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STATUS OF FOUR ARBOREAL SPECIES OF MAMMALS IN DARJEELING DISTRICT, WEST BENGAL, INDIA

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INTRODUCTION

To ascertain the present status of four arboreal species of mammals *viz.*, Rhesus Macaque, *Macaca mulatta* (Zimmermann), Assamese Macaque, *Macaca assamensis* (M'Clelland), Common Langur, *Semnopithecus entellus* (Dufresne) and Malayan Giant Squirrel, *Ratufa bicolor gigantea* (M'Clelland) in North Bengal, a project was undertaken by the Zoological Survey of India. The project was taken up for the following reasons (i) to ascertain their abundance, (ii) to add information at National level about their population and lastly, (iii) to collect data to built up comparative behavioural and demographic studies. The knowledge about the population status of primates is a prerequisite to formulate any management plan or to carry out meaningful long-term behavioural studies. Therefore, this population survey may add some information to primate resources in India.

The distribution of these four arboreal species of mammals in India has been given below (vide Alfred *et al.*, 2000).

Species	Distribution
<i>Macaca mulatta</i>	Whole of North and Northeast India to south up to 15° 46' N Latitude near Bay of Bengal.
<i>Macaca assamensis</i>	Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland, Sikkim, Tripura, Uttar Pradesh, West Bengal.
<i>Semnopithecus entellus</i>	Throughout India except North East India and western part of Gujarat.
<i>Ratufa bicolor gigantea</i>	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura and West Bengal.

STATUS OF NON-HUMAN PRIMATES

Amongst non-human primates Rhesus Macaque, *Macaca mulatta*, Assamese Macaque, *Macaca assamensis* and Common Langur, *Semnopithecus entellus* are the more common species. Rhesus Macaque and Hanuman Langurs are widely distributed in Indian subcontinent but the Assamese Macaque is restricted in its distribution in the northeastern states. They are found living in feral condition and also as commensal around human settlements, in the towns and villages as opposed to their forest dwelling populations that were quite sizeable in our country. The people treated these rural and urban populations with tolerance on religious and ethical grounds. However, under increased economic pressure the traditional tolerance of the people tend to become eroded and in turn resulted in confrontation, which put the population under severe stress of survival. In addition to this the commercial trade of Rhesus and Assamese Macaque for use in biomedical research especially in developed countries, and similar but relatively recent usage of Hanuman Langur for such purposes within the country resulted in their general population decline. In order to ensure proper conservation of these species it soon became necessary to collect baseline data on several aspects. So, the present status of the population of these species, their major habitat use, the significant ecological factors affecting their survival, needed to be studied for their conservation.

One of the earliest population surveys of non-human primates was done in the country (Southwick and Siddiqui, 1966) which was mainly for the Rhesus Macaque in northern Indian states. Khajuria (1966) published a brief account of the distribution of Assamese Macaque in certain parts of Darjeeling district. Mukherjee and Mukherjee (1972) also conducted surveys for some of the same states and for the same species. Dolhinow and Lindburg (1980) surveyed the forest populations of Rhesus Macaque and Hanuman Langur in the same region. Kurup (1984) recorded the survey findings of Andhra Pradesh, Karnataka, Tamil Nadu and Kerala. Zoological Survey of India conducted survey of non-human primates from 1977 to 1981, particularly of the Rhesus Macaque and Hanuman Langur of India and recorded the distribution, abundance and present status of these two species in different states of India (Tiwari and Mukherjee, 1992). Field studies of non-human primates were also made by Mukherjee *et al.* (1995), Murmu *et al.* (2004) and reported the entire range of distribution of Rhesus and Assamese Macaque of Darjeeling district. Chaudhuri *et al.* (2006) reported the distribution of Rhesus Macaque in three districts of Northern West Bengal.

This report presents the result of three census surveys conducted on Rhesus Macaque, *Macaca mulatta* (Zimmermann), Assamese Macaque, *Macaca assamensis* (M'Clelland) and Hanuman Langur, *Semnopithecus entellus* (Dufresne) during the period from January 2002 to November 2003.

