

6. POPULATION

6.1. INTRODUCTION :

Data on population ecology and density of rhesus monkey in North Bengal regions is almost completely absent. This study attempts to record population ecology data in the field in this region. Populations are the fundamental units in ecology as important to the ecologists as tissues and organs are to the anatomists and physiologists (Southwick, 1972). Knowledge of population tells us its reproductive potential, present status and its distribution and abundance in the area under observation. A population by definition is a group of individuals of the same species operating within a specific time and space (Pearl, 1937; Sladen and Beng, 1969; Odum, 1971).

The present study was done to obtain basic data on the abundance and habitat distribution of rhesus monkey in Baikunthapur forest Division with its adjacent villages (Dabgram), to study certain aspects of its ecology, behaviour and to formulate suitable methods of conservation. Population studies of rhesus monkeys in India has been extensively done by Southwick and his associates (1961, a, b; 1965; 1966; 1967; 1968; 1970; 1977); Neville (1968); and Lindburg (1971) and in Cayo Santiago by Koford (1966) and Sade (1975).

This chapter presents data on distribution, group size, home range, population density, composition, natality, mortality and trends of rhesus population in the study area.

6.2. METHODS :

Population survey work was conducted mainly in the Baikunthapur Forest Division including surrounding villages in the Jalpaiguri District, West Bengal, India. This area is situated in the eastern part of the distribution range of *M. mulatta* in India (Figure-1.1) and is in general considered to be an area of high rhesus abundance.

For systematic field study, the technique adopted by Southwick et. al., (1961) was followed for forest and village surveys. Population survey work was conducted by walking, cycling in the study area with a field assistant for keeping constant watch on monkeys. A scooter was used upto certain distance. The census period was maintained for, 6.00 A.M. to 11.00A.M. and from 1.00P.M. to 6.00P.M. On occasions local people and forest department personnel helped in the survey work within and outside the forest. One square kilometre area was chosen randomly from each block for accurate population counting. On sighting a group the number and age-sex classes were carefully recorded. The study groups were censused in 1987, 1988 and 1989. Regular systematic counts were started in the month of January, 1987. Censuses in the month of May and June provide the best data on Maximum count (June) and minimum count in the month of January of each year. It may be mentioned that the young are born in the months from February to July and the number of deaths or disappearances are maximum in the monsoon and winter.

The population census for Baikunthapur Division as a whole was done in 1987 on the basis of counting of groups and counting the number in each group. In the same year the number of population structure in village area was done. Similar census for the Baikunthapur Forest Division as a whole were also collected for the year 1988 and 1989 on monthwise basis.

The method followed here, was direct count by spatial census. By definition, "a spatial census" is one in which account is made of all the specified 'point in time'. (Overton and Davis, 1969). The animals were counted from permissible distance during feeding and resting period, when they congregate. These areas also contain many other wild animals. One Sq.km area in each block but 2 Sq.Km in Laltong were visited in the same week within specified hours when the animals were usually involved in feeding and resting. It may be mentioned that animals are permanent residents of the division. Besides, these two portions of the division, i.e., Baikunthapur and Apalchand the villages inside and outside the forest area were also thoroughly searched to count the animals which might have remained away from the feeding and resting sites in the specified hours of the day. The sightings of mon-

key in the stipulated time in the study area by others were also considered. Counting was done once in a week from January to August i.e., approximately the period when rhesus monkeys abound in the forest area. The monkeys, however, were sighted throughout the division and adjacent forest areas evenⁿ the remaining months of the year.

Censuses are conducted by careful visual inspection of each home range area, and complete counts are made of all individuals under the four age-sex classes. i.e., (i) adult males, (ii) adult females, (iii) juveniles and (iv) infants. The criteria of defining age-sex classes have been described by Southwick et al., (1965); Southwick and Siddiqi (1968) and Yamagiwa (1979). At the beginning it is necessary to visit an area on several consecutive days to obtain accurate count.

There was no report about trapping in and around the area during the entire study period. It was possible to count with ease all the individuals in small groups but in case of large groups it needed long hours of observation sometimes even several days. The reports of deaths of individuals by other people were also considered.

There are several methods commonly used in wildlife censusing, such as aerial count, time-transact count and foot print analysis. These methods were not followed because of obvious reasons.

6.3. RESULT AND DISCUSSION

6.3.1. Population Estimate :

A hypothetical estimate by Southwick and Siddiqui (1965) gave the rhesus population in Uttar Pradesh (294,364 Sq.Km.) as between 8,00,000 and 10,00,000 in 1960, distributed in various ecological situations : roadside (48,000), canal banks (25,000), railroad (4,000), villages (372,000), small and medium towns (133,000), large towns and cities (100,000), temples (20,000), and forests (100,000). Mukherjee and Mukherjee (1972)

gave specific figures for northern India (Western Uttar Pradesh, Delhi and Haryana). Southwick, Ghosh and Louch (1964) indicated that the major rhesus populations have been distributed to the forested areas in the northern Tarai (the Himalayan foot-hills). In spite of this no estimate of rhesus population in North Bengal as a Whole is available.

