

SHORT COMMUNICATION

Adoption in Free-ranging Red Howler Monkeys, *Alouatta seniculus* of Venezuela

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ABSTRACT. This report describes three cases of infant adoption in red howler monkeys (*Alouatta seniculus*) of Venezuela. In one case, a lactating female adopted her infant granddaughter after the infant's mother disappeared and the infant survived for the next 25 months. In the second case, an adult female adopted her infant granddaughter for nine days while the infant's mother was still a group member. In the third case, a nulliparous female temporarily adopted an infant from a neighboring group. The details and the possible reasons for these adoption are described.

Key Words: Adoption; Kin-relation; Red howlers; *Alouatta seniculus*.

INTRODUCTION

Infant adoptions have been reported in several non-human primates species (reviewed in THIERRY & ANDERSON, 1986). Permanent infant transfer in unrelated individuals has been considered as selfish behavior and it may benefit the foster mother directly by providing maternal skills (LANCASTER, 1971) or indirectly by reducing the fitness of rival females (SILK, 1980). Contrary to this, adoption can also be regarded as a case of altruism which can be explained in terms of kin-selection theory (WEST-EBERHARD, 1975). Here we report three cases of infant adoption by adult female red howler monkeys. The first and second case of kin-related adoptions occurred within social groups while the third case of unrelated adoption took place between social groups discussed in this paper.

MATERIALS AND METHODS

Some 35 groups of red howler monkeys (*Alouatta seniculus*) that inhabit the savanna woodland habitat of Hato Masaguaral, Guarico State of Venezuela have been under long-term study since 1976. Demographic details of these howler groups and the habitat have been published else where (see RUDRAN, 1979; CROCKETT & RUDRAN, 1987). Most of the adults and immatures red howlers have been periodically captured and ear marked for demographic and behavioral studies (THORINGTON et al., 1979). The animals mentioned in this paper were all identifiable by their ear tags, and also the individual life history details were known.

The social interactions of six red howler groups including group No. 15 where an adoption occurred were closely monitored for 26 months from April 1989 to May 1991 at Hato Masaguaral. These study groups were followed on a monthly basis for five 12-hr periods

(i.e. a sample period). Two other groups (No. 4 and No. 31) were also observed for eight hr on a daily basis since adoptions occurred in these groups as well. All-occurrences sampling (ALTMANN, 1974) was used to collect data on the aggressive, affiliative, and sexual interactions. Also, 15-min scan sampling was used to record inter-individual distances (ALTMANN, 1974).

RESULTS

Case 1

The first case of adoption was observed within a multi-male group. A 4-month-old female infant was adopted by her grandmother after the disappearance of her mother.

On May 5, 1989 group No. 15 consisted of ten individuals, including three adult females. Adult female No. 3 carried a 4.5-month-old male infant while her daughter, adult female No. 5 had a 4-month-old female infant. The kin-relation was confirmed through long-term group history records (RUDRAN, unpubl.). The third adult female did not have an infant. On May 8, 1989 when the group was contacted at 07:00, adult female No. 5 was missing. The reason for female No. 5's disappearance was not known. But, female No. 3 was observed carrying the missing female's infant ventrally and her own infant dorsally. She had apparently adopted her granddaughter, although the details of adoption was not observed. Female No. 3 was observed nursing the adoptee and also her own infant simultaneously. The adoptee was successfully raised by the caregiver female until weaning at about for eight months. Wild born red howlers are dependent on their mother's care for nine months. But, in this case, the infant was dependent on mother plus adopter for a total period of 12 months, which is longer than usual. Female No. 3 gave birth to her next infant on October 22, 1990. The adoptee survived to be a 29-month-old juvenile at the time of writing.

Case 2

An adult female temporarily adopted her granddaughter, while the infant's mother, a young adult female was still alive in the group. Group No. 4 consisted of eight individuals, including three adult females in February 1990. On February 1, 1990 when the group was contacted at 07:00, female No. 4 did not have her infant, but she was chasing one of the resident males (No. 1). The circumstantial evidence suggested that male No. 1 might have killed the infant (AGORAMOORTHY & RUDRAN, in prep.). On February 8, 1990 at 06:30, adult female No. 6 (daughter of female No. 4) was seen with a new-born infant. At 15:58, adult female No. 4 approached and sat in body contact with female No. 6, and pressed her head against the infant. The infant then transferred itself to female No. 4 who hugged, sniffed, and groomed it. The mother did not attempt to retrieve the infant, but sat watching her infant and female No. 4. At 16:02, she groomed female No. 4 for 28 sec and at 16:41 she groomed both her infant and female No. 4 for 29 sec. During that period female No. 4 was observed nursing the adoptee and the mother of the infant was within 3 m of female No. 4. At 16:45, female No. 4 started to move with the infant and followed by female No. 6. The infant spent the night with the adopter on the first day of adoption. Female No. 4 was the infant's sole caregiver for the next nine days. During this period, female No. 4 provided the infant with milk, care, and transportation. Also, female No. 6 did not threaten female No. 4 or attempt to retrieve infant during this period. The infant transferred to its mother again on February 18, 1990 while the mother began to groom female No. 4. On the day of adoption, female No. 4 was seen copulating with one of the resident males (No. 2), which indicated that she was coming into estrus. Later she gave birth to her subsequent infant on August 28, 1990.

