

KUDREMUKH WILDLIFE DIVISION, KARKALA

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**PRIMATES OF KUDREMUKH WILDLIFE DIVISION:
SPECIAL EMPHASIS ON CURRENT STATUS OF
LION-TAILED MACAQUE (*Macaca silenus*)**



Slender loris



Bonnet macaque



Lion tailed macaque



Lion tailed macaque Jumping



Hanuman langur



Jomlu falls at Seethanadi



LTM eating Jack fruit



PRIMATES OF KUDREMUKH WILDLIFE DIVISION: SPECIAL EMPHASIS ON CURRENT STATUS OF LION-TAILED MACAQUE (*Macaca silenus*)

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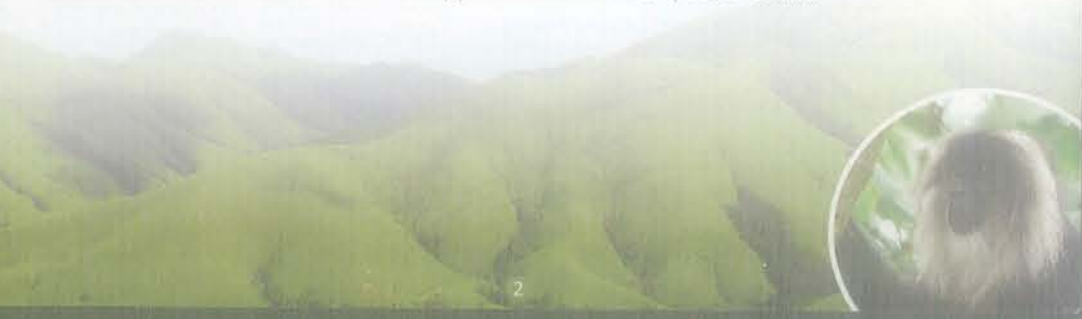


Primates of Kudremukh Wildlife Division: Special emphasis on current status of lion-tailed macaque (*Macaca silenus*)

Kudremukh Wildlife Division :

Kudremukh Wildlife Division was created as per the Government of Karnataka Order No.AHFF.83.FNG.92, dated 08-05-1992. The administration of Kudremukh National Park, Someshwara Wildlife Sanctuary and Mookambika Wildlife Sanctuary was brought under the newly constituted Kudremukh Wildlife Division, Karkala. Kudremukh National Park is located at the tri-junction of Dakshina Kannada, Udupi and Chikmagalur districts. It falls approximately at the middle of mid-Western Ghats (the stretch between Goa and Nilgiris). It lies to the south - west of Karnataka State and is just 50 km. from the west coast between the 75° 01' to 75° 25' east longitude and 13° 01' to 13° 29' north latitude. The national park is a part of Sahyadri hill ranges and constitutes a geographic barrier between the coastal areas and the hinterland. For ages this has segregated people and gave protection to the coastal areas, its wealth, its culture and traditions from casual invasion by the strong ruling party of the maidan areas.

The park derives its name from the highest hill peak known as the Kudremukh Peak having an altitude of 1892 m from the sea level. It is the queen of many fascinating hill peaks in Karnataka. It is also studded by a host of places such as Kigga, Valikunja, Narasimhaparvatha, Gangamoola etc, which have mythical leanings. The name of the peak, meaning horse-face, is descriptive of its appearance seawards. The park was initially notified in G.O.No.AHFF.42. FWG.87, dated: 2nd September 1987. Five reserved forests, viz., Naravi, Andar, South Bhadra, Tunga Bhadra and Narasimhaparvatha were brought together to constitute the National Park. This park may shortly be declared as Kudremukh Tiger Reserve as it has received approval from NTCA, New Delhi.



Introduction

The Western Ghats, a series of hill ranges with a length of about 1600 km from north to south and with an east to west width of 30-80 km, run parallel to the western coast of southwestern India. The hill system has been classified comprising ecological zones viz. wet evergreen forests, dry evergreen climax forests and deciduous climax forests (Ramesh, 2001). In brief, the forests also can be considered as tropical evergreen forests at the western slopes and the ridges and deciduous and scrub forests in rain shadow areas on the eastern slopes of the hills. Due to canopy contiguity, high diversity of tree species and availability of fruit bearing trees throughout the year, the forests of the Western Ghats harbour many arboreal fauna including primates. Though the forests of the Western Ghats are home to many species of primates, systematic population assessments have been attempted only at a few sites. This may be due to the undulating terrain of the hill system and lack of appropriate methods for estimation of arboreal mammals in such a terrain. The Forests of the Western Ghats are home to seven species of primates including slender loris (*Loris lydekkerianus*), bonnet macaque (*Macaca radiata*), lion-tailed macaque (*Macaca silenus*), southern plains gray langur (*Semnopithecus dussumieri*), black-footed gray langur (*S. hypoleucos*), tufted gray langur (*S. priam*) and Nilgiri langur (*Trachypithecus johnii*).