Monthwise census data from January to August is shown in Tables-6.1, 6.2 and 6.3 for the year 1987, 1988 and 1989 respectively. The age and sex classes of rhesus were carefully counted. Obviously counts were not inclusive of all the animals present in the block on the specific dates. Generally infants accompanied their mothers but all other age-sex classes sometimes indulged in wandering about away from their groups particularly the juveniles and adult males. Possibly, for this reason often accurate population counts in a group could not be done in single glance counts. Fortunately, an accurate count could always be made by continuing observation on the group for an hour or so. Occasionally for larger scattered groups it was necessary to visit an area on several consecutive days to complete the count. Movement of adult males and juveniles sometimes caused great problems in counting the number of a group. To overcome this problem the total of largest single glance counts on an age-sex class in individual sectors of the study area, irrespective of weather made on scheduled or non-scheduled dates, were considered to form the total population of that age-sex class for the month. The sum of the largest counts of all the age-sex classes constituted the total population of rhesus for that period.

Census data of Baikunthapur Forest Division as a whole is shown in Figure-6.1. Rhesus were less common in the dense forest area. During feeding period they often concentrated at the riverine forest area. In the breeding season, they were mostly found in deep forest areas. Further they concentrated at the edge of the forest and villages during the cultivation period. During July - August, population was low possibly because of heavy rainfall which kept the animals under some rest of cover there by hindering observation.

It is clear from the Tables-6.1, 6.2 and 6.3 that occurrence of animals were higher in Baikunthapur portion than in Apalchand portion. Higher incidence of animals in

Baikunthapur portion is possibly due to greater abundance of preferred food plants.

Figure - 6.1, indicates that population of the division peaked in May- June and were 2800, 3049 and 3259 in the years 1987, 1988, and 1989 respectively. Besides, some animals particularly isolated adult males possibly strayed outside the beat and escaped count. Births peaked in May-June in all the years, as new shoots, fruits and leaves erupted at that period following moderate rainfall. Longest counts were thus obtained in May-June in these areas. July- August count was significantly lower in all the years possibly because of the following reasons : (i) visibility was highly disturbed by rainfall. So, searching of animals was restricted, (ii) movement of the animal was restricted during heavy shower. They possibly took shelter at suitable sites under the cover of thick vegetation and thus shielding themselves from outside. (iii) during rainy season the forest floor was slushy and thickly covered with under bush so that movement was difficult. Besides, unwanted animals such as leeches and snakes were regularly encountered, thus regular systematic searching was hampered.

Southwick et al., (1961, 1965, 1968 and 1977) made census of rhesus in different habitats. Table-6.4, shows population of rhesus in different habitat categories of Baikunthapur Forest Division, such as sal forest, riverine forest, grass-land, basti inside forest (BIF-Phuljhora) and basti outside forest (BOF-Barevasa). It is interesting to note that the incidence of animals in riverine forest was higher (38.7%) than in sal (14.7%) and grassland (9.9%) habitat. Sal forest is less favoured habitat possibly because it does not provide major food-plants. Grassland is preferred even less due to disturbance caused by local people and direct exposure to sunlight and risk of predation. Riverine forest on the otherhand provides abundant preferred food-plants and at the same time excellent cover. BIFs and BOFs near human population were preferred more than sal forests, i.e. 19.8% and 16.9% respectively. Rhesus monkeys survive in villages only by the tolerance of the human inhabitants. BIFs provide readymade supply of food and water. So, occurrence of rhesus in this area was higher (19.8%) than BOFs (16.9%).

6.3.2. Population Dynamics :

It has been generalized that a rhesus group comprises of several individuals i.e., male, female, juvenile and infant. The groups, were specially dominated by an adult male. Few female dominated groups were also found during the course of the study. The tendency of leaving original group by the grown-up males was noted. Females mostly remained in the original group. One group consisting of a single adult male and adult female was also found. Population dynamics will be described in the following sections such as, home range, age-sex composition, natality, mortality and density etc.

6.3.2.1. Home Ranges :

Rhesus macaques, like many other animals, restrict their activities to a rather measurable, circumscribed, geographical area called home range. In a broad sense it may be defined as a composite measure of multiple daily ranges, taking seasonal changes into account, covered by an individual or a group in the course of normal feeding and other conceivable activities. Like many other primates, rhesus monkeys are group living and home range refers to a group rather than individuals. Size of home range varies widely in rhesus monkey and appear to depend on nature of habitat, occurrence of food species and other basic requirements in an area.

