

## 8. ACTIVITY PATTERN

### 8.1. INTRODUCTION :

Study of daily activity pattern of animals is important in the sense that it enables the observer to make reasonably accurate guess about when and where to find the animal within its habitat. The activities of an animal are not randomly organized, but rather follow some definite schedule with reference to time and space. Some biological clock mechanism seem to regulate their daily activity patterns. The total activity pattern of an animal is often referred to as the behavioural repertoire, i.e. what the animals do and the frequency of occurrence of different activity patterns with reference to time and space is often referred to as behavioural profile or daily activity budget or in other words where, when, and how much of what they do ( Pal, B.C., 1983). The behavioural repertoire varies according to species and circumstances. Various workers classified major activities of animals according to convenience. In general, two tendencies are observed ; some workers, such as Mchugh (1958), Jerman and Jerman (1973), Miura (1981), Jingfors (1982) classified 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 patterns. There exists, however, obvious inherent advantages and disadvantages in both types of divisions, i.e. broad and narrow. The behavioural repertoire of rhesus monkeys in this study has been classified into eight basic acts such as:

- I. Feeding : included eating and drinking and also examining food items followed by eating.
- II. Resting : Animals sitting, standing or lying on the ground or on tree branches without apparent involvement in any specific activity have been included in this category.
- III. Locomotion included all kinds of movement such as walking; hopping, jumping

and running.

- IV. Social Grooming : This involved cleaning of the body fur from insects etc. usually by a sub-ordinate member from the body of a dominant member. However, in case of mother-infant and sexual partners the dominants were observed to groom the sub-ordinate.
- V. Play includes all types of interactions that although contained elements of other discrete acts such as aggression, sex, etc. were incomplete, non-sequential or out of context and as such could not be included in any other category. Play mostly involved grown-up infants, juveniles and young adults.
- VI. Aggression involved fighting and included threat, hop, chase, attack, biting etc.
- VII. Sexual inspection referred to presentation of sexual swelling by females to the males, and physical, visual and olfactory verification of sexual parts by the latter.
- VIII. Copulation included mounting of adult females by adult males followed by intromission of male organ into the vagina.

## 8.2. METHODS

' 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 in studying behaviour of children. Many improvements, however, have been suggested from time to time in this widely used technique for more effective application under specific situations such as field and laboratory set up (Olson and Cunningham, 1934 ;

Dunber, 1976 ; Simpson and Simpson, 1977 and Tylor, 1979 ).

The technique essentially is simple and consists of taking a single count of number of individuals engaged in different behavioural acts at a single glance on every unit time interval. In this study the time interval was 5 minutes. Observations were distributed throughout the day time period starting from 06.00 hours to late dusk i.e. 18.00 hours, so that the total period of observation at any particular hour of the day was comparable to any other period . The actual hourly breakup of the number of time-samples and number of rhesus observed is shown in Table -8.1.

### **8.3. RESULTS AND DISCUSSION :**

#### **8.3.1. Diurnal Activities**

A total of 90 hours of observations were carried out on the activity of rhesus monkeys stretching over 06.00 to 18.00 hours. Observations were made from December, 1988 to May, 1989. A total of 13,841 activity patterns of rhesus monkeys were recorded in 1080 time-sample units.

Percent various behaviour patterns at different hours of observation are shown in Table -8.2 . Feeding was the most prominent activity and was continued throughout the day. It had a bimodal distribution with peaks at morning and dusk. The tempo of morning feeding built up gradually and peaked around 8.00 hour to 10.00 hour, while the peak dusk feeding was observed about 15.00 hour to 18.00 hour. Similar feeding pattern have been reported for rhesus by Lindburgh (1971) and Puget (1971). About 70% of the animals were involved in feeding during the peak feeding hours. Feeding started to decline at 11.00 hour when temperature was 23°C and continued at a low level till 14.00 hour. Only 20% of the animals exhibited feeding during this period . It may be pointed out that lower rate of feeding during mid-day period could be due to high temperature and more resting by the monkeys . It was observed that unlike hot sunny days more rhesus fed during the mid-

day in cloudy days.

