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A POPULATION SURVEY OF RHESUS MONKEYS AND HANUMAN LANGURS OF PURI AND KHURDA DISTRICTS, ORISSA, INDIA

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INTRODUCTION

Field studies on the non-human primates of Orissa was undertaken by Zoological Survey of India as a part of status survey of non-human primates of India from 1977-81 under a DST Project (Tiwari and Mukherjee, 1992). Other workers studied primates of Orissa and mammals are Behura and Guru (1969) reported wildlife of Orissa; Tiwari *et al.* (1997) published the sightings of monkeys and langurs at Chandaka wildlife sanctuary; Ramakrishna (2006) published faunal account of Simlipal Biosphere Reserve; Chaudhuri *et al.* (2007) reported primates of Nayagarh district; Ramakrishna *et al.* (2008) published hanuman langur population of Balasore district. In 1978 Zoological Survey of India team had surveyed Puri, Bolangir and Sundargarh districts of Orissa. Later the Puri district was divided into 3 districts in 1994 as Puri, Khorda and Nayagarh. Tiwari and Mukherjee (1992) discussed the account of primates in Orissa state as a whole but no separate district wise results were given. Monitoring and estimation of primate population is important for the purpose of management. The status of primates in Nayagarh district was already published (Chaudhuri *et al.*, 2007) and the remaining two districts Puri and Khurda are dealt in this report based on the population of primates over a period of two decades.

This report deals with the information regarding distribution, abundance, social composition of rhesus monkey, (*Macaca mulatta*) and Hanuman langur (*Semnopithecus entellus*) of Puri and Khurda districts, Orissa. In these districts the rhesus monkeys and Hanuman langurs were recorded in the temples, towns, forests and villages.

The rhesus monkeys and hanuman langurs the two widely distributed species in India are found in these two districts. These two monkeys inhabit in diverse habitats from forests to open lands and near human settlements as also in montane arid zone.

STUDY AREAS

Puri district lies between 19°28'–26°35' N and 84°29'–86°25' E with an area of 3479 km² and Khurda district with an area of 2887² km. The districts are divided into dissimilar natural divisions—the littoral tract, an alluvial tract and hilly tract. Areas along river Daya is flat and alluvial with having long ranges of rugged hills at many places. The littoral tract lies between alluvial plain and Bay of Bengal. The land assumes the form of a bare silt of sand, stretches along seashores for full length of the district, which varies from 6 km to few hundred meters in width. Alluvial tract is occupied by villages and cultivated fields. The hilly tract is mainly in Khurda district. Hill ranges at many places break the country into small well cultivated fertile valleys intersected by hill streams. The length of the seacoast of Puri District is about 150 km. The rivers are Mahanadi, Kuakhani, Daya, Bhargavi and Kuakhai. Climate of the district is warm and humid and it enjoys a sub-tropical monsoon climate, with three districts season's *viz.* winter, summer and monsoon. May is the hottest month with a mean daily temperature of 35°C and January is the coldest having a daily temperature of 14-16°C. The average annual rainfall is about 1443 km.

The forests consisted of dry, semi-evergreen and approximate more to the type met within the agnatic sub-region than to dry deciduous type prevalent in

parts of Bihar and Orissa (Plate-I). The forests contain common species to both the northern and southern tracts and similar to vegetation found in Nayagarh district (Chaudhuri *et al.*, 2007). There are many low hills at many parts of Puri district have good contact grows and raised garden of betel leaf which are the principal cash crop of many villages. Polang tree was seen at many villages whose seeds produced principal illuminant before kerosene came to use.

METHODS

The survey methods applied in Puri and Khurda districts were the same that was adopted in Nayagarh district survey (Chaudhuri *et al.*, 2007). The survey was conducted on road sides, villages, towns and forests. The roadside surveys were made by using a slow moving vehicle while forest roads and trails were surveyed both by vehicle and on foot. Transect and point methods were adopted to locate monkeys in the forests and hills. 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 for presence of monkeys (Southwick *et al.*, 1961). The point method was adopted in hills where elevation exceeds 200 m and above. In other areas total count and sweep sampling techniques were used to estimate the primate population.