Each group has a definite home range which varied from 1.56 to 5.89 Sq. Km. in five different habitats. Within the home range there is a smaller area, where the group spends most of its time, is the core area. Core areas usually include important resting or resting sites and food trees (Jay 1965). In the present study area food trees were essentially concentrated in the riverine forest. So that the home range was prominent towards riverine forests. Table-6.5 represents home range size of rhesus groups in the forest and village areas respectively. The home ranges in the sal forest were larger than riverine forest (1.62 Sq. Km \pm 0.82) as well as grassland (2.64 Sq. Km \pm 0.16). The position of home range in the village habitat as BIF, 1.56 Sq.Km \pm 0.098 and BOF, 3.96 Sq. Km. \pm 1.37. The size of

it depends on the distribution and density of food resting -nesting trees and upon the availability of adequate amount of food. Thus if the food trees are concentrated at a few spots within the home range, the core area (the area of maximum use) may be relatively quite small. It can be cited that distance covered less particularly in riverine forest, 1.62 Sq. Km. 10.82 and in BIF, 1.56 Sq.Km. +0.098 was possibly due to abundance of food trees in those areas. However, by far the greatest number of sightings were made in riverine forest, 38.7% as compared with a range of 9.9% to 19.8% for the others (Table-6.4)

In Dehradun forests the home range was reported to be about 16 Sq. Km. (Lindburg, 1971). In the sub-mountain forests in northern Uttar Pradesh the home range varied from 1 Sq. Km. to 3 Sq. Km. (Neville, 1968). It was estimated as about 0.05 Sq. Km. in the town of Haldwani (Neville, 1968). In temple population in western Uttar Pradesh, Southwick et al, (1965) noted that the groups were aggressive towards each other. In the mangrove swamps of Sundarbans the homerange of a group (20-30 individuals) occupied an entire small island while more groups were found on larger islands (Mukharjee and Gupta, 1965). The extent of a home range may be governed partly by the activities of the dominant males (Southwick and Siddiqi, 1967). In an introduced free ranging colony in La Cueva Island (Puerto Rico), Vessey (1971) noted that the removal of alpha male did not affect group's home range.

6.3.2.2. Birth Season :

Populations of a species may have birth season at different times of the year depending upon geographical distribution and associated climatic conditions. A comparison of timing of births of rhesus macaques cited by different authors seem to support the statement. Dodsworth (1914) reported births in March and April in the Himalayas. Hingston (1920), however, reported births in March in the Himalayas. In Sundarbans, Mandal (1964) found most new born young in April-May but some in September-October. In Rajasthan, Prakash (1958, 1960 and 1962) found births in late March, April and May. He also observed births to occur in September and October. Southwick et al., (1965), Lancaster

and Lee (1965) found births from March to June with a few in September in northern India. In Dehradun forests, Lindburg (1971) noted births to occur in April and May with a few in March. In North-eastern Afghanistan, Puget (1971) found births from April to early November. Southwick (1980), Johnson and Southwick (1984) noted peak births in May-June in Nepal and North India.

In Cayo Santiago, Carpenter (1942) observed births in June-August. Koford (1963, 1965) reported births from mid January to early July, with most births in February-April. Altmann (1962) also found late winter and spring to be the birth season. In La Cuava and La Par Guera, the introduced rhesus macaques showed births during March to August, the majority (80%) concentrated in May, June and July. (Vanderbergh and Vassey, 1968, Vanderbergh, 1972).

A total of 3635 infants were sighted in different months over the study period (Table-6.6). Although the span of birth season extended over a period of eight months the peak period was from May to June when 63.2% births occurred (Figure 6.2.). From Figure 6.2 it is clear that although births start in January but a considerable percentage of infants were sighted in March (10.4%) and April (12.3%).

Thus it may be concluded that reproduction is seasonal. Births in South Asia generally occurs during February to June with a second birth period in September and October in some places. In Baikunthapur Forest Division, however, no births occurred in September and October all births occurred during January to August. From the above discussion it is clear that May-June is the peak birth season in this area.

Females of many non-seasonal species renew their sexual activities after the death of infants (Altmann et al., 1978) but Rhesus macaques undergo a phase of sterility which lasts at least until the beginning of the next mating season. Within the birth season, the timing of birth is dependent on the age and reproductive history of the mother (Drickamer, 1974; Wilson et al., 1978). As found in Barbary macaques (Paul and Thommen, 1984) 4-

year old rhesus macaques gave birth significantly later than all others. Thus, May and June as well as March -April are specially important in rhesus for behavioural studies.