Most other activities appeared to be related to feeding. During rest they used to occupy the shady trees of the riverine and sal forests. They rested in different postures (Plate-8.1 and Plate-8.2) either on the ground or on the trees. Resting peaked during 11.00 hour to 15.00 hour when temperature ranged from 25°C and 32°C. Southwick and co-workers (1962,1965), Puget (1971) and Lindburgh (1971) reported resting period was mainly restricted to mid-day session.

Locomotion also occurred at all hours of the day (Plate-8.3). Arboreal pathways through the forest canopy appeared to be well established and groups mostly moved quadrupedally along these routes. However, occasional bipedal locomotion were also seen. Horizontal jumps of incredible lengths were occasionally made by all age-sex classes except infants. Landing was always on the rear feet first. In areas where the canopy of trees over-lapped, established pathways were used frequently. Group members moved in a single file when moving through riverine areas. In sal forest movements were less organised.

Grooming activity although observed at every hour of the day was considerably higher during 09.00 hour to 11.00 hour and 15.00 hour to 18.00 hour (Plate-8.4 and Plate-8.5). Grooming occurred in standing, sitting, and in sleeping posture of the presentor and also on the ground as well as on the tree branches. Usually the groomed animal is dominant over the groomer. However, mutual grooming between mating pairs were also observed. Infants and juveniles from time to time received grooming from the mother.

Playing was confined in the morning and in the afternoon with no occurrence during 11.00 hour to 14.00 hour (Plate-8.6). It was slightly higher during morning hour (6.00 hour to 10.00 hour) than in the late afternoon.

Aggressive acts occurred throughout the day but was maximum in the late morning as

the temperature started increasing. It usually involved encounters between adults and adult-subadults. Aggression involving adult females and infants were not common.

Sexual inspection of ano-genital parts was recorded only in several periods of the day. It was absent in the morning and mid-day.

Copulation activities were slightly higher during morning (7.00 hour to 9.00 hour) and afternoon (15.00 hour to 16.00) than the mid-day.

#### 8.3.1.2. Resting Sites :

During the day-light hours rhesus maintained their activities on the ground as well as on the trees. Overall sighting on the ground (G) and on the tree (T) refer to occurrence of the individuals at respective sites. Percent time spent on the ground and on the tree at different parts of the day is shown in Table-8.3. Sightings on the ground peaked around 06.00 hour to 8.00 hour and declined gradually with the increase of temperature, while sightings on the tree build up gradually and peaked around 16.00 hour to 18.00 hour. Similar pattern was reported by Southwick and Co-workers, 1965. Over the year sightings on the ground declined from January, when temperature was 12°C and continued at a low level till May, when temperature was 32°C. The reverse trend was found in case of sightings on the tree. About 43% and 57% of animals were engaged on ground-resting and tree-resting during 6.00-8.00 hours period while 13% and 87% at 11.00-13.00 hours period respectively. Sighting on the tree increased all the hours and eventually peaked in the dusk. It may be pointed out that a major portion of sighting on the ground occurred at morning hour when temperature and light intensity remained low. During dusk all the animals left the ground towards tree-resting sites and settled down for final sleeping clusters. Puget (1971) and Vessey (1972) also reported similar observations. From the above discussion it may be concluded that sightings on the ground and on the tree in different parts of the day and at different months of study period seemed to be affected by direct high intensity of sunlight or by a combination of sunlight and temperature rather than temperature alone. Significant decline of time spent on the ground in April and May may also have been influenced by wet soil due to premonsoon showers.

