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Fur Rubbing Behavior in Free-Ranging Black-Handed Spider Monkeys (*Ateles geoffroyi*) in Panama

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Members of the population of black-handed spider monkeys (*Ateles geoffroyi*) on Barro Colorado Island, Panama, use the leaves of three Rutaceae species in a behavior that resembles fur rubbing in the white faced capuchin (*Cebus capucinus*). This behavior has not been reported from other sites where *Ateles* has been studied. During more than 1,200 hours of observation, 30 episodes of this behavior were recorded ad libitum. Adult males engage in this behavior more than adult females. Season did not impact the frequency of the behavior. The behavior described here differs in many respects from that reported for *Cebus capucinus*, and does not fit the hypotheses that the behavior functions in repelling insects or other antiseptic purposes. It is proposed that fur rubbing in this group of spider monkeys is a modification of a behavior previously recorded in *Ateles* and may function in scent marking. Am. J. Primatol. 51:205–208, 2000.

Key words: *Ateles geoffroyi*; spider monkeys; fur rubbing; Rutaceae; scent marking; Barro Colorado Island

INTRODUCTION

There is an increasing body of evidence that non-human primates use plants for pharmacological purposes [Huffman, 1997]. The rubbing of foreign substances on the fur, or "fur rubbing," is particularly well documented in the white-faced capuchin (*Cebus capucinus*) [Baker, 1996]. Plant species used by *C. capucinus* often have insecticidal and antiseptic properties, suggesting that the monkeys may select plants because of their pharmacological values [Baker, 1996]. Fur rubbing by *C. capucinus* has been compared to "anting" behavior in birds and other mammals [Longino, 1984; Baker, 1996], but reports of similar behaviors in other non-human primates are scarce.

Fur rubbing in the genus *Ateles* has been documented only in *Ateles geoffroyi* on Barro Colorado Island (BCI), Panama [Richard, 1970; Dare, 1974]. I provide here a detailed description of this behavior in the BCI group of spider monkeys and propose an alternative to the hypotheses that attempt to explain the behavior in *Cebus capucinus*.

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METHODS

Episodes of fur rubbing were recorded ad libitum [Altmann, 1974] during a 15 month study period from October 1997 to December 1998. BCI is a 1,500 ha. island in the Gatun Lake of the Panama Canal, administered by the Smithsonian Tropical Research Institute. The forest on BCI is classified as tropical moist forest with an average of 2,600 mm of rainfall each year, falling mostly during the months of May through December [Dietrich et al., 1996]. The group of spider monkeys on BCI consisted of 20 monkeys during this study and had a home range of approximately 950 ha. (Campbell, unpublished data). The group was made up of 4 adult males, 7 adult females, 3 sub-adult females, and 6 juveniles/infants. The frequency of fur rubbing by adult males and females was compared using the Mann-Whitney U-test, with level of significance determined from Sokal and Rohlf [1981]. Differences in frequencies of fur rubbing by season were determined using Chi square analyses. Expected frequencies for the comparison of the dry (N = 4 mo) and wet (N = 8 mo) seasons were calculated under the null hypothesis that fur rubbing frequencies are a direct result of the different lengths of each season.

RESULTS

During more than 1,200 hours of contact, 30 episodes of fur rubbing were recorded involving 12 members of the BCI group. The monkeys rubbed the leaves of three Rutaceae species (*Citrus aurantifolia*, N = 11; *Zanthoxylum procerum*, N = 14; *Z. belizense*, N = 5). *Citrus* is exotic to Panama and its distribution on BCI is extremely limited [Croat, 1978]. Only adult males were observed to rub this species. The two *Zanthoxylum* species are native to the area, and more common on the island. *Z. belizense* is found in patches in the old forest, and *Z. procerum* is frequent in both the young and old forest [Croat, 1978]. The monkeys masticated leaves of these species, which induced excessive salivation. The saliva and/or chewed leaves were rubbed on the fur of the sternal and axillary areas. In most cases, animals were then observed to rub the sternum against a tree trunk or branch.

