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RHESUS MONKEY *MACACA MULATTA* IN THREE NORTHERN DISTRICTS OF WEST BENGAL, INDIA

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INTRODUCTION

Among all other macaques in India, rhesus monkey (*Macaca mulatta*) is the most common monkey and occupied an important role in the cultural and traditional aspects of the country. It inhabits in diverse habitats from dense forests, mountains to open lands and near human settlements. The range of distribution of rhesus macaque and hanuman langur is very interesting. Hanuman langur (*Semnopithecus entellus*) is distributed throughout India except northeastern India while rhesus macaque occurs in all habitats of India. In southern Indian states, it is replaced by other two species *viz.* Bonnet macaque (*Macaca radiata*) and lion tailed macaque (*Macaca silenus*).

Studies on rhesus monkey were in carried out by a number of workers in West Bengal; Southwick *et al.*, (1964) surveyed in the road sides between Contai and Kakdwip in the south, from Bankura to Asansol in the west and Darjeeling district in the north. Mandal (1964) reported the behaviour of rhesus monkeys in the Sundarbans; Mukherjee and Gupta (1965) recorded on the habits of this species at Sundarbans. Khajuria (1966) published a brief account of the distribution of Assamese macaque found in certain parts of Darjeeling district, West Bengal. Mukherjee *et al.*, (1995) conducted a survey of Darjeeling district on the distribution, abundance of Rhesus and Assamese macaques.

This paper deals with the distribution, abundance and social composition of *Macaca mulatta* in three northern districts of West Bengal, India, *viz.* Darjeeling, Jalpaiguri and Coochbehar (Fig. 1). Field surveys carried out in 1997 at Darjeeling district and in 1998 at Jalpaiguri and Coochbehar districts. In West Bengal now the rhesus monkeys inhabit only in the north Bengal and in Sundarbans. So, these three northern most districts are taken up to find out their population trend.

