). During the winter, competition resulted in increases in territorial and foraging behavior when associated with marmosets. Evidence of benefits during the summer was reduced adult vigilance while associated to marmosets. Golden lion tamarins were also observed feeding on gums obtained from tree gouges made by the marmosets. Marmosets represented a threat for the conservation of golden lion tamarins.*

Key words: Ecology, behavior, golden lion tamarin, common marmoset, invasive species, conservation

INTRODUCTION

The introduction of exotic or allochthonous species, both accidental and purposeful, has been and is a factor altering native biotas worldwide (Elton, 1958; Daehler and Gordon, 1997; Fritts and Rodda, 1998; Guy et al., 1998; Thomas, 1998). The lack of natural predators, abundance of prey without natural defenses and disturbed habitats, frequently give the invading species an advantage over the native species (Williamson,

1996; Sakai et al., 2001). Introduced species often cause alterations to the habitat or bring diseases that can lead to the extinction of native species (Mack and D' Antonio, 1998). Introduced species can also be competitors. There is no published evidence of any beneficial effects of introduced species on native species of vertebrates (Williamson, 1996). The impact of introduced species can increase in fragmented landscapes (With, 2002), where many species of animals, especially terrestrial vertebrates, are vulnerable to

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extinction because they live in small populations with different degrees of isolation (Meffe and Carroll, 1994; Foose et al., 1995).

Golden lion tamarins (*Leontopithecus rosalia*-mico-leão-GLTs) are endangered primates endemic to the Atlantic coast forest of Brazil (Kleiman et al., 1988; Dietz et al., 1994; Kierulff, 1994). The remaining populations (about 1000 animals) are distributed in a mosaic of forest fragments, of which 60% are legally protected, 25% are not protected but in safe areas, and 15% are in isolated and unprotected small fragments (Kierulff and Oliveira, 1996; AMLD, 2002). There appears to have been considerable genetic losses and genetic structuring cause by fragmentation (Grativol et al., 2001; Grativol, 2003). The conservation program for this species includes protection of wild populations in biological reserves, translocation of wild groups in small and highly degraded areas to biological reserves, and reintroduction of captive-born animals to forests in private farms within the State of Rio de Janeiro (14 farms) (Kierulff and Oliveira, 1994; Kierulff and Oliveira, 1996; Ballou et al., 1998). The population of reintroduced animals (the captive-born animals and their wild-born offspring) represents today 30% of the golden lion tamarins living in the wild. In the last PHVA (Population and Habitat Viability Analisis), one of the priorities for conservation was the understanding of the factors affecting survival and reproduction after reintroduction (Ballou et al., 1998). One of these factors is the presence of marmosets, *Callithrix jacchus and C. penicillata*, primates introduced to the State of Rio de Janeiro (Cerqueira et al., 1998; Ruiz-Miranda et al., 2000). The presence of common marmosets (*Callithrix jacchus*- sagüi) was first recorded in the private forest fragments targeted for reintroduction of golden lion tamarins in 1985. The common marmosets are native to northeastern Brazil (Stevenson and Rylands, 1988), and because they were introduced into the state of Rio de Janeiro as the direct result of the illegal wildlife, they are considered an exotic species (Ruiz-Miranda et al., 2000). There is a strong potential for inter-specific competition because the ecology and behavior of these species is similar to that of lion tamarins (Rylands and Faria, 1993). Marmosets and lion tamarins are frugivore-insectivores (Kleiman et al., 1988; Rosenberger, 1992). The marmosets also feed substantially on tree exsudates (mostly gum) (Coimbra-Filho and Mittermeier, 1976; Stevenson and Rylands, 1988; Ferrari, 1993; Kinzey, 1997). The GLTs feed on gums only opportunistically [Peres, 1989].

