SHORT COMMUNICATION

Adult Male-infant Interactions in Wild Muriquis (*Brachyteles arachnoides hypoxanthus*)

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ABSTRACT. We examined adult male-infant interactions in wild muriquis (*Brachyteles arachnoides hypoxanthus*), a species in which close relatedness among philopatric males and high paternity uncertainty should minimize both aggressive and affiliative behavior by males toward infants. As expected, male-infant interactions were extremely rare during this 10-month field study. None were observed in over 236 hr of observation on a cohort of six infants (0 – 13 months old). The 29 interactions observed ad lib involved 5 of the 6 infants and 9 of the 16 adult males in the group. All of the male-infant interactions were affiliative, but extremely brief. The median duration of interactions was only 0.33 min, and none lasted longer than 1.52 min. Infants always initiated, and nearly always terminated, their interactions with adult males. The indifference that appears to characterize muriqui male-infant interactions differs from the ways in which other male primates interact with infants when protection of genetic interests or investment in mating effort are involved.

Key Words: Muriquis; *Brachyteles arachnoides hypoxanthus*; Male-infant interactions; Male philopatry; Paternity uncertainty.

INTRODUCTION

Variation in the frequency and nature of adult male-infant interactions in primates has been associated with male strategies that reflect investment in offspring and other closely-related kin, mating effort, or the use of infants in buffering aggression and developing coalition partnerships amongst themselves (e.g. ALTMANN, 1980; STEIN, 1984; SMUTS, 1985; WHITTEN, 1987; PAUL et al., 1996). Whether males benefit or jeopardize infant well-being has also been attributed to the degree to which social and mating systems increase or confuse male paternity certainty, and the extent to which interacting with infants affects male relationships with one another or with females that subsequently chose them as mates (VAN SCHAIK, 2000).

We investigated male-infant interactions in wild muriquis (*Brachyteles arachnoides hypoxanthus*), a species in which male philopatry leads to close male relatedness and the inability of males to monopolize access to mates leads to high paternity uncertainty (STRIER, 1997). Both conditions should reduce the threat of male aggression, and thus minimize the importance of male-infant interactions in protecting genetic interests or enhancing mating effort (WHITTEN, 1987; STRIER, 1996; VAN SCHAIK, 2000).

METHODS

This study was conducted from September 1999 to June 2000 at the Estação Biológica de Caratinga in Minas Gerais, Brazil, where one muriqui group has been the target of long-term investigations (STRIER, 1999). From 62 – 65 individuals, including 16 adult males, 19 adult females, and 28 – 30 immatures were present in the group during the present study. All individuals in the group can be recognized by their natural markings, and are fully habituated to human observers. The ages and maternal geneaologies of all group members have been documented since 1982.

Observations focused on the six infants (one male and five females) that were born between July – November 1999, and were therefore 0 – 13 months old during the present study (Table 1). Although weaning occurs during their second year of life, muriqui infants begin to leave their mothers' bodies to explore their surroundings and interact with other group members within a few months after birth (ODALIA RÍMOLI, 1998). Mortality prior to weaning shortens subsequent interbirth intervals in this population (STRIER et al., 2001), so the infant's first year of life is a critical period for evaluating their interactions with males.

Systematic focal samples of 8 – 10 min in duration were conducted on each of the six infants. The sequence of focal subjects was designed to avoid repeated sampling of the same infants close in time and to balance the distribution of observation time per infant across time of day and months as much as possible. We also recorded the duration and nature of male-infant interactions and the individuals responsible for initiating and terminating the interactions on an ad lib basis. As in previous analyses of infrequent agonistic interactions in this group (PRINTES & STRIER, 1999), we used the focal samples conducted on each infant to estimate individual variation in the frequency of their interactions with adult males.

RESULTS

No interactions between adult males and infants were observed during a total of 1,438 focal samples representing nearly 237 hr of focal observation (Table 1). However, 33 approaches by 5 of the 6 infants toward 10 of the 16 adult males were observed ad lib. In three cases, adult males (*BLK*, *CL*, and *IV*) moved away from their resting sites when the male infant (*Pb*) approached. In a fourth case, one of the same adult males, *CL*, moved away on one of the two occasions a female infant (*Bre*) approached him. In total, 29 male-infant interactions were observed (Table 2).

Table 1. Distribution of focal samples and male-infant interactions observed ad lib.

Infant	Sex	Age (month)	Focal samples	Focal hours	Approaches	Interactions	Total duration of interactions (min)	Median duration of interactions (min)
Bre	F	4-13	227	37.07	10	9	5.87	0.53
Jo	F	0-8	248	41.05	2	2	1.07	0.54
Nt	F	2-11	283	46.55	5	5	1.57	0.18
Rf	F	2-11	215	35.52	0	0	0.00	(0.00)
Pb	M	1-10	171	28.23	7	4	1.72	0.29
Val	F	2-11	294	48.45	9	9	3.30	0.18
Total			1438	236.87	33	29	13.52	

F: Female; M: male.