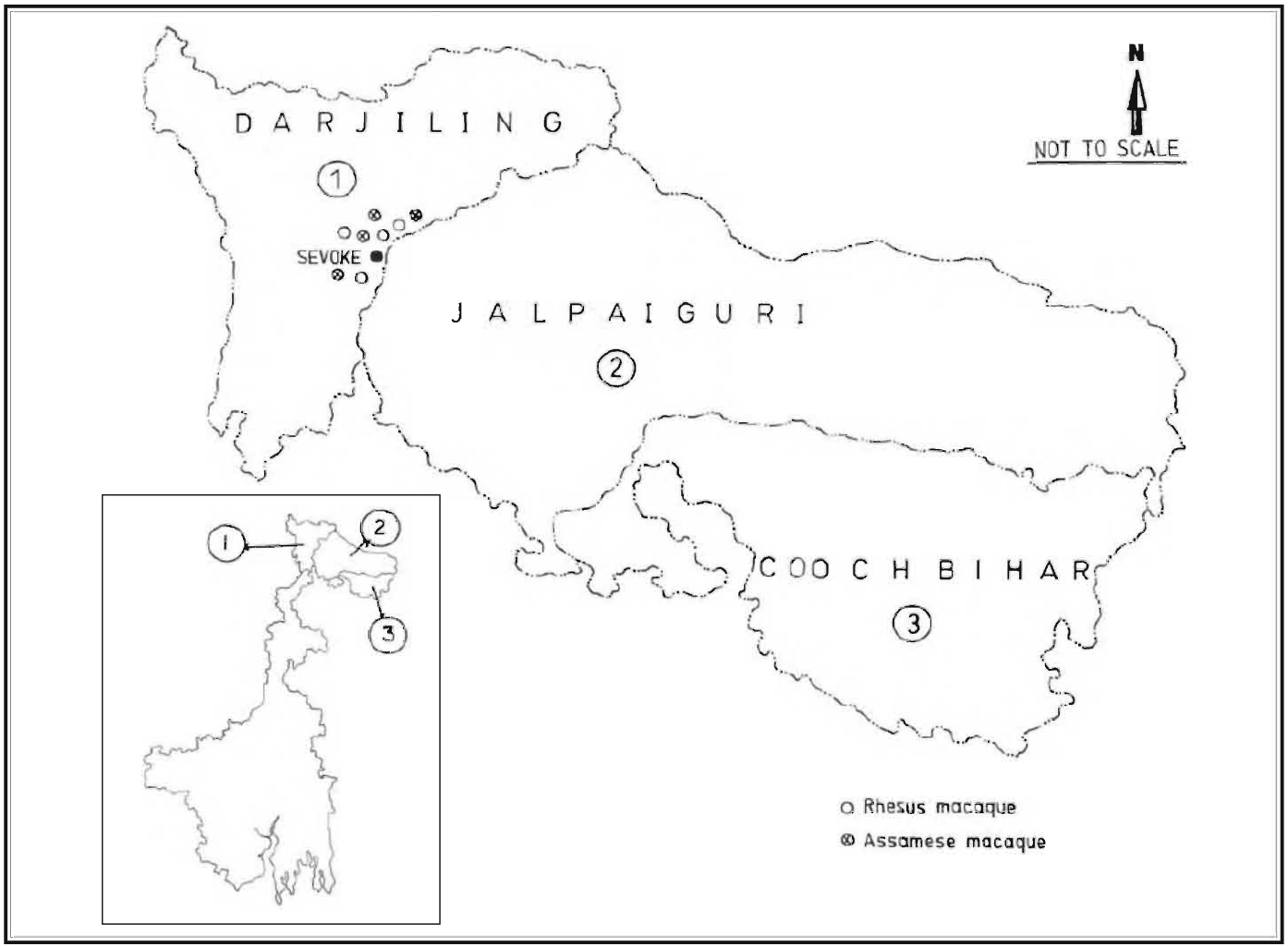

Fig. 1. : Map showing three study districts of North Bengal.

ECOLOGY OF THE STUDY AREAS

The Darjeeling district lies between 87°56'–88°2' E and 26°33'–27°13' N with an area of 3148 sq. km. The mean temperature varies from 18.5°–34°C (max) and 1.6°–8.5°C (min) with an average annual rain fall of about 2600–3000 mm. The major part of the district falls on Sub-Himalayan region, extended over an elevation of 50 m to 3800 m. About 20% of the total area are dense forests and 11% open forests. The detail ecology of the district was discussed elsewhere (Murmu *et al.*, 2004).

Jalpaiguri has an area of 6226 sq. km and it lies in the moist tropical zone. The average day temperature varies from 15.5°C to 32°C, depending upon the season. The effect of the south-east monsoon is marked by the onset of rain in the latter part May. The average annual rainfall varies from 4100–5100 mm. The main rivers of the district are Rydak, Jaldhaka, Torsa, Kalgini and Dhawis. The forests do not form a continuous belt, however, some well known forests such as Gorumama Wildlife Sanctuary, Chapramari Wildlife Sanctuary, Jaldapara Wildlife Sanctuary and Buxa Tiger Reserve are situated in this district. These forests lie on the elevated plateau of the rivers and in the flat plains. The total forested area is 23.5%, out of which 13.26% dense forests, 5.9% open forests and 4.37% plantation with a total area of 1465 sq. km. The Sal forest, which is most important from the economical and ecological point, extends over large parts of the plains and foothills. The bulk of the forest is situated in the Bhabar and Terai areas at the foothills with a general inclination from north to south.

The district Coochbehar geographically forms part of the Himalayan terai and lies between latitudes 25°87'–26°32' N and 88°47'–89°54' E longitudes. This district is almost plain land, which is intersected by numerous rivers such as Torsa, Jaldhaka, Kaljini, Gadadhar and Rydak. These rivers flow from northwesterly to southeasterly direction.

The mean temperature in the coldest months of January is 10.4°C and the mean maximum is 24.1°C. The average annual rainfall is 3200 mm. The total geographical area of the district is 3388 sq. km of which 37.1 sq. km is under forests and it is only 1.09% of the total area of the district.