6.3.2.3. Sex Ratio :

Age and sex are vital aspects of population. A growing population must have a healthy ratio of adult males, females, juveniles and infants. Table-6.7 shows adult male to adult females ratio varied from 52 to 99 : 100 from January to August. Table-6.7 also shows that the ratio of juvenile to adult ranged from 15 to 34 : 100 and the ratio of infant to adult female varied from 31 to 45 : 100 . Average adult sex ratio, i.e., adult females per adult male of unprotected and protected rhesus populations were 1.5 and 2.7 respectively in Uttar Pradesh (Southwick, 1977). Southwick (1965) noted that adult male and females ratio was 1:2 in forest areas. Lindburg (1971) found sex ratio in forest area was 1:2.4 to 4. In the sub-Himalayas (Kurseon and Darjeeling in North Bengal) the sex ratio of *M. assamensis* was 1:1.7 (Southwick, Ghosh and Louch 1964) . In Indonesia the mean adult sex ratio in the group was 1:6.3 (Toru ot, 1990). The Malayan pig tails exhibited sex ratio 1: 8 (Caldecott, 1986) . The sex ratio of *M. fascicularis* was 1:25 in Malay (Furuya , 1965).

6.3.2.4. Population Composition :

Percent average age-sex composition in Baikunthapur monkey populations is shown in Table-6.8. Adult males comprised 24.7% , adult females 37.1%, juveniles 22.1% and infants 16.1 % respectively. Table 6.8 shows population composition in 1987, 1988 and 1989.

Population composition of rhesus in Uttar Pradesh was 21.4 % male, 43.6% female, 25.5% infants and 9.5 % juveniles (Southwick , Beg and Siddiqi, 1965). In 1969, the rhesus population in India as a whole had declined to about 5,00,000 but 43.6% were adult females and natality was 80% (Southwick et. al., 1970) . Southwick (1961) noted that lower percentages of juveniles was due to high rate of trapping. It may be pointed out that

there was no report of trapping in the study area and around during the course of the study. Prior to 1972, (Indian wildlife conservation Act, 1972), field surveys throughout the Gangetic basin and Himalayan foot hills, indicated that rhesus population was declining steadily, group sizes were getting smaller and population composition indicated serious shortage of juveniles (Southwick et al., 1961, 1965, 1969). The juveniles are the vital part of rhesus population and was the age group most intensively trapped for commercial export.

Mukherjee & Mukherjee (1972) obtained population composition in northern India as adult, male-21.3%, adult female-41.5%, juvenile 11.1% and infant-26.1% which is similar to southwick et al., (1965). In 1959 the population of Cayo Santiago island comprised of 20% infant, 40% juveniles and 40% sexually mature animals (Koford, 1963, 1965).

The population of rhesus at Baikunthapur having a rather high percentages of juveniles (22.1%) in comparison to northern India may be due to the following reasons :

(i) Absence of effective predators in the study area.

(ii) Strict enforcement of ban on trapping and hunting or other forms of exploitation including ceremonial hunting by the tribals. The percentages of males (24.7%) and females (37.1%) are similar to that recorded for northern India. The percentages of infants accompanied by mothers was 16% which is obvious low than 26.1% observed among the population of Northern india (Mukherjee and Mukherjee, 1972).

6.3.2.5 Natality :

Natality is a measure of reproductive efficiency and growth potential of a species. It can be defined as the average number of offsprings produced per unit time. Natality or birth rate is generally expressed as :

$$\text{Birth rate} = \frac{\text{Number of birth per unit time}}{\text{Average population}} \dots\dots\dots (1)$$

But in case of primates it is expressed as :

$$\text{Birth rate} = \frac{\text{Number of births per unit time}}{\text{Average adult female population}} \dots\dots\dots (2)$$

[Odum 1971]

The latter was followed in the present section.

The equation no. 2, was also used for population dynamics of European bison (*Bison bonasus*) and gaur (*Bos gaurus*) by Guin, (1989). Birth rate of rhesus macaque form 73.0% to 78.80% with an average of 76.3% (Table -6.9) which is more or less similar to Southwick's (1975) observation of 76.4% at Aligarh city (Western Uttar Pradesh) ; of unprotected rhesus population. The semi-protected population of the same area showed an average natality of 90.7%. The rhesus population of Cayo Santiago averaged 78% natality (Koford, 1965) and the rhesus of La Parguera, averaged 73% natality from 1964 to 1972 (Drickamer, 1974). In Srilanka, the toque monkey averaged 59.8% natality (Dittus, 1975). This means that on an average 23.7% females do not give birth to infants which may be due to following reasons :

- i) Some female members newly included in the adult category had not given birth to infants.
- ii) An effect of disturbed habitat condition .

The birth rate in the study area is of course slightly lower than in the semiprotected population of Aligarh. It can be concluded that present population is

disturbed by human activity. It is expected that present population will give better birth rate if they are provided with partial protection. The normal and ideal natality rate is 90.7% in this species. Data of Southwick (1975), Koford (1965), Drickamer (1974) and present study are obviously close to the expected 90.7% natality.

