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Extragroup Copulations Among Brown Howler Monkeys in Southern Brazil

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Introduction

Like most other howler monkeys, brown howlers (*Alouatta guariba*) form one-male groups with up to 10 individuals. Even if there is more than one adult male, the alpha male howler monkey usually monopolizes all reproductive females and sires all young (Pope, 1990). However, extragroup copulations (EGCs) have been observed in *Alouatta pigra* (Horwich, 1983) and *A. seniculus* (Agoramoorthy and Hsu, 2000). Here we report the first EGCs observed in *A. guariba clamitans.*

Methods

We studied brown howler troops in hillside forest in Porto Alegre (30°12'S, 51°04'W), Brazil, during the summer (Nov 1998 – Jan 1999, 483 obs. hours) and winter (Jun – Aug 1999, 386 obs. hours; Fialho and Setz, 2000). Study group GA was comprised of three adult males, three adult females, and four immatures. An adult male had emigrated from this group in October 1999 (MMA Jardim, pers. comm.). A neighboring group (GB) had five individuals. The GB alpha male was larger and had a more intense reddish coloration than any GA adult male.

Results

Daily inter-group encounters between the study groups were accompanied by extended vocalizations, but they were usually peaceful. However, an aggressive encounter between GA and GB occurred on June 12. During this encounter, the GA group chased and bit individuals from GB, and one GB individual fled to the ground. Only the GB alpha male was not attacked. Shortly after this aggressive encounter, the GB alpha male copulated with a GA female, just a few meters away from other GA group members. The observing males of GA group did not react. On June 13, the same two individuals performed two more EGCs. In the morning, the male inspected the female's genitalia twice and copulated with her; an hour and a half later, the large GB male was feeding in a *Ficus* tree where GA group was resting. The GB male approached their group more closely, and GA group members became agitated. The GB alpha male vocalized within a few meters of the group, and the female left her group and followed him for about 50 meters. The female produced nasal sounds ("Hummm, hummm"), while flick-

ing her tongue rhythmically in and out of her mouth. The male approached and mounted her.

On the days that the EGCs were observed (June 12 and 13) no within-group copulations were observed for the GA group. We did not follow the group on June 14 and 15. Early on June 16, the GB alpha male visited GA's home range again; he approached, vocalized and left, followed by the same female as above. Simultaneously, another female disappeared from GA, but minutes later the two females reappeared in the group. Later on the same day we saw three copulations involving a resident GA male and the female that had copulated with the GB male. This was the first within-group sexual activity we had observed in GA. A group GA female carrying an infant observed the copulations but did not react. In summary, all EGC copulations occurred in the mornings, and each one lasted a minute or less. About five minutes after each EGC, the GB male chased the female for several meters. All EGCs involved the same pair and occurred at the periphery of GA's area, where home ranges overlapped. The GB male did not follow the GA group when it moved away from the edge of its range after these encounters.

Discussion

Extragroup copulations have been described both in Old (Smuts, 1987) and New World monkeys (Digby, 1999), and in monogamous (Mason, 1966; Palombit, 1994; Reichard, 1995) as well as polygynous species, including *Alouatta* spp. (Horwich, 1983; Agoramoorthy and Hsu, 2000). The behavioral repertoire of *A. pigra* during EGCs (Horwich, 1983) is more diverse than in *A. guariba.* However, the male vocalization in our study has not been described for either *A. pigra* or *A. seniculus*. In general, EGCs are similar across *Alouatta* species. For example, after male solicitation, the female moves towards the male (Horwich, 1983), and rhythmic tongue flicks precede copulations (Horwich, 1983; Mendes, 1989; Agoramoorthy and Hsu, 2000). Genital inspection was observed in both *A. seniculus* (Agoramoorthy and Hsu, 2000) and in *A. guariba* (this study). Extra-group copulations last about one minute across *Alouatta* species (Horwich, 1983; Agoramoorthy and Hsu, 2000; this study). After copulation the male chases the female (Horwich, 1983) and no agonistic behaviors are directed at the female by her group mates (Horwich, 1983; Agoramoorthy and Hsu, 2000). In 44% of observed EGCs in *A. seniculus*, one or more resident males had visual contact with the mating pair but did not react (Agoramoorthy and Hsu, 2000); group members also appeared indifferent to EGCs in this study.

EGCs may be rare in *Alouatta* compared to other primates. In the common marmoset, *Callithrix jacchus*, for example, EGCs occur frequently during group encounters, and males act aggressively and chase females after copulations (Digby, 1999). Among primates, females are responsible for most copulation solicitations (Smuts, 1987). In all *A. seniculus* EGCs, it was the female who took the lead (Agoramoorthy and Hsu, 2000). In *A. guariba* females also initiated EGCs. The few data available suggest that females are more prone to EGCs in multi-male groups (Horwich, 1983; Agoramoorthy and Hsu, 2000; Kowalewski *et al.,* 2006).