All four adult males were seen to fur rub with a mean frequency of 3.75 bouts per individual (s.d. = 2.36, range = 2 to 7). In contrast, only three adult females fur rubbed, resulting in a mean frequency of 0.71 bouts per animal (s.d. = 1.11, range = 0 to 3). The frequency of fur rubbing by these two groups differed significantly ($U_{s\ (7,4)} = 26$, $P < 0.05$). All three subadult females were seen to rub twice; one juvenile male rubbed three times, and one juvenile female rubbed once. Season did not impact the frequency of this behavior ($X^2_{(1)} = 0.018$, $P > 0.05$; Dry Season, N = 10; Wet Season, N = 20).

DISCUSSION

Previous reports of fur rubbing by the BCI spider monkeys have only noted the use of *Citrus* [Richard, 1970; Dare, 1974]. White-faced capuchin monkeys (*Cebus capucinus*) on BCI are also known to fur rub with leaves and fruits of *Citrus aurantifolia* (personal observation), as well as other species [Mitchell, 1989; Oppenheimer, 1996] (Melissa Panger, personal communication); however, there are no previous reports of either species using *Zanthoxylum* spp. Nearly 3/4 of the spider monkey fur rubbing episodes seen in this study involved only one animal. In *Cebus* multiple individuals usually rub at the same time, often interacting with each other during the rubbing episode [Baker, 1996]. On two occasions spider monkeys were seen to rub from the same tree in a short period of time.

However, the animals did not interact with each other on either of these occasions. Unlike *Cebus* that fur rub over the entire body [Baker, 1996], *Ateles* rubbed the leaf/saliva mix only on the sternal and axillary regions of the body. These interspecific differences in the behavior suggest that the function of fur rubbing in *Ateles* may be different from that in *Cebus*. In the latter species, pharmacological activity has been the favored explanation for this behavior [Baker, 1996]. This hypothesis does not fit the data for *Ateles* fur rubbing for three main reasons. First, it is unlikely that rubbing of foliage on such a limited area of the body would aid greatly in the prevention of insect bites, or provide antiseptic functions. Second, adult males perform this behavior more frequently than adult females. This difference is likely to be greater than reported here, as males were not the focus of the research in which these data were collected; thus it is likely that many episodes of male fur rubbing were missed. There is no reason to expect that adult males have higher loads of external parasites, or are more susceptible to insect bites than their female counterparts [Karesh et al. 1998]. Third, the lack of seasonal variation in *Ateles* fur rubbing further suggests that this behavior does not have insecticidal functions, as irritating insects such as mosquitoes and ticks show marked seasonal variation.

Similar behaviors have been seen in captive and free-ranging *Ateles*. Klein and Klein [1971] and Klein [1972] report "chest-to-mouth scratching" and "chest rubbing" in captive and wild spider monkeys. The monkeys rub their hand vertically between the mouth and sternal areas in a repeated fashion and then rub their chest region against a substrate in the environment [Klein & Klein, 1971; Klein, 1972]. Saliva was an important component in these behaviors and certain vegetables (e.g., celery and green onion) appeared to elicit these behaviors in captivity [Klein & Klein, 1971]. However, the use of plant materials in the field was never observed [Klein, 1972].

Spider monkeys have apocrine glands in the sternal region [Hill, 1962; Montagna & Ellis, 1963; Perkins & Machida, 1967] which are used in olfactory communication between members of a social group [Klein, 1972]. Klein [1972] notes that the behavior of rubbing saliva onto this area and then onto a tree may function as some type of olfactory communication to other spider monkeys. Two factors lend support to this possibility: the fact that adult males seem to perform the behavior more frequently, and the strong "lemon like" aroma of two of the species rubbed (*Citrus aurantifolia* and *Zanthoxylum procerum*). In conclusion, I hypothesize that fur rubbing in *Ateles* is a form of scent marking and is not related to similar behaviors in *Cebus capucinus*.

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