Four surveys were conducted in these two districts from 2002 to 2004 during summer and winter months and the data collected during summer 2004 survey is presented here, when the two districts were resurveyed so as to avoid any duplication of monkey counts. The survey was conducted in the forenoon (0700-1130 hrs.) and afternoon (1500-1800 hrs.) depending upon available sunlight. A total of 1600 hrs. was conducted for in the field survey. About 2400 km² area was surveyed which was 40% of the total geographical area of the study districts. The monkey groups when located, their social composition, habitat, inter-intra group interactions were recorded. The individuals of a group were broadly classified, for both the monkey species, as adult males, adult females, juveniles and infants. Adult males and adults females were determined depending upon their body size and age. 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.

RESULT

A total of 2400 km² area was surveyed which comprised about 38% of the total geographical area of Puri and Khurda districts. Eighteen groups of rhesus monkey and 110 groups of Hanuman langur were recorded. The Hanuman langurs were mostly sighted in the villages and forests while rhesus monkeys were mainly observed in the forests.

RHESUS MONKEY

Altogether 18 rhesus monkey groups of 501 individuals comprising 61 adult males; 224 adult females; 100 juveniles and 116 infants were observed (Table-1) (Plate-I). The distribution of these monkeys is shown in Fig. 1. The group's size varied from 5 to 52 individuals excluding Jagannath temple group in Puri town, which consisted of 134 monkeys. The Jagannath temple monkeys were distributed in more than one group, but identification of the groups was not possible due to close association and constant overlapping. The mean group size was 27.8 ± 7.06 of which 3.39 ± 0.76 was adult males, 12.44 ± 2.58 was adult females, 5.5 ± 2.23 was juveniles and 6.4 ± 1.73 was infants (Table-1). This provides a population estimate of 0.0075 groups/km² and 0.20 individuals/km².

Out of 501 monkeys, the population composed of 12.18% adult males; 44.71% adult females; 19.96% juveniles and 23.15% infants. About 51.7% adult females were carrying infants. The adult males and adult females ratio was 1 : 3.6 and adult females and juveniles and infants ratios were 1 : 0.44 and 1 : 0.5 respectively. The 18 rhesus groups were observed in 4 habitats—villages, forest, temples and towns. Five temple groups were recorded with 234 monkeys; forests contained 214 individuals in 9 groups; 3 groups with 48 monkeys were counted in the villages and a town group with 5 monkeys was recorded. The mean density of the habitat categories is shown in Fig. 1.

The undivided Puri district was first surveyed by Zoological Survey of India team in 1978 under a DST (Tiwari & Mukherjee, 1992); the said report of the survey did not mention districtwise population. The Nayagarh district primate survey, which was a part of the then Puri district, was published by Chaudhuri *et al.*, 2007.

During 1978 survey 9 groups of rhesus monkey with a total of 178 individuals were recorded. Out of 9 groups one group containing 3 monkeys were recorded at Baruni hill forests where the social composition was not mentioned. The remaining 8 social groups having 175 monkeys of which 29 were adult males; 62 were adult females; 51 were juveniles and 33 were infants. These monkeys were found inhabiting in temples, forests and in villages (Table-2). The mean density of monkeys in these three habitats is shown in Fig. 5. The

average group size excluding the Baruni group was 10.78 ± 8.83 monkeys of which 3.22 ± 1.41 was adult males; 6.89 ± 2.90 were adult females; 5.67 ± 2.64 was juveniles and 3.67 ± 2.13 were infants. The percentage composition consisted of 16.57% adult males, 35.43% adult females, 29.15% juveniles and 18.85% infants. About 53% females were carrying infants. The ratio of adult males to adult females was 1 : 2.13 and adult females to juveniles and infants ratios were 1 : 0.82 and 1 : 0.53 respectively.