Male-infant interactions occurred during each of the ten months of our study, but were more common (21/29) during the second half (February – June), when the infants were older (Fig. 1). Interactions resulted in gentle, often playful, physical contact, but they were uniformly brief. The longest interaction lasted 1.52 min, and only four interactions lasted more than 1 min. Individual infants spent from 0 – 5.87 min interacting with adult males. The median durations ranged from 0.28 – 0.54 min for the five infants that interacted with adult males (Table 1). Calibrating the frequency of interactions by focal sample times for each infant yields estimated rates of 0 – 0.24 interactions per hour (median = 0.12).

Infants terminated all but 3 of the 29 interactions with adult males. Two of the three adult males that terminated an interaction did so only after the interaction had exceeded 1 min in duration. Infants were significantly more likely to terminate interactions sooner (less than 1 min) than adult males (Fisher exact test, $p < 0.03$, two-tailed).

Infants interacted with up to five different males (Table 2). One infant (*Nt*) interacted with two of her maternal brothers (*NE* and *NI*); another infant (*Bre*) interacted with her maternal uncle (*BE*). Only two of the infants (*Bre* and *Nt*) interacted with any of the males that had copulated with their mothers when they were conceived.

DISCUSSION

The infrequency of muriqui male-infant interactions is consistent with the indifference that philopatric males with high paternity uncertainty are expected to display toward infants, and differs from the ways in which other male primates interact with infants when genetic interests or mating effort are involved. Our findings extend previous observations on this muriqui group (e.g. STRIER, 1993; ODALIA RÍMOLI, 1998), and provide preliminary insights into possible pat-

Table 2. Distribution of infant interactions/approaches with adult males.

Males[a]	*Bre*	*Jo*	*Nt*	*Pb*	*Rf*	*Val*	*N* infants
AG	0	0	0	0	0	0	0
AM	**0**	0	**0**	1/1[c]	0	0	1/1
BE	**2/2**[b]	1/1	**0**	0	0	4/4	3/3
BLK	**0**	0	0	0/1	**0**	0	0/1
CL	**1/2**[c]	**0**	**0**	1/2	0	0	2/2
CO	**0**	**0**	0	0	0	0	0
CY	**0**	0	0	**0**	0	0	0
DA	**3/3**	**0**	**1/1**	1/1[c]	**0**	2/2	4/4
DI	**0**	0	1/1	0	**0**	1/1	2/2
IV	**0**	**0**	1/1	1/2	0	1/1	3/3
JR	0	0[d]	0	0	0	0	0
NE	**0**	**0**	1/1[d]	**0**	0	**0**	1/1
NI	**2/2**	1/1	1/1[d]	0	**0**	1/1	4/4
NO	0	0	0[d]	0	0	0	0
RB	**1/1**	0	0	0	0[d]	0	1/1
TL	0	0	0	0	0	0	0
N males	5/5	2/2	5/5	4/5	0	5/5	

Cell values represent the number of interactions per approaches for each dyad. Zeros indicate that no approaches by infants, and therefore no interactions with those males, were observed. Values in bold represent males that copulated with the infants' mothers when the infants were conceived. a) Capital letters represent all adult males that were sexually active during the study period. One of these males (*NO*) first copulated in May 2000; *JR* and *TL* first copulated in January 2000. b) Male is the infant's maternal uncle. c) Male terminated the interaction. d) Male is the infant's maternal brother.