### 8.3.1.3. Utilization of Different Parts of the Tree :

It is interesting to note that the monkeys stay or occupy different parts of the canopy of trees in specific pattern. Often the resting spot was found to be the place of origin of two or more branches beset with leaves. No specific nest construction of any sort was found. Nocturnal activities at the nest were also not observed. The canopy may extend to maximum of about 20 metres in height. The common nesting trees are : *Shorea robusta*, *Anthocephalus cadamba*, *Dalbergia sissoo*, *Bombax ceiba*, *Dillenia indica*, *Albizia proceera*, *Terminalia belerica*, *Ammora wallichii*, *Syzygium Sp.*, *Fiscus wrightiana* and *Azadirachta indica* etc. A number of other trees in the sal and riverine forest also provide nesting spots to the animals. Use of different parts of tree by the monkeys were recorded seasonally and during the course of the day. The monkeys were observed to use the entire canopy of tree although different parts were used differentially for different activities. The canopy area was divided into 3 parts, i.e., central area (CA), middle area (MA) and peripheral area (PA).

(i) Central Area (CA), included a spherical area within a radius of 1 metre taking the mid-point of the canopy as the centre.

(ii) Middle Area (MA), referred to an area within a radius of 2 metres from the mid point excluding the centre area.

(iii) Peripheral Area (PA), the remaining part of the canopy was considered to be the peripheral area.

During 06.00 - 08.00 hour, the sightings of animals in CA and MA, gradually increased from December and reached a maximum in May. Sightings in the PA region on the other hand, was maximum during January and declined to a minimum in May. Similarly rhesus tended to spend longer periods in MA and CA during mid-day hours (11.00-13.00) in all the months. Percent occupancy or particular parts of the tree by rhesus as shown in Table-8.4, obviously have been dictated by the suitability of particular spots to meet the immediate necessities of the animals such as food, cover, security, avoidance of heat and other factors required for survival of the animal.

It seems that with the increase of temperature and sunlight following March the animals tend to spend more and more time in MA, during morning and in CA, during mid-day and evening. Activity pattern of rhesus apparently seem to have been influenced more by high intensity of sunlight and temperature. It may further be pointed that mid-day sightings at MA and PA, gradually declined following a maximum in December. This is probably due to increasing sunlight, temperature and insufficient cover provided by these two parts. On the whole CA seemed to be the most preferred region averaging a sighting score of 46% in comparison to 38% and 16% for MA and PA respectively. CA apparently provided the animals with denser cover, better security and more favourable resting spots. As such rhesus spent a considerable part of their time in this region of the canopy throughout the study period although its expanse is limited. However, peripheral areas (PA) were preferred over CA, during morning hours in December-April probably as a means to warm up by absorbing heat from direct sunlight. Vessey(1972) reported that nesting sites were changed as different trees became more or less suitable with seasonal variations in growth. Similar observations were made by Sussman (1981) for crab-eating monkey (*M. fascicularis*). Lindburgh (1971) reported that during heavy rainfall monkeys huddled together in the central sections of trees.

Table -8.1 : 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.
6.00 - 7.00	102	1034	10.1
7.00 - 8.00	92	1209	13.1
8.00 - 9.00	69	1115	16.1
9.00 - 10.00	67	998	14.0
10.00 - 11.00	83	928	11.2
11.00 - 12.00	85	945	11.1
12.00 - 13.00	95	857	9.0
13.00 - 14.00	90	881	9.8
14.00 - 15.00	86	1012	11.8
15.00 - 16.00	88	1210	13.8
16.00 - 17.00	118	1720	15.0
17.00 - 18.00	115	1932	17.0



Table - 8.2 Percent activities of rhesus during study period at different hours of the day.

