

11. REPRODUCTIVE BEHAVIOUR

11.1. INTRODUCTION :

Reproductive behaviour has an important central role in social life, especially in rhesus monkey in which large groups are formed. The sexual cycle in monkeys and apes is uninterrupted, (Zuckerman, 1930, 1953). This characteristic distinguishes the higher primates, including man, from other mammals (Bullough, 1961). But field evidence suggests that the reproductive cycle in several species of monkeys, though not in all, is seasonal, and that females are not receptive year-round (Carpernter, 1942 ; Altmann, 1962; Koford, 1965 ; Sade, 1965 ; Dickamer, 1974 and Teas et al, 1981). The term 'annual reproductive cycle' includes the seasonal distribution of copulations, conceptions, and births in a population (Lancaster and Lee, 1965). Such broad outline of this term covers all the intra-specific reproductive interactions (Rostal and Eaton, 1983 ; Wolfe, 1986 and Hanby et. al., 1971). Some workers (Dukelow, 1970), however, described specific reproductive parameters such as gestation period, age of maturity, birth season and length of estrous cycle. Dominance and aggression are also important aspects in the reproductive behaviour of a group (Trivers, 1972). Consort arrangements and sex ratios are also important aspects of primate reproduction (Lindburgh, 1971).

This chapter deals with various aspects of reproduction of rhesus. The major objectives of this section are : to determine feeding season, age of maturity, pre-mating, mating and post-mating behaviour, and consort-relationships of rhesus population during the day time.

11.2. METHODS :

The problem of observing reproductive behaviour without disturbing the animals is a difficult task in the wild. Because consort pairs, i.e., adult males and adult females were found to be extremely wary when involved in sexual association. As such

sufficient precautions were adopted during observations on reproductive behaviour so, that the animals were not disturbed. The different aspects concerning reproduction were observed either by naked eyes or with the help of a pair of binoculars (7 X 35). Duration of reproductive acts were recorded by stop-watch in the note book. Emphasis was given on the actions and reactions of participants of different age and sex classes. Observations were distributed throughout the whole day, i.e., from 06.00 hour to 18.00 hour so as to get the frequency and nature of reproduction at different periods of the day. This part of the study was carried out from August, 1987 to July, 1988.

11.3. RESULTS AND DISCUSSION :

11.3.1. Breeding Season :

Populations of a species may have breeding seasons at different times of the year depending on its geographical distribution and climatic conditions. In Northern India breeding occurred at different times of the year (Heape, 1896). But Hingston (1920) reported that mating starts in September in the Himalayas, whereas in southern India, breeding has a defined season (Krishnan, 1972). Ascertaining specific breeding season in this species is further complicated by the fact that mating and birth have been reported to occur throughout the year (Praksah, 1962 ; Prater, 1965 ; Southwick et al., 1965 , and Lindburgh, 1971) . A total of 3600 copulations were sighted in different months over the study period, out of which 04.6% occurred in September, 17.4% in October ,31.0% in November , 29.0% in December , 10.0% in January and 8% in February (Table -11.1). Although the span of breeding season extended over a period of seven months the peak period was from October to December when a total of 77.8% couplations occurred. Figure - 11.1 compares copulations in disturbed area (DA) and non-disturbed area (NDA) during breeding season.

11.3.2. Age of Maturity :

Age and sex-compositions usually reflect reproductive potency of a population

(Pal and Guin, 1986). The following age - sex classes were distinguished, based on body size and sexual traits (Southwick, 1961 and Dukelow, 1970). Young males reached sexual maturity at 3 and 1/2 years of age. Sade (1965). However, in tropical country it starts earlier. Most of the females begun breeding at years and mating activity experienced peak at about 7 years at Cayo Santiago population (Carpenter, 1942 Altmann, 1962 ; Kaufman, 1965 and Sade, 1968). The highest ranking males were most sexually active, whereas lower ranking ones were less active (Table - 11.2) . The dominant males were mated primarily with the dominant females (61.7%), but they also mated with lower ranking females (16.3%) of the group. The relative percentage of acceptance for lower ranking males by higher females is 22%. As such dominance hierarchy appears to play key role in sexual activity.

