Assessment of the Important Wildlife Habitat in Sirsi-Honnavara forest divisions, Karnataka: with special emphasis on estimation of lion-tailed macaque *Macaca silenus* population

June 2008

H. N. Kumara, Vijay Mohan Raj and K. Santhosh,

KARNATAKA FOREST DEPARTMENT

Cover Page Photo : Mr. Kalyan Varma

Book Designed and Created by Pyramid, Bangalore - 9845997379

Assessment of the Important Wildlife Habitat in Sirsi-Honnavara forest division, Karnataka: with special emphasis on estimation of lion-tailed Macaque *Macaca silenus* population

H. N. Kumara[1]
Vijay Mohan Raj[2]
K. Santhosh[3]

---

[1]**National Institute of Advanced Studies, Bengalooru 560012, India**
[2]**Karnataka Forest Department, Karnataka, India**
[3]**No.11, 1st Cross, K. S. Colony, 2nd Block, Thyagarajnagar, Bengalooru 560028, India**

Suggested Citation

Kumara, H. N., Raj, V.M. and Santhosh, K (2008). Assessment of the Important Wildlife Habitat in Sirsi-Honnavara forest division, Karnataka: with special emphasis on estimation of lion-tailed macaque *Macaca silenus* population. Technical Report 1, Submitted to Karnataka Forest Department, Sirsi, India

Contents

Abstract

The forests of Sirsi-Honnavara lie in the central Western Ghats in the state of Karnataka, and remain outside the Protected Area Network under the custody of the Sirsi and Honnavara territorial Divisions of Kanara Circle. We conducted the survey of the lion-tailed macaque in the region to explore the current status of the population. The persistence of the metapopulation with the estimated number of 638 lion-tailed macaques was established. The average group size of the population was estimated as 20.6 monkeys/ group. The review of literature confirms the population in Sirsi-Honnavara is largest among known populations in the wild. The compilation of the information on other flora and fauna, confirms the high bio-diversity and high endemism, which further enhance the conservation value of the region. Thus we prepared different maps required to develop conservation area, and with this we intend to propose a new protected area for this population keeping the lion-tailed macaque as an umbrella species. The strategies required for the management of the proposed conservation reserve area for lion-tailed macaque has been briefly discussed and suggested.

Acknowledgements

We thank the Karnataka Forest Department-Sirsi Division, Margot Marsh Biodiversity Foundation-Primate Action Fund, Rufford Maurice Laing foundation and Primate Conservation Inc. for financial support. Mr. G. Satish, Conservator of Forests, Kanara Circle, Mr. H.S.S. Murthy, Deputy Conservator of Forests, Honnavara Division, Anthony Rylands, Ella Outlaw, Thomas T. Struhsaker, John F. Oats, Vernon Reynolds, Mohamed Irfan-Ullah, Ajith Kumar, Anindya Sinha, Sidhu Radhakrishna, Mewa Singh, Josh Cole and Jane Raymonds provided encouragement and support during the project for which we are grateful. H.N.Kumara would like to thank Mr. A.K. Varma for his support for the study.

Thanks are also due to Range Forest Officers Mr. H.H. Gowda and Mr. Bhagwan Das, who have taken care of all the logistic support made the work progress smooth. Special thanks are due to the frontline staff of Kyadgi Range, Siddapur Range, Gersoppa Range, Kumta Range and Honnavara Range.

We thank Messers S. Sunil, Kuldeep Roy, S. Amogh(ATREE), Shivshankar, Pradeep, Chidananda, Kumar & Mahesh, Ranganath Sharma, Krishna Prasad, Reddy, M.K. Sapta Girish and students of Sirsi Forestry College, who have involved in the fieldwork and gave their precious time. Our special thanks are due to Prof.Vasudev, College of Forestry, Sirsi who gladly shared the list of the flora occurring in the study area. Acknowledgements are due to Dr.Gururaja of IISc who contributed immensely for our understanding of frogs and providing the checklist on frogs. Thanks are also due to Arvind Madhyastha, Ganesh H.S and Ashwin for sharing the images used in the report.

We are indebted to Mr. Jaswanth Shetty, who stood throughout the study period and gave all possible support, and involved in by raising discussions on several issues on the study, and he had become an integral part of the team. We do not have many words to pen down his contribution to the present study.

We thank all the local people who have supported the study by providing the information to working as field assistants, especially Govinda, Subraya, Ganapathi Naika, Suresha, Krishna, Eerajja…….

Shanthala who helped in processing and analysis of the data, doing some maps for the report, more than all providing moral support throughout the study period being in the field, it was wonderful.

