

A PEAK IN SEXUAL ACTIVITY DURING MID-PREGNANCY IN THE
GOLDEN LION TAMARIN, *LEONTOPITHECUS ROSALIA*
(PRIMATES: CALLITRICHIDAE)

It is generally believed that pregnancy in mammals, except in humans, results in a rapid reduction of sexual activity. In several primate species, however, copulatory behavior has been reported as occurring during gestation, although mainly during the first trimester (Bielert et al., 1976; Epple, 1970; Hendrickx and Houston, 1971; Hess, 1973; Travis and Holmes, 1974). In this paper we report a consistent and marked peak in sexual behavior in lion tamarin (*Leontopithecus rosalia*) pairs during mid-pregnancy.

Leontopithecus rosalia tends to breed seasonally in captivity with estrous cycling and conception occurring mainly between September and January, and a birth peak occurring in March and April. Because the occasional female will breed continuously throughout the year and the major birth season lasts for about 6 months, births have been recorded for all months of the year. The duration of the behavioral estrous cycle, based on intervals between peaks of male mounting, is 2 to 3 weeks (Kleiman, 1977a). This corresponds closely with a cycle in ovarian hormones of 16 days reported for another callitrichid, *Callithrix jacchus* (Hearn and Lunn, 1975). Like other marmosets and tamarins, *L. rosalia* does not menstruate nor does it exhibit easily visible changes in the genitalia during the reproductive cycle. The gestation averages 128 days and appears to be the shortest in the family Callitrichidae (Kleiman, 1977a).

Around the time of estrus, there are certain characteristic changes in the behavior of lion tamarin pairs. The frequency and duration of male mounting behavior increases, as would be expected. In addition, males approach, sniff, and groom the mate more frequently. The female also exhibits increased sniffing, approaching, and grooming the male, but these typically precede the peak in male mounting and contact behaviors by 2 to 4 days (Kleiman, 1977a).

Lion tamarins are monogamous, and the levels of sociosexual behavior patterns are lower in pairs with bonds of long duration than in newly-formed pairs (Kleiman, 1977b). However, the onset of estrus can usually be predicted by increases in the female's approaching and sniffing the partner even if mounting behavior is never seen.

Lion tamarin social and reproductive behavior has been under intensive study at the National Zoological Park since 1973. Care and maintenance of the animals and observation techniques are

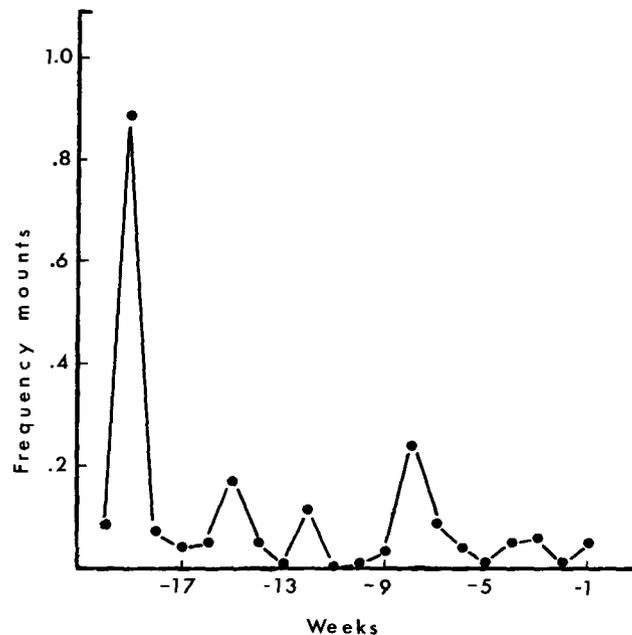


FIG. 1.—The average frequency of mounting by male golden lion tamarins during pregnancy.

described in Kleiman (1977a). In 1975, one of us (D.S.M.) first noted the occurrence of copulatory activity during mid-pregnancy in some lion tamarin pairs. Fig. 1 presents the average frequency of mounting per half-hour observation period per week during 14 pregnancies. The mounting peaks seen in weeks 18 to 19 (conception) and 7 to 8 before birth derive from observations of sexual behavior during eight and six pregnancies, respectively. The subsidiary peaks in weeks 12 to 13 and 15 to 16 before birth each represent mounting behavior seen during only two pregnancies.