METHOD

The survey was conducted on roadsides and forested areas. The roadside surveys were made from a slow moving vehicle with four observers, while the forest roads and trails were surveyed both on foot and on vehicle. Transect and point methods were applied to locate the monkeys. The transect method in the forest path was accomplished by slow walking and waiting for 5–6 minutes in every 200 m for visual and auditory signals of the presence of monkeys (Southwick *et al.*, 1961). The point method was adopted in Darjeeling district where the range of elevation was

200 m and above. The surveys conducted mainly in the forenoon (0700–1100 hr) and afternoon (1500–1800 hr) in summer and during the whole day in winter. A total of 300 hours were spent for census work. On locating the groups notes on their social composition, habitat and human interaction, were recorded. The individuals of the group were classified as adult males, adult females, juveniles and infants. The juveniles were those more than one year or less than three years old and infants were those carried by mothers, pre-weaned and less than one year old.

RESULTS

Darjeeling

21 groups of rhesus macaques were recorded in about 1200 km^2 survey. The 21 groups contained 402 monkeys of which 55 were adult males, 215 were adult females, 78 were juveniles and 55 infants. The group size varied from 2 to 38 excluding one temple group consisting of 72 monkeys (Table 1). The percentage compositions of 402 monkeys were 13.6% adult males, 53.5% adult females, 19.5% juveniles and 13.4% infants. The ratio of adult male to adult females was 1 : 3.9. The ratio of females to infants was 1 : 0.2 and ratio of sub-adults was 1 : 0.6. About 25.1% females having infants.

Habitat analysis revealed that rhesus of Darjeeling was harbouring in two main categories, roadsides and forests. Four groups were recorded in the forest consisting of 49 monkeys and 16 groups were found in roadsides with a total of 281 monkeys. One temple group was found in Darjeeling town containing 72 monkeys at an altitude of 2120 m. and it was the highest elevation where rhesus was found in the district.

Mukherjee *et al.*, (1995) recorded 11 groups of rhesus macaque with a total of 188 monkeys at Darjeeling. Out of which 23 were adult males, 97 were adult females, 34 each were juveniles and infants. So, there was a considerable increase in number of groups and total number of monkeys in all categories, but decrease in the percentage of infants from 18.1% to 13.4% and also marginal fall in female-subadult ratio. The comparative figure of both the surveys are given in Table 2.

The other species of monkey inhabiting at Darjeeling is Assamese macaque (*Macaca assamensis*). Mukherjee *et al.*, (1995) observed that Assames macaque were more in relatively upper elevation whereas the rhesus inhabited in lower elevations. During the present survey a shift in their habitat preference was observed as the rhesus monkeys were approaching the upper ridges along roadside in this district.

Jalpaiguri

The monkeys that were encountered in the district from 2000 km^2 were all forest dwelling groups. 24 groups with a total of 318 monkeys were recorded. The social composition of monkeys

were 54 adult males, 150 adult females, 63 were juveniles and 51 infants. The group size varied from 2 to 45 individuals with an average of 13.25 ± 2.3 monkeys (Table 3). Adult males to adult females ratio was 1 : 2.77, adult females to juveniles and infants were 1 : 0.42 and 1 : 0.34 respectively. The percentage composition of the groups was 17% males, 47.2% females, 19.8% juveniles and 16% infants. The ratio of infants to adult females was quite less and 10 groups had no infants at all. 34% of females were carrying infants.

Extrapolation of rhesus macaque population distributed in the forested habitat of Jalpaiguri district provides an estimate of 0.04 groups/km^2 consisting of 0.53 monkeys/km^2 in the surveyed areas. The village and roadside monkeys were not encountered during the present survey. The forests of Jalpaiguri provide food and ideal shelter for monkeys as compared to other districts of West Bengal, where the bulk of primate population inhabits in the villages. The major food trees are *Terminalia belerica, T. cerenulata, Schima wallichii, Sterculia villosa, Michelia champaca, Amoora rohituka, Lagerstroemia parviflora, Michelia excelsa, Gmelina arborea* and numerous shrubs and herbs. This district is still retaining viable tropical rainforests in West Bengal.

Coochbehar

Only 3 groups of rhesus macaque were recorded totaling of 27 monkeys from an area of 1500 km^2 at Coochbehar (Table 4). These three forest groups inhabited exclusively in close proximity to each other in the eastern fringe of the district (Atiamochar range). Local inquiries also revealed that there were no monkeys in other parts of the district.