Further, slender loris and bonnet macaque include two subspecies each viz. Mysore slender loris *L. l. lydekkerianus*, Malabar slender loris *L. l. malabaricus*, dark-bellied bonnet macaque *M. r. radiata* and pale-bellied bonnet macaque *M. r. diluta*. According to the IUCN Red list, the lion-tailed macaque is 'endangered', black-footed gray langur and Nilgiri langur are 'vulnerable', Malabar slender loris, Mysore slender loris and tufted gray langur are 'near-threatened' and others are 'least concern' categories.



Malabar slender loris (*Loris lydekkerianus malabaricus*) :

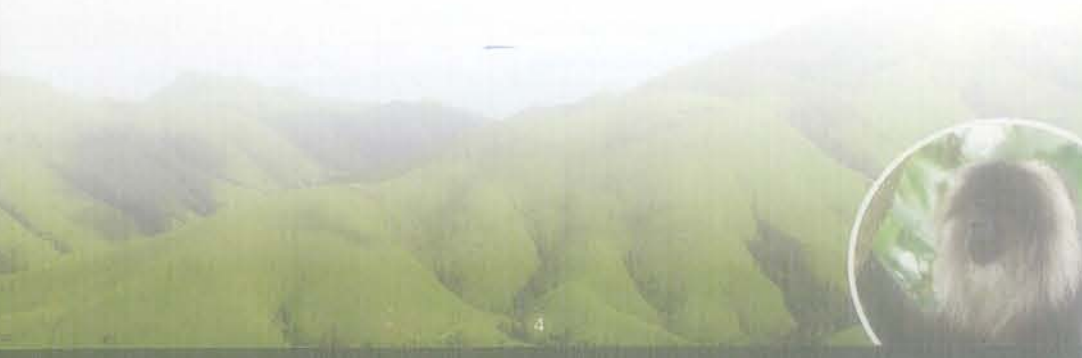
One of the nocturnal primates confined to forests of Western Ghats. The species has been recorded from all types' forests except the shola forests; however they are known to abundant at wet scrub forests of the Ghats. The known maximum weight of the animal is 180 g, and animal is having red tinted gray coat, lengthy limbs, slender body, and no tail. Animal is insectivorous and occasionally feeds on few berries. They are solitary and territorial animals. Twice they give birth to singleton or twins in a year.

Black-footed gray langur (*Semnopithecus hypoleucos*):

Black-footed gray langur has narrow distribution range and is endemic to Western Ghats i.e. north of Aralam Wildlife Sanctuary in Kerala to forests of Kudremukh in Karnataka. The habitat of the species is evergreen, semi-evergreen and moist deciduous forests. They are folivorous, feeds on leaves, fruits and vegetative parts of the plants. The coat colour is blackish gray, black colour on limbs and no crown on the head. They live in group with an average group size of eight.

Dark-bellied bonnet macaque (*Macaca radiata radiata*):

Dark-bellied bonnet macaque has wide range of distribution from south of Tapti and Godavari river to entire southern India except some extreme southern parts. The species is generalist species found in variety of habitats from wet evergreen forests of Western Ghats to dry scrub forests of Eastern Ghats, villages, urban areas and agriculture fields. They have grey coat on the body, long tail, and weigh 8 to 9 kg. They live in group with an average group size of 20. They feed on fruits, insects and many small animals.



Lion-tailed macaque (*Macaca silenus*):

Lion-tailed macaque is an endangered primate endemic to evergreen forests of Western Ghats ranging from southernmost part of the forests at Kanyakumari district in Tamil Nadu to Aghanashini- Lion tailed macaque Conservation Reserve at Uttara Kannada district in Karnataka. The surviving population is estimated as about 3500 animals in the wild. The species has a black body, with white mane, with short tail with hair tuft at the end of the tail which are the external features of the species. They are omnivorous feeds on both vegetative resources from trees and many small animals and insects. They live in groups with a mean group size of 19. They are slow breeders and have long maturity period.

The lion-tailed macaque is always found in a low abundance, its population has been assessed using total count method for each area and the estimates are now available for several sites. The total population in the wild habitats is assessed to be about 3,500 individuals (Molur et al. 2003). Kumara and Sinha (2010) reported a decline in the population size and possible local extinction in certain reserves and parks in the Karnataka state. Nevertheless, the available data on population size shows presence of a few large and contiguous populations in the wild. However, large extents of rain forests inhabited by lion-tailed macaque are yet to be surveyed. The largest known populations, which can be considered as viable populations, include Sirsi-Honnava (31 groups: Kumara et al 2008), Kalakad-Mundanthurai Tiger Reserve (31 groups), Kudremukh National Park - Someshwara Wildlife Sanctuary (24 groups: Kumara and Singh, 2008), and Silent Valley National park (14 groups: Joseph and Ramachandran, 1998). The state Karnataka holds two major populations of lion-tailed macaque i.e. Sirsi-Honnava and Kudremukh-Someshwara. Thus population monitoring, and a further detailed study of them in these areas are very crucial for the long-term survival of the species and also to develop a species specific management plan.