6.3.2.6 Mortality :

In absence of direct observations on mortality such as actual death or detection of any carcass or remnants there of discussion on mortality on the present study is based mainly on indirect data i.e., from analysis of population composition on the assumption that the same population stayed in the Baikunthapur forest over the study period. As the duration of infant stage of rhesus is one year. From Table 6.9, we have 392 infants in 1987 and 421 infants in 1988. The number of juveniles recorded in 1989 were 370. Thus infant loss during the two years (1987 to 1988) is $(392 + 421 - 370) = 443$ which amounts to 54.5% (approx.). This shows that mortality is rather high to that of unprotected and semiprotected population of Aligarh i.e., 18.5% and 15.4% respectively. Infant mortality in this area is much higher than that of the rhesus colony in Cayo-Santiago (8-9%) whereas rhesus populations at La Parguera exhibited annual mortality as 17-19% (Drickamer 1974).

During my survey tenure I did not find any removal of infants by trapping. Forest watchers, however, reported occasional trapping. So, loss of infants due to occasional trapping could be a factor. Immunity does not grow rhesus infants probably until the age of one year. (Southwick, 1977). So, the chances of loss due to disease and starvation can not be eliminated. Southwick (1977) reported probable illegal trapping, lack of sufficient food materials and weather. Accidental death of infants during group movement was also found and forest watchers reported infant hunting by tribal people and killing by leopard and python. Drickamer (1974) showed that infant mortality varied according to the parity of the mother, social rank of the mother and month of births.

6.3.2.7 Population Increase :

The rhesus population at Baikunthapur forest showed moderate increase from 1540, to 1677 and to 1747 in the years 1988 and 1989 respectively (Table-6.9). Table 6.9 shows that rhesus population increased at the rate of 8.89% and 4.17% during 1987-1988 and 1988-1989 respectively. The average annual increase is 6.53%. Chhatari (Aligarh) population showed an average annual increase of 5.6% from 1959 to 1975 (Southwick and Siddiqi, 1977), Cayo Santiago population increased at 16% during 1960 to 1964 (Koford, 1966), and over a ten years period increase was 13.4% in La Parguera (Drickamer, 1974). The Japanese macaques showed an average annual increase of 10.2% over a 20 year period (Itani, 1975). The howler monkey population at Barro Colorado island increased at an average annual increase of 16% (Carpenter, 1962).

These data indicate that monkey populations are capable of increasing steadily when provided with suitable habitat, food and protection. The rate of increase of the present population is lower than that of other populations under comparable situations.

No trapping operation was observed but extension of human population and deforestation in the area were well marked. The present population may be considered to be disturbed by human activity.

Southwick and Siddiqi (1977) expected an average annual rate of increase of 10-16% for this species in Northern India. Data of Southwick (1977) and that of the present study were considerably lower than expected.

6.3.2.8 Population Density :

Because of greater availability of food in forest environments, primate populations are denser there than in other habitats (Crook, 1970). But information regarding population density of rhesus is inadequate. Most workers did not work out population

density in details. Neville (1968) reported that 5-15 individuals per Sq. Km. in elevated chir forest, 57 individuals in the moist deciduous areas at lower elevations and about 753 in the towns of northern Uttar Pradesh.

Density of pig-tailed macaque (*M. nemestrina*) was approximately 53 per Sq. Km. (Toru et, 1990). Population density of Hanuman langur in forest area of North India was 57.9-134.6 per Sq. Km (Oppenheimer, 1975). The population density is calculated here, by dividing the animals sighted per month by the area of the portion. As the rhesus tended to concentrate in the two portions of the division, i.e., Apalchand and Baikunthapur, a comparison of density between the two portions is made in Table-6.10. The abundance of large wild animals specially large carnivores are less in Baikunthapur portion than that of Apalchand. Thus, it can be cited as another factor for higher density in Baikunthapur. The density of rhesus at Baikunthapur forest changed all the months of the year within the forest area. Births peaked in May-June as such the density also peaked in May and June every year. The carrying capacity of any part with respect of rhesus has not been determined. The maximum population density observed for rhesus population was 102 animals per Sq. km. in June, 1989.

Table - 6.1 : Monthwise census data from January, 1987 to August, 1987.

Month	Apalchand Portion				Baikunthapur Portion						
	M	F	J	I	T_A	M	F	J	I	T_B	$T_A + T_B$
Jan.	35	45	25	20	125	60	100	38	52	250	375
Feb.	47	60	33	25	165	85	125	50	70	330	495
Mar.	56	72	40	37	205	95	165	70	80	410	615
Apr.	70	90	50	35	245	120	200	56	104	490	735
May	105	135	100	105	420	165	275	168	207	790	1260
June	126	162	115	132	510	210	375	160	260	980	1540
July	07	09	05	04	25	15	20	10	10	55	80
Aug.	05	09	04	02	20	08	15	05	07	35	55

Index : M = Adult male , F = Adult female , J = Juvenile, I = Infant,

T_A = Total population of Apalchand, and T_B = Total population of Baikunthapur portion.

Table - 6.2 : Monthwise census data from January, 1988
to August, 1988.