DISCUSSION

The present analysis indicates that amongst three surveyed districts, the rhesus population is more in Darjeeling district though the number of groups is more in Jalpaiguri district (Fig. 1). Mukherjee *et al.*, (1995) recorded 11 groups of rhesus macaque with a total of 188 monkeys in 1985 census. Out of these 11 groups, 3 were recorded in forests at Sevoke, 1 in Gorubathan forest (eastern side of the Darjeeling bordering Jalpaiguri) and the remaining groups were located in the roadside. During the survey it was found that Gorumara group was lost and the forest have become more open. In 1985 census 437 linear km. surveyed showed one rhesus group in every 39.7 km. at Darjeeling whereas during the present survey of 543 linear km. revealed one group in every 25.8 km. and 1 group/57 km^2. Though arithmetically the figure showed one group in every 25.8 linear km. when the groups are extrapolated in the total surveyed areas to monkey population in general, but the rhesus was concentrated in a very limited area of Darjeeling district mainly roadside forests.

Southwick *et al.*, (1964) recorded 6 groups of rhesus monkey in 120 miles of forest road survey, *i.e.*, one group in every 20 miles (32 km.) in northern Bengal. Southwick *et al.*, (1964)

opined that the accurate comparison couldn't be made with the estimated made during 1962, as the area was full of forests.

Population estimation for last 12 years indicates an increasing trend at lower elevation but a few groups are also observed in the higher elevation. Murmu *et al.*, (2004) also recorded that rhesus inhabiting in lower elevation (150–500 m) at Darjeeling. There is another monkey species at Darjeeling, the Assamese macaque (*Macaca assamensis*). The Assamese macaque is now restricted in its distribution at Darjeeling and at Gorumara wildlife sanctuary of Jalpaiguri district, West Bengal (Murmu *et al.*, 2004), while the rhesus macaques are found in all three districts. In the past Assamese macaque had a sizeable population at Jalpaiguri but due to invasion of highly adaptive species of rhesus macaque in the territory of Assamese macaque it was wiped out from other area and restricted in few pockets at Gorumara WLS. At Sevoke-Bagrakote road (Fig. 1) in the foothills these two species are harbouring in the same area but there home range did not overlap. Provision food is another factor for concentration of monkey's in roadsides. All the roadside groups are partially provisioned and the foodstuffs are offered by the commuters of the road mostly Bus or Truck drivers.

The rhesus population of Jalpaiguri district is restricted in the forest habitat. 318 monkeys in 24 groups were recorded in a large area of the forest. Further, the forest rhesus are very shy and it was not possible to count 3–4 groups during the field survey, hence these groups are not included in this report. Food is one of the important limiting factor in the distribution of animals. The rhesus macaques are predominantly ground feeder and they utilize mainly seeds and fruit including herbs, shrubs and leaves. The majority forests of the present Jalpaiguri having monoculture plantation and this not much suitable for primates.

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Table 1. : Distribution and social composition of Rhesus macaque at Darjeeling district.

Sl. No.	Location of group	Total	Males	Females	Juveniles	Infants
1.	Sukna forest, 1 km from Sukna Range office in Mahananda Wildlife Sanctuary	2	1	1	–	–
2.	Sukna forest	21	2	12	4	3
3.	Sukna forest	17	3	10	3	1
4.	2 km north of Rongton near Chunabhati	23	3	13	4	3
5.	5 km north of Sukna between Sukna and Tindharia	11	1	5	2	3
6.	7 km north of Sukna to Tindharia (60 km Milepost near falls)	4	1	3	–	–
7.	Garidhura (Range Bamanpukhri)	15	2	8	2	3
8.	Garidhura	12	2	6	2	2
9.	1.5 km from Garidhura village on Pankhabari road	14	1	6	3	4
10.	On Simulbari-Mirik road crossing	11	2	6	1	2
11.	0.5 km from Garidhura village on Pankhabari road	9	2	5	2	–
12.	2 km from Bamanpokri Range office towards Sukna	9	2	5	2	–
13.	Darjeeling town	72	10	32	19	11
14.	10 km from Jore Bungla (Ghoom towards Testa)	28	3	16	5	4
15.	6 km from Jore Bungla to Teesta	13	2	7	2	2
16	3.5 km from Sevoke to Bagrakote	12	2	8	2	–
17.	4 km from Sevoke to Bagrakote	27	3	15	4	5
18.	Mongpong, 4.5 km from Sevoke to Bagrakote	38	4	20	9	2
19.	Samsing, 3.5 km from Samsing on Khasmehal Basti	20	3	13	2	2
20.	Mongpong, 4 km from Sevoke to Bagrakote (Ratikhola Jhora)	28	3	14	7	4
21.	Ringdung, 2 km from Mongpong	16	3	10	3	–
	TOTAL	**402**	**55**	**215**	**78**	**54**
	MEAN	**19.14±3.33**	**2.61±0.42**	**10.23±1.54**	**3.71±0.91**	**2.57±0.56**