11.3.3. Sexual Behaviour :

Before the onset of the breeding season males showed an increased redness in their sexual skin. The colour was brightest during October, November and December. The skin of the perineum, tail, thighs, abdomen and back of adult females and adolescent females became swollen, turgid, convoluted and colour of these parts changed to pink-red. The swellings gradually disappeared in older females. Some females showed highly reddish and bright face, and exhibited restlessness. Possibly those were adolescent females (Plate-11.1). Sade (1964) reported that testes were large at breeding season and small at non-breeding season.

11.3.3.1. Mating Patterns

Mating behaviour patterns of rhesus may be broadly divided in 3 phases (Table 11.3). Table 11.3 summarizes the specific activities of pre-mating, mating and post-mating, behaviour of adult males and females.

11.3.3.1.1. Per-mating Behaviour :

It involved grooming, following and maintaining close-association between adult male and females. In most cases receptive females took initiative in forming consort-pairs (Table 11.4). Males were the recipients of grooming at the end of close-physical association. Males and females of a consort pair followed each other. Males were observed to monitor the females when the females moved away from the males for short periods (Plate - 11.2 and Plate - 11.3). Females were found to solicit the attention of males and made lip-contact with the male partners body. Sometimes females touched different parts of partner's body such as mouth, chest, fur and penis. In some cases, females were observed to try to persuade the males who were not ready for mating.

11.3.3.1.2. Mating Behaviour :

During copulation both the partners were active. Copulation was observed in all the months from September to February (Table - 11.4). It is clear from Table - 11.4, that at the time of mounting male's activity increased thrice than that of the female. At the time of mounting, males placed both hands on the female's hips or lateral aspect of the body just anterior to the hips and then lifted themselves off the substrate by positioning their feet against the female's calves (Plate - 11.4). Penis insertion was followed by rhythmic pelvic thrusts (Plate - 11.5 and Plate - 11.6). Ejaculation was indicated by appearance of semen on the vulva. This, however, could not be observed in all cases. In some cases males tried to maintain intromission state after ejaculations despite females attempt to move off. A mating bout may last for about 2-29 minutes with 3-65 mounts (Table - 11.5). Carpenter (1942) reported copulation to last for about 40 minutes involving 37 mountings prior to ejaculation.

The frequency of copulation in different hour of the day during breeding season is presented in Table - 11.6. The average frequency of copulations during morning, noon and afternoon periods of the day were 5 cop./hr., 2.7 cop./hr. and 1.26 cop./hr.

respectively. It was clear that the frequency of copulation in the morning phase was much more greater than that of other phases of the day possibly due to lower intensity of temperature. The lower frequency at noon was possibly correlated to restoration of energy.

Successful and unsuccessful copulation differed in the number of thrusts provided by the males. Unsuccessful copulation was positively correlated to female's passive role in male-initiated sexual encounters. Copulation with unwilling or passively receptive females required the use of force. Such type of encounters were observed in Orang-utans (Mackinnon, 1979 and Jolly, 1985) and in Samango monkeys (Henzi and Lawes, 1987).

11.3.1.1.3. Post-mating Behaviour :

It is marked by the male's passive interest towards further copulation. The male, however, was observed to lick the mating fluid collected at the genital area of the female. Post-mating frequencies in males and females were 8.0 cop./hr. and 19.6 cop./hr. (Table - 11.4). Therefore, after copulation female partners showed greater initiatives to continue mating than its counter-parts. Females were observed to collect mating fluids from the vulva and penis and frequently rub it throughout the face of the male-partners. Females are also frequently made lip-contact with them and touched them with hands so as to excite their male-partners (Plate - 11.7). In response to all these female activities the male-partners simply watched the female passively and did not show any positive or appropriate activity. In some cases, the females successfully persuaded the male-partners to get involved in further copulation (Plate- 11.8).