Month	Apalchand Portion					Baikunthapur Portion					
	M	F	J	I	T _A	M	F	J	I	T _B	T _A + T _B
Jan.	42	54	30	34	160	75	125	65	25	290	450
Feb.	56	72	40	32	200	90	160	78	52	370	570
Mar.	70	90	45	35	240	105	175	91	89	450	690
Apr.	80	100	60	40	280	120	200	104	106	530	810
May	112	144	111	104	441	180	300	187	234	901	1342
June	133	171	126	126	556	225	375	226	295	1121	1707
July	6	10	6	3	25	12	22	10	6	50	75
Aug.	-	12	4	4	20	25	45	15	15	100	120

Index : M = Adult male, F = Adult female, J = Juvenile, I = Infant,

T_A = Total population of Apalchand, T_B = Total population of Baikunthapur portion and '-' = nil.

Table- 6.3 : Monthwise census data from January, 1989
to August, 1989.

Month	Apalchand Portion					Baikunthapur Portion					
	M	F	J	I	T _A	M	F	J	I	T _B	T _A + T _B
Jan.	59	73	35	23	190	75	145	70	30	320	510
Feb.	66	72	50	37	225	95	155	90	50	390	615
Mar.	80	100	60	45	285	115	175	101	89	480	765
Apr.	94	106	70	50	320	140	220	114	106	580	900
May	122	154	121	124	521	200	320	197	274	991	1512
June	129	163	149	135	586	250	395	221	305	1171	1747
July	16	20	9	10	55	--	--	--	--	--	55
Aug.	--	--	--	--	--	20	38	25	17	100	100

Index : M = Adult male, F = Adult female, J = Juvenile, I = Infant,

T_A = Total population of Apalchand Portion,

T_B = Total population of Baikunthapur portion and '--' = nil.

Table - 6.4 : Percent sightings of rhesus monkeys in different habitat categories of Baikunthapur Forest division during the study period

Habitat	Habitat condition	No. of Monkey's counted	Percent of sightings
Sal Forest	UD	921	14.7
Riverine Forest	UD	2473	38.7
Grassland	PD	632	9.9
BIF	UD/PD	1269	19.8
BOF	D	1082	16.9

Index : 'BIF' = Basti inside forest, 'BOF' = Basti outside forest,
'UD' = Undisturbed, 'PD' = Partly disturbed, 'D' = Disturbed.

Table - 6.5 : Home range of rhesus Monkey's in different habitat of Baikunthapur Forest Division during the study period.

No. of group	Sal Forest Sq. Km	Riverine Forest Sq. Km	Grassland Sq. Km	Basti inside Forest Sq. Km (BIF)	Basti outside Forest Sq. Km(BOF)
1	4	2	2	2	5
2	7	1	3	2	5
3	5	3	3	3	5
4	3	2	3	1	5
5	5	1	2	1	6
6	5	2	3	2	4

.Contd.....

Table 6.5 Contd.

No. of group	Sal Forest Sq. Km	Riverine Forest Sq. Km	Grassland Sq. Km	Basti inside Forest Sq. Km.(BIF)	Basti outside Forest Sq. Km(BOF)
7	4	2	2	2	4
8	8	1	3	2	3
9	7	5	1	2	3
10	7	5	1	3	5
11	6	2	2	1	5
12	4	3	3	1	5
13	6	4	3	2	4
14	7	1	3	2	2
15	6	1	6	1	2
16	6	1	3	2	1
17	7	1	2	1.5	1
18	6	1	5	1.5	5
19	6	1	4	2	5
20	5	2	3	1	5
21	4	2	2	1	5
22	8	1	3	2	4
23	6	1.5	1	1	4
24	6	1.5	1	0.5	4
25	6	1.5	3	0.5	4
26	7	1.5	2	1	2
Total	153	43	69	40	103
Average(x)	5.89	1.62	2.64	1.56	3.96
	± 1.32	± 0.82	± 0.16	± 0.098	± 1.37

Table - 6.6 : Sightings of new born in different months in different years at Baikunthapur Forest Division.

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
1987	72	95	117	139	312	302	14	09
1988	59	84	124	146	338	421	09	19
1989	43	87	134	156	398	440	10	17
Total	174	266	375	441	1048	1253	33	45
Percentages	4.7	7.3	10.4	12.3	28.8	34.4	0.9	1.2

Table - 6.7 : Different ratios on population structure of rhesus monkey during 1987 - 1989 at Baikunthapur Forest Division.

Month	Adult Male : Adult Female	Juvenile : Adult	Infant : Adult Female
January	79.0 : 100	29.2 : 100	31.3 : 100
February	82.8 : 100	32.9 : 100	40.0 : 100
March	99.2 : 100	30.9 : 100	45.6 : 100
April	82.4 : 100	33.3 : 100	42.9 : 100
May	78.2 : 100	31.7 : 100	42.8 : 100
June	78.2 : 100	34.2 : 100	43.6 : 100
July	74.3 : 100	29.4 : 100	43.2 : 100
August	52.9 : 100	15.3 : 100	38.6 : 100

Table - 6.8 : Population composition of rhesus monkeys during 1987, 1988 and 1989 at Baikunthapur Forest Division.