Kumara, Vijay Mohan Raj & Santhosh

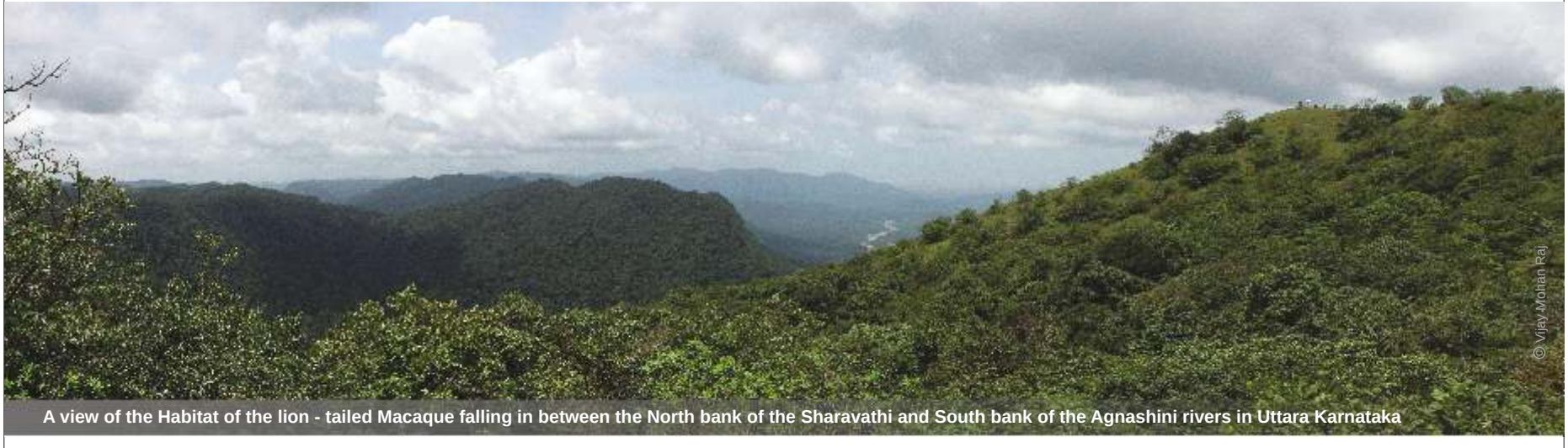
June 2008

Chapter 1

Introduction

Need for Proposal

Forests worldwide are subject to various pressures from people. The continued pressure on forests and with an ever increasing population has resulted in alteration of landscapes and resulted in shift in lifestyles. With the recent confirmation of the fact that such unsustainable use of natural resources has a long term impact on our environment through a well documented human induced climate change is beyond doubt. Rainforests or Evergreen forests indicate the true form of our nature undisturbed; such relicts of the true eco-system are few and far between. The Sirsi-Honnavara forest landscape is one such relict of the central Western Ghats forests where the true vegetation of the landscape exists till date. Such an eco-system is also now under renewed threat as pressure from adjoining areas spill over to these pristine eco-systems.



A view of the Habitat of the lion - tailed Macaque falling in between the North bank of the Sharavathi and South bank of the Agnashini rivers in Uttara Karnataka

Often the pressure on such eco-systems cannot be easily identified nor understood. It is only through its denizens one can understand the eco-system. Such an attempt is made to understand this fragile evergreen forests eco-system in Central Western Ghats through its flagship species, the lion-tailed macaque *Macaca silenus.* The lion-tailed macaque is at the apex of the wildlife chain in such an eco-system. An almost entirely arboreal mammal, whose life and existence depends on the tree cover it survives, indicates the potential or the lack of it in an eco-system that has many stories to tell to the people.

The present proposal of “Assessment of the Important Wildlife Habitat in Sirsi-Honnavara forest division, Karnataka: with special emphasis on estimation of lion-tailed

macaque *Macaca silenus* population" is aimed at documenting the pressures on the eco-system by studying this important endemic mammal, a true mammalian representative of the rainforest biome. This study was undertaken also to highlight the fact that some communities for long have led a lifestyles in which wildlife and people can rightly co-exist. This attitude of accommodation of wildlife needs and the model of tolerance can easily be the model for conservation in a country like India which is witnessing human-animal conflict increasingly.

The cardinal principle of a habitat being occupied by lion-tailed macaque is the proof that the habitat has little or no disturbing human interference. This paves the way to study other life forms which comprise of this ecologically fragile eco-system. The proposal not only documents the myriad life forms in the habitat but also outlines the threats on the ecosystem and also goes on to formulate to combat the threats and chalk out the strategy for conservation of entire ecosystem with primary focus on the lion-tailed macaque.

Basis for Proposal

The Western Ghats, a series of mountain ranges running parallel to the west-coast of India- from Tapti river mouth in Dhule District in Maharashtra to southern tip of India at Kanyakumari in Tamil Nadu District, passes through six states and covering an area of 160,000 square kilometers (Fig. 1.1).

Due to this hill system created the precipitation gradients that have influenced the distribution of vegetation type, regional climate and hydrology (Pascal, 1988). The Ghats receives 2000-7000 mm of rainfall a year. The wide array of vegetation type and microhabitat available in the hill system harbour the high diversity of flora and fauna. The Western Ghats is one of the five major forest regions in India and is one of the two internationally recognized bio-diversity hotspots in the country. The Western Ghats is one of the few areas in the Indian sub-continent that has more than 20% of the original habitat remaining and is floristically one of the richest areas in the country, for which it has won national and international recognition.

The Western Ghats constitute 20% of Karnataka's geographical area and 97% of its

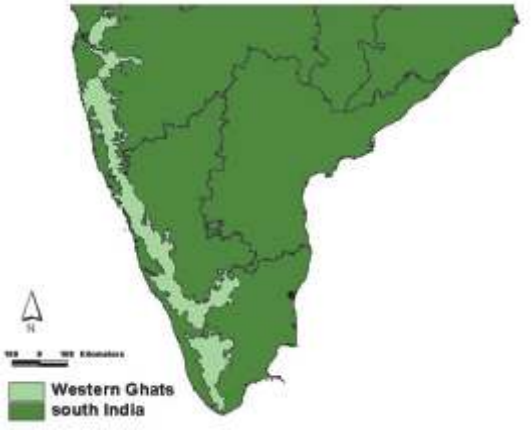


Fig. 1.1 Map of Western Ghats in south India

forest cover. Nearly 12% of Western Ghats in Karnataka has completely been lost in the last two decades. This has affected the bio-diversity of the region and led to water shortage in south India. Thus, there is an urgent need to conserve these biological resources *in situ* and *ex situ* before it is lost forever.