11.3.4. Quantitative aspects of consort-relationships :

A total of 230 mating interactions including 2-changing - partners were recorded; most of which were during October, November & December. Higher percentage of consort-association between dominant male to dominant female (61.7%) would indicate consort-association in rhesus to be highly social rank oriented. But consort

association between dominant male to lower-ranking female (16.3%) and dominant female to peripheral male (22%) were also observed. Thus dominance and availability of consort partners were important factors which regulate the existence and success of consort pair formation. Lindburgh (1971) reported that during breeding season, females of any rank were tolerated by males to form consort pair. The consort period lasted from a few hours to a few days (Dodsworth, 1914; Southwick, 1965). Changes of partners were not infrequent and less than 50% females were found to be associated with only one male. Southwick (1965) stated that consort-relationships, could be considered as flexible. In this context, I like to present here two case histories from field records where simply changes of partners were observed during breeding season (Table- 11.7 and 11.8).

Case - I : Here four males i.e., M1, M2, M3 and M4 were seen to form a 'consort-group' with one female which lasted for five days from 6th October, 1987 to 10th October, 1987 (Figure -11.2). On the very first day i.e., 6th October, 1987, M2 male copulated with the female more even than that of most dominant male, M1, possibly due to absence of M1. For the next four successive days the male, M1, established its dominance to others, while the male, M2 maintained its higher frequency of couplings than that of M3 and M4.

The average frequency of copulation in males were 10.1, 6.0, 2.6 and 1.0 respectively. So, natural selection allows fights among males but not among females. Only few instances of change of partners were observed. Since number of samples is too small, not much could be deduced from it. It is assumed that several males are engaged in mating with a single female due to unavailability of receptive females. Lindburgh (1971) expressed similar opinion in this regard.

Case- II : In this case three females and a single male formed a consort-group and continued in the group for (Figure - 11.3) five-days from 26th October, 1987 to 30th October, 1987. The average copulatory frequency of the three females, i.e., F1, F2 and F3 were 6.3, 3.5 and 1.3 respectively which seemed to be established from the outcomes of stronger competition among adult males within a group. Thus it may be concluded that

consort -association in rhesus is flexible. In the same context it may be assumed that female choice of mating partners played an important role in this regard. Several authors have reported that several species of primates often show interest in and mate with strange males. Males also often prefer unfamiliar females (Clutton-Brock and Harvey, 1977 ; Harcourt, 1978). In primates, inter-groups consort formation by females was observed by Koford, 1963 ; Brereton, 1981 ; and Pracker, 1979.

11.3.5. Aggression of Consort-Pairs :

Aggressive acts, such as threat, chase, attack and bite, were shown by the consort-partners and other members when they were disturbed. It should be mentioned here that only threats were used by consort-partner towards the observer, while all the aggressive acts were used towards conspecific as and when necessary. Fedignan and Baxter (1984) stated that primate males usually are more aggressive than females. Table -11.9 shows frequency of threats displayed by consort pairs towards different group members of different age classes on spotting the observer (either on own or being informed by the consort -partner) at a distances within and beyond 15 meters. In general, males reacted more when the observer was close to them . The reaction of males , females and juveniles consisted of a typical threat display. Singh (1966) and Ojha (1972) reported that bites to people were common during breeding season. The frequency of threat was maximum when males were accompanied by female partners and was probably due to the typical act of female choice. This type of aggression persisted in varying degree for long time until the consort-associations reached mature stage. The aggressiveness of consort-partners towards adversary decreased with termination of breeding season.