There are no quantitative data on the population size of the introduced marmosets, on the degree of association between marmosets and tamarins or on the organization of the association. The association between sympatric primates, including the formation of mixed groups, has been documented for Amazonian forest species (Garber, 1988; Heymann, 1990; Peres, 1992; Peres, 1993; Lopes and Ferrari, 1994). In these cases, the associations appear to bring mutual benefits in prey capture (Peres, 1992; Lopes and Ferrari, 1994), predator defense (Peres, 1993) and exploitation and defense of larger territories (Garber, 1988; Heymann, 1990). The genus *Leontopithecus* and *Callitrhix* are sympatric only in the Atlantic forest of northern Bahia. At the Una Biological Reserve, *L. chrysomelas* and *C. kuhli* associate infrequently (Raboy, 2002).

The objetive of this study was to assess if the presence of *Callithrix jacchus or penicillata* presented a problem for the conservation of *Leontopithecus rosalia*. The specific objectives were: (1) estimate the population of marmosets in the largest private forest fragment with reintroduced golden lion tamarins; (2) quantify the degree of association between the species and document any seasonal differences in a large and a small forest fragment; (3) characterize the association, aiming to find behavioral evidence of competition or cooperation between the species. If there were direct competition, then the presence of marmosets would be associated with changes in foraging or territorial behavior. If there were cooperation, then the possible benefits would be reduction in vigilance and exploitation of alternative food sources.

METHODS

Study site

The main study site was the Fazenda Rio Vermelho (FRV), Rio Bonito municipality. The secondary study site was the Fazenda do Estreito (FES), municipality of Silva Jardim. Both sites are located in Rio de Janeiro State (42° 35'00''W, 22°43'00''S). The FRV has the largest forest fragment (1000 ha) where tamarins are reintroduced and the largest population of captive-born reintroduced GLTs. The FES represents one

of the small forest fragments (30 ha) and has one social group of reintroduced GLTs. Both farms have common marmosets. All GLTs were habituated to human observers and most of the common marmosets were either habituated or semi-habituated (showing no flight from but also no approaches and some avoidance toward humans). The tamarins in these farms were monitored three times per week by field observers of the AMLD. During these visits, the animals were counted, observed for 1-3 hours and supplemented with bananas. At the beginning of the study, there were 10 GLT groups with 65 animals at FRV. GLTs were marked individually with tattoos and hair dye, and at least one animal per group was fitted with a telemetry transmitter.

Four groups from the FRV and the group in the FES were selected for observation. The selection of groups was based on the accessibility of the territories, degree of habituation of GLTs and marmosets and the confirmed presence of the marmosets (Table 1). The groups of marmosets were estimated through observations during the supplementation of food and when following groups of GLTs. These estimates were the minimum number of marmoset groups in the study areas.

Sampling of the population
As part of the monitoring procedures of the AMLD, reintroduced GLTs were captured twice a year and all individuals marked. Observations by the field team ascertain if any animals were not captured. Capture efforts were directed then toward those individuals. The result was a complete census of the GLTs in both locations. For the marmosets, trapping was done monthly from October 1998 to May 1999. Between 12-16 Tomahawk® traps baited with bananas were positioned in seven of the platforms where GLTs were supplemented and captured. Traps were opened and monitored hourly from 5:00 to 18:00. Capture efforts ended when one marmoset was captured in the platform. This effort never went beyond five consecutive days in a month.

Table 1 - Composition of the golden lion tamarin (GLT) groups studied and a priori determination of occurrence of common marmosets. N = number of tamarin individuals. Males = number of adult and sub-adult males. Fem = number of adult and sub-adult females, and CM = estimated groups of marmosets.

GLT groups	N	Males	Fem	Imm	CM
Estocolmo (EST)	13	4	4	5	2
Rio Vermelho (RV)	6	2	1	3	1
Triplets (TRI)	9	4	2	3	2
Appenheul (APP)	6	2	2	2	1
Olympia (OLY)	6	2	2	2	1

All marmosets captured were taken to a field laboratory located at 5 km from the FRV. At the laboratory the marmosets were immobilized with Ketamine, tattooed in the interior of the right thigh, their body condition assessed (by noting pelage condition, teeth wear and wounds), body measures taken, and one animal (>350 grams) in four of the platforms was fitted with a telemetry transmitter. The marmosets were also assigned to age classes (infant, juvenile, sub-adult and reproductive adult) using size, weight (following a growth curve obtained from captive animals), development of teeth and sexual organs as criteria. Animals remained under veterinary supervision until the Ketamine effects wore off and no less than four hours later returned to the capture site. The population density estimate was calculated by dividing the total number of animals marked by the area of forest. This estimate represented the minimum number of marmosets at the time.