Endemism and Rarity of flora and fauna of Western Ghats

Western Ghats has more than 4000 flowering plants, 218 fishes, 156 reptiles and 121 amphibians, among them 38% plants, 53% fishes, 62% reptiles and 78% amphibians are endemic to the area. These forests are also

macaque *Macaca silenus* population" is aimed at documenting the pressures on the eco-system by studying this important endemic mammal, a true mammalian representative of the rainforest biome. This study was undertaken also to highlight the fact that some communities for long have led a lifestyles in which wildlife and people can rightly co-exist. This attitude of accommodation of wildlife needs and the model of tolerance can easily be the model for conservation in a country like India which is witnessing human-animal conflict increasingly.

The cardinal principle of a habitat being occupied by lion-tailed macaque is the proof that the habitat has little or no disturbing human interference. This paves the way to study other life forms which comprise of this ecologically fragile eco-system. The proposal not only documents the myriad life forms in the habitat but also outlines the threats on the ecosystem and also goes on to formulate to combat the threats and chalk out the strategy for conservation of entire ecosystem with primary focus on the lion-tailed macaque.

Basis for Proposal

The Western Ghats, a series of mountain ranges running parallel to the west-coast of India- from Tapti river mouth in Dhule District in Maharashtra to southern tip of India at Kanyakumari in Tamil Nadu District, passes through six states and covering an area of 160,000 square kilometers (Fig. 1.1).

Due to this hill system created the precipitation gradients that have influenced the distribution of vegetation type, regional climate and hydrology (Pascal, 1988). The Ghats receives 2000-7000 mm of rainfall a year. The wide array of vegetation type and microhabitat available in the hill system harbour the high diversity of flora and fauna. The Western Ghats is one of the five major forest regions in India and is one of the two internationally recognized bio-diversity hotspots in the country. The Western Ghats is one of the few areas in the Indian sub-continent that has more than 20% of the original habitat remaining and is floristically one of the richest areas in the country, for which it has won national and international recognition.

The Western Ghats constitute 20% of Karnataka's geographical area and 97% of its

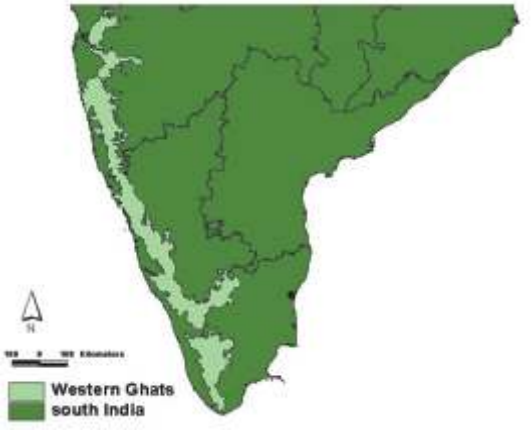


Fig. 1.1 Map of Western Ghats in south India

forest cover. Nearly 12% of Western Ghats in Karnataka has completely been lost in the last two decades. This has affected the bio-diversity of the region and led to water shortage in south India. Thus, there is an urgent need to conserve these biological resources *in situ* and *ex situ* before it is lost forever.

Endemism and Rarity of flora and fauna of Western Ghats

Western Ghats has more than 4000 flowering plants, 218 fishes, 156 reptiles and 121 amphibians, among them 38% plants, 53% fishes, 62% reptiles and 78% amphibians are endemic to the area. These forests are also

rich in orchids and very rich in lower plants especially lichens. The region harbour endemic mammal species which include Lion-tailed macaque *Macaca silenus,* Nilgiri langur *Semnopithecus johnii* and Nilgiri tahr *Hemitragus hylocrius.* The area has wild swamps that are habitats for *Myristica fatua* and *Pinanga dicksonii.*

Objective

The forests of Sirsi-Honnavara is an important habitat for the lion-tailed macaque, and the status of forest need to be explored, which inturn helps in management of the only largest population of the species. **Hence, we aimed to estimate the lion-tailed macaque population in the forests of Sirsi division and its adjacent forests.**

Study Area: **Sirsi-Honnavara**

Area and Jurisdictional Status

The proposed areas form the part of the Central Western Ghats in the district of Uttara Kannada in Karnataka State in South India (Fig. 1.2). The present area which is under study for assessment of the Wildlife Habitat with primary focus on Lion-tailed macaque extends from the North of the Sharavathi river into the administrative jurisdiction of Uttara Kannada district covering the Taluks of Siddapura, Honnavara and a small portion of Kumta taluk (Fig. 1.3). The latitude and longitude details of the study area is as below:

North : 14°23' - 14°23' 38''

East : 74°48' - 74°38'