Table - 11.1 : Percent sightings of copulation in different months in the breeding season.

| Name of the Month | Percent of copulation |
|-------------------|-----------------------|
| September | 4.6 |
| October | 17.4 |
| November | 31.0 |
| December | 29.0 |
| January | 10.0 |
| February | 8.0 |

Table 11.2 : Relative percentage of acceptance of female by male during breeding season.

| | Relative percentage of acceptance |
|---------------------------------------|-----------------------------------|
| Dominant male to dominant female | 61.7 |
| Dominant male to low-ranking female | 16.3 |
| Low - ranking male to dominant female | 22.0 |

Table - 11.3 : Different activities in three phases of mating behaviour at study site

| Activity | * Pr. M. | | M. | | Po. M. | |
|----------------------------------|----------|--------|------|--------|--------|--------|
| | Male | Female | Male | Female | Male | Female |
| Attention | ** P | --- | --- | --- | --- | --- |
| Presentation | --- | P | --- | --- | --- | --- |
| Body Contact | P | P | P | P | --- | P |
| Grooming | --- | P | --- | --- | P | P |
| Inspection | P | --- | --- | --- | P | --- |
| Smelling | P | --- | --- | --- | P | --- |
| Licking | P | --- | --- | --- | P | --- |
| Mounting | --- | --- | P | --- | --- | --- |
| Thrusting | --- | --- | P | --- | --- | --- |
| Complementary movements | --- | --- | --- | P | --- | --- |
| Ejaculation | P | --- | P | --- | --- | --- |
| Rapid travel to another location | --- | P | --- | --- | --- | P |
| Relaxation | --- | --- | --- | --- | P | --- |

*Pr. M. = Pre-mating ,

*M= Mating ,

*Po.M. = Post-Mating ,

**P = Activity Present,

**' - ' = Nil

Table - 11.4 : Frequency of different mating patterns of consort-pairs.

| Name of the Month | *Pr. M. | | *M | | *Po. M. | |
|-------------------|---------|--------|-------|--------|---------|--------|
| | Male | Female | Male | Female | Male | Female |
| September | 16.0 | 18.5 | 27.5 | 7.5 | 4.5 | 16.25 |
| October | 21.7 | 23.4 | 32.25 | 12.25 | 7.25 | 20.25 |
| November | 32.5 | 36.5 | 46.25 | 16.25 | 15.57 | 32.25 |
| December | 20.1 | 27.8 | 30.5 | 10.5 | 10.15 | 20.3 |
| January | 14.0 | 18.0 | 23.75 | 8.75 | 6.35 | 15.75 |
| February | 10.4 | 13.5 | 15.25 | 5.25 | 4.45 | 9.0 |

* Pr.M. = Pre-mating, M. = Mating, Po.M. = Post Mating

Table - 11.5 : Duration of copulation bouts and number of mounting in different cases.

| No. of occasion | Length of copulation bout (in second) | No. of mountings. |
|-----------------|--|-------------------|
| 1. | 120 | 5 |
| 2. | 1150 | 45 |
| 3. | 1250 | 40 |
| 4. | 150 | 14 |
| 5. | 200 | 20 |
| 6. | 1650 | 45 |
| 7. | 1700 | 59 |
| 8. | 1500 | 48 |
| 9. | 120 | 14 |
| 10. | 100 | 15 |
| 11. | 80 | 6 |
| 12. | 170 | 12 |
| 13. | 50 | 3 |
| 14. | 1600 | 48 |
| 15. | 1750 | 65 |
| 16. | 1450 | 50 |
| 17. | 150 | 9 |
| 18. | 60 | 10 |
| 19. | 1300 | 45 |
| 20. | 1650 | 60 |
| Total | 16200(270 minutes) | 613 |
| Average | 13.5±1.92 | 30.6±2.4 |

Table - 11.6 : Frequency of copulation in different hour of the day (e.g. morning, noon and afternoon) in different months during breeding season.

| Name of the month | Frequency of copulation | | |
|-------------------|-------------------------|------|-----------|
| | Morning | Noon | Afternoon |
| September | 2.25 | 0.5 | 0.8 |
| October | 6.25 | 1.75 | 2.65 |
| November | 13.00 | 3.25 | 6.25 |
| December | 4.25 | 1.25 | 3.75 |
| January | 2.75 | 0.5 | 2.25 |
| February | 1.25 | 0.4 | 1.0 |

