

BRIEF REPORT

Abortion Following the Immigration of an Adult Male Baboon (*Papio cynocephalus*)

MICHAEL E. PEREIRA

Department of Biology, Allee Laboratory of Animal Behavior, University of Chicago

Three abortions and the death of a vigorous infant occurred in a baboon (*Papio cynocephalus*) group in Amboseli National Park, Kenya, within the two weeks following the immigration of an aggressive adult male. The immigrant male attained top-ranking dominance status in the group prior to these events. Circumstantial observations suggest that the reproductive losses were related to persistent intense aggression from the immigrant adult male. In the past ten years, only three other miscarriages have occurred in Amboseli. Inducement of abortion is discussed as a reproductive tactic that may be available to males of mammalian species whose life histories favor the evolution of infant-killing by males.

Key words: Baboon, abortion, immigration, infant-killing, reproductive tactic

INTRODUCTION

For several years, field and laboratory observations have revealed that adult males of many mammal species occasionally kill conspecific infants (see Hrdy [1979] for review). Because most of these species whose natural social structures are well-understood are organized into social groups containing one reproductive male or sequential cohorts of reproductive males (eg, lions [Bertram, 1975; Packer & Pusey, in press]), the hypothesis that infant-killing is a male reproductive tactic has received considerable attention. The data that follow add to the growing evidence that infant-killing by adult males also occurs in mammal species with multimale groups [see Angst & Thommen, 1977; Packer, 1980; Busse & Hamilton, 1981; Pirta & Singh, 1981; Busse, 1982]. Of particular note, these observations are the first to suggest that the presence of and interaction with an unfamiliar adult male may result in early termination of pregnancy in a primate species. Observations of infant death and abortion in association with the appearance of an unfamiliar adult male help to illuminate normative mammalian social behavior and reproductive strategies.

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Address reprint requests to Michael E. Pereira, Department of Biology, Allee Laboratory of Animal Behavior, University of Chicago, 940 East 57th Street, Chicago, IL 60637.

METHODS

The events reported in this paper occurred in Hook's Group, one of two baboon study groups in Amboseli for which long-term demographic and reproductive records exist. From mid-September 1980 until mid-December 1981, I observed each of the two study groups in Amboseli for 10 to 12 days per month. I began each day with a group by recording the presence or absence of each group member, and by describing any new members (infants and adult males) not seen on my previous day with that group. In addition, for each adult female I recorded the size and turgidity of her perineal swelling and the color of her paracallosal skin. The paracallosal skin of both lactating and sexually cycling female savannah baboons is typically gray or black, but only cycling females exhibit periodic, full perineal turgescence [Gillman, 1935; Altmann, 1970]. In Amboseli, all pregnant females begin to lose the skin pigment melanin from their paracallosal skin by two months postconception, and no female has ever exhibited loss of paracallosal skin pigmentation without being pregnant [Altmann, 1970; J. Altmann & S.A. Altmann, personal communication].

Throughout my study, I contributed daily descriptions of the severity and condition of all observable wounds and other injuries to the long-term records of the Amboseli Baboon Research Project [Hausfater et al, 1982].

Adult male Kong is the first male known to have migrated into Hook's Group in over two years. At the time of Kong's immigration, Hook's Group consisted of 31 members, including four adult males, one subadult male, 13 adult females, three juvenile males, six juvenile females, two infants, aged 8 and 4 months, and two neonates less than 1 month old. Opportunities for conception were few. Five of the 13 adult females were pregnant; four others were lactating and not exhibiting menstrual cycles. Of the four cycling females, three were nulliparous; two of these females had not yet been observed to attract resident adult males into sexual consortships.

OBSERVATIONS

Kong assumed top-ranking dominance status in Hook's Group within a week of his immigration. Throughout the month after his immigration, Kong frequently threatened and attacked the adult males and females of Hook's Group. The following observations are based on my field notes taken during the month of Kong's immigration.