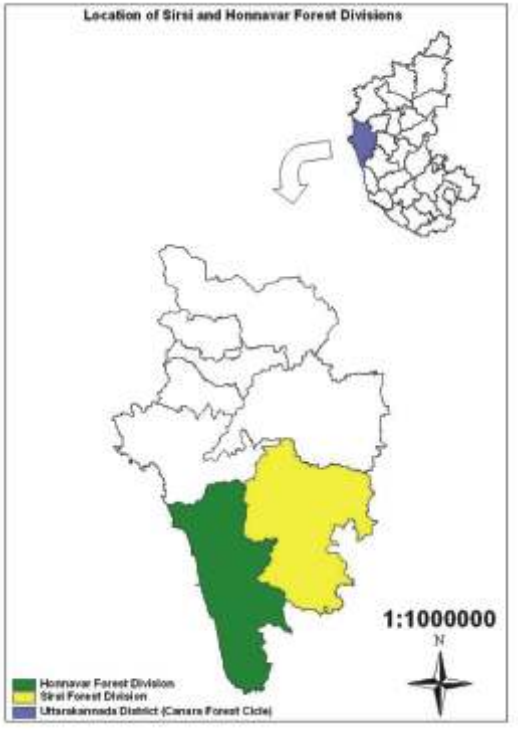


Fig. 1.2 Map of Sirsi and Honnavara forest division in Uttara Kannada district

The forests of the study area fall under the jurisdiction of the Sirsi forest division and Honnavar forest division under the administrative control of the Kanara Forest Circle. In Sirsi division majority of the habitat falls under the Kyadgi Forest range and and Siddapur forest range.

Fig. 1.3 Different ranges of Sirsi-Honnavara division surveyed for the lion-tailed macaque

In Honnavara division the habitat extends to parts of Gersoppa range, Honnavara range and a small portion of Kumta range as well (Fig. 1.3). Out of the 50 identified Bio-diversity Hotspots of Hope in the state of Karnataka. 22 Bio-diversity Hotspots of Hope occur in and around the study area.

Physical Features

Altitude

The study area is located in the ridge of the Ghats extending in the Westerly direction towards the West Coast. The altitude varies from 300 m asl to 800 m asl.

Terrain and Slope

The terrain being the part of the ridge of the Western Ghats is generally undulating; the terrain forms the primary watershed for the origin of many streams and rivers. The area is densely covered with Southern Tropical Evergreen and Southern Tropical semi-evergreen forests with many layers of vegetation. The terrain is highly undulating with generally slope of the study area varies from 20% to >35% in general.

Watershed and Catchments

The important wildlife habitat area is a prime forest dominated watershed which sustains the water resources of the major rivers. The forests in this watershed soak up the heavy rains of the monsoon and contribute to the perenniality of many streams. The catchments of the habitat contribute to the Sharavathi and Aghanashini river systems, which both are west flowing, mainly through the streams like Mugthihole and Vatehole.

Soil

With the rainfall in excess of 3000 mm, the soils comprise of mainly leached out laterite soils. The fertility of the soil is attributed to the detritus contributed from the forests, the forests not only harvest rain water but also contribute the protection of the soil which if exposed will lead to laterisation as it has been noticed in case of exposed slopes which has let to laterisation forming hard laterite pans. The soils vary from well drained loamy soils to

Prime lion tailed macaque habitat of closed canopy forests along the Sharavathi river near Gersoppa

shallow loamy soils. Clayey soils are encountered closer to the river systems, in the ridges gravelly soils are encountered. Rocky and boulder outcrops are encountered in the streams systems.

Temperature

The temperature of the region varies from 15° C in the winter to as high as 36° C during the summer in the ridge of the hill system, where in the lower altitude the temperature will be still higher, however the average temperature is maintained to 23° C.

Precipitation

Though the region receives both the monsoon the majority of the rainfall is received from the South Western monsoon which is experienced from June to October. Small amount of rainfall is received from the retreating monsoon in November. The dry season is long and will last for more than 6 months, summer showers are received in the month of the April and pre-monsoon showers in the month of May. The mean annual rainfall of the region is 5000mm (Nilkund rain station).

Present Management

Prevailing models of conservation in Sirsi-Honnavara

Historically the region had a strong conservation past; most of the prime relict forests of the region are a result of the areas maintained as sacred groves (*kans* or Devarabanas) by the local community prior to the colonial era. In the colonial period with the shift in the focus of these forests for timber most of the forests have suffered from logging related works. Post-colonial period with the department pursuing rising of high-value species and until recently the selection felling of softwoods for veneer and matchwood purpose the habitat has seen much further degradation.