Table - 11.7 : Frequency of copulation by four males (M1, M2, M3, and M4) with one female during full five day observation period in Basanti Basti during breeding season.

| Date | Frequency of Copulation | | | |
|----------|-------------------------|----|----|----|
| | M1 | M2 | M3 | M4 |
| 6.10.87 | 06 | 10 | 03 | 01 |
| 7.10.87 | 08 | 06 | 03 | 02 |
| 8.10.87 | 12 | 05 | 02 | 01 |
| 9.10.87 | 20 | 07 | 02 | 01 |
| 10.10.87 | 15 | 08 | 04 | 01 |

Table - 11.8 : Frequency of copulation by three females (F1, F2, & F3,) with one male during full five day observation period in Basanti Basti during breeding season.

| Date | Frequency of Copulation | | |
|----------|-------------------------|----|----|
| | F1 | F2 | F3 |
| 26.10.87 | 06 | 04 | 02 |
| 27.10.87 | 03 | 02 | 01 |
| 28.10.87 | 07 | 03 | 01 |
| 29.10.87 | 12 | 06 | 02 |
| 30.10.87 | 10 | 05 | 01 |

Table - 11.9 : Threat display to the observer by group members of different age-classes of rhesus during breeding season.

| Age - classes | Detection distance | | | |
|----------------|--------------------|---------------|------------------|---------------|
| | Within 15 metres | | Above 15 metres | |
| | No. of detection | No. of threat | No. of detection | No. of threat |
| Adult - male | 135 | 119(88.0) | 65 | 49(75.3) |
| Adult - Female | 95 | 82(86.0) | 35 | 29(82.8) |
| Juvenile | 45 | 21(47.0) | 19 | 7(36.8) |

N.B. : Figures in parenthesis indicate percentage.