Along the Western Ghats, many protected areas have been created; among them nine protected areas encompass the forests on the ridge and Western slopes of the Ghats covering evergreen forests viz. Brahmagiri Wildlife Sanctuary, Talakaveri Wildlife Sanctuary, Pushpagiri Wildlife Sanctuary, Kudremukh National Park, Someshwara Wildlife Sanctuary, Mookambika Wildlife Sanctuary, Sharavathi Valley Wildlife Sanctuary, Dandeli and Anshi Tiger Reserve. Though, many protected areas were created, but population monitoring of any wildlife is not available from any of these protected areas. Few sporadic surveys conducted on few taxonomic groups reveal little knowledge on wildlife of these parks.

The survey of primates was carried out between 2001 and 2009 for southern part of the Western Ghats in Karnataka, including six protected areas (Kumara and Singh 2004a.b; Kumara et al. 2006; Kumara and Singh, 2008; Kumara and Sinha, 2010) provided baseline information on current status of populations of primate species and the importance of the population monitoring, further important protected areas with sizeable population of different primates. Kudremukh forest complex is one of important protected forests holding such primate populations in the state. The status of lion-tailed macaque was ascertained during January 2007. Further, as a part of population monitoring, after a series of discussions, the need of primate survey and reassessment of lion-tailed macaque was thought, and accordingly the survey was carried out during January 2011 and January 2012. In the present report the findings on the status of diurnal primates are provided and its importance area discussed.



Study Area



Kudremukh forest complex, located in the central Western Ghats, includes the Kudremukh National Park (Kudremukh NP) [Fig 1a], Someshwara Wildlife Sanctuary (Someshwara WLS) [Fig 1b] and Mookambika Wildlife Sanctuary (Mookambika WLS) [Fig 1c]. Kudremukh NP is located in the district of Dakshina Kannada and Chikmagalur, whereas SWS and MWS are located in the Udupi district. The physical features and the location points are provided in the Table 1. The Kudremukh forest complex lies between $13^{\circ}01' - 13^{\circ}29' \text{ N}$ and $75^{\circ}01' - 75^{\circ}25' \text{ E}$. All the three parks receive about 4000 mm of average annual rainfall. Altitude varies from 20 to 1892 m ASL, the highest point being the Kudremukh peak (1892 m) in the south of Kudremukh NP. The forest types include high altitude grass land with shola forests, Evergreen and Semi evergreen forests at slopes and plateau of the hills and deciduous forests towards the edge of the park. Few areas with open grasslands were converted into *Acacia auriculiformes* plantations in the past. Kudremukh NP has four ranges namely, Karkala, Kerekatte, Kudremukh and Belthangdi, and Someshwara WLS and Mookambika WLS have one range each i.e. Someshwara and Kollur.

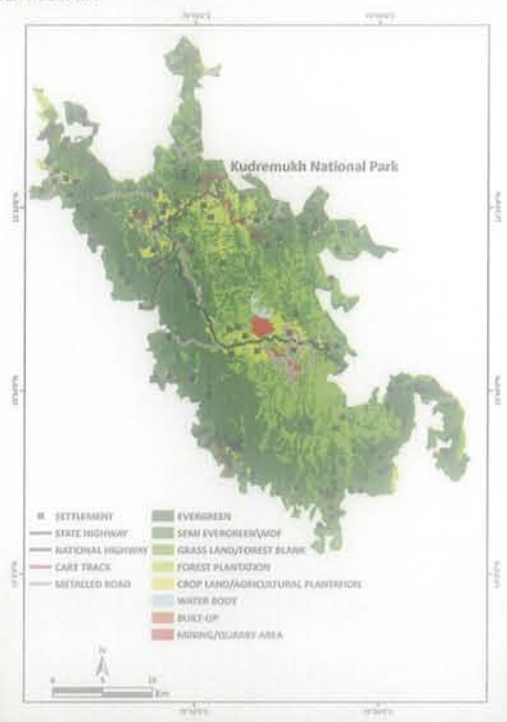


Figure 1a Vegetation Types of Kudremukh National Park

Table 1 Physical features of study area

Protected Area	Geocoordinates	Area (km ²)	Elevational range (m asl)	Ranges
Kudremukh NP	13°01'00"-13°01'00"N 75°00'55"-75°25'00"E	600.32	134-1892	Belthangadi, Karkala, Kudremukh, Kerekatte
Someshwara WLS	13°27'54"-13°30'54"N 74°56'09"-74°59'45"E	88.40	75-870	Someshwara
Mookambika WLS	13°41'24"-13°58'48"N 74°39'58"-74°55'54"E	247.00	20-1343	Kollur