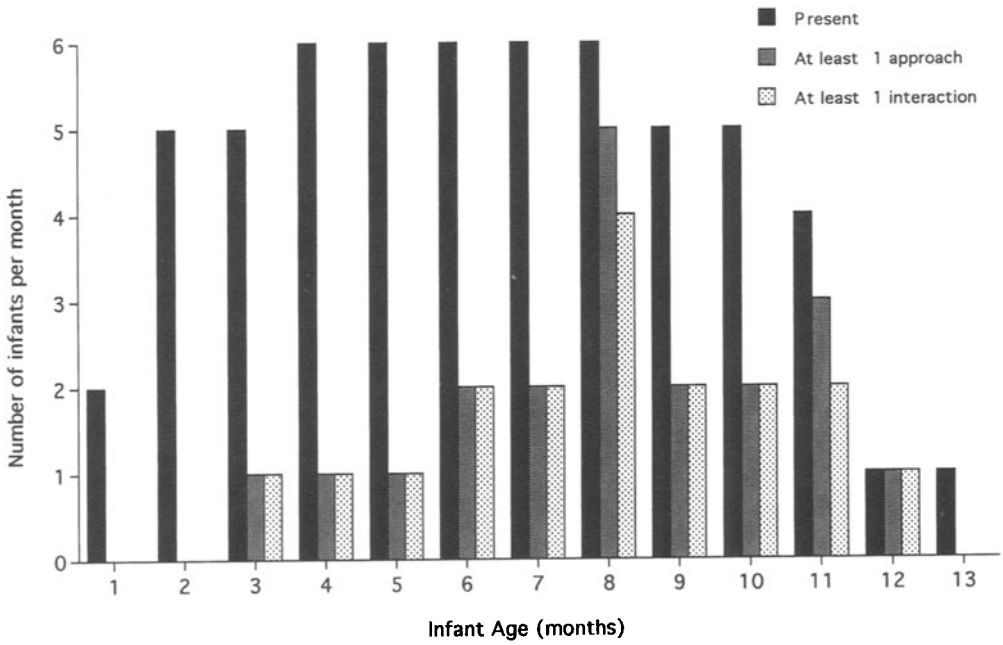

Fig. 1. Distribution of infant approaches and interactions with adult males by infant ages. The number of infants at each age are shown per month. Thus, neither of the two infants that were 1-month old during the study approached or interacted with adult males. By contrast, of the six infants that were 8 months of age during the study, five approached and four interacted with adult males at this age.

terns of individual variation that merit further investigation. For example, the one male infant (*Pb*) in our study approached adult males that females ignored, had a lower rate of interacting relative to his approach frequency (0.57) than females that approached adult males (0.9 – 1.0), and had a greater proportion of his interactions terminated by adult males. Rates of interaction were also highly variable among females, and one female infant (*Rf*) did not interact with males at all. Independent of sex, infants differed in whether they interacted with maternally-related males or with any of the males that were identified as possible fathers (Table 2).

Despite the limitations of our data for interpreting individual variation, documenting the infrequency and brief duration of muriqui male-infant interactions is important for comparisons with other primates in which male philopatry and high paternity uncertainty occur (e.g. bonobos: FURUICHI & IHOBE, 1994). Comparative data from species in which males and infants rarely interact are necessary for evaluating hypotheses about the evolution of male-infant interactions across diverse social and mating systems.

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REFERENCES

ALTMANN, J. 1980. *Baboon Mothers and Infants*. Harvard Univ. Press, Cambridge, Massachusetts.

FURUICHI, T.; IHOBE, H. 1994. Variation in male relationships in bonobos and chimpanzees. *Behaviour*, 130: 211 – 228.

ODALIA RÍMOLI, A. 1998. Desenvolvimento Comportamental do Muriqui *(Brachyteles arachnoides)* na Estação Biológica de Caratinga, Minas Gerais. Ph.D. thesis, Univ. de São Paulo, São Paulo.

PAUL, A.; KUESTER, J.; ARNEMANN, J. 1996. The sociobiology of male-infant interactions in Barbary macaques, *Macaca sylvanus*. *Anim. Behav.*, 51: 155 – 170.

PRINTES, R. C.; STRIER, K. B. 1999. Behavioral correlates of dispersal in female muriqui monkeys (*Brachyteles arachnoides*). *Int. J. Primatol.*, 20: 941 – 960.

SMUTS, B. B. 1985. *Sex and Friendship in Baboons*. Aldine, Hawthorn, New York.

STEIN, D. M. 1984. Ontogeny of infant-adult male relationships during the first year of life for yellow baboons (*Papio cynocephalus*). In: *Primate Paternalism*, TAUB, D. M. (ed.), Van Nostrand Reinhold, New York, pp. 213 – 243.

STRIER, K. B. 1993. Growing up in a patrifocal society: sex differences in the spatial relations of immature muriquis. In: *Juvenile Primates: Life History, Development, and Behavior*, PEREIRA, M. E.; FAIRBANKS, L. A. (eds.), Oxford Univ. Press, New York, pp. 138 – 147.

STRIER, K. B. 1996. Male reproductive strategies in New World primates. *Human Nature*, 7: 105 – 123.

STRIER, K. B. 1997. Mate preferences of wild muriqui monkeys (*Brachyteles arachnoides*): reproductive and social correlates. *Folia Primatol.*, 68: 120 – 133.

STRIER, K. B. 1999. *Faces in the Forest: The Endangered Muriqui Monkeys of Brazil*. Harvard Univ. Press, Cambridge, Massachusetts.

STRIER, K. B.; MENDES, S. L.; SANTOS, R. R. 2001. Timing of births in sympatric brown howler monkeys (*Alouatta fusca clamitans*) and northern muriquis (*Brachyteles arachnoides hypoxanthus*). *Amer. J. Primatol.*, 55: 87 – 100.

VAN SCHAIK, C. P. 2000. Social counterstrategies against infanticide by males in primates and other mammals. In: *Primate Males: Causes and Consequences of Variation in Group Composition*, KAPPELER, P. M. (ed.), Cambridge Univ. Press, Cambridge, pp. 34 – 52.

WHITTEN, P. L. 1987. Infants and adult males. In: *Primate Societies*, SMUTS, B. B.; CHENEY, D. L.; SEYFARTH, R. M.; WRANGHAM, R. W.; STRUHSAKER, T. T. (eds.), Univ. of Chicago Press, Chicago, pp. 343 – 357.

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