Table-1. Distribution and social composition of Rhesus macaque at Puri and Khurda District during–2004.

Habitat	Total	Males	Females	Juveniles	Infants
Temple	234	28	91	54	61
Town	5	1	2	0	2
Forest	214	26	107	38	43
Village	48	6	24	8	10

Table-2. Distribution and social composition of Rhesus macaque at Puri and Khurda district–1978.

Habitat	Total	Males	Females	Juveniles	Infants
Temple	73	14	27	20	12
Forest	74	12	22	20	17
Village	31	3	13	11	4

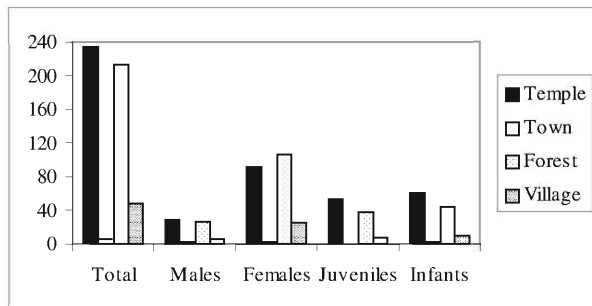


Fig. 1. Distribution & Social composition of Rhesus macaque at Puri & Khurda districts in 2004.

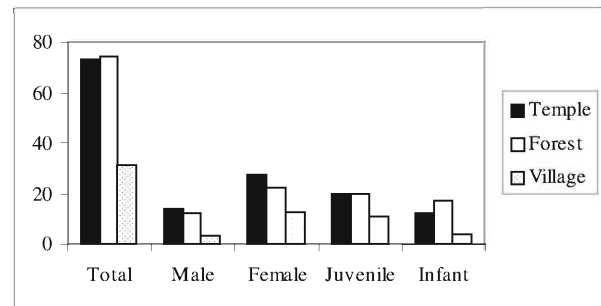


Fig. 2. Distribution & Social composition of Rhesus macaque at Puri & Khurda districts–1978.

HANUMAN LANGURS

Result from the survey revealed the sightings of 110 groups of Hanuman langur, of which 3 were all male bands and 3 solitary males and rest 104 were social groups (Plate-I). The 110 groups consisted of 2114 langurs. The distribution of social langur groups is shown in Fig. 2. This provides a population estimate of 0.045 groups/km² which comprised of 0.88 langurs/km². The group size varied from 4 to 64 individuals. The 3 all male bands consisted of 14 langurs and all these inhabited the villages close to bisexual groups in Puri and Khurda districts.

The 104 social groups consisted of 2097 langurs, which composed of 228 adult males; 1031 adult females; 438 juveniles and 400 infants. The mean group size was 20.16 ± 1.22 individuals (Table-3). The adult males to adult females ratio was 1 : 4.5 and adult females to sub-adults ratio was 1 : 0.81. About 38.7% females were having infants. These 104 social hanuman langur groups were distributed in 4 habitat categories—villages, forests, temples and towns. The mean density of these groups is shown in Fig. 2. The habitatwise distribution of langurs is given in Table-3.

Table-3. Distribution and social composition of Hanuman Langur at Puri and Khurda district–2004.