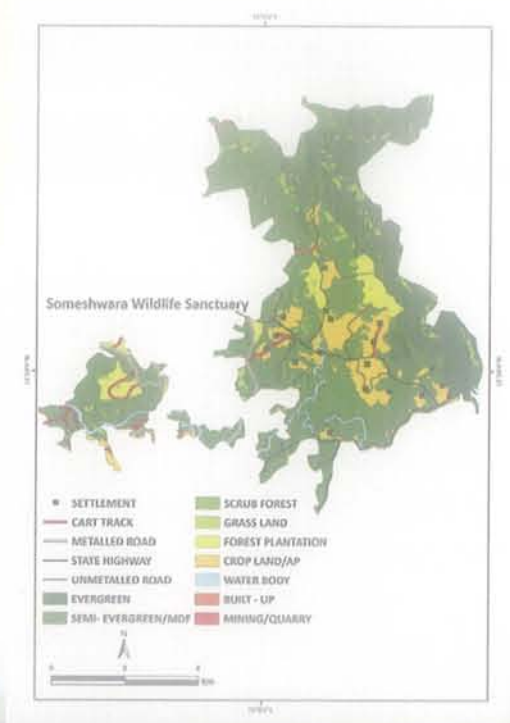


Figure 1b Vegetation Types of Someshwara WildLife Sanctuary

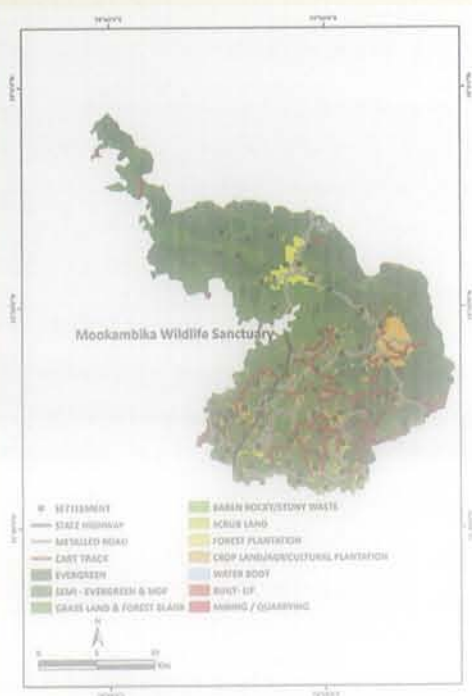


Figure 1c Vegetation Types of Mookambika Wildlife Sanctuary

Methods :

As lion-tailed macaques occur in low numbers in the wild and are highly restricted to narrow strips of rainforests in the Western Ghats, estimation of their density through line transect survey or distance sampling requires an enormous effort. Laying of transect lines is often not possible over much of the species' range. The total count method (NRC, 1981) has thus been widely adopted to estimate populations of such rare and patchily distributed species (Whitesides et al., 1988; White and Edwards, 2000).



The total count of the groups can be achieved with two approaches, firstly by two to three people conducting repeated walks in the same region and confirming the group location and the group identity. Usually the groups are identified based on the repeated group counts and its consistency and further by recording the location of the group at each sighting. This helps in differentiating one group from the other. However, this method demands enormous amount of time and energy. The total count method with little modifications has been widely adopted for lion-tailed macaque surveys in different regions including the Anaimalai hills and Sringeri Forest range (Singh et al., 2000, 2002), Silent Valley National Park (Joseph and Ramachandra, 1998) and the Brahmagiri-Makut and Sirsi-Honnava areas (Kumara and Singh, 2004a).

The other approach can be the simultaneous walk by many trained people in selected grid or the region, and repetition of the walk for three to four times. We adopted this method in the present study with some modifications. In this method, since the effort is intensive, the accuracy of the information is expected to be high. As all the study areas harboured tropical rainforests, it was assumed that neither the 'visibility factor' nor the 'detectability factor' would affect observations or bias the data to any significant extent.

We trained forest department personnel, naturalists and volunteers with few locals regarding the survey methods. The selection of the locals was done based on their previous association with the forest department and also based on their knowledge of the lion-tailed macaque presence in different ranges of the park. We trained them to walk in the forests for getting the best sightings of the lion-tailed macaques, maintaining inter-individual distances, to identify the primates species, to differentiate lion-tailed macaque from other primates, to count the individuals in the group (group count), and to record and store the GPS reading. This training was conducted at Seethanadi nature Camp at Someshwara near Hebri.



After the rigorous training, the survey was conducted in all the three parks of Kudremukh NP, Someshwara WLS and Mookambika WLS from 27 to 29 January 2011 and 12 to 14 January 2012. The trained persons made consecutive walks in each fixed areas for three days. During each walk, at least two to three people walked parallel to each other with a 100 m inter-individual distance. The walks were conducted between 6 am to 11 am, after sighting a macaque group, sufficient time was spent to obtain a proper count of individuals and a GPS location. Previous studies have documented the home range of a single group to be about 5 km² (Kumar, 1987; Umapathy, 1998). Hence, we considered each group that was sighted within a range of 1.5 km radius from the other group as same, unless the two groups were sighted in a short span of time and the group identity of each was confirmed as different. The inter-group distance was extracted on a GIS platform using ArcView 3.2.

Each sighting of other primate's viz. bonnet macaque and gray langur were also recorded during the walk along with lion-tailed macaque. The abundance was considered as an encounter rate by calculating the number of groups encountered per kilometer for each species. The data could not be collected on group size, age and sex of the individuals in the group in spite of large effort due to less proximity of the groups and also time constraints. We also interacted with local people and forest department personnel to find out the occurrence of the slender loris in each park.