Case 3

An intergroup adoption was observed, where a six-week-old male infant of group No. 31 was temporarily adopted by a nulliparous female of neighboring group No. 36.

In March 1990, group No. 31 was invaded by six males (two adults, one sub-adult, one large juvenile, and two medium juveniles) from neighboring group No. 14. The group had three adult females and two of them (*No. 3* and *No. 5*) were lactating with six-week-old infants while the third was a nulliparous female. On April 21, 1990, the infant of female *No. 3* was attacked by a sub-adult male invader (AGORAMOORTHY & RUDRAN, in prep.). As a result of the attack, the left eyeball of the infant was ripped out of its socket. Later, the mother retrieved her infant and tended to it for the next five days. In the meantime, on April 25, female *No. 5*'s infant was attacked by another adult male invader (AGORAMOORTHY & RUDRAN, in prep.). On April 27 at 07:20, when the group began to move from its roosting tree, female *No. 3* abandoned her wounded infant. As the female moved, the infant was observed sitting alone 50 m away screaming intermittently. None of the individuals from the infant's group returned to retrieve it. After approximately eight hr, a young adult female (*No. 2*) from neighboring group No. 36 approached the infant, picked it up, and moved immediately back to her group. After the infant was picked up by female *No. 2*, it stopped screaming, looked more relaxed, and clung tightly to the belly of the female. On April 28, the infant was seen only with the adopter who was seen carrying, cuddling, and holding the adoptee. When observations resumed at 06:30 the following day, the infant was not seen with the adopter. It was presumed to have died of starvation during the night since the nulliparous female was unable to nurse the infant.

DISCUSSION

Behavioral definitions of adoption are scarce (STEIN, 1984), but RIEDMANN (1982) defines a foster parent (adopter) as "one who provides exclusive care for another's offspring" (p. 405). In several non-human primates species adoption has involved adult females who were either lactating or had recently lost their infants (MARSDEN & VESSEY, 1968; BREUGGEMAN, 1973; CAINE & MITCHELL, 1980; DOLHINOW, 1980; FUCCILLO et al., 1983; THIERRY & HERRENSCHMIDT, 1985). In all three cases of adoption observed in red howlers, the adopted infants were unweaned and hence provided with exclusive care for different time periods by the adopters. In mantled howlers, an unweaned infant was temporarily adopted and nursed by an adult female in the group, while the mother was located in another area after a capture and release operation (CLARKE & GLANDER, 1981).

In non-human primates, neonates receive a great deal of attention from adult females (HRDY, 1976; ALLEY, 1980). In addition, the role of infants in attracting the attention of females and initiating the process of adoption was experimentally demonstrated in captive hanuman langurs (DOLHINOW, 1980; DOLHINOW & DEMAY, 1982) and also observed in the wild mantled howler monkeys (CLARKE & GLANDER, 1981). In *case 3*, the infant's loud intermittent screaming may have attracted the attention of the nulliparous female in a neighboring group. However, since the adopter was non-lactating female the adoptee was unable to survive for more than two days. Unsuccessful adoption of infants have been reported in chacma baboon (HAMILTON et al., 1982), yellow baboon (RHINE et al., 1980), and Japanese macaque (HASEGAWA & HIRAIWA, 1980).

In *case 3*, why didn't the group members adopt the infant after the mother rejected her offspring? There was a lactating female and a nulliparous female, who was a sister of the infant but, neither of them retrieved the abandoned infant. During that time, the group underwent severe social tension due to male invasion and the infants were attacked by invading males. Male aggression may have prevented other females from adopting the infant.

The adoption of a close relative as noted in *cases 1* and *2* of the present study has also been reported in rhesus macaque (SADE, 1965) and Japanese macaque (HASEGAWA & HIRAIWA, 1980). In *case 2*, when the lactating female adopted her granddaughter, she

became sexually receptive on the first day of adoption. The physiological changes related to conception may have gradually terminated lactation, and facilitated the transfer of the infant back to its mother nine days after adoption. Furthermore, this adoption occurred soon after the female has lost her own offspring, probably as a result of infanticidal attacks. Also, the mother of the infant was young therefore inexperienced which may have motivated the grandmother to extend protection through temporary adoption. In hanuman langur, a female who lost her offspring to an infanticidal harem male gave exclusive protection to her grandson, who escaped infanticide (AGORAMOORTHY & MOHNOT, 1988). Also, in red howlers of Columbia, an adult female was reported to adopt her younger sister's infant (IZAWA, 1989). Thus evidences from *cases 1* and *2* fit the explanation of kin selection theory which suggests that an allomother can increase her inclusive fitness by investing in immature relatives (WEST-EBERHARD, 1975; WILSON, 1975). Adoption of an unrelated infant may be genetically maladaptive for the adopting mother since it requires considerable maternal energy investment at the expense of similar investments on related infants (DAWKINS, 1976). However, the cost of raising two infants (adoptee plus own offspring) seems to be high, as in case one where the adopter gave birth after an interval of 21.7 months compared to the average birth interval of 16.6 months (CROCKETT & SEKULIC, 1984; CROCKETT & RUDRAN, 1987).

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