Average frequencies of sniffing the mate are presented in Fig. 2. Males exhibit high frequencies of sniffing at conception. These frequencies decrease during the first month of pregnancy and there is a slight increase in mid-pregnancy. Female sniffing peaks, however, are more well-defined with high levels at conception and a noticeable increase 7 to 8 weeks prior to birth. This is similar to what is seen during normal estrus. The more dramatic changes in the female when compared with the male suggest that the female is behaviorally receptive 7 to 8 weeks before birth, but not as attractive to the male as during a normal estrus.

The occurrence of a limited but well-defined period of estrous behavior and sexual activity during mid-pregnancy has not been reported for a primate. Bielert et al. (1976) noted sexual behavior in rhesus monkeys (*Macaca mulatta*) through the second month of pregnancy, with a peak 6 to 10 weeks after conception which correlates with increases in circulating estrogen. Yet in middle and late pregnancy when estrogen levels rise even further than in the first trimester, rhesus monkey copulatory activity is suppressed. There are occasional references to estrous or sexual behavior during pregnancy in other mammals—bongos, *Tragelaphus eurycerus* (H. Buechner and R. Kiltie, personal communication), tigers, *Panthera tigris* (Kleiman, 1974), and lions, *Panthera leo* (Schaller, 1972)—although not at consistently defined periods during gestation. Both Hafez (1968) and Fraser (1968) reported estrus as occurring in 3 to 10 percent of pregnant cows, *Bos taurus*, as well as in ewes, *Ovis aries* and water buffalo, *Bubalus bubalis*. Gier (1975) reported copulatory behavior as being common in the coyote, *Canis latrans*, during the 10 days preceding birth, which is surprising because the coyote is seasonally monestrous.

Given the close correlation between circulating hormone levels and sexual activity in female mammals (Carter, 1974), it is likely that the lion tamarin copulatory activity in mid-pregnancy

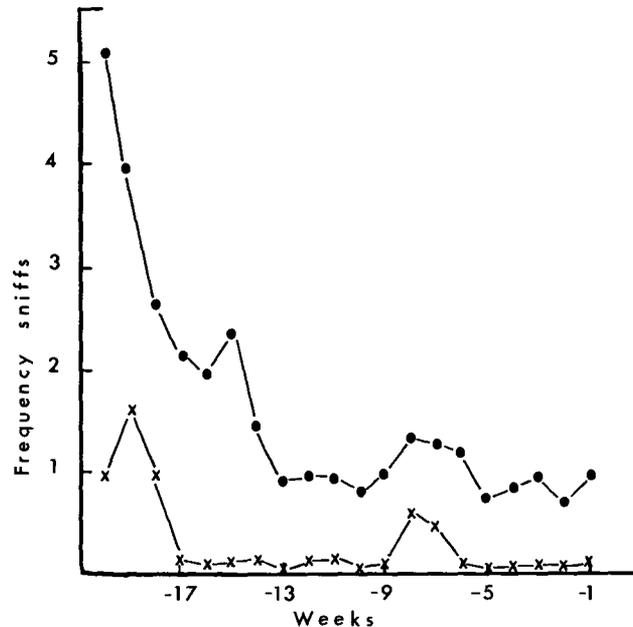


FIG. 2.—The average frequency of sniffing the mate during pregnancy in male and female golden lion tamarins. Closed circles equal males; crosses equal females.

would be accompanied by hormonal changes. In the only callitrichid (*Callithrix jacchus*) in which steroid hormone levels have been monitored during pregnancy, there is a gradual increase in estradiol until week 17 of pregnancy at which point there is a surge (Hearn and Lunn, 1975). These same authors noted the occasional occurrence of copulation up to 40 days gestation and during the 6 weeks preceding birth, but not at other times during pregnancy.