METHODOLOGY

In order to do this, initially, contact was made with the forest officials to inquire about the availability of these primates. However, most of the staff and officers of the forest department and forest labourers were found to be keen observers of these primates. In addition to above, knowledgeable villagers were also contacted to have further information available, if any. On receipt of the information counting by direct count method of different troops living by roadsides and adjacent forests was adopted. Utmost care was taken to count them but as some of the groups were wild there might be some chances of missing a few members in some groups. Driving a vehicle at slow speed (20–30 km per hour) made the roadside surveys with four observers keeping a constant watch for monkeys and langurs along the road and roadside forests. In forest different ecological areas were selected for census and transect and point methods were applied to locate them. Surveys were conducted during dry periods only to obtain quite clear visibility to scan a long distance as far as clearly visible through a 7 × 50 binocular. At Takdah due to dense fog the visibility was too poor and it was not possible to make an extensive survey. Selected groups in each sub-division were observed to estimate population growth and birth rate.

The individuals of a group were classified as adult males, adult females, juveniles and infants. Juveniles were identified as those, which were independent of their mothers. Infants were identified as those that were carried by their mothers.

ECOLOGY OF THE STUDY AREA

Darjeeling district lies in the northern part of West Bengal, extending between 26° 33' to 27° 13' N latitude and 88° 2' to 88° 56' E longitude with a geographical area of about 3148 sq. km. The major part of it lies in the eastern Himalayas ranging at an elevation between 200 m at Reang in the Teesta Valley to about 3800 m near Sandakphu and Phalut. The climate of the area also varies considerably due to altitudinal variations. The major crops of the area are rice, wheat, maize and tea. The area also experiences a few winter shower and snowfalls in many places during winter months. The main rivers are Teesta and Mahananda, which with their numerous affluence form the drainage system.

The forests are of mixed type from riverine to Oak-Hemlock forests. In the lower altitude in many places Sal (*Shorea robusta*) is the predominant species with principal associates being *Schimia wallachii*, *Terminalia belerica*, *Terminalia crenulata*, *Sterculia villosa*, *Pinus longifolia*, *Amoora rohituka*, *Michelia champaca*, etc. On the upper ridges *Cryptomeria japonica* is the predominant species with other species like *Michelia excelsa*, *Bucklandia populnea*, *Acer combelii*, *Alnus nepalensis*, *Nysa javanica*, *Prunus nepalensis*, *Michilus gamaniieana*, etc.

Nearly 550 km. road was surveyed including forest road and foot trails and 46 groups of *Macaca assamensis*, 27 groups of *Macaca mulatta* and 2 groups of *Semnopithecus entellus* were seen in the forested habitat and roadsides (Fig. 1).

The Darjeeling district has four sub-divisions. The Siliguri sub-division was devoid of Assamese Macaque and was replaced by Rhesus Macaque. The other three sub-divisions viz. Kurseong, Kalimpong and Darjeeling were found to contain the entire population of Assamese Macaque. The distribution and social composition of Assamese Macaque is given in Table 1, of Rhesus Macaque in Table 2 and of Hanuman Langur in Table 3.

Table 1 : *Macaca assamensis* (M'Clelland) [Status IUCN-VU].

Area	Total no. of Troops	Total no. of Individuals	Male	Female	Juvenile	Infant
Kurseong sub-division	14	182	30	110	32	10
Kalimpong sub-division	24	340	70	210	40	20
Darjeeling sub-division	8	100	18	65	10	7
Total	46	622	118	385	82	37
Percentage composition	–		19	61.9	13.2	5.9

Table 2 : *Macaca mulatta* (Zimmermann) [Status IUCN-L Rnt].

Area	Total no. of Troops	Total no. of Individuals	Male	Female	Juvenile	Infant
Kurseong sub-division	1	31	4	19	5	3
Kalimpong sub-division	15	201	32	102	40	27
Darjeeling sub-division	2	81	15	35	15	16
Siliguri sub-division	9	108	18	56	20	14
Total	27	421	69	212	80	60
Percentage composition			16.4	50.4	19.0	14.2

Table 3 : *Semnopithecus entellus* (Dufresne) [Status IUCN-L Rnt].

Area	Total no. of Troops	Total no. of Individuals	Male	Female	Juvenile	Infant
Kurseong sub-division	2	45	7	20	10	8
Total	2	45	7	20	10	8
Percentage composition			15.6	44.4	22.2	17.8