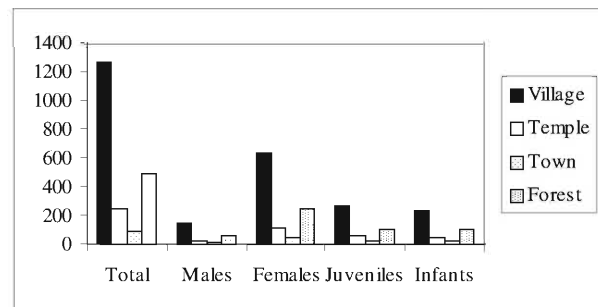
Habitat	Total	Males	Females	Juveniles	Infants
Village	1270	140	628	266	236
Temple	242	26	115	52	49
Town	94	11	46	18	19
Forest	491	51	242	102	96

Village : The 68 bisexual village groups contained 1270 langurs with a mean group size of 18.78 ± 1.4 individuals. The social composition consisted of 140 adult males; 628 adult females; 266 juveniles and 236 infants (Table-3, Fig. 2). The adult male to adult female ratio was 1 : 4.48 and adult females to sub-adults ratio were 1 : 0.79. The percentage composition of population consisted of 11% adult males; 49.45% adult females; 20.95% juveniles and 18.6% infants. The 37.5% females were having infants.

Forests : The second largest population of langur was recorded from the forests. Nineteen forest groups having 491 langurs with a mean group size of 25.84 ± 2.7 individuals. The 491 langurs consisted of 51 adult males; 242 adult females; 102 juveniles and 96 infants (Table-3). The percentage composition revealed 10.38% adult males, 49.3% adult females, 20.77% juveniles and 19.55% infants. The ratio of adult males to adult females was 1 : 4.7, adult females to infant were 1 : 0.39 and adult females to total sub-adults ratio was 1 : 0.81. About 39.6% females found carrying infants.

Temple : Ten temple groups contained 242 langurs with a mean group size of 24.20 ± 5.5 individuals. The social composition of temple groups consisted of 26 adult males; 115 adult females; 52 juveniles and 49 infants (Table-3). The percentage composition in the population consisted of 10.75% adult males, 47.52% adult females; 21.48% juveniles and 20.25% infants. About 42.6% females were having infants and this figure was the highest in terms of infant-female relationship. The adult males to adult females ratio was 1 : 4.4 and adult females to infants' ratio was 1 : 0.42.

Town : Only 7 town groups with 94 langurs were sighted with a mean group size of 13.43 ± 1.0 individuals. The 94 langurs consisted of 11 adult males; 46 adult females; 18 juveniles and 19 infants (Table-3). The adult males to adult females ratio was 1 : 4.18 and adult females to sub-adults ratio was 1 : 0.8. The percentage

**Fig. 3.** Distribution & Social composition of Hanuman langur at Puri & Khurda districts-2004.

composition in the population consisted of 11.7% adult males; 48.94% adult females; 19.15% juveniles and 20.21% infants. About 41.3% females were carrying infants.

In 1978 Puri district was surveyed by the ZSI team. Khurda district at that time was a part of Puri district. During that period 39 social groups of Hanuman Langur was recorded with a total of 592 langurs and the mean group size was 15.18 ± 1.53 individuals. The social groups composed of 58 adult males (1.48 ± 0.12); 308 adult females (7.90 ± 0.82); 118 juveniles (3.0 ± 0.42) and 108 infants (2.77 ± 0.44) (Table-4). The group size rose from 3 to 42. The adult males to adult female's ratio were 1 : 5.31. Adult females to juveniles and infants ratios were 1 : 0.38 and 1 : 0.35 respectively. The percentage composition of different sexes and age class was 9.8% adult males, 52.0% adult females, 19.95% juveniles and 18.25% infants. The Hanuman langurs those were recorded duringn 1978 survey were distributed in three habitat categories—villages, forests and towns and only one temple group was encountered with 36 langurs at Udaigiri. In earlier survey three town groups with 45 langurs were reported from Puri district whereas during 2004 survey 7 town groups with 94 langurs were recorded. The in earlier survey three villages contained 22 groups, the maximum number recorded at Puri district followed by forests 13 groups. The 22 village groups were having 354 individuals of whom 32 were adult males; 185 were adult females; 78

were juveniles and 59 were infants. The mean density of langurs harboring different habitats is shown in Fig. 4. The two status survey of non-human primates of Puri and Khurda districts revealed a huge change of population over a period of about 26 years.