Estimates of association and interactions
Two methods were used: Monitoring and Intense Observations. In Monitoring, the field observers of the AMLD visited each group three times a week year round; each day the GLT groups were observed for one hour. During this time the observers collected data *ad libitum* (Altmann, 1974; Martin and Bateson, 1986) on presence of marmosets and any behavioral interactions between the species. From this monitoring data, monthly rates of agonistic and affiliative behaviors were calculated by adding all observations seen each day and dividing them by the number of days of observation per month. A monthly index of the presence of marmosets was calculated by adding

the number of days in which marmosets were observed together with the tamarins, then dividing that number by the number of observation days in that month.

The second method (Intense Observations) consisted of observing the groups for 7-9 days during each Wet season (December to April) and Dry season (July to September) for a total of 32 days in the Wet Season and 25 days in the Dry season. Observations were done from 7:00 to 16:00 with a mean of 7 hours of contact per day per group. The observers collected behavioral data using a scan sampling technique in which, every 20 minutes (Table 2) the presence of marmosets was noted (present or absent) and the behavior of each GLT scored (foraging fruits-insects; eating-fruits or insects; social; vigilant; territorial; resting-sleeping or not visible). The presence of the marmosets was determined using telemetry equipment and visual observations as follows: (a) Absent: when there was no signal from the telemetry or a weak signal indicating that the animal was far away. To confirm this, a visual inspection was done for 5 minutes within a radius of 30 meters. (b) Present: when the marmosets were either heard or seen from where the GLTs were, or when there was a strong telemetry signal coming from 360° from the receiver (which in this habitat indicates that the source is within 20

meters from the receiver). In these situations, the observers also approached the telemetry signal or triangulated the signal, or approached the vocalization of the marmosets to confirm the location. These criteria for presence were used because marmosets are difficult to see in this forest, and some marmoset groups were not habituated to humans and individuals would act cryptically.

An association index was calculated for each group in each season as the proportion of the total scans in which the marmosets were present. The differences in association between seasons were tested using a non-parametric Wilcoxon statistic. The behavioral data from scans was used to calculate the relative occurrence of each behavior by age class (adult, sub-adult and immature) when marmosets were present and absent. The frequency of occurrence of each behavior was calculated for each individual within the group as the proportion of observations in each behavioral category divided by the number of scans in which the individual was visible. This individual frequency of occurrence was used to calculate group age class means for each behavior. The sample size was the number of groups multiplied by 3 (the number of age classes). ANOVA was used to test mean differences when the marmosets were present or absent.

Table 2 - Definitions of the behavior recorded during scans sampling of golden lion tamarins

Behavior	Definition
Insect Foraging	Searching for insects or small vertebrates in branches, trunks, leaves, tree bark, bromeliads or ground.
Banana Foraging	Eating or searching for supplementary food (bananas) in the feeding platforms provided by the AMLD.
Fruit Foraging	Searching for fruits in the camopy or terminal branches or pods.
Success	Time spent eating insetc or prey divided by the the fime foraging for insects or prey.
Vigilance	Animal is alert, visual scanning , generally in the periphery of the group, and prone or in the Sphynx posture (Oliveria et al., 2003).
Territorial	Animals emiting multiple long calls or clucks, with fights, agonistic displays, scent marking.
Eating	Ingesting fruits or prey items. Includes the manipulation of the items.
Resting	Animal in prone position in large branches, trunks, with eyes closed or otherwise inactive.
Social	Animal interacting socially, including play, grooming, affiliative behavior, nursing.