Kong was first sighted on the periphery of Hook's Group on April 16; he was not sighted on April 18, my next day with the group. I returned to work with Hook's Group on April 25 through 27. On April 25, I found Kong with the group in its sleeping grove. The top-ranking resident adult male and three adult females (Winter, Kupita, and Tatu) all exhibited serious injuries (deep, bleeding wounds and/or severe limping) that were probably inflicted by the immigrant male (see below). That night, two other adult females (Pindua and Willy) incurred severe injuries. Also, at 0700 on April 26, a partially dried, sticky mass of blood covered Willy's vulva. Subsequent repigmentation of Willy's paracallosal skin confirmed the loss of her 49–60-day conceptus. Pindua's infant was unharmed. However, when I returned to work with Hook's Group on May 2, Pindua was found carrying the corpse of her infant (0827). The degenerate condition of the corpse suggested that the infant's death had occurred on April 28 or 29 and made it impossible to determine the existence of wounds. At 0830, female Sister was seen with her anogenital region covered with fresh blood. At 1137, Neena was noticed with dark, dried blood surrounding her genitalia. Subsequent repigmentation of the paracallosal skins of both of these females confirmed the losses of 162-day and 71-day conceptuses.

TABLE I. Reproductive States of Adult Females in Hook's Group at the Time of Kong's Immigration

| Lactating | Pregnant | Cycling |
|--|--------------------------|------------------------|
| Pindua ^{a,b} (1) ^c | Willy ^{a,b} (2) | Penny (8) |
| Winter ^a (3) | Neena ^b (5) | Lois (9) |
| Lista (4) | Eta (7) | Moja (10) |
| Kupita ^a (6) | Sister ^b (11) | Tatu ^a (12) |
| | Nubbin (13) | |

^aFemales who received severe injuries within two weeks following Kong's immigration.

^bFemales who experienced reproductive loss within two weeks following Kong's immigration.

^cFemales' dominance ranks appear in parentheses.

Within a few days after Kong's immigration, the resident top-ranking male and five adult females, including the three top-rankers, had incurred severe injuries to anterior body parts and limbs. Prior observations of Amboseli baboons suggest that the simultaneous occurrence of these wounds was unusual and attributable to the immigrant adult male with some certainty. The wounds received by the top-ranking resident male typify those of severe agonistic encounters between males that result in the reversal of the males' relative dominance ranks [Hausfater, personal communication]. Wounds received by adult female baboons in Amboseli are usually inflicted by other adult females and most often occur on the tail or hindquarters, whereas wounds inflicted by adult males are more frequently seen on anterior body parts [Hausfater, 1975]. During my study, Hook's Group females were never observed with large wounds on anterior body parts or limping for extended periods prior to Kong's immigration. On a single other occasion during my study, an adult female in Alto's Group received serious head wounds. That event also occurred about two weeks after an adult male had immigrated and taken over top-ranking status in that group.

Table I displays the reproductive states of the adult females of Hook's Group, the identities of the females who incurred serious injuries, and the identities of the females who experienced reproductive loss during Kong's immigration. Tatu, the only cycling female who was seriously injured, was undergoing her menarcheal cycle at the time of Kong's immigration. Tatu approached Kong frequently, and spent much more time in close proximity to the immigrant than did any other female in the group.

Table II describes the reproductive changes that occurred in Hook's Group within fourteen days of Kong's immigration. Kong's aggression toward the females of Hook's Group may have enabled Kong to mate with at least three of the four females whose current reproductive efforts were terminated shortly after his immigration. Kong retained alpha dominance status, and thus, presumably, high reproductive status among the adult males [Hausfater, 1975; Packer 1979b; but see Strum, 1982], until the middle of August, or about 112 to 118 days. During this time, Pindua, Willy, and Neena became pregnant. All four females would have resumed estrus cycling well after Kong had lost top-ranking dominance status had they not experienced their reproductive losses (Table II). The consort records of Hook's Group for this period are insufficient to determine whether it was Kong or a resident adult male who consorted with these females on days during which they were most likely to conceive.