To find out the changes that occurred, were selected 20 common langur groups were selected from the both surveys inhabiting all categories and distributed at different places throughout the districts. The 1978 survey was conducted in the month of May. A number of surveys were conducted for the study of status of primates in 2003-2004 and 20-langur groups were chosen from the survey carried out during the month of May 2003 so as to make comparative study. These 20 groups contained 332 in 1978 survey and 335 langurs in 2004 survey (Table-5, Fig. 3). The only major changes were noticed in the adult males and adult female's populations. In 1978, 9.3% males and 51.2% females were recorded whereas during 2003 survey it was 12.2% males and 47.7% females were observed. The 't' test of these two population yielded insignificant results ($t = -0.043$, p value $Pct < t$).

DISCUSSION

The rhesus monkeys of Puri and Khurda districts were found inhabiting the forests and temples. Out of 18 rhesus groups from 5 groups were recorded from temples and 9 groups from forests. The forest dwelling monkeys represented 42.7% of the total recorded population in these two districts. The forest provides natural food and shelter to these monkeys, whereas provisional food provided by the visitors to the temple monkeys was main factor for their concentration in the temples.

In 1978 survey 3 temple groups were recorded of which 2 groups were from Puri town. The Jagannath temple group was the largest with 64 monkeys, whereas the survey of 2004 recorded 5 temple groups from Puri town. The number of monkeys of Jagannath temple had increased to 134 in number. The Jagannath temple monkeys as observed were not a single group. The area of the temple is nearly 1 km² and we tried time and again to ascertain the sleeping but due to restrictions number of groups of our movement during evening hours it was not possible to trace the night individual

Table-4. Distribution and social composition of Hanuman Langur at Puri and Khurda during the year 1978.

Habitat	Total	Males	Females	Juveniles	Infants
Forest	157	18	80	31	28
Town	45	5	23	5	12
Temple	36	3	20	4	9
Village	354	32	185	78	59

Table-5. Social composition of Hanuman langurs during summer of 1978 & 2004 of Puri & Khurda districts.

Year	Total	Males	Females	Juveniles	Infants
Total (1978)	332	31	170	62	69
Total (2004)	335	41	160	71	63

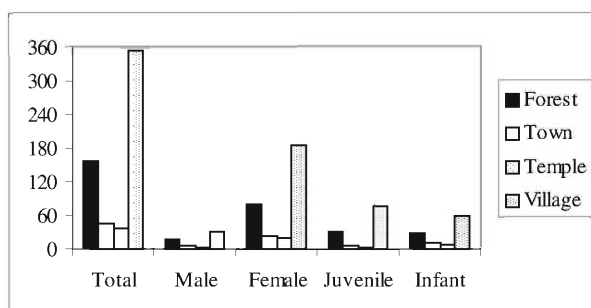


Fig. 4. Distribution & Social composition of Hanuman langur at Puri & Khurda districts-1978.

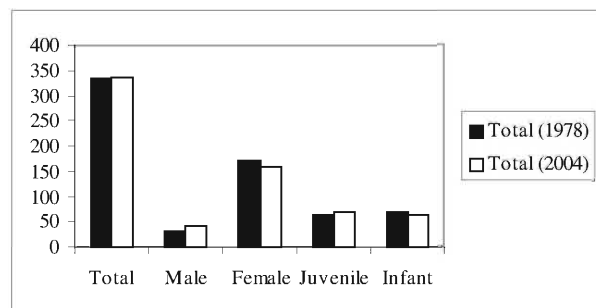
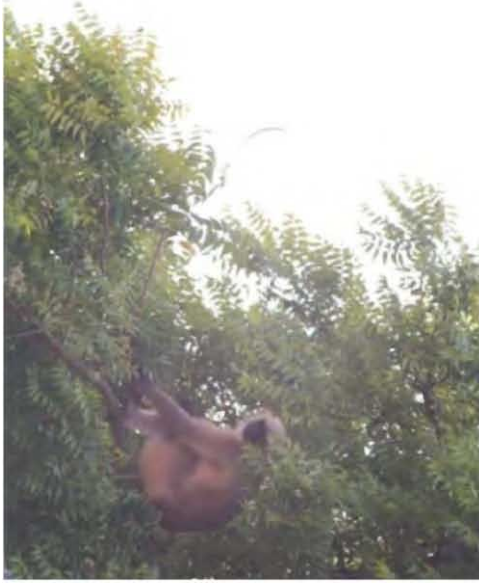