RESULTS

Two species of marmosets were identified: *Callithrix jacchus* and *C. penicillata*. Some individuals seemed to be hybrids of the two species, because they had intermediate tufts in color (grey) and orientation (slopping). The marmosets were more abundant than the tamarins

at both locations. At FRV, 90 marmosets were marked from apparently nine social groups, representing a population density of 0.09 ind/ha. At FRV, there were 62 GLTs (density= 0.06 ind/ha). The territories of GLT groups (TRI, EST) had at least two social groups of marmosets, whereas in groups (APP, RV), there was only one group of marmosets. There was one group of

marmosets at FES with 9 individuals (Density = 0.32 ind/ha), and 8 GLTs (Density = 0.28 ind/ha). Eighty-one marmosets were properly aged and sexed. These were distributed into sex-age categories as follows: Females (N = 42)- 24 adults, 3 sub-adults, 6 juveniles and 7 infants; Males (N = 39)- 28 adults, 3 sub-adults, 6 juveniles and 2 infants. There were 20 females in reproductive phase (10 lactating, 6 pregnant and 4 pregnant and lactating). The adults females (AVG = 374.1 grams, SD = 40.2) were slightly heavier that the adult males (AVG = 364.6, SD = 35.8).
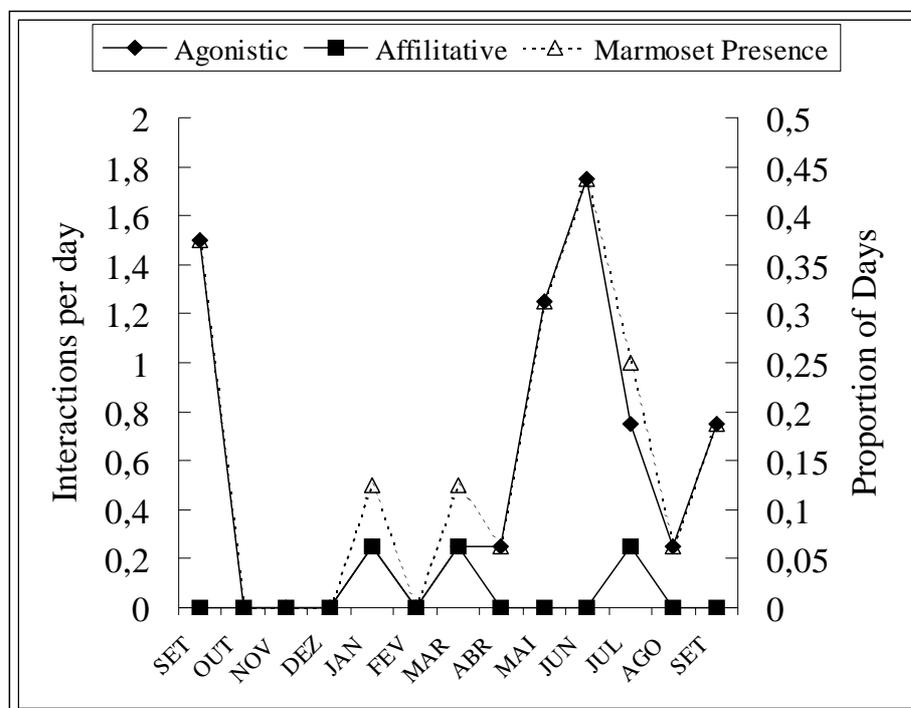
Figure 1 - Mean values of interactions between common marmosets and golden lion tamarins that occurred from September 1998 to September 1999

The monitoring data indicated that the number of days in which the marmosets were observed together with the tamarins increased from April to September (Fig. 1). The scan sample data showed that the degree of association between marmosets and lion tamarins varied among groups of GLTs and seasons (Table 3). The group Estocolmo showed the highest index of association between species, almost twice that of other groups. The indexes of association during the dry season were higher than during the wet season (Wilcoxon's Z= 2.02; df= 5; p=0.04).

Table 3 - Association index between golden lion tamarins and marmosets during the dry and wet seasons at the Rio Vermelho (FRV) and Estreito Farms (FES).