Table 2. : Population composition of Rhesus macaque observed in 1985 and 1997 at Darjeeling district.

Year	Species	Km. surveyed (linear)	No. of groups seen	No. of groups counted	Km. per group	No. of monkey (sample size)	Average group size	Adults %		Sub-adults %	
								Male	Fem	JJ	II
1985	M. mulatta	437	11	11	39.73	188	17.09	12.23	51.59	18.09	18.09
1997	M. mulatta	543	21	21	25.8	402	19.14	13.68	53.48	19.40	13.43

Table 3. : Distribution and social composition of Rhesus macaque at Jalpaiguri district.

Sl. No.	Locality	Total	Adult Males	Adult Females	Juveniles	Infants
1.	Panijhora, 1 km from Rajabhatkhawa	7	2	3	–	2
2.	On Kalimpong-Lava road, 10 km from Lava	33	5	13	8	7
3.	Jayanti west beat (Buxa)	16	3	7	2	4
4.	22 miles beat office (Buxa)	3	1	2	–	–
5.	Rajabhatkhawa	7	2	4	1	–
6.	0.5 km from Rajabhatkhawa Tower road	6	1	2	2	1
7.	3 km from Rajabhatkhawa on Tower road	3	1	1	1	–
8.	Valka range, Barobisa F. R. H.	3	1	1	–	1
9.	1 km from Barobisa F. R. H.	2	1	1	–	–
10.	Rungdung village 2 km from Mongpong	16	3	10	3	–
11.	Elenbari	6	1	4	1	–
12.	Near Mongpong	10	2	6	1	1
13.	Chapramari Forest	19	4	8	5	2
14.	Chapramari Forest	12	3	6	2	1
15.	Bagrakote	16	2	7	4	3
16.	Lataguri Forest	21	3	12	6	–
17.	Lateguri Forest	2	1	1	–	–
18.	Lateguri Forest	8	2	4	–	–
19.	Khunia Basti-Murti Forest	15	2	8	3	2

Table 3. : *(Cont'd.).*

Sl. No.	Locality	Total	Adult Males	Adult Females	Juveniles	Infants
20.	Murti Forest	30	4	14	6	6
21.	Chilapata Forest	19	2	10	2	5
22.	Kodali Basti	45	5	16	12	12
23.	3 km from Kodali Basti	14	2	7	3	2
24.	2 km from F. R. H. at Barobisa	5	1	3	1	–
	TOTAL	**318**	**54**	**150**	**63**	**51**
	MEAN	**13.25± 2.3**	**2.25± 0.26**	**6.25± 0.92**	**2.62± 0.62**	**2.12± 0.60**

Table 4. : Distribution and social composition of Rhesus macaque of Coochbehar district.

Sl. No.	Locality	Total	Adult Males	Adult Females	Juveniles	Infants
1.	Atiamochar Range	5	1	2	1	1
2.	Atiamochar Range	10	2	5	1	2
3.	Atiamochar Range	12	2	7	1	2
	TOTAL	**27**	**5**	**14**	**3**	**5**
	MEAN	**9± 2.55**	**1.66± 0.40**	**4.66± 1.77**	**1± 0**	**1.66± 0.4**