Fig. 5. Distribution & Social composition of Rhesus macaque at Puri & Khurda districts-1978.

PLATE-I



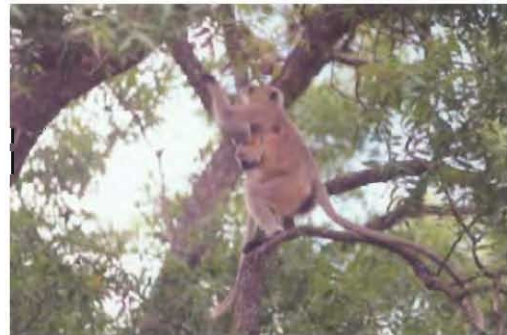
Hanuman Langur at Balipatra village



Hanuman Langur on Khandagiri-Chandka Road



Rhesus macaque at Bara Pukuria village



Hanuman Langur at Nachuni village



Hanuman Langur in agriculture land at Balipatna village



Hanuman Langur at Barunei forest



Forest Type of Balukhand Wildlife Sanctuary, Konark

trees or places for group counts. The monkeys found in other temples at Puri were supposed to be budded of from Jagannath temple groups. The population of rhesus monkeys in these two districts is low in terms of habitable areas and food availability.

The present survey revealed that hanuman langurs are more or less widely distributed in Puri and Khurda districts. The langurs mostly inhabit villages. About 65% of the total langur groups recorded from these two districts is found in villages. The villages provide food and trees for shelter to the langurs. The langurs often raid crops and gardens in the villages. This has become a serious concern to the villagers but still the man-monkey conflicts are less in this part of Orissa. The people of the state are much tolerant towards the monkeys due to their sacred status, which they enjoy from the ancient times, though this attitude has eroded in many parts of the country. The earlier survey of 1978, 39 groups with 592 langurs was reported whereas during present survey 2097 langurs in 110 groups were recorded. Thus the population groups three and half times over a period of 25 years. In both the cases village groups were more in numbers than any other habitat. Twenty two village groups with 354 langurs were sighted in 1978 survey whereas during 2004 census 68 groups with 1270 langurs were encountered. The village groups were increased about five times in 25 years. The 1978 survey was conducted in the month of May, the hottest month; this may be the reason for not

locating all the groups. Analysis of field data of 1978 survey, it was observed that at least 50% of the places where the survey team could not sighted the langurs but local people reported their presence. However, during 2004 survey the langurs were recorded from the places from where the local people reported their presence in the earlier survey.

Nayagarh district, which is part of the then Puri district, was surveyed in 2005 (Chaudhuri *et al.*, 2007) and the field investigation revealed that the rhesus population could not flourish during the last two decades. Only 4 new groups were added from 6 groups that were counted in 1978 survey at Nayagarh, though good forest cover (about 31%) still exists. Hanuman langur, the other primate species, nearly doubled from 16 groups to 30 groups from 1978 to 2005. It is evident from the present study that the rhesus monkeys are less adapted to the habitat of Puri and Khurda than the langurs. The hanuman langur which is regarded as leaf eating monkey and use the upper canopy now found inhabiting all type of habitats and changed the feeding pattern, thus causing great threat to the bottom feeders, the rhesus monkeys.

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