Groups (Location)	Summer	Winter
Rio Vermelho (FRV)	0.32	0.40
Appenheul (FRV)	0.25	0.64
Estocolmo (FRV)	0.68	0.81
Triplets (FRV)	0.17	0.63
Olympia (FES)	0.32	0.58
Average	0.35	0.61

The monitoring data showed that the occurrence of agonistic behaviors increased from April to September, whereas the rate of affiliative behaviors was higher from October to March. The scan sampling data showed that the presence of marmosets affected the behavior of lion tamarins

differently according to season (Table 4), and the groups were also affected differently. During the wet season, the presence of marmosets was associated to a reduction in the foraging of supplemented bananas (F=4.66; df=1,11; p=0.05), increase in social behavior (F=4.80; df=1,11; p=0.05), and a reduction in the vigilance of adult GLTs (F=13.08; df=1,7; p=0.01). In the dry season, the presence of marmosets was associated to an increase in the time spent foraging fruits (F=15.7; df=1,11; p=0.002) and the occurrence of territorial behavior (F=8.06; df=1,11; p=0.01).

DISCUSSION

The results indicated that introduced *Callithrix* were a concern for the conservation of golden lion tamarins because (1) the population in the studied areas was equal or larger than that of *Leontopithecus*, (2) measures of body condition and demography suggest a healthy population of marmosets, (3) marmosets associate significantly with the tamarins, especially in the food supplementation platforms and (4) this association lead to changes in the behavior of the tamarins.

Table 4 - Mean (X); Standard Deviation (sd) and acceptance level (p) for behaviors of golden lion tamarins at Fazenda Rio Vermelho in the absebce and presence of common marmosets during both summer and winter. Data obtained from scan sampling. ns= not signiticant/ p> 0.05; ANOVA repeated measures.; n=12.

| | Summer | | | | | Winter | | | | |
| Behavior | Absent | | Present | | | Absent | | Present | | |
	X	sd	X	sd	p	X	sd	X	sd	p
Forage Prey	.14	.06	.17	.04	ns	.17	.05	.17	.04	ns
Success	.12	.10	.11	.18	ns	.08	.13	.08	.07	ns
Forage Bananas	.007	.006	.002	.006	.05	.02	.02	.02	.01	ns
Forrage Fruits	.02	.01	.03	.03	ns	.03	.02	.07	.02	.02
viglance	.09	.05	.06	.05	ns	.06	.05	.07	.06	ns
Adult vigilance	.12	.05	.06	.05	.008	.08	.04	.07	.05	ns
Territorial	.03	.04	.02	.03	ns	.02	.03	.06	.06	.01
Resting	.14	.09	.13	.08	ns	.07	.08	.04	.03	ns
Social	.05	.03	.10	.07	.05	.08	.04	.10	.05	ns

The *Callithrix* observed at FRV were mostly *C. jacchus* and at FES were *C. penicillata*. However, at both places we observed animals that appeared to be hybrids of these two species. These are species native to northeast (Mata Atlântica) and central (Cerrado) Brazil that invaded the Rio de Janeiro state as a result of introductions by humans. In both locations studied, there were more marmosets than golden lion tamarins.

The body weight of both male and female marmosets at FRV was higher than weights reported weights for *C. jacchus* in captivity and wild within their native home range (Araújo et al., 2000). There were pregnant and lactating females observed in all of the study months, and some of the females had two births per year. Lion tamarins in this location had one birth per year and a seasonal birth period (Verona, 2001). The demographic structure showed a preponderance of reproductively active adults, albeit few young. Strong conclusions were barred because of limitations in sampling and determining age,

however, there was evidence of a growing population because the lack of sub-adults appeared to be the result of early sexual maturation, hence the large number of "adults". The lack of neonates could be a sampling problem because adults that carried neonates were "trap shy".

The degree of association between *L. rosalia* and *C. jacchus* differed between seasons. Seasonal differences (winter > summer) could be the result of higher food abundance during summer (Boinski and Fowler, 1988), when there was a lesser need to extensive search for food and there was less competition for food. The increase in association during winter could be related to scarcity of resources, which caused an increase in the temporal and spatial aspects of searching for food. This could lead to higher overlap in territories between the species. Also, during winter, the supplementation of tamarins with bananas created a clumped food source with lead to higher degree of association and direct competition.