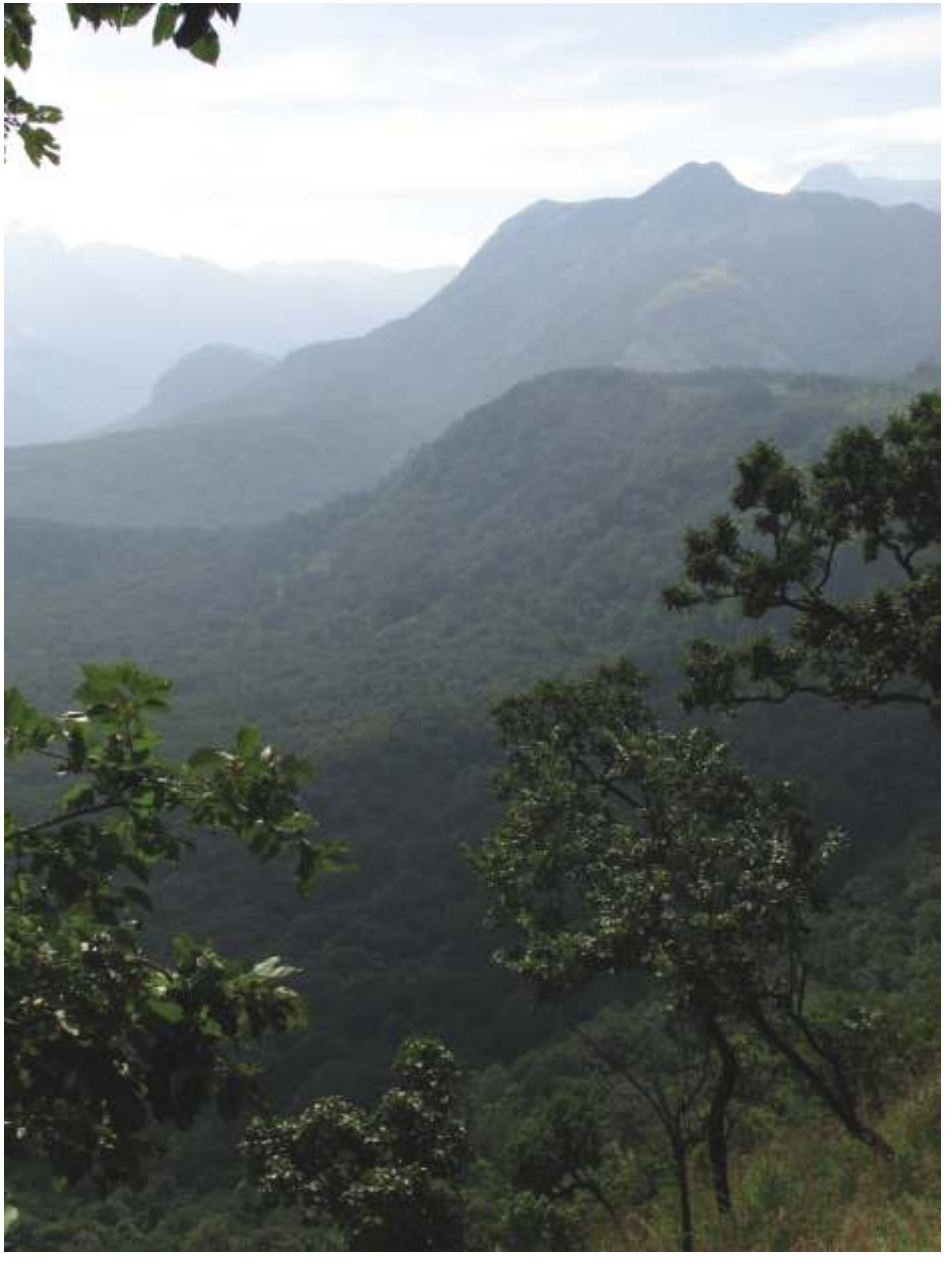
Blue Mormon butterfly which prefers evergreen forests occuring in the study area.

The present existing Working Plan for Sirsi division by K.S. Saibaba is in currency from 2002-03 to 2012-13 and the Working Plan for Honnavara division by K.S. Saibaba is in currency from 2002-03 to 2012-13, which prescribes the study area as Protection Working Circle where only the collection of Non-Timber Forest Produce is allowed and all other forest removals prohibited (Saibaba, 2002). This present management policy has really contributed for the study area to be so well protected. This also lays the foundation for future management of the area on a much intensive conservation oriented scale.

References

Pascal, J.P. (1988). Wet Evergreen Forests of the Western Ghats of India. Institut Français de Pondicherry, Pondicherry, India.

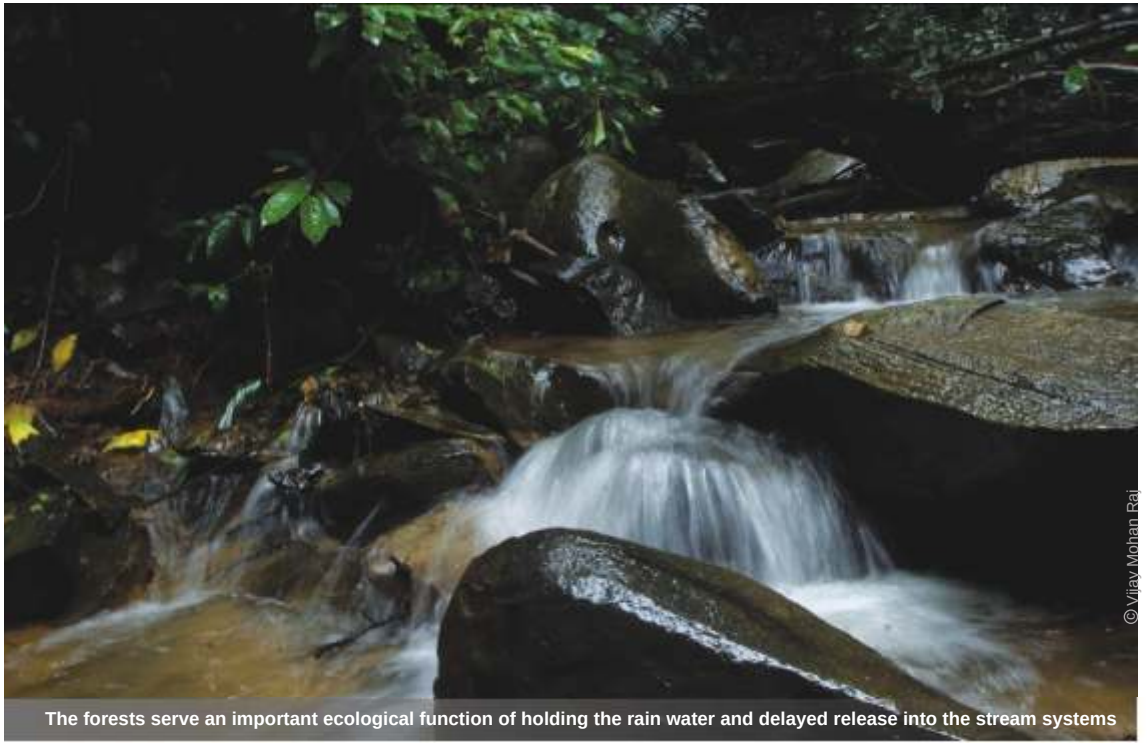
Saibaba, K.S. (2002). Working Plan for the Forests of Sirsi Division. Working Plan Wing, Dharwad.