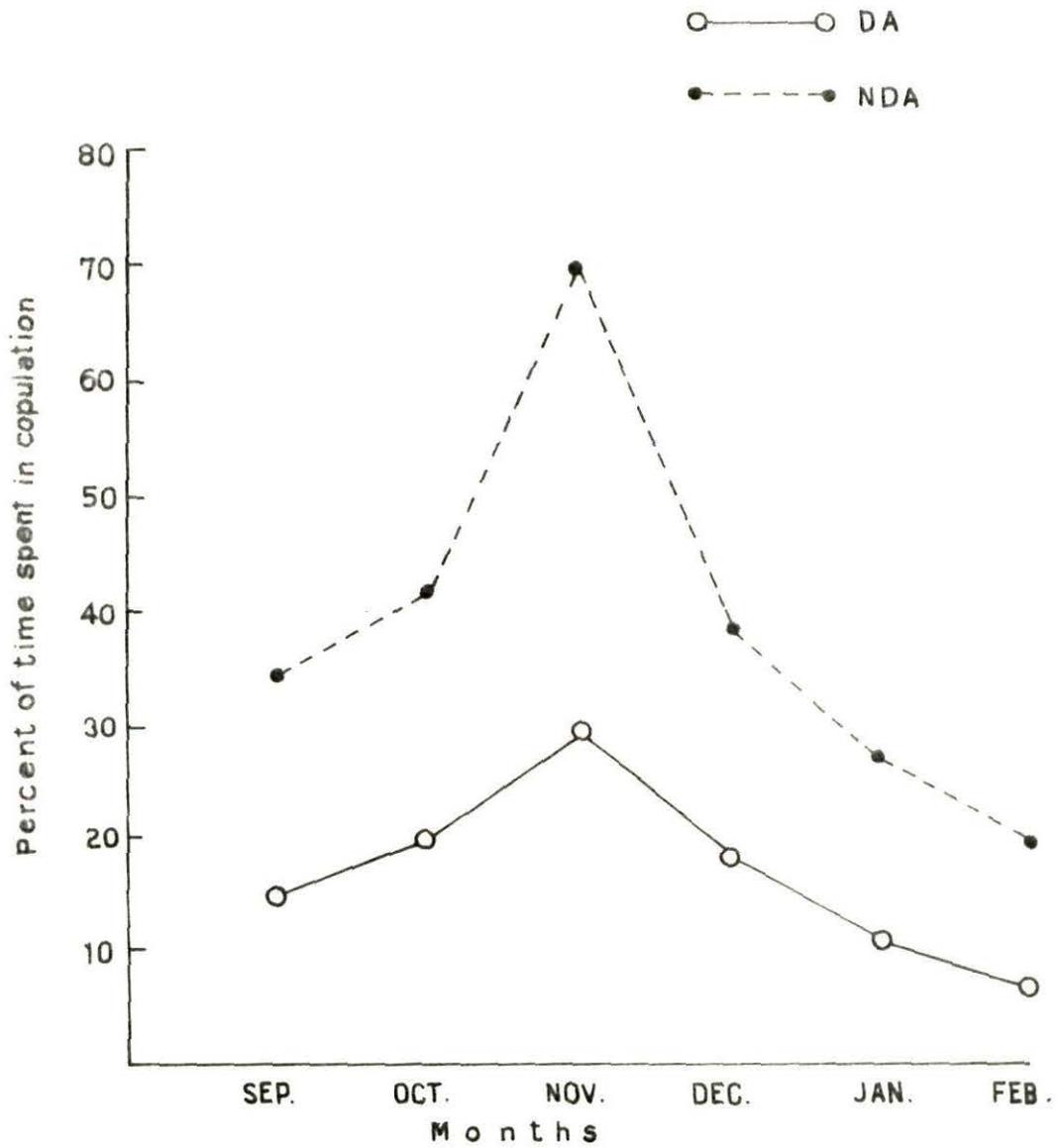


Fig. 11-1 : Percentages of time spent of copulation in disturbed area (DA) and nondisturbed area (NDA) during study period .