Even though these indexes of association were high, the species did not form mixed groups, similarly to those that occured in Saguinus, such as *Saguinus fuscicollis avilapiresi and Saguinus mystax pileatus* in Brazilian Amazônia (Peres, 1992, 1993), *Saguinus fuscicollis* and *Saguinus mystax* na Preuvian Amazônia (Garber, 1988; Heymann, 1990), *Saguinus fuscicollis weddelli* and *Callithrix emiliae* in Brazilian Amazônia (Lopes and Ferrari, 1994), in which clear benefits in prey capture (Peres, 1992; Lopes and Ferrari, 1994); predator detection and defense (Peres, 1993); exploitation and defense of larger territories (Garber, 1988; Heymann, 1990). The association between *L. rosalia* and *C. jacchus* observed in this study appeared to be more similar to the situation in Una, Bahia, where the golden headed lion tamarin, *Leontopithecus chrysomelas* is sympatric with *Callithrix kuhlii*, but associates infrequently and without forming mixed groups (Rylands, 1989).

The association between the golden lion tamarins and the common marmosets showed mostly evidences of competition, with some benefits related to predator detection. Competition was more evident during winter, when resources are scarce. The presence of marmosets during winter led to the tamarins increasing both their foraging of natural fruits and bananas, and their territorial behavior toward the marmosets. The tamarins showed more encounter behavior, with emissions of long calls and increases in agonistic chases and fights. During winter, the marmosets would approach the platforms with supplemental bananas more often, attempted to eat bananas ("steal") while the tamarins chased them away. Agonistic behaviors were initiated by the lion tamarins; suggesting that the presence of the marmosets was not tolerated (Affonso et al., 2004). We interpreted all these observations as evidence of scramble competition. The presence of a competitor with similar diet during times of food scarcity could lead to higher exploitation and defense of resources (Connell, 1983). The tamarins may be following a strategy of "eat before the other eats" or resource depletion, increasing competition and defense. A similar strategy has been suggesting for wild golden lion tamarins at the Poço das Antas reserve to explain why tamarins spent most of their time foraging and patrolling in the periphery of their territories (Peres, 1989).

During wet summer months, the tamarins appeared to tolerate the marmosets and there were indications of benefits from the association. The presence of marmosets was associated to reduction in feeding of bananas, an increase in social behavior by the tamarins and a reduction in the time spent vigilant by adult tamarins (but not the immature). Two benefits from sociality are a reduction in individual vigilance as group size increases and the exploitation of novel food sources (Pulliam, 1973). Predator defense benefits of inter-specific associations have been reported for *Saguinus*. We observed that when feeding from bananas in the platforms, any alarm calls given by either of the species, resulted in animals from both species locomoting towards nearby branches and initiating search and mobbing behaviors. Perhaps, the abundance of resources together with less time looking for predators, allowed for increases in social behaviors among the tamarins. However, predator related benefits could not be shared equally between the species. Even though vigilance was reduced and both species emitted alarm calls, the marmosets may receive higher benefits because its more cryptic coloration would render it less detectable by an approaching bird or mammalian predator. At this site, predation events observed include attacks by birds of prey and snakes (Stafford et al., 1995).

One possible benefit of the association for the tamarins would be the exploitation of novel food sources. There was the possibility that captive-born reintroduced tamarins would feed on the gums trees harvested by the marmosets. This potentially newly available food source could enrich tamarins diet with calcium and polysaccharides, both important resources for reproductive females and young. Tamarins naturally take gums opportunistically from tree nodes and wounds (Coimbra-Filho and Mittermeier, 1976). The tree holes made by marmosets occupy the entire tree trunk and are more common during winter. However, tamarins were observed to feed on marmoset gum trees infrequently. It is unknown if the use of gums by tamarins would be detrimental to the marmosets, as was the case for *Callithrix emiliae* in Amazônia (Lopes and Ferrari, 1994). On occasion, when groups of *Saguinus fuscicollis weddelli* and *Callithrix emiliae* were traveling together, *Saguinus fuscicollis weddelli* would reach gun trees first and deplete them before *C. emiliae* would arrive. Before asserting that marmosets brought some benefits to the endangered species, it

would be necessary to obtain more information on the use of gums by tamarins, whether it was consumed only opportunistically and whether it was digested. Marmosets have dietary adaptations for processing these gums (Power, 1991; Power and Oftedal, 1996), and the tamarins might not be able to take advantage of gums in the form harvested by marmosets.