Chapter 2

Bio-Diversity and Ecological Information

Though the forests of Western Ghats have got a high bio-diversity, conversely the bio-diversity assessment is not available for all the pockets of the hill system, further if the assessment is available for some pockets it is restricted to certain taxa. The same is also true for many protected areas in the Western Ghats. To fill the gap, documentation of large mammals was initiated during 2001 and produced a series of papers on different pockets of Western Ghats in Karnataka including the forests of Sirsi-Honnavara (Kumara and Singh, 2004 a, b, 2006; Kumara et al., 2005, 2006; Kumara and Singh, 2007; Kumara and Sinha, in press; Kumara, 2007). This has documented the baseline information on distribution and conservation status of many mammals ignored in management and conservation actions, and identified the surviving potential populations of such species. Such baseline information is very vital to develop a conservation action plan for the species and to the region. Equally such documentation is required for all the taxa, but unfortunately such documentation is not available even on many major taxa for the forests of Sirsi-Honnavara; however we review the available literature, archive records of the species and also unregistered sight records by different explorers to highlight the richness of the region.



The forests serve an important ecological function of holding the rain water and delayed release into the stream systems

Though there is no attempt to establish diversity and checklist of flora, butterflies, amphibians and birds from the study region, nevertheless some records are available from part of the study region. Floral diversity, some butterflies and checklist of amphibians are prepared for the region 'Kathlekan', which is a part of the present study region; hence we use those lists in the present chapter. R. Vasudev, Forestry College, Sirsi has contributed the list on floral diversity, H. Gururaj, Indian Institute of

Science, Bengalooru has contributed the list of amphibians and the butterfly list has been extracted from (Devar, 2008). Vijay Mohan Raj has recorded the list of birds sighted in the region from 2005 to 2008; we present this as a minimum species occurrence list. Since no attempt has been made to document on reptiles, we could not include the list.

Floristic diversity and important species

A total of 268 species of plants have been recorded that include 14 species of liana, 35 species of climber, 33 species of herb, 59 species of shrub, 4 species of plam, 2 species of grass, 5 species of orchid and 116 species of tree (Appendix 1). Among them two species are listed as critically endangered viz. *Semicarpus kathlekanensis, Vateria indica,* and five species as endangered viz. *Chenomorpha fragrans, Dipterocarpus indicus, Dysoxylum malabaricum, Nothapodytes nimmoniana, Persea macrantha,* and about 16 species as vulnerable. The more characteristic feature of the region is Myristica swamps.

Myristica swamps

Fresh water swamp forests that are found at elevations below 600 m asl, are dominated by family Myristicaceae, hence called wild nutmeg or Myristica swamps. There are several sacred groves in the area. Kathlekan located along the northern boundary of Sharavathi River is one such grove in this part of Western Ghats. In the last three decades, new plants and animal species have been discovered in the area and in similar areas of Western Ghats from laterite flats called *Sadas* that are rich in herbaceous monsoon flora. This indicates that the area is one where new species originates such areas, rich in bauxite and hence under threat to mining. Disturbance in the area may have an impact on evolution of new species. A rare endemic toad thought to be extinct was rediscovered after 100 years in the area. This indicates that among the other things that once widespread species, are getting

Stilt roots of *Myristica fatua* showing adaptation, an indication of Myristica swamps

***Semecarpus kathalekanensis* - Occurs only in the study area, nowhere else in the world**

restricted to some remote areas, and may finally vanish.

These Myristica swamps have a high endemism and harbour critically endangered plant species like *Madhuca bourdillonii* and *Syzygium travancoricum* along with interesting species like *Aglaia anamallayana, Calophyllum apetalum, Diospyros paniculata, Diospyros pruriens, Dipterocarpus indicus, Gymnocranthera canarica, Semecarpus kathalekanensis, Holigarnna grahamii, Hydnocarpus pentandra, Hopea ponga, Mastixia arborea, Myristica fatua, Pinnanga dicksonii.* Trees associated with Myristica swamps are highly threatened. These are *Gymnacranthera canarica, Myrisica fatua* var. magnifica and the newly described *Semicarpus kathalekanensis.* Many more groups of organisms such as lower plants and invertebrate animals have not found place in the lists which gives scope for further inclusion.

Some butterflies, list of amphibians and checklist of birds .

We incorporated the list of butterflies (Appendix 2) from the study on floristic diversity of '*Kan*' of Sirsi division (Devar, 2008), in which the author has addressed the host plants of larvae of butterflies in '*Kan*'. The total number of species recorded are 65. A total of 35 species of amphibians are recorded (Appendix 3) that includes two species of Caecilians. Among them 26 species are endemic to Western Ghats. Avian diversity is very high in the region with more than 182

Layers of vegetation in the closed canopy forests crucial for the movement of the lion tailed macaques

Slender Loris - Loris *lydekerrianus malabaricus*, a noctural mammal occuring in the project area

species which include 7 endemic species to Western Ghats (Appendix 4).

Occurrence and sight record of Mammal species

The presence of mammals (excluding smaller rodents and animals belongs to Order Chiroptera) in the forests of Sirsi-Honnavara was documented during the above study. We also have recorded all the mammal sightings during the sweep sampling for lion-tailed macaque in the region, with this information we update and present the mammal records of earlier list from Kumara and Singh (2004b).

