9. GENERAL ACTIVITY PATTERN

9.1. Introduction

To study behaviour of animals in the field, it is important to observe their daily activity pattern as because it enables the observer to make probable guess about where and when to find the animals within its habitat. However, the animal activities are not randomly organized but with reference to time and space it follow some definite schedule. The behavioural patterns varies according to species and environmental circumstances. Some biological clock mechanism seem to regulate their daily behavioural pattern. The total activity pattern of an animal is often referred as the behavioural repertoire, i.e. what the animals do and the frequency of occurrence of different activities with reference to time and space is called behavioural profile or daily activity budget or in otherwords where, when and how much of what they do (Pal, 1983). Many workers classified major activities of animals according to convenience. Generally two tendencies are observed so far : a group of scientists like McHugh (1958), Jerman and Jerman (1973), Jingfors (1980) classified animal activities broadly into 2 to 5 categories, whereas Saratchandra and Gadgil (1980), Pal (1982), Pal (1983) considered the finer activities totalling to more than 8 categories. In this study the behavioural repertoire of rhesus monkey has been classified into eight basic patterns and these are as follows :

1. Feeding : Eating and drinking mechanism of animals, also examining food items in different season.

2. Resting : Animals standing or lying, sitting on the ground or on tree branches without involvement in any other specific activity have been included in this category.

3. Locomotion : Walking, hopping, jumping, running all have been included in this section.

4. Social Grooming : Its involved cleaning of the body fur from insects, large dust particles etc. usually by a sub-ordinate member of a group from the body of a dominant member. In case of mother-infant and sexual partners the dominants were observed to groom the sub-ordinate.

5. Playing : Play mostly involved in grown-up infants juveniles and young adults. All types of interactions that although contained elements of other discrete acts such as aggression, sex etc. were incomplete, non-sequential or out of conext and as such could not be included in any other category.

6. Aggression : This involved fighting including threat, hop, chase, attack, biting etc.

7. Sexual inspection : It referred to presentation of sexual swelling by females to the males and physical, visual and olfactory verification of sexual parts by the latter.

8. Copulation : This included mounting of adult females by adult males followed by intromission of male organ into the vagina.

9.2. Methods

For studying animal behaviour many methods have been suggested by various field scientist from time to time. Attempts were made to refine widely used technique for more effective application under specific circumstances such as field and laboratory (Olson and Cunningham, 1934; Dumber, 1977; Simpson and Simpson, 1977 and Tylor, 1979). However, 'time-Sampling' method used in this study is one of the basic methods for studying animal behaviour. Olson (1929) is credited to be the first person to use this technique for studying children bahaviour.

The technique consists of taking a single count of numbers engaged in different behavioural activities glance on every unit time interval. In this study the

time interval was 5 minutes. Observations were distributed throughout the day time period from 06.30 to 09.30, 11.00 to 13.00 and 14.00 to 18.00 Hours. So that the total period of observation at any particular session of the day was comparable to any other period. The actual hourly break-up of the number of time-samples and number of rhesus observed is shown in Table.9.2.1.

9.3. Results and Discussions

9.3.1. Diurnal Activities

A total of 100 hours of observations was carried out on the activity of rhesus monkeys stretching over 06.30 to 09.30, 11.00 to 13.00 and 14.00 to 18.00 hours. Observations were made from January, 2001 to June, 2001. A total of 862 activity patterns were recorded in 694 time-sample units (Table.9.1.).

Table.9.2. shows percent of various behavioural patterns of rhesus monkeys at different hours of observation. Feeding behaviour had a bimodal distribution with peaks in the morning and afternoon session. The feeding behaviour continued throughout the day and was the most prominent activity. The process of feeding built up gradually and attain peaked during 11.00 to 12.00 hour, the peak dusk feeding was observed about 16.00 to 18.00 hour. Patterns of feeding behaviour of rhesus were reported by various workers such as Lindburgh (1971), Puget (1971) and Kali (2001). More than 60% of the animals were involved in feeding during the peak hours (Plate.9.1. and Plate.9.3.) In the noon session between 12.00 to 15.00 hour when temperature increases to about 30^0C or above feeding started to declined. Only about 20% of the total animals exhibited this behaviour during this (Plate.9.2.) period. It is to be noted that higher temperature in this session compelled the animals to rest instead of feeding. The rate of feeding in the mid-day was observed to be higher in cloudy days than hot sunny days.