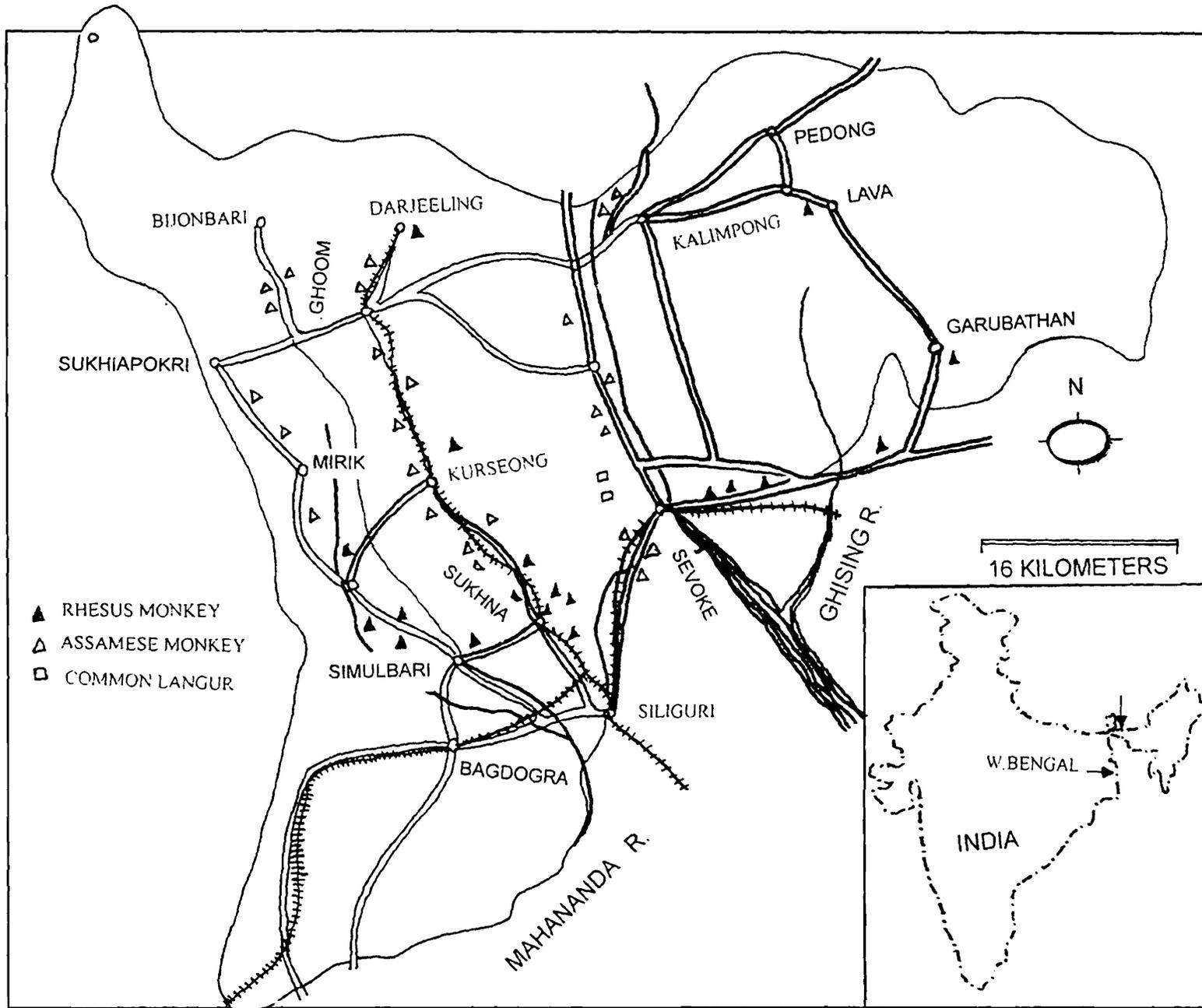


Fig. 1 : Distribution of non-human primates of Darjeeling district, West Bengal.

The 46 groups of Assamese Macaque contained a total of 622 monkeys with an average group size of 13.6 individuals of which 2.6 were adult males, 8.4 adult females, 1.8 juveniles and 0.8 infants. The group size varied from 5 to 40 individuals. Out of 622 monkeys the percentage composition were 19.0% adult males, 61.9% adult females, 13.2% juveniles and 5.9% infants. Ratio of adult male to adult female was 1 : 3.3; adult female to infant was 1 : 0.2 and ratio of females to combined population of juvenile and infant was 1 : 0.3.

The 27 groups of Rhesus Macaque contained a total of 421 monkeys with an average group size of 15.6 individuals of which 2.6 were adult males, 7.8 was adult females, 3.0 juveniles and 2.2 infants. The group size varied from 6 to 25 individuals. Out of 421 monkeys percentage composition was 16.4% adult males, 50.4% adult females, 19.0% juveniles and 14.2% infants. Ratio of adult male to adult female was 1 : 3.2, adult female to infant was 1 : 0.3 and ratio of females to combined population of juvenile and infant was 1 : 0.7.