Temperature	18°C	20°C	21°C	22°C	23°C	25°C	27°C	32°C	30°C	26°C	24°C	20°C
Hours.	06.00	07.00	08.00	09.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
	07.00	08.00	09.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00
Activity												
Feeding	22.0	27.0	28.0	30.0	38.0	25.0	20.0	15.0	20.0	25.0	30.0	35.0
Resting	16.0	20.0	18.0	16.0	12.0	28.0	26.0	35.0	35.0	25.0	15.0	08.0
Loco- motion	18.0	20.0	32.0	25.0	20.0	18.0	12.0	18.0	15.0	18.0	20.0	05.0
Groo- ming	10.0	16.0	15.0	18.0	15.0	16.0	14.0	12.0	14.0	10.0	15.0	40.0
Playing	08.0	05.0	03.0	04.0	03.0	04.0	06.0	05.0	02.0	03.0	03.0	---
Aggre- ssion	10.0	08.0	04.0	04.0	08.0	02.0	08.0	7.0	04.0	06.0	04.0	05.0
Sexual- inspec- tion	---	---	---	---	02.0	03.0	08.0	06.0	02.0	03.0	03.0	---
Copu- lation	16.0	04.0	---	03.0	02.0	04.0	06.0	02.0	08.0	10.0	10.0	07.0

\* Index : '-' = Nil.

Table - 8.3 : Percent time spent by rhesus on the ground and on tree in different parts of the day during December, 1988 to May 1989.

Months	Morning (6.00-8.00 Hours.)		Noon (11.00-13.00 Hours.)		Afternoon (16.00-18.00Hours.)	
	G*	T*	G	T	G	T
Dec. '88	64.3	35.7	25.5	74.5	14.5	85.5
Jan. '89	60.6	39.4	20.2	79.8	11.8	88.2
Feb '89	49.03	50.7	15.4	83.6	10.7	89.3
Mar '89	44.5	55.5	12.1	87.9	07.9	92.1
Apr. '89	20.3	79.7	08.4	91.6	06.2	93.8
May. '89	15.6	84.4	04.2	95.8	02.7	97.3

\*Index : 'G' = animals on the ground , 'T' = animals on the tree.

Table - 8.4 :Month -wise presentation of percent time spent by monkeys at different parts of tree at different hours of the day during December, 1988 to May, 1989

Months	Temperature 18°C - 21°C Morning (06.00-08.00hrs.)			23°C - 32°C Noon (11.00-13.00hrs)			26°C - 20°C Afternoon (16.00-18.00hrs)		
	Different parts of tree			Different parts of tree			Different parts of tree		
	*CA	*MA	*PA	CA	MA	PA	CA	MA	PA
Dec. 88	7.6	27.0	65.4	25.8	50.2	24.0	65.5	9.5	25.0
Jan. 89	9.2	30.2	60.6	35.8	45.0	19.2	56.2	15.6	28.2
Feb. 89	13.5	46.2	40.3	40.0	41.8	18.2	50.4	19.2	30.4
Mar. 89	13.4	48.6	36.0	45.0	40.0	15.0	43.7	23.8	32.5
Apr. 89	18.5	51.2	30.3	55.8	35.0	9.2	40.4	26.4	34.2
May. 89	21.2	60.8	18.0	65.4	25.6	9.0	33.8	28.2	38.0

\* Index : CA = Central Area of tree, MA = Middle Area, PA = Peripheral Area

**Plate - 8.1 : Adults, juveniles and infants of a group during a mid-day rest period on a road side railing at the edge of a river.**

**Plate - 8.2 : Adults, juveniles and infants resting in a typical relaxed position on a road side railing at the edge of a river.**

**Plate - 8.3 : Resting, feeding and locomotion of a group during morning period**



Plate – 8.1



Plate – 8.2



Plate – 8.3

**Plate - 8.4 : A juvenile grooms a sleeping adult male, while three individuals take rest on the ground in a typical seated position during mid-day period.**

**Plate - 8.5 : Adult individuals with juveniles groom each other while on the ground during mid-day period.**

**Plate - 8.6 : Play copulation between a juvenile and a large infant, while other individuals collected food from the road. Arrow shows non-sexual present.**



Plate – 8.4



Plate – 8.5



Plate – 8.6