They used shady spaces under the tree in most cases during resting. They rested in different postures either on the tree or on the ground. In the mid-day session i.e. between 11.00 to 15.00 hour when temperature ranged from 27^0C to

32^0C resting peaked (Plate.9.4., Plate.9.5., Plate.9.6. and Plate.9.9.). Southwick et al. (1962, 1965), Puget (1971) and Lindburgh (1971) reported resting to be restricted to mid-day session.

Locomotion behaviour occurred at almost all hours of the day. The groups mostly moved quadrupedally (Plate.9.10.) along the established routes. The arboreal pathways through orchard canopy appeared also to be well established. Horizontal jumps (Plate.9.12.) of incredible lengths were occasionally made by all age-sex classes except infants. Landing was always observed to be on their rear feet. However, occasional bipedal movement were also seen and such movements were less organized in mango orchard. Swimming behaviour (Plate.9.11.) was often seen in the study area during hot summer days.

Grooming was considerably higher in the late morning and in the afternoon session although it was observed at every hour of the day (Plate.9.13., Plate.9.14. and Plate.9.15.). Grooming occurred almost in all posture and on ground as well as on the branches of trees. Usually the groomed animal is dominant over the groomer (Plate.9.14.). However, mutual grooming between mating pairs were also observed. Infants and in some occasion juveniles received grooming from their mothers from time to time.

Playing activities was confined in the morning and in the afternoon session. It was slightly higher in the early morning session and absent in mid-day i.e. in between 11.00 hour to 14.00 hour.

Aggressive behaviour was recorded throughout the day but was maximum in the late morning session (i.e. 07.30 hour to 09.30 hour) as the temperature started to increase (Table.9.2.). It involved encounters between adults and adult-subadults (Plate9.16., Plate.9.17., Plate.9.18.). Adult females and infants (Plate.9.19, Plate.9.20, Plate.9.21.) were not involved in this behaviour. Infants always remained in safe custody of adult females (Plate.9.22., Plate.9.23., Plate.9.24.).

Sexual inspection of ano-genital parts was recorded mainly in the afternoon session (Plate.9.25., Plate.9.26.). It was completely absent in morning and noon sessions (Table.9.2.).

Occurrence of copulation (Plate.9.28., Plate.9.29., Plate.9.30.) was higher in the early morning and afternoon session and was rare in the mid-day period. Play copulation (Plate.9.27.) between the infants and juveniles were also found on several occasions.

9.3.2. Resting Sites

Rhesus maintained their diurnal activities both on the ground and on trees. Percent time spent by the animals on the ground (OG) and on the tree (OT) at different parts of the day is shown in Table.9.3. Records of sightings on the ground peaked in the morning i.e. between 06.30 to 08.30 hour and declined gradually throughout the day with the increase of temperature. Percent time spent by rhesus on the tree gradually build up and peaked at dusk (16.00 to 18.00 hour). Southwick and co-workers reported the similar pattern in 1965. Month-wise sightings on the ground declined from January and continued at a low level till May, when the temperature soared from 11^0C to 38^0C. The trend was just the reverse in case of sightings on the tree. Percent animals resting on ground and tree were 46 and 54 in the morning session (06.30 – 08.30 hour), 15 and 85 (11.00 – 13.00 hour) and 16 and 84 in the afternoon session (16.00 – 14.00 hour) respectively. In the morning session when the intensity of light and temperature was low most animals remained on ground but finally they moved to their sleeping sites by the evening in small clusters. Similar observations noted by Puget (1971), Vessey (1972) and Kali (2001). It may be concluded sightings of animals on the ground and on the tree in different parts of the day varied widely and was influenced by light and temperature rather than by the later alone. It may be pointed out that in May percent sightings on ground declined to 30.2 (lowest) but increased again in June to 40.3 despite the general trend of decreasing percent sightings on ground with rise of temperature probably because of increased availability of food i.e. dropped mangoes on the ground.