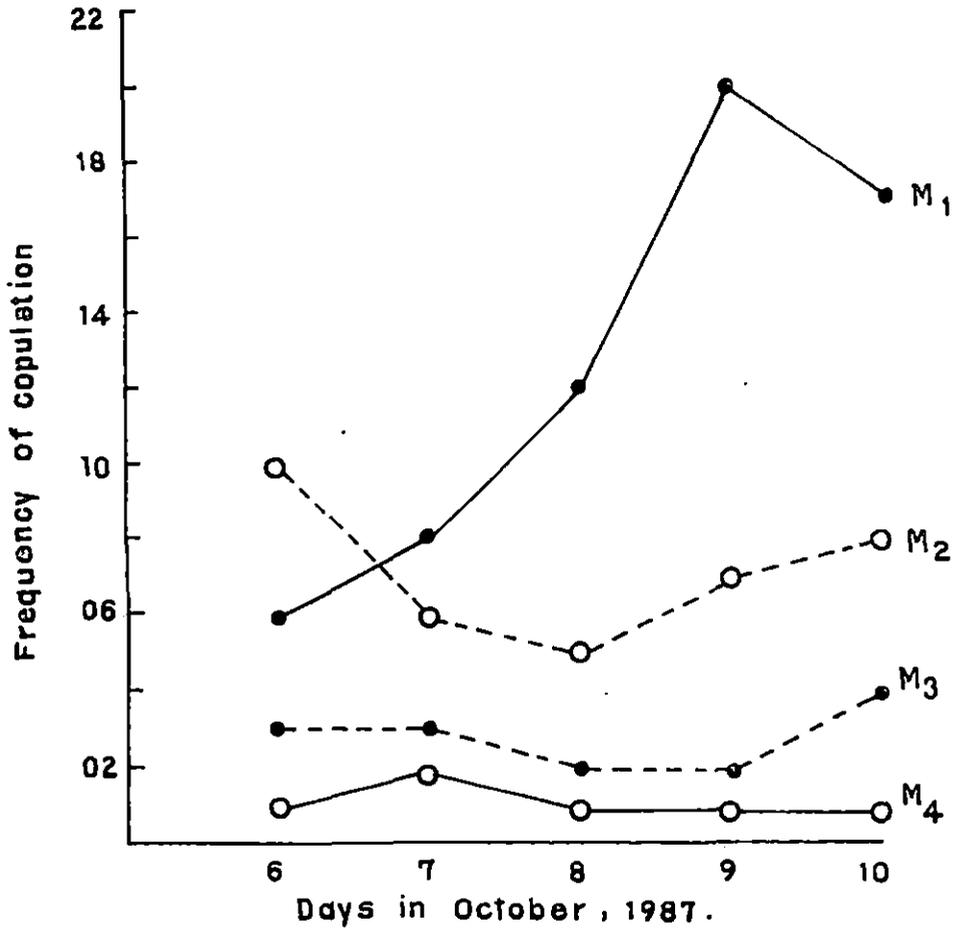


Fig. 11:2: Frequency of copulation by four males (M₁, M₂, M₃ & M₄) with one female during full five day observation period in Basanti basti at breeding season .