A total of 526.5 km of walk was made during the survey in Kudremukh NP, which include 142.5, 156, 102 and 126 km in Karkala, Kerekatte, Kudremukh and Belthangdi ranges respectively (Table 2), while 63 and 93 km were walked in Someshwara and Kollur range respectively.



Table 2 showing the survey effort in each forest ranges

Protected Area	Range	No. of transects	Range Min-Max	Transect length	Total walk
Kudremukh NP	Belthangadi	6	6-8	42.0	126.0
	Karkala	10	3-6	47.5	142.5
	Kudremukh	5	4-12	34.0	102.0
	Kerekatte	9	5-8	52.0	156.0
Someshwara WLS	Someshwara	4	3.5-7	21.0	63.0
Mookambika WLS	Kollur	6	1.5-10	31.0	93.0
	Total	40	1.5-12	227.5	682.5

Results :

Three diurnal primate's i.e. black-footed gray langur, dark-bellied bonnet macaque and lion-tailed macaque, and the nocturnal primate Malabar slender loris found to occur in all the three protected areas (Table 3). Except the bonnet macaque all other primates are high priority species for the conservation. Black-footed gray langur and bonnet macaque was found in all the altitudinal gradients and also vegetation types, where lion-tailed macaques were highly restricted to evergreen and semi-evergreen forests of the parks.

Table 3 Primates of Karkala Wildlife Division

		Status
Black-footed gray langur	<i>Semnopithecus hypoleucos</i>	VU
Dark-bellied bonnet macaque	<i>Macaca radiata radiata</i>	LC
Lion-tailed macaque	<i>Macaca silenus</i>	EN
Malabar slender loris	<i>Loris lydekkerianus malabaricus</i>	NT

Table 4 summarizes the number of groups seen and encounter rate for each species. The overall encounter rate of gray langur (0.14 ± 0.02) and bonnet macaque (0.12 ± 0.03) was higher than the lion-tailed macaque (0.06 ± 0.01). The mean encounter rate of lion-tailed macaque did not differ between the parks ($F_{2,37} = 0.946$, $p = 0.397$), where the encounter rate of bonnet macaque ($F_{2,28} = 4.126$, $p = 0.05$) and gray langur ($F_{2,28} = 3.632$, $p = 0.05$) differed significantly (Figure 2). The encounter rate of gray langur and bonnet macaque was more in the Mookambika WLS then other two parks, where the encounter rate of lion-tailed macaque remained low in all the parks especially it was very low in Mookambika WLS (0.01 ± 0.01) (Figure 2).

Table 4 Relative abundance of diurnal primates in Karkala Wildlife Division

Protected Area	Range	Gray langur		Bonnet macaque		Lion-tailed macaque	
		No.	En.rate	No.	En.rate	No.	En.rate
Kudremukh NP	Belthangadi	19	0.16 ± 0.05	2	0.09 ± 0.03	2	0.01 ± 0.01
	Karkala	12	0.10 ± 0.04	11	0.09 ± 0.05	3	0.02 ± 0.02
	Kudremukh	8	0.06 ± 0.03	1	0.02 ± 0.02	4	0.05 ± 0.02
	Kerekatte	-	-	-	-	25	0.17 ± 0.04
Someshwara WLS	Someshwara	7	0.11 ± 0.05	8	0.13 ± 0.07	4	0.07 ± 0.05
Mookambika WLS	Kollur	20	0.25 ± 0.06	18	0.26 ± 0.09	2	0.01 ± 0.01
	Total	66	0.14 ± 0.02	49	0.12 ± 0.03	40	0.06 ± 0.01