It is not really known how common sexual activity is during pregnancy in most mammals because in captivity where such observations are typically made, males and females are often separated after conception, even in social species. However, it is possible that such behavior has an important social function as a means of maintaining the pair bond in monogamous mammals such as coyotes, marmosets, and tamarins. However, because estrous behavior during pregnancy has been recorded for both solitary and social polygamous mammals, such behavior may well have other functions.

Acknowledgments.—The research on lion tamarins has been supported in part by grants from the National Institute of Mental Health (R03 MH 25242 and R01 MH 27241) to D.G.K. We are grateful to the people who have helped in observing the animals, including Jan Hitchcock, Lynn Dorsey, Kaye Brown, and Lisa McLanahan.

LITERATURE CITED

- BIELERT, C., J. A. CZAJA, S. EISELE, G. SCHEFFLER, J. A. ROBINSON, AND R. W. GOY. 1976. Mating in the rhesus monkey (*Macaca mulatta*) after conception and its relationship to oestradiol and progesterone levels throughout pregnancy. *J. Reprod. Fert.*, 46:179-187.
- CARTER, C. S. (ed.). 1974. Section II. Pp. 102-249, in *Hormones and sexual behavior*, Dowden, Hutchinson, and Ross, Inc., Stroudsburg, Pennsylvania, 362 pp.
- EPPLER, G. 1970. Maintenance, breeding, and development of marmoset monkeys (*Callithricidae*) in captivity. *Folia Primat.*, 12:56-76.
- FRASER, A. F. 1968. Reproductive behavior in ungulates. Academic Press, New York, 202 pp.

- GIER, H. T. 1975. Ecology and behavior of the coyote (*Canis latrans*). Pp. 247-262, in *The wild canids* (M. W. Fox, ed.), Van Nostrand, Reinhold, New York, 508 pp.
- HAFEZ, E. S. E. 1968. Gestation, prenatal development, and parturition. Pp. 173-205, in *Reproduction in farm animals* (E. S. E. Hafez, ed.), Lea and Febiger, Philadelphia, 440 pp.
- HEARN, J. P., AND S. F. LUNN. 1975. The reproductive biology of the marmoset monkey, *Callithrix jacchus*. Pp. 191-202, in *Breeding simians for developmental biology* (F. T. Perkins and P. N. O'Donoghue, eds.), Laboratory Animals, Ltd., London, 353 pp.
- HENDRICKX, A. G., AND M. L. HOUSTON. 1971. Gestation. Pp. 269-301, in *Comparative reproduction of nonhuman primates* (E. S. E. Hafez, ed.), Charles C. Thomas, Springfield, Illinois, 557 pp.
- HESS, J. P. 1973. Some observations on the sexual behaviour of captive lowland gorillas. Pp. 507-581, in *Comparative ecology and behaviour of primates* (R. P. Michael and J. H. Crook, eds.), Academic Press, London, 847 pp.
- KLEIMAN, D. G. 1974. The estrous cycle in the tiger (*Panthera tigris*). Pp. 60-75, in *The world's cats, vol. II* (R. L. Eaton, ed.), Feline Research Group, Woodland Park Zoo, Seattle, 260 pp.
- . 1977a. Characteristics of reproduction and sociosexual interactions in pairs of lion tamarins (*Leontopithecus rosalia*) during the reproductive cycle. In *The biology and conservation of the Callitrichidae* (D. G. Kleiman, ed.), Smithsonian Institution Press, Washington, D.C., in press.
- . 1977b. Monogamy in mammals. *Quart. Rev. Biol.*, 52:39-69.
- SCHALLER, G. B. 1972. *The Serengeti lion*. Univ. Chicago Press, Chicago, 480 pp.
- TRAVIS, J. C., AND W. N. HOLMES. 1974. Some physiological and behavioral changes associated with oestrus and pregnancy in the squirrel monkey (*Saimiri sciureus*). *J. Zool.*, 174:41-66.

DEVRA G. KLEIMAN AND DAVID S. MACK, *National Zoological Park, Smithsonian Institution, Washington, D.C. 20008. Submitted 1 February 1977. Accepted 18 April 1977.*