The two groups of Hanuman Langur contained a total of 45 Langurs with an average group size of 22.5 individuals of which 3.5 was adult males, 10.0 adult females, 5.0 juveniles and 4.0 infants. The group size was of 20 and 25 individuals. Out of 45 Langurs the percentage composition was 15.6% adult males, 44.4% adult females, 22.2% juveniles and 17.8% infants. Ratio of adult male to adult female was 1 : 2.9; adult female to infant was 1 : 0.5 and ratio of females to combined population of juvenile and infant was 1 : 0.9. Moreover, a third group was observed in the top canopy of the same area, which could not be counted due to poor visibility. Population composition and incidence of monkeys is detailed in Table 4.

Table 4 : Population composition and incidence of monkeys in Darjeeling district.

Species	Km surveyed	No. of groups	Groups/ Km	No. of monkeys	Average group size	Adult %		Sub-adult %	
						Male	Fe-male	Juve-nile	In-fant
<i>Macaca mulatta</i>	550	27	20.37	421	15.6	16.4	50.4	19.0	14.2
<i>Macaca assamensis</i>	550	46	11.96	622	13.52	19.0	61.9	13.2	5.9
<i>Semnopithecus entellus</i>	550	2	—	45	22.5	15.6	44.4	22.2	17.8

DISCUSSION

The present survey revealed that the Rhesus Macaques are confined to lower altitude, between 100 m and 550 m whereas the Assamese Macaques are mostly restricted to higher altitudes except three groups of Rhesus Macaque—one at Darjeeling town (*c* 2123), one at Dowhill (*c* 1880 m) near Kurseong and one at Lava (*c* 2184 m) region were found inhabiting at higher altitudes. In spite of

local enquiries it could not be confirmed whether it was a natural group or introduced or group formed by the escaped monkeys. The Assamese Macaque and Rhesus Macaque both inhabit in lower elevation at Sevoke and adjacent areas but the home range of these two species was found not to overlap. Mukherjee *et al.* (1995) conducted survey in the same area during 1985 and found 188 Rhesus Macaque, 156 Assamese Macaque and 19 Hanuman Langur, with an average of 1 group in every 36.4 sq. km. in the study area. Murmu *et al.* (2004) surveyed the said area during 1997 and found 574 Assamese Macaque inhabiting there and recorded 1 Assamese Macaque in every 12.9 linear km. and 2.6 monkeys per sq. km. During present survey it was recorded 0.08 groups of Assamese Macaque per linear km and 1 Assamese Macaque group in every 21.7 sq. km. So, the population of Rhesus Macaque has increased by 133 monkeys during the last 20 years and that of Assamese Macaque by 48 monkeys during the last 8 years. The Nepali people constitute the major population in this district and they are more tolerant to these monkeys. This may be one of the reasons for having the viable population in this district. The two troops of Langur observed near Coronation Bridge on Sevoke-Teesta Road have also increased by 26 Langurs during the last 20 years. The increase of Langur population should have shown a higher figure if the third troop was possible to count.

A number of Assamese Macaques were found to have lost their forelimbs due to shock from high tension electric wire placed in the roadside forests at Andheri Jhora, 27th mile, 29th mile on Sevoke-Teesta road. They were also found carrying their infants on back and showing erect bipedal movement on hind limbs.

The monkeys have been found living with human beings and have influenced each other. It has been amply emphasized that human disturbance to habitat has important consequences on the demography, behaviour, and ultimately the survival of non-human primates, specially of the Indian subcontinent (Bishop *et al.*, 1981). During present investigation it was observed that, as the provisioning was highest at temples and tourist areas the population of Assamese Macaque has shown considerable increase in their population. On the other hand as the provisioning was low in the forest areas the population of Rhesus Macaque did not show much increase.

It is evident from the present surveys that Rhesus Macaque population has increased considerably than that of Assamese Macaque at Darjeeling district. The Assamese Macaque was at present found inhabiting only at Darjeeling district in Bengal. The Rhesus Macaque is a highly adaptive species among the Macaques and now it is invading the territory of Assamese Macaque in the district. The Assamese Macaque is a broad-leaf, evergreen species but due to shrinkage of forest habitat and scarcity of preferred food this species is forced to harbour in the roadside forest predominantly of monoculture habitat at Darjeeling. If the Rhesus Macaque proceed on invading the higher elevation of Darjeeling district then there is a possibility of decline in Assamese Macaque population. So, regular monitoring is needed to formulate a strategy for survival of Assamese

Macaque in this montane region of West Bengal. Hanuman Langur was found to live in top canopy to avoid territorial fight with other primate species.