Considering the nominal distribution in the literature about 33 species of mammals were included in the check list (Appendix 5), excluding smaller rodents and species belongs to Order Chiroptera. However, we were able to record the occurrence of 29 species, and among them 19 species were recorded by direct sightings. Among 29 species, 13 species were included in IUCN Red List (IUCN, 2003) with various conservation status viz. three species as endangered, six species as vulnerable, and one species as data deficient.

Within evergreen forests of the Western Ghats more than large ungulates, arboreal mammals are expected to be more due to continuous and closed canopy. Three species of diurnal (Hanuman langur- *Semnopithecus entellus,* bonnet macaque – *Macaca radiata* and Lion-tailed macaque- *Macaca silenus*) and one species of nocturnal primates (slender loris) are found in the region (Kumara and Singh, 2004a). Slender loris has two subspecies viz. Mysore slender loris (*Loris lydekkerianus lydekkerianus*) which is predominantly found in dry forests of southern India, Malabar slender loris (*Loris lydekkerianus malabaricus*) which is primarily found in the forests of Western Ghats. The Malabar slender loris is found in low abundance in the

Dhole - one of the top predator in the area

entire distribution range, nevertheless they are found in all the ranges of Sirsi-Honnavara (Kumara et al., 2006). The region harbour two squirrel species viz. Indian giant squirrel- *Ratufa indica* and Giant flying squirrel – *Petaurista petaurista* (Kumara and Singh, 2007). The Travancore flying squirrel – *Petynomus fuscocapillus* is reported from different parts of the Western Ghats of Karnataka, which is rarer and highly vulnerable due to loss of the habitat, but no sightings in the region, however the area needs a proper exploration to confirm the status of the species especially at foot hills of the region (Kumara and Singh, 2007).

Although the evidence for the existence of three top carnivores (Tiger - *Panthera tigris,* Leopard-*Panthera pardus* and Dhole - *Cuon alpinus*) available (Kumara and Singh, 2004b), only dholes were sighted during the survey. On March 20, 2008 we saw three dholes in the den site situated on the hill just behind Singumane in Kyadagi range. Later couple of hours was spent watching the activity of animals near the den site, and observed the presence of minimum of two pups, which has confirmed the breeding by dholes in the region. Jackals – *Canis aureus* are usually sighted and observed breeding near a forest interface with human habitation even in the ridges of the hill system.

Gaur - A rare mega herbivore occuring in the study area

The other group of animals predominate the evergreen forests are small carnivores. About 13 species are expected to present in the region, but the occurrence of 9 species was reported and only three species were confirmed by direct sightings (Kumara and Singh, 2007). Brown palm civets – *Paradoxurus jerdoni* are common than all other small carnivore species in the region, however since they are very elusive, small and many of them have nocturnal habit, it has made the researchers difficult to document them.

A total of six large herbivores were reported to present in the region (Kumara and Singh, 2004b), are again sighted during the present survey. Earlier elephant - *Elephas maximas* was thought locally extinct from the forests of Sirsi-Honnavara, but the existence of one elephant was confirmed by direct sighting during the present survey. However the local people revealed that the health of the animal was not in good condition and it has incurred several wounds. This individual is mostly ranging in forest areas associated with Mahime and Sasiguli villages of the Gersoppa

range. Though other species (Muntjac- *Muntiacus muntjak*, Chevrotain - *Tragulus meminna*, Sambar - *Cervus unicolor*, Gaur- *Bos gaurus* and Wild pig - *Sus scrofa*) were found in all the ranges, they remained in low density.

Bonnet macaque - A co-existing primate in the LTM habitat

Arboreal mammals, especially primates were reported to be more abundant than all other species in the region, and it was attributed to the belief system among the local people, hunting practice and access to ammunition (Kumara and Singh, 2004b). This has made the lion-tailed macaque to be less vulnerable for elimination in the region.

References

Devar, K.V. (2008). Assessment of floristic structure and composition of '*Kan*' forests in Sirsi division. Final Technical Report (2006-2008), submitted to Deputy Conservator of Forests, Sirsi Forest Division, Sirsi.

IUCN (2003). 2003 Red List of Threatened Species. www.redlist.org, accessed on October 15, 2004.

Kumara, H.N. (2007). Impact of Local Hunting on Abundance of Large Mammals in Three Protected Areas of the Western Ghats, Karnataka. Technical Report, submitted to Rufford Maurice Laing Foundation, UK. National Institute of Advanced Studies, Bangalore.

Kumara, H.N. and Singh, M. (2004a). Distribution of primates and conservation of *Macaca silenus* in rainforests of the Western Ghats, Karnataka, India. *International Journal of Primatology,* 25: 1001-1018.

Kumara, H.N. and Singh, M. (2004b). The influence of differing hunting practices on the relative abundance of mammals in two rainforest areas of the Western Ghats, India. *Oryx*, 38: 321-327.

Kumara, H.N. and Singh, M. (2006). Distribution and relative abundance of giant squirrels and flying squirrels in Karnataka, India. *Mammalia*, 40- 47.

Kumara, H.N. and Singh, M. (2007). Small carnivores of Karnataka: Distribution and sight records. *Journal of Bombay Natural History Society*, 104:155-162.

Kumara, H.N. and Singh, V.R. (2007). Estimation of lion-tailed macaque *Macaca silenus* population in Kudremukh forest division, Karnataka. Technical Report, Kudremukh Wildlife Division, Karkala, India.

Kumara, H.N. and Sinha, A. (in press). Decline of lion-tailed macaque populations in the Western Ghats, India: Identification of a viable population and its conservation in Karnataka state. *Oryx*.