Notwithstanding these trends, there was evidence that the interactions between the species were different for the tamarins groups. The degree of association between species differed among groups of tamarins. These differences could be related to demographic characteristics of the tamarins groups (group size; age structure) or to the number of marmosets in the vicinity, or to habitat characteristics (more resources). The tamarins group that showed the highest index of association both in winter (81%) and summer (68%) was the largest group at FRV with 13 animals (including 6 sub-adults and 4 immature) and with the presence of at least two marmoset groups. In this tamarin group we observed play bouts with the marmosets that went uninterrupted for over two hours (Oliveira et al., 2003). Moreover, there is an abandoned orchard (with jaca -*Artocarpus* spp., jambo-*Syzygium malaccense*, cashew trees-*Anacardium occidentale*) that attracts both species. Another possibility is that the higher degree of association in larger social groups of tamarins is the result of larger territories, and therefore a higher probability of encountering marmosets. This is unlikely because group size is not a determinant of territory size in golden lion tamarins (Procópio de Olivera, 2003). The second highest association index was at the FES, a fragment with less than 30 ha. Here food is scarce during some times of the year and the supplementation with bananas results in "clumped" resources. Also, in this group, as with the group Appenheul at FRV, the sleeping hole of the marmosets in only meters away from that of the tamarins and from the supplemental feeding platform. Future research could consider the relationship between territory size, resource distribution and interactions with marmosets.

The use of two methods of data collection provided useful information for future monitoring of these interactions. Because the results of the two methods were qualitatively similar, we suggest that one-hour periods of observation repeated at least 5 days per month would provide enough data to assess relative changes or levels of interactions between these species. These kinds of relative data could be used by teams monitoring species interactions after management actions such as re-forestation, recuperation of degraded fragments, building of corridors, changes in levels of supplementation or changes in the populations of either species. These data should be collected from groups that reflect the variation in social systems or ecological conditions of the region and species under study.

From these combined data, we concluded that marmosets were an important factor for the conservation of lion tamarins. Both at FRV, the largest fragment with reintroduced lion tamarins, and at FES, the marmosets were surviving and reproducing well and had the potential of being a serious competitor for resources for the tamarins. There is a considerable association between the species and this association lead to changes in the behavior of the tamarins that suggest direct competition for resources during the winter months. The possible benefits to the tamarins of access to gum resources appeared to be insignificant. Moreover, the apparently high reproductive potential of the marmosets, together with the indiscriminate releases related to the wildlife trade, could make the introduced species likely to colonize other fragments where tamarins could be reintroduced or translocated. Survey studies revealed that common marmosets were widespread and perhaps dispersing throughout the state of Rio de Janeiro (Cerqueira et al., 1998; Ruiz-Miranda et al., 2000). Before any control measures can be exerted over the marmosets, more research would be needed on niche overlap, marmoset population trends and dispersal capabilities in the fragmented landscape of the region.

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RESUMO

Callithrix jacchus e spp (micos estrela) tem sido introduzido no estado do Rio de Janeiro em áreas designadas para a reintrodução do *Leontopithecus rosalia* (mico leão dourado). Os objetivos deste estudo foram estimar a população de sagüis em dois fragmentos particulares, e caracterizar a interação entre as espécies. A densidade de sagüis (0.09 a/ha) foi maior que a de mico-leão (0.06 a/ha). O grau de associação entre mico-leão e o sagüi variou entre grupos e estações do ano (inverno= 61%, verão =35%). Foram observados sinais de competição durante o inverno quando a presença do mico estrela está associada a mudanças no forrageio do mico-leão e aumento de comportamentos territoriais. No verão, sinais de benefícios foram uma diminuição da vigilância por parte dos adultos de micos leões. Além disso, os micos leões foram observados se alimentando de goma proveniente dos buracos feitos pelos micos estrela. Estes resultados sugerem que o mico estrela é uma ameaça para a conservação do mico-leão, no entanto.

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