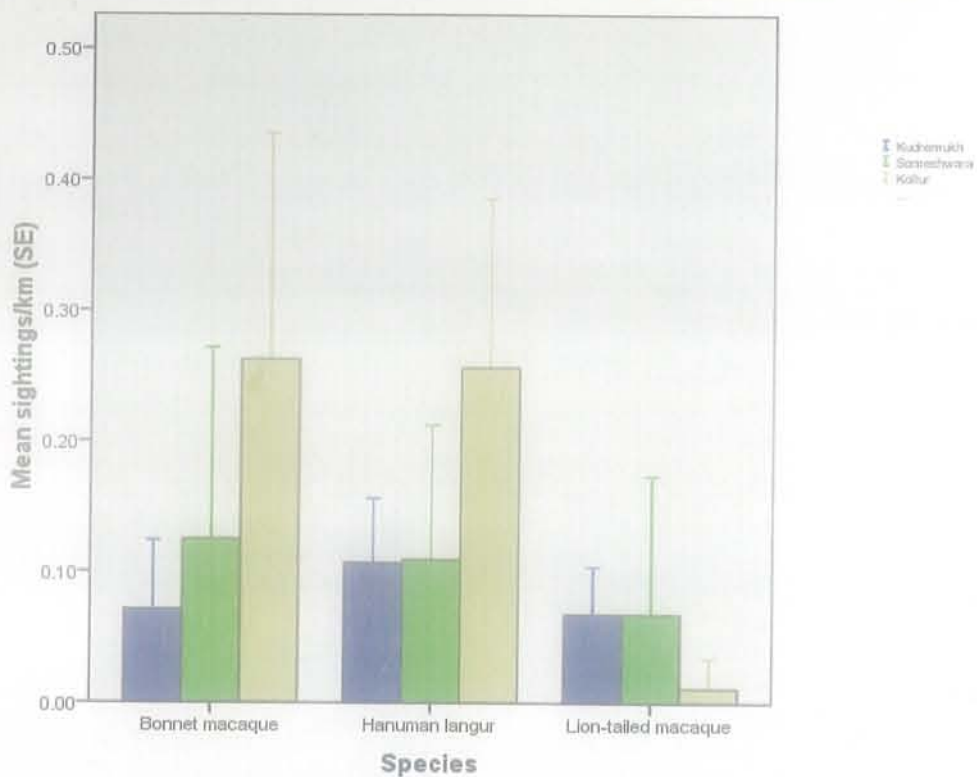


Figure 2 Encounter rate of primates in Kudremukh NP, Someshwara WLS and Mookambika WLS

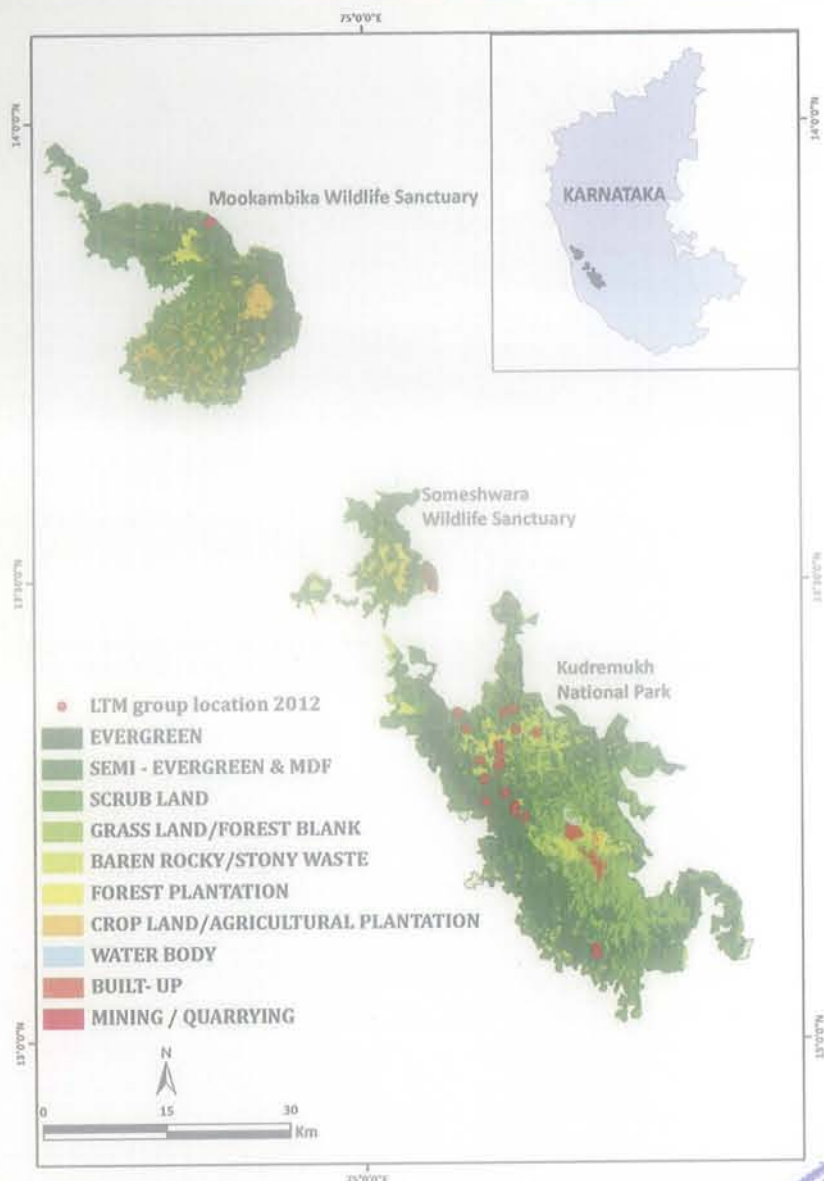


Figure 3 Showing the group locations of lion-tailed macaque during the survey in 2012



Table 5 Minimum number of groups and individuals of lion-tailed macaque recorded during the survey in January 2012

Ranges	No. of Sightings	Total animals sighted	Minimum No. of groups	Minimum number of individuals
Kudremukh NP				
Karkala	3	44	2	41
Kerekatte	25	169	11	141
Kudremukh	4	34	3	33
Belthangdi	2	10	1	10
Someshwara WS				
Someshwara	4	109	2	37
Mookambika WS				
Kollur	2	38	1	20
Total	40	404	20	282

Table 6 Group sizes and age-sex of some lion-tailed macaque groups in Karkala Wildlife Division