TABLE II. Reproductive Changes Within Two Weeks Following Kong's Immigration

| Date | Animal | Event | Days to resume cycling | Cycles to conception | Days to conception | E (Days to conception without event) ^a |
|----------|--------|--------------|------------------------|----------------------|--------------------|---|
| April 26 | Willy | Fetal loss | 16 | 3 | 97-107 | 499 |
| April 29 | Pindua | Infant death | 16 | 3 | 94-104 | 341 |
| May 1 | Neena | Fetal loss | 11 | 2 | 54-63 | 477 |
| May 2 | Sister | Fetal loss | 26 | 5 | 169-174 | 386 |

^aMean values for gestation length (177 days, SD = 4 days [Altmann et al, 1978]) and interbirth interval (548 days, SD = 183 days, including data from mothers whose infants died prior to weaning [J. Altmann, S. Altmann & G. Hausfater, unpublished data]) in Amboseli baboons were used to calculate the entries for the expected number of days to conception had fetal loss or infant death not occurred.

DISCUSSION

Abortion of pregnancy is a rare event among the baboons of Amboseli. In the past 10 years, 83 pregnancies have been recorded in the other baboon study group in Amboseli (Alto's Group) using the paracallosal sign of pregnancy. Only three of these pregnancies ended in miscarriage [J. Altmann, S.A. Altmann & G. Hausfater, unpublished data]. That three abortions occurred along with the death of a healthy infant in Hook's Group within two weeks following the immigration of an aggressive adult male is remarkable. I suggest that physical and psychological trauma due to attacks from and the presence of the immigrant male resulted in reproductive losses for four of the females of Hook's Group. Evidence that harassment from other group members sometimes results in abortion in monkey species can be found in the field and laboratory literature [Nash, 1974; Sackett et al, 1974; see Small, 1982, and references therein].

Data from several laboratory and field investigations suggest that infant-killing has evolved as a male reproductive tactic in some mammalian species [see Hrdy, 1979]. Some authors have noted that aspects of the life history of savannah baboons are compatible with infant-killing as a male reproductive tactic [Chapman & Hausfater, 1979; Hrdy, 1979; Busse & Hamilton, 1981]. Because periods of infertility in adult female mammals begin at conception, abortion inducement is functionally equivalent to infant-killing as a male reproductive tactic in species whose life histories favor the evolution of infant killing by males: Following infant or fetal death, females resume estrus cycles and thus become available for reproduction sooner than if they had continued supporting their developing offspring [Altmann et al, 1978].

However, long-term data detailing social interactions among immigrant males, resident males, and females are needed to elucidate the role of infant-killing and abortion in the reproductive strategies of male and female baboons. Extreme aggressiveness in migrant males could result by natural selection if aggressiveness increases a male's chance of surviving migration, gaining entry to a new group, and then attaining high dominance status. Infant-killing by immigrant males could be a fortuitous result of intense aggressive interactions among immigrant males and resident adult group members that would also help perpetuate selection for aggression in migrating males.

Answers to the following research questions could help distinguish whether infant death and abortion at times of male immigration in baboons are by-products of immigrant males' general hyperaggressiveness, or whether infant-killing and abortion inducement are specific acts of aggression that confer important reproductive advantages upon males who employ them under appropriate conditions:

1. Does the number or proportion of females that are sexually receptive in a group affect the rate and intensity with which high-ranking immigrant males attack adult females?
2. Do pregnant and lactating females receive a disproportionate amount of the aggression that immigrant males direct toward adult females upon immigration?
3. Do resident adult males increase the time they spend with pregnant and lactating females in response to the immigration of aggressive males without increasing their time spent with cycling females? If so, does the additional time spent with these females effectively buffer the females from the aggression of immigrant males?

Affirmative data would lend substantial support to the hypothesis that inducement of abortion and infant-killing are reproductive tactics exploited by adult male baboons.

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