9.3.3. Utilization of different areas of tree

It was observed that the monkeys used different part of the canopy in specific manner. They, however, were observed to move to terminal parts of the canopy to pluck fruits and feed them. Besides resting and feeding various other activities such as grooming, aggression, play, maternal, mate inspection etc. were also observed at various parts of the canopy. The canopy may extend to a maximum of about 12-15 metres in height. The common nesting trees in this study area are : *Mangifera indica, Phyllanthus emblica, Melia azadirachta, Syzygium cumini, Terminalia bahera, Bambusa tulda, Acacea auriculiformis, Artocarpus heterophyllus* etc. A number of other trees in this study area also provide nesting spots to the animals. Use of different parts of the tree by rhesus were noted seasonally and during the course of the day. The animals were observed to use the entire canopy of tree although different parts were used for different activities. The canopy of tree was differentiated into 3 areas such as central area (C), middle area (M) and peripheral area (P).

Central area of canopy included a spherical area within a radius of 1 metre taking the mid-point of the canopy as the centre. The middle area referred to an area within a radius of 2 metres from the mid point excluding the central area (Plate.9.7.). The remaining part of the canopy was considered to be the peripheral area (Plate.9.8.).

During morning session, the sightings of animals in C and M gradually increased from January to June. On the other hand sightings in the P region was maximum during January and declined to a minimum in June. In mid-day hours the animals tended to spend more time in M and C areas in all the months. Percent time spent by rhesus macaques at different areas of tree during the different day-hours (Table.9.4.) seem to be a function of food, security, avoidance of heat etc.

The intensity of sun light and increase in temperature following compels the animals to spent more and more time in the C area during the noon and afternoon session and in the M area during the morning session. It may be pointed out that

mid-day sightings at M and P region gradually declined from the months of January probably due to increasing of temperature and sunlight. As a whole C area seemed to be the slight preferred region by the rhesus averaging a sighting percent of 43% in comparison to M (38%) and P (19%) region. The rhesus population spend a considerable part of their time in C region of the canopy as because this region apparently provide the animals better security, denser cover and more favourable resting spots (Plate.9.5.). It is to be noted that P region were preferred by the rhesus over C region in the morning session probably as a means to warm-up by absorbing heat from sunlight. Lindburgh (1971) noted that during heavy rainfall monkeys huddled together in the central areas of trees. Vessey (1972) and Sussman (1981) reported that the monkeys changed their nesting sites from one tree canopy to another with seasonal variations in canopy pattern in different tree species.

Table.9.1. Hourly distribution of number of time samples recorded and number of rhesus observed.

Hours	No. of time samples recorded	Total number of rhesus observed	Average number of rhesus per time sample
06.30 – 07.30	98	902	9.2
07.30 – 08.30	80	811	10.1
08.30 – 09.30	58	702	12.1
11.00 – 12.00	80	714	8.9
12.00 – 13.00	72	628	8.7
14.00 – 15.00	68	642	9.4
15.00 – 16.00	66	677	10.3
16.00 – 17.00	82	892	10.9
17.00 – 18.00	90	1056	11.7

Table.9.2. Percent activities of rhesus during study period at different hours of the day.

Average Temperature	:	19^{0}C	21^{0}C	22^{0}C	27^{0}C	30^{0}C	32^{0}C	26^{0}C	24^{0}C	22^{0}C
Hours Activities	:	06.30 07.30	07.30 08.30	08.30 09.30	11.00 12.00	12.00 13.00	14.00 15.00	15.00 16.00	16.00 17.00	17.00 18.00
Feeding	:	26.0	24.0	26.0	36.0	28.0	23.0	25.0	29.0	36.0
Resting	:	19.0	20.0	15.0	26.0	26.0	36.0	22.0	13.0	07.0
Locomotion	:	20.0	23.0	32.0	18.0	18.0	17.0	20.0	24.0	04.0
Grooming	:	08.0	14.0	10.0	08.0	16.0	10.0	09.0	18.0	38.0
Playing	:	09.0	07.0	02.0	-	-	01.0	05.0	02.0	02.0
Aggression	:	04.0	10.0	16.0	08.0	08.0	06.0	06.0	02.0	04.0
Sexual Inspection	:	-	-	-	-	01.0	02.0	02.0	05.0	02.0
Reproduction	:	14.0	02.0	-	04.0	03.0	05.0	11.0	08.0	07.0

* Index : '-' = Nil.

Table.9.3. Percent time spent by rhesus macaques on the ground and on tree in different time of the day during January, 2001 to June, 2001.