Group name	Adult Male	Adult Female	Sub Adult	Juvenile	Infant	Total
Agumbe 2 nd HP bend	2	11	2	4	3	24
Vanakabbe waterfalls road	-	-	-	-	-	13
Kerekatte Nursery 1	1	8	1	5	3	18
Kerekatte Nursery 2	1	4	1	1	1	8
Pandramukki up	2	15	2	8	2	29
SK boarder (2 km from the boarder)	2	8	2	5	5	22
SK road (middle of the road)	-	-	-	-	-	18
Hanumanagundi	-	-	-	-	-	18
Bhagavathi	-	-	-	-	-	17
Trekking path Kurinjal peak	-	-	-	-	-	14

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A total of 404 lion-tailed macaque individuals were sighted in 40 sightings (Figure 3). The estimated minimum number of groups and individuals were 20 and 282 respectively (Table 5). The estimated groups in Karkala, Kerekatte, Kudremukh and Belthangadi in Kudremukh NP was 2, 11, 3 and 1 group respectively, and two groups in Someshwara WLS and one group in Mookambika WLS. We were able to collect group size for 10 groups and age-sex for five groups (Table 6). The average group size of lion-tailed macaque was 18.1, and the adult male to adult female ratios was 5.75, and adult female to infants was 0.3, and adult female to immature was 0.98 (Table 7).

Table 7 Group size and age-sex ratios of lion-tailed macaque population in Karkala wildlife Division

Population parameter	Value
Average group size	18.1
Adult male: Adult female	1: 5.75
Adult female : Infant	1: 0.30
Adult female: Immature	1:0.98

Discussion:

All the three parks being a part of Western Ghats having large proportion of area with evergreen forests supports many arboreal mammals. Primates being arboreal mammal highly restricted to the forests of tall trees with high canopy. In the recent past people have started exploring and settled in these forests. Now, their livelihood is partially depending on the neighboring forests further, the local hunting depleted



the large mammal's abundance along the Ghats the large mammal's abundance along the Ghats. However, yet primates are in sizeable number at many reserves, Kudremukh forest complex is one such forests having primate population.

The survey of primates could not be done in all the potential places where the lion-tailed macaque was earlier recorded or the potential evergreen forests of all the parks due to intensive activity of extremists. Thus the current estimate of lion-tailed macaque is only a partial representation of the population. The present findings confirm the presence of lion tailed macaque in all the three parks, but the sightings during the current study was insignificant (Figure 4). Further, the effort for survey during 2007 was several folds higher than the current survey that also probably had negatively influenced the sighting rate of lion-tailed macaque groups. This is due to the Naxal activities within the National Park, But with all courage and duty conscious the department staff and voluntaries have taken risk to move around the forest and gather information on Primates specially Lion Tailed Macaque. However, the population in Kerekatte in Kudremukh NP shows consistency in location of occupancy, but the number of groups has relatively raised and the group size has decreased. This may be due to splitting of large groups in to small groups. The average group size (18.1) of the population remained close to the known mean group size (19) of the species. Though the age –sex ratio slightly varied from the ratios of other population, but the variation is insignificant, further all the groups had an infant which is an indicator of the general health of the population. In the recent past, primate taxonomy was revised by Groves (2001) and taxonomy of Colobinae and leaf monkeys of south Asia by Brandon-Jones (2004). Though, Brandon-Jones (2004) came out with a detailed reclassification of langurs, due to lack of clarity and ground truthing, his classification has not been well received among the researchers.