Observations of EGCs in *Alouatta* are consistent with two hypotheses proposed by Smuts (1987) to explain female mate choice: (a) the search for genetically superior males and (b) the preference for non-familiar males (see also Agoramoorthy and Rudran, 1993). The first hypothesis is supported by observations on *A. guariba* (this study) and *A. seniculus* (Agoramoorthy and Hsu, 2000) in which males involved in EGCs were noticeably larger than those belonging to the female's group. Agoramoorthy and Hsu (2000) suggested that by copulating with neighboring males a female could reduce the likelihood of infanticide if her group was taken over by a new male. Six out of seven *A. seniculus* females involved in EGCs had previously lost infants through infanticide (Agoramoorthy and Hsu, 2000). EGCs could also be a prelude to female dispersal to the neighboring group. However, in our group, this had not occurred by January 2000, when both GA females gave birth in GA (MMA Jardim, pers. comm.). The small number of EGCs observed in howler monkeys does not yet allow us to falsify any of these competing hypotheses.

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Golden Lion Tamarins, *Leontopithecus Rosalia* (Linnaeus, 1766) in the Taquara Municipal Natural Park (Duque De Caxias, RJ): A Southern Extension of the Known Range

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Introduction

The golden lion tamarin, *Leontopithecus rosalia* (Linnaeus, 1766), is an endangered species (IUCN, 2004) according to the World Conservation Union, Species Survival Commission. The first geographical study of this species, by Wied-Neuwied (1826), described *L. rosalia* as distributed along the coast of the state of Rio de Janeiro between 22˚and 23˚S, from the São Tomé Cape to the municipality of Mangaratiba. In 1969, Coimbra-Filho hypothesized that the historical distribution of this lion tamarin species extended across the length of the coast of the state of Rio de Janeiro in lowland forests and at low altitudes usually not exceeding 300 m a.s.l. (Coimbra-Filho, 1969; Kleiman and Rylands, 2002). According to Coimbra-Filho, the historical distribution of *L. rosalia* comprised several municipalities of the Fluminense lowlands, including Duque de Caxias. Based on population counts performed between 1962 and 1969, Coimbra-Filho reported that *L. rosalia* was extinct in 17 municipalities, including Duque de Caxias (Coimbra-Filho, 1969; Kleiman and Rylands, 2002).

In the 1990s, censuses across the range of *L. rosalia* by Kierulff (1993) and later, Kierulff and Procópio de Oliveira (1996) found *L. rosalia* in only four of the municipalities described by Coimbra-Filho: Silva Jardim, Casimiro de Abreu, Cabo Frio, and Saquarema. More recently, *L. rosalia* was found in Araruama in some mountainous areas of Macaé de Cima (Rylands *et al.*, 1993), but this recent expansion of their range clearly resulted from human interference and is not indicative of past distribution. In the most recent census of *L. rosalia* distribution (Kierulff and Rylands, 2003), the authors reported a population of 562 individuals distributed in groups of three to six and restricted to the aforementioned four municipalities. They also reported reintroduced populations throughout the length of the BR-101 road between the municipalities of Rio Bonito and Casimiro de Abreu in Rio de Janeiro state. Here, we report the occurrence of golden lion tamarins in the Taquara Municipal Natural Park, a conservation unit of the municipality of Duque de Caxias (RJ), where the species was considered extinct during the most recent census (Kierulff and Rylands, 2003).

Materials and Methods

In August 2006, golden lion tamarins were observed in the Taquara Municipal Natural Park (22º35' S, 43º14' W, approximately 76 m a.s.l.), municipality of Duque de Caixas, Rio de Janeiro. The 190 km^2 park was created according to Law 1157 (November 11, 1992), and its northern limit is the Taquara River, near the Núcleo Colonial of Duque de Caxias District Three (Fig. 1). The lion tamarins were observed by the authors during visits to the park guided by biologists.

Results and Discussion

Based on reports of the presence of golden lion tamarins near the conservation unit, we interviewed local inhabitants and showed them pictures to identify the species they had observed. When golden lion tamarins were confirmed as the species sighted, we began periodic morning surveys by walking existing trails close to the areas where the animals had been spotted. In the first encounter with lion tamarins, we observed a non-habituated group of approximately 12 animals that fled towards the Environmental Protection Area of Petrópolis (APA Petrópolis), a conservation unit contiguous with the Taquara Municipal Natural Park. Subsequent sightings of the same group were recorded at an altitude of approximately 76 m a.s.l. Occasionally, the group was observed foraging in sympatry with groups of *Callithrix jacchus*, *Callithrix penicillata* and, possibly, hybrids of these two introduced marmoset species.

Increased control of access into Taquara Municipal Natural Park will allow *L. rosalia* to safely utilize the forest