Year	Male		Female		Juvenile		Infant		Total no. of monkey
	No.	%	No.	%	No.	%	No.	%	
1987	1284	24.8	1938	37.4	1113	21.5	840	16.3	5175
1988	1393	24.4	2109	37.2	1266	22.2	928	16.2	5696
1989	1539	25.0	2214	36.2	1399	22.8	982	16.0	6134
Average		24.7		37.1		22.1		16.1	

Table - 6.9 : Population structure on maximum count on different age - sex classes.

Year	Male		Female		Juvenile		Infant		Total
	No.	%	No.	%	No.	%	No.	%	
1987	336	62.5	537	100	275	51.2	392	73.0	1540
1988	358	65.5	546	100	352	64.4	421	77.1	1677
1989	379	67.9	558	100	370	66.3	440	78.8	1747

Table - 6.10 : Density of rhesus monkey per square-kilometre at different portions of Baikunthapur Forest Division in different months during 1987, 1988 and 1989.

Months	Apalchand			Baikunthapur		
	1987	1988	1989	1987	1988	1989
January	15.6	20.0	23.7	25.0	29.0	32.0
February	20.6	25.0	28.1	33.0	37.0	39.0
March	25.6	30.0	35.6	41.0	45.0	48.0
April	30.6	35.0	40.0	49.0	53.0	58.0
May	45.6	50.0	52.5	73.0	77.0	81.0
June	56.2	59.3	63.1	90.0	94.0	102.0
July	3.1	3.1	6.8	5.5	5.0	--
August	2.5	2.5	--	3.5	10.0	10.0

-- = indicate nil.