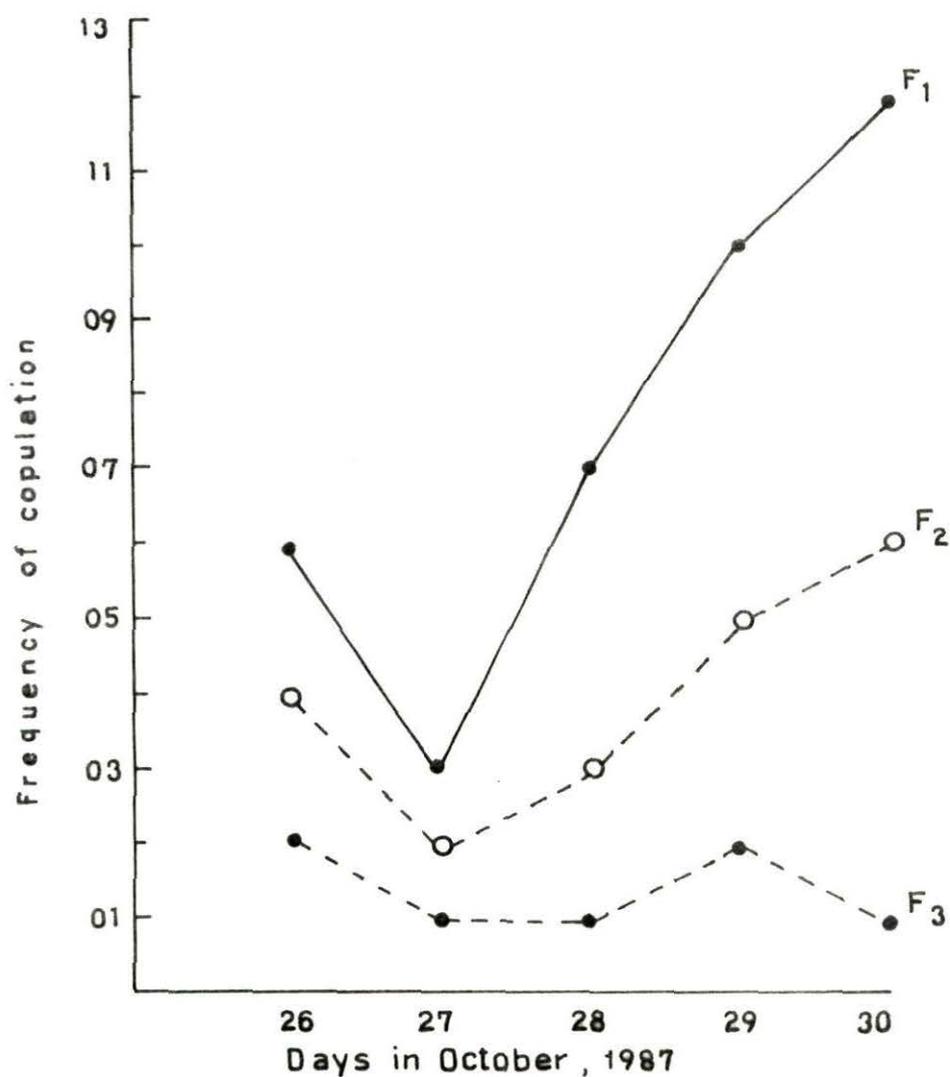


Fig. 11.3. Frequency of copulation by three females (F₁, F₂ & F₃) with one male during full five day observation period in Basanti basti at breeding season.

Plate - 11.1 : A consort-pair between dominant male and a higher ranking female. The female showed greatly reddish and bright colour of the face.

Plate - 11.2 : Consort formation between an adult male (middle) and an adult female (right), while an adult male (extreme left) followed the two maintaining considerable distance.

Plate - 11.3 : Completion of consort-pair between an adult male and an adult female.



Plate – 11.1



Plate – 11.2



Plate – 11.3

Plate - 11.4 : Adult male mounts adult female, while on the ground.

Plate - 11.5 : Adult male inserts penis into the vagina of adult female.

Plate - 11.6 : True copulation consisting of male's pelvic thrusts between an adult male and an adult female.



Plate – 11.4



Plate – 11.5

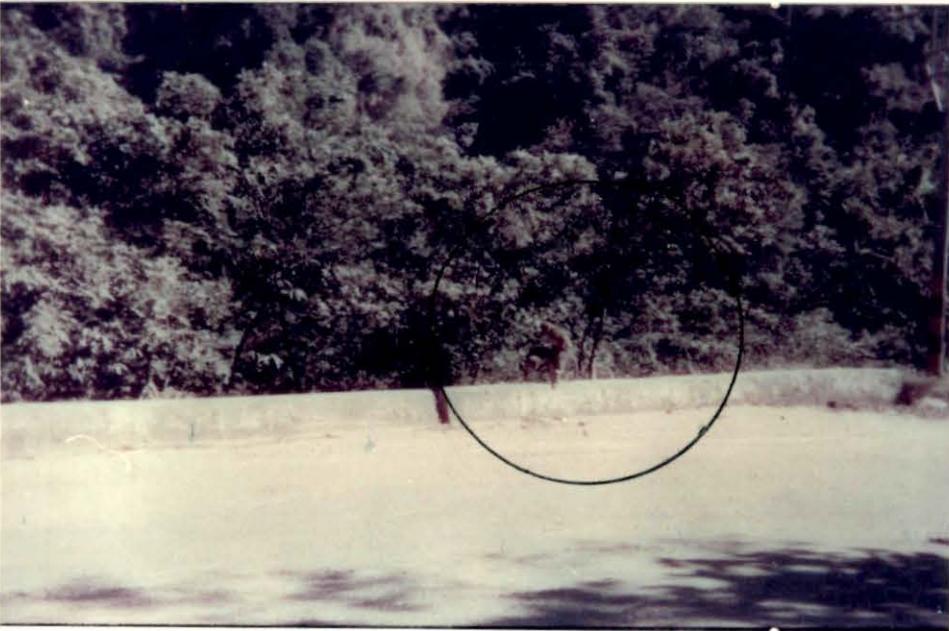


Plate – 11.6

Plate - 11.7 : Just after end of copulation, adult female rubs ejaculatory fluid on the back of adult male and touched lip of him.

Plate - 11.8 : Adult female instigating male partner for further copulation, while male remains inactive.



Plate – 11.7



Plate – 11.8