For better conservation attention needed to be given on the following points :

1. Study of communicable diseases especially of Assamese Macaque.
2. Group wise capture, translocation and release in suitable habitats.
3. Systematic analysis of attitude of people towards monkeys.
4. Grow more trees in newly constructed housing colonies to provide food and shelter.
5. Continue density estimate to gather more information on population trends.

STATUS OF MALAYAN GIANT SQUIRREL

Within the Indian limit, the Malayan Giant Squirrel, *Ratufa bicolor gigantea* (M'Clelland) [Status IUCN L Rnt] is restricted to the mixed semi evergreen or evergreen forests of Northeast India. Ecological requirements of this squirrel are very different from most of the diurnal vertebrates. At present, rapid destruction of its habitat in northeast is adversely affecting their population and no detailed information about the population size of this taxon recurring in Indian range is available. However, for adopting an appropriate conservation programme, it is much necessary to have detail conservation programme. It is much necessary to have detail information of this species in respect of distribution, ecology, behaviour, population etc. Unfortunately, very little information is available about this significant species occurring in the North Bengal. This species can be used as an indicator species for making assessment of the quality of habitats. To fill up this lacunae this research project has been taken up by the Zoological Survey of India. In connection with this project, seasonal surveys were conducted in the different forests of Darjeeling district, North Bengal. Survey was done on foot by a four-member team along the jungle roads but occasional entry was also made deep inside the forest to locate the animal. Survey was conducted from early morning to noon and again from afternoon to evening.

Date and timing of each sighting is detailed below :

Date	Place of sighting	No. of animals
20.01.2002	Chitri, 2 km from Dowhill	4
26.01.2002	Near F.R.H., Takdah	3
29.01.2002	Riyang	1
04.02.2002	Near F.R.H., Sukna	6
21.09.2002	Kalijhora	2
23.09.2002	5 km from Kalijhora towards Sevoke	4

Date	Place of sighting	No. of animals
24.09.2002	8 km from Kalijhora towards Sevoke	5
11.11.2003	Reshap	3
12.11.2003	4 km on way to Lolegaon from Lava	4
14.11.2003	Near Coronation Bridge	4
15.11.2003	Dalim Forest, 4 km from Gorubathan	4
16.11.2003	Samsing	2
17.11.2003	Suntalyekhola	1

DISCUSSION

Most of the sighting records were made during feeding. If not disturbed, it was found to feed on a single tree for more than 40 minutes. However, none of the animals were found to feed on the trees of the forest village.

Chakraborty and Chakraborty (1991) reported on the activity pattern and population of this squirrel in Jalpaiguri district of North Bengal. Pratihari *et al.*, (1995) reported about the status of this squirrel in different forests of North Bengal. They also reported about their feeding habits.

During survey it was observed that their feeding activity continues almost throughout the day. Feeding activity starts within an hour of sunrise and continues till dusk with a lean period from about 1.00 p.m. to 3.30 p.m. For feeding, it comes out of the dense forested part to somewhat open areas and is restricted to a selected tree species within a small area. In the morning activity is related to feeding and interspecific territorial chasing. During noon it takes rest lying flat on the shaded branches of tree. Wide varieties of foods are taken depending upon the availability within the foraging ground. It was also observed that the animal debarks the trees in search of insect food. From the sighting frequency and number of animals sighted it appears that it lives in pairs or sometime singly. But at certain times even five to six animals were also found foraging in the same area. It was also found that different species of birds, Macaques and Langurs sharing the food items with this species at certain areas. Due to very nice matching colour with the background forests, this species can easily be located for its frequent characteristic loud call and dropping of leaves, fruits, seeds etc. The forests of Darjeeling district supports and carries a good population of this squirrel. Chakraborty and Chakraborty (1991) reported that this squirrel is strictly arboreal and never descends below 5 metre. But during survey work a pair was found feeding on seeds on ground inside forest at Lava-Lolegaon road and a pair was found crossing the road running to reach the other side forest on the same road.

SUMMARY

The present status survey conducted in the Darjeeling district, West Bengal revealed that the populations of Assamese Macaque, *Macaca assamensis*; Rhesus Macaque, *Macaca mulatta* and Hanuman Langur, *Semnopithecus enellus* have increased considerably in that area. The area also carries a good and viable population of Malayan Giant Squirrel *Ratufa bicolor gigantea*.

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