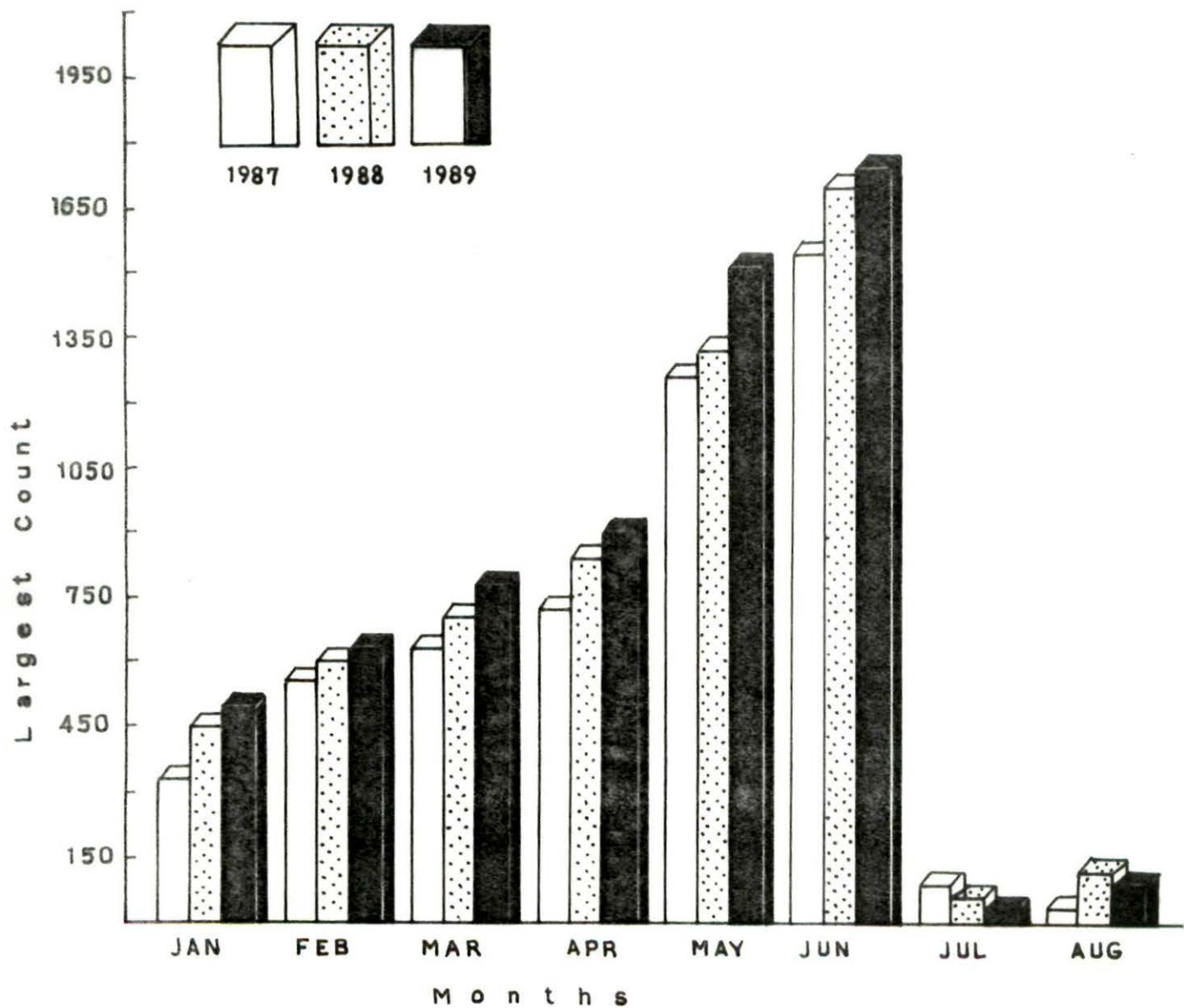


Fig. 6-1 : Estimated population of rhesus monkey in different months of the year, 1987, 1988 and 1989 at Baikunthapur Forest .

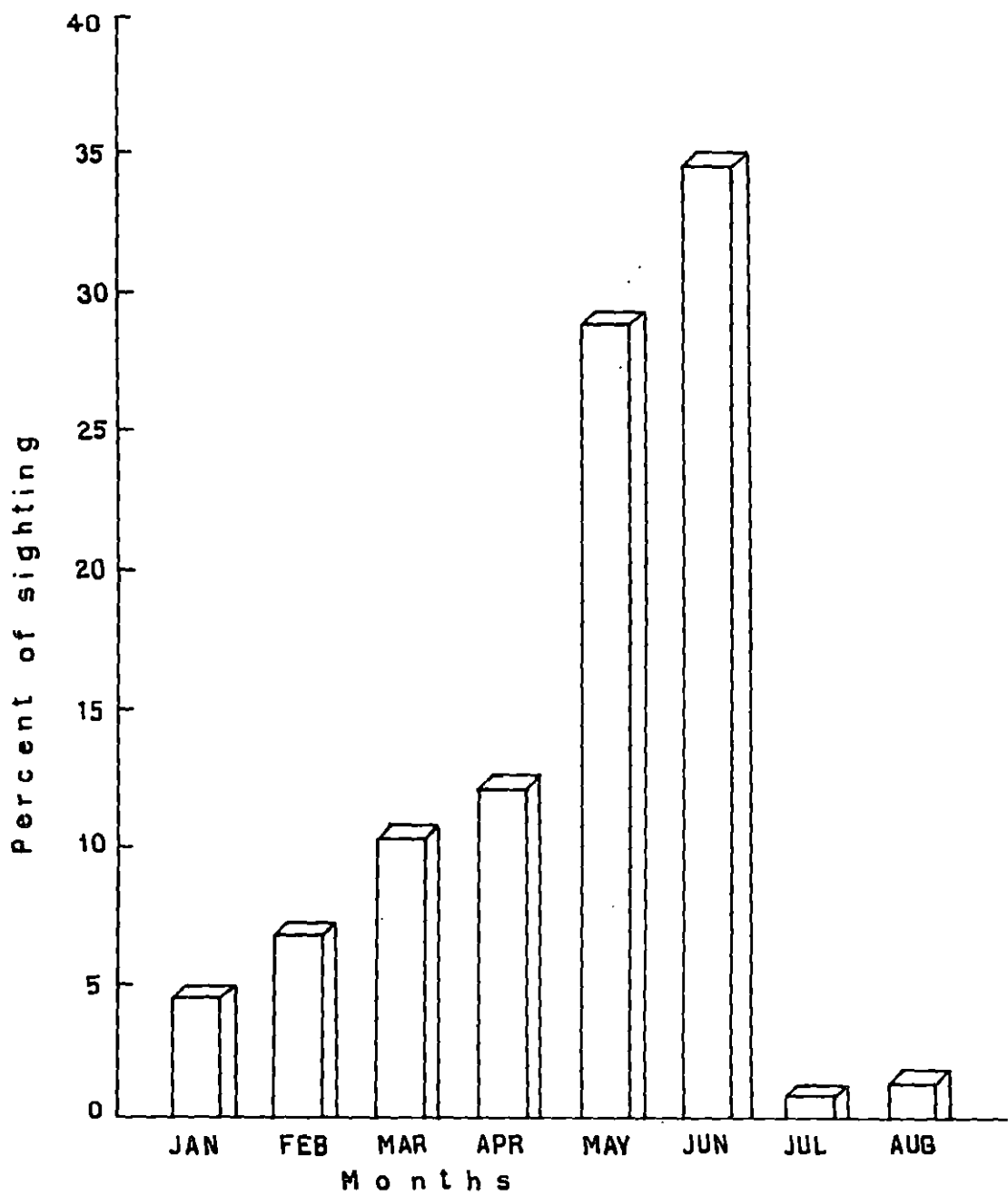


Fig. 6-2: Percent sightings of infants of rhesus during study period at Baikunthapur Forest .