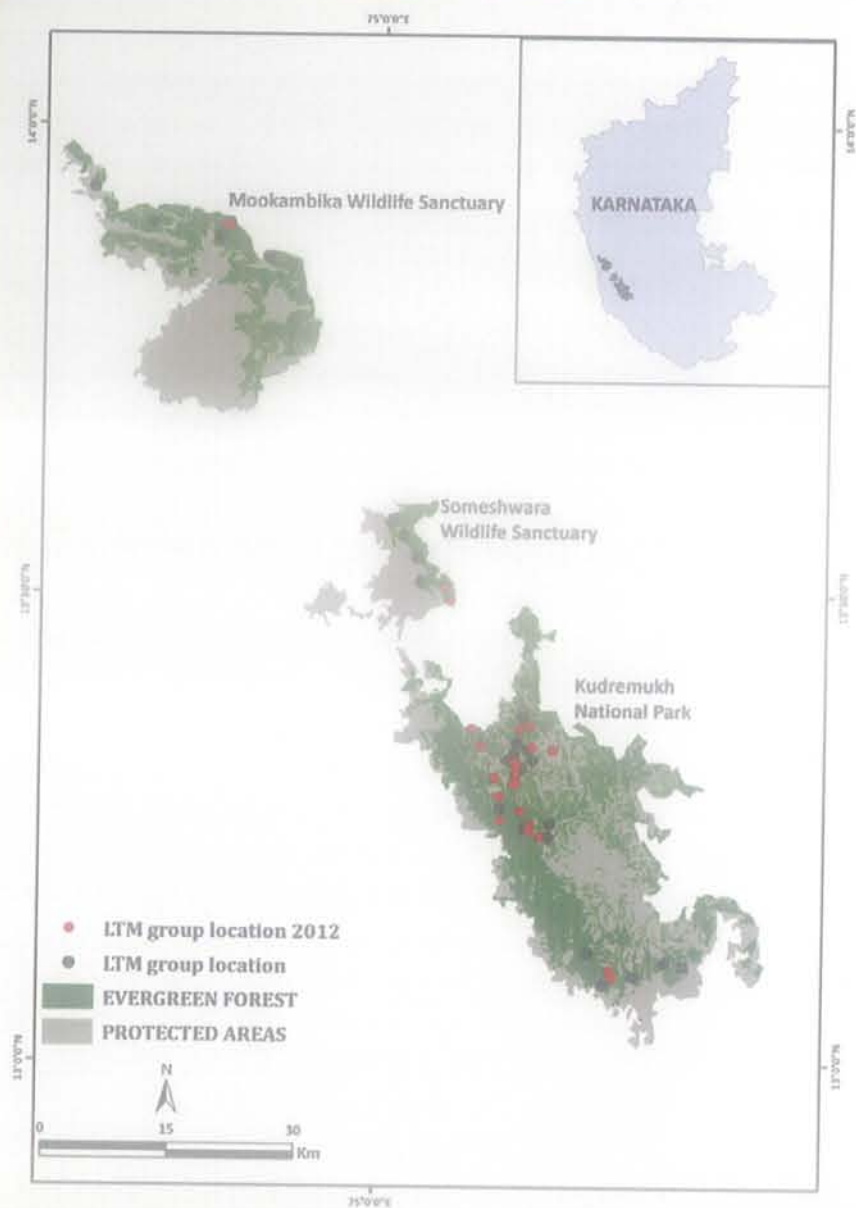


Figure 4 Showing the lion-trailed macaque group locations in the study parks between the two study period.

Thus the taxonomy by Groves (2001) has been widely used and considered for the evaluation of the species and subspecies of primates. Considering the classification by Groves (2001), the forests of the Western Ghats are home to four species of langurs viz. southern plains gray langur *Semnopithecus dussumieri*, black-footed gray langur *S. hypoleucos*, tufted gray langur *S. priam* and Nilgiri langur *Trachypithecus johnii*. Among them *S. hypoleucos* has narrow occupancy and restricted to relatively wet forests of Western Ghats. The species has been almost wiped off from certain forests patches in its range, thus the present population assessment is an important documentation on the species and its conservation. Bonnet macaque is a generalist species and occurs in variety of habitats from wet forests with high rainfall to dry scrub forests and villages and urban ecosystems. However, they occur in low abundance in evergreen forests than the other forests. Except the road side groups, other groups in the forests are very shy in all the parks, thus we were unable to collect the group size and age-sex of the individuals in the group.

Conclusion :

1. Periodic monitoring of lion-tailed macaque should be made as part of the department activity. We suggest monitoring can be done once in three years.
2. During the same survey the abundance of other primates should be documented, which gives an idea about general trend of the population and anthropogenic interference in each of the park.
3. Since the present survey was partial, another assessment is recommended in near future.
4. Recording of each sighting of lion-tailed macaque and other rare animals during the regular activity by forest department personnel should be made as mandatory. This will help in understanding the general trend of the species, and also help in outlining the next surveys.



5. One time baseline data on status and distribution of slender loris in all the parks are recommended.
6. A register should be maintained at every Range Office to document the sighting of Primates/LTM by any staff or local villager with date and time.
7. Loss of any suitable habitat is very expensive for the survivality of the species, thus any further forest conversion for either agriculture or developmental activities should be barred from the entire forest complex.
8. Local hunting can slowly wipeout the animals from the region, and should be taken care during the management of the parks.

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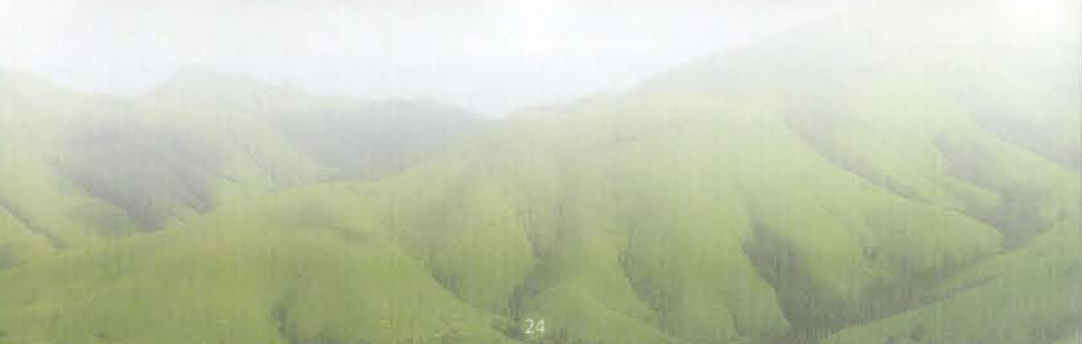
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7



Kachessnuck peak



Roadside view of Kachessnuck
during monsoon

Kuduremukh National Park





ANEJARI, MOOKAMBIKA WILDLIFE SANCTURY, KOLLUR



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