Months	Morning Session (06.30 – 08.30 Hours)		Noon Session (11.00 – 13.00 Hours)		Afternoon Session (16.00 – 18.00 Hours)	
	OG	OT	OG	OT	OG	OT
January	68.2	31.8	23.4	76.6	18.1	81.9
February	54.2	45.8	20.3	79.7	17.7	82.3
March	46.7	53.3	17.0	83.0	18.0	82.0
April	40.5	59.5	10.8	89.2	15.5	84.5
May	30.2	69.8	06.2	93.8	12.3	87.7
June	40.3	59.7	13.7	86.3	15.4	84.6
Average	46.6	53.4	15.2	84.8	16.1	83.9

* OG – On Ground; OT – On Tree.

Table.9.4. Month-wise data of percent time spent by rhesus macaques at different areas of tree during the different day-hours in the study period (January, 2001 to June, 2001).

Average Temperature	$19^0C – 21^0C$			$27^0C – 30^0C$			$24^0C – 22^0C$		
	Morning (06.30-08.30 Hrs.)			Noon (11.00-13.00 Hrs.)			Afternoon (16.00-18.00 Hrs.)		
Months	Different areas of tree			Different areas of tree			Different areas of tree		
	C	M	P	C	M	P	C	M	P
January	08.2	30.7	61.1	26.1	48.2	25.7	61.3	08.9	29.8
February	08.0	32.1	59.9	30.4	49.1	20.5	52.2	14.2	33.6
March	14.1	37.2	48.7	38.7	42.3	19.0	49.6	17.3	33.1
April	13.4	46.5	41.1	46.2	37.3	16.5	41.0	24.2	34.8
May	17.8	49.2	33.0	51.3	30.4	18.3	38.2	27.6	34.2
June	20.3	58.3	21.4	62.4	23.7	13.9	32.5	27.9	39.6
Average	13.6	42.3	44.1	42.5	38.5	19.0	45.8	20.0	34.2

* C – Central area of tree; M – Middle area of tree and P – Peripheral area of tree.

Plate.9.1. A group feeding on ground in the morning hours.

Plate.9.2. A juvenile feeding a mango beneath a mango tree.

Plate.9.3. An adult female feeding in a shady area in the morning hours by the side of a *Citrus* tree near a household.

Plate.9.4. A consort pair in resting posture in the mid-day.

Plate.9.5. A consort pair on the branch of a mango tree. The male is resting while the female is grooming.

Plate.9.6. A group is resting in the shade during a hot-humid noon. An infant is seen in contact with its mother.

Plate.9.7. An adult male on the middle portion of a mango tree at noon.

Plate.9.8. The juvenile at the periphery of a mango tree in the morning session.

Plate.9.9. A small group is resting while an adult is seen drinking in the shady pondside area at noon.

Plate.9.10. Quadrupedal group movement on the ground in the morning.

Plate.9.11. A monkey is swimming in a pond in a hot-humid summer noon.

Plate.9.12. A juvenile jumping horizontally while other members of the group are on quadrupedal motion.

Plate.9.13. A consort pair resting in the shade during noon time . The male is grooming the female.

Plate.9.14. A consort pair on the boundary wall of a house in the morning. The female is grooming her mate.

Plate.9.15. A female grooming her mate on the tree in the

Plate.9.16. Two adults and a grown-up juvenile engaged in a fighting interaction in the noon time.

Plate.9.17. Fight between one adult male and the juvenile.

Plate.9.18. Biting attack to the subordinate male by the victorious male, the looser fell down on the ground.

Plate.9.19.Threating posture of an adult male during ground feeding in the noon session.

Plate.9.20. The adult male chasing over the another male.

Plate.9.21. Aggressive encounter between two adults in the late morning session.

Plate.9.22. The infant is in the safe custody of his mother while the dominant adult male move away in search of food in morning hours.

Plate.9.23. An injured infants being nursed by his mother while an adult male looks on.

Plate.9.24. An infant with his mother during feeding in late morning.

Plate.9.25. Sexual inspection in the afternoon session.

Plate.9.26. The female partner inspects the mate in the afternoon session.

Plate.9.27. Play copulation between a juvenile and an infant in the morning hours.

Plate.9.28. An adult male clasping his female partner before copulation in the morning session (I).

Plate.9.29. The partners taking position for copulation (II).

Plate.9.30. Finally the process of intromission is achieved (III).