Kumara, H.N., Kumar, S. and Singh, M. (2005). A novel foraging technique observed in slender loris (*Loris lydekkerianus malabaricus*) feeding on r e d ants. *Folia Primatologica* 76: 116-118.

Kumara, H.N., Singh, M. and Kumar, S. (2006). Distribution, habitat correlates and conservation of slender loris *Loris lydekkerianus* in Karnataka, India. *International Journal of Primatology*, 27:941-969.

Ruby-throated Bulbul - An endemic bird

Common langur - an associate primate of the LTM in the evergreen forests

Chapter 3

Population status of lion-tailed macaque

Introduction

The lion-tailed macaque ranges across three southern Indian states: Karnataka, Tamil Nadu and Kerala, and endemic to evergreen forests of the Western Ghats. Due to its highly selective feeding habits, limited range of occupancy (about 2500 km2), delayed sexual maturity, long inter-birth intervals, low population turnover and a small remaining wild population, this species has been classified as endangered (IUCN, 2003), with habitat loss, habitat fragmentation and hunting having most drastically affected its populations (Karanth, 1992; Krishnamurthy and Kiester, 1998).

Status in Western Ghats

Comprehensive information on the surviving numbers of this primate is not readily available although there have been a few estimates earlier (Green and Minkowski, 1977; Kurup, 1978; Ali, 1985; Karanth, 1992; Kumar, 1995; Easa et al., 1997; Molur et al., 2003), are summarized in Table 3.1. Most of these studies, though based on sporadic visits to different parts of the species range or on short surveys made in a few pockets, have, nevertheless, contributed to our knowledge of the status of these populations. Green and Minkowski (1977) projected the number of the surviving Lion-tailed macaques in the wild to be about 600 individuals, while Kurup (1978) and Ali (1985) later estimated the entire population to consist of 825 (in 55 groups) and 915 individuals (in 61 groups), respectively. Joseph (1985), however, believed that there were 635-735 individuals in the state of Kerala alone, while later estimates reported these numbers to be approximately 475-594 (Government of Kerala, 1993) and 1216 (Easa et al., 1997). In Karnataka, Karanth (1985) estimated 2000-3000 lion-tailed macaques, distributed in approximately 200 groups in the state on the basis of secondary information but this was questioned by Kumar (1988) on the basis of his long-term study on the ecology of the species. Karanth (1992) later reported a population of about 1000-2000 individuals in Karnataka. Unfortunately, no such state-level estimates are available from Tamil Nadu. Based on the collective opinion of several experts during a population assessment exercise, Kumar (1995) estimated 3500-4000 lion-tailed macaques for the entire Western Ghats, a number later put at 3500 in a similar exercise (Molur et al., 2003). These individuals were believed to consist of 49 subpopulations isolated in rainforest fragments scattered over eight locations (Molur et al., 2003).

Table 3.1. The status of lion-tailed macaques estimated by different studies

Area	Number of groups	Total number of individuals	Source
Western Ghats	-	600	Green & Minkowski (1977)
Western Ghats	55	825	Kurup (1978)
Western Ghats	61	915	Ali (1985)
Western Ghats	-	3500-4000	Kumar (1995)
Western Ghats	-	3500	Molur et al. (2003)
Karnataka	200	3000	Karanth (1985)
Karnataka	-	1000-2000	Karanth (1992)

Status in Karnataka

In Karnataka, Karanth (1985) had estimated based on the minimum area required by an average group of macaques from Green and Minkowski (1977) and following an extensive questionnaire survey, reported the existence of 123 groups in the state. Our survey and

other earlier surveys in the state have thus been compared with that of Karanth (1985). He had reported ten groups each in TWS and Pushpagiri-Subramanya, and nine groups in Sharavathi-Gersoppa, in the recent survey Kumara and Sinha (in press) shows a 69% decline in the groups in the same regions (Table 3.2). The status of the lion-tailed macaque appears to be similarly threatened in other Protected Areas of the state as well. Kumara and Singh (2004a), for example, reported only a single group in Brahmagiri-Makut; this population has thus declined more than 90 % from that reported by Karanth. In contrast, however, Karanth had reported only six groups in Sirsi-Honnavara, while Kumara and Singh (2004a) later reported 32 groups from the same region. During a survey between 2006, Kumara and Singh (2007) reported only 30 groups in Kudremukh National Park, Someshwara Wildlife Sanctuary and Mookambika Wildlife Sanctuary, from where Karanth (1985) had reported 62 groups. However, since the distance between Someshwara Wildlife Sanctuary and Mookambika Wildlife Sanctuary is about 20 km and no continuous forests exist; forests between Kudremukh National Park and Someshwara Wildlife Sanctuary are continuous with reserve forests. Hence the population of lion-tailed macaques in Kudremukh National Park and Someshwara Wildlife Sanctuary was considered as one population with 24 groups.

Table 3.2. Lion-tailed macaque groups in different Protected Areas and adjacent ranges in Karnataka state, India. (Adopted from Kumara and Sinha, in) press; Updated with the recent findings

Map location*	Area	Ranges	Karanth, 1985	Recent surveys	
				No. of groups	Source
1	Brahmagiri WS	Srimangala, Makut[1]	4	0	Kumara & Singh, 2004a
2	Makut RF	Makut[1]	6	1	Kumara & Singh, 2004a
3	Talakaveri WS	Bhagamandala	10	4	Kumara & Sinha,(in press)
4	Pushpagiri WS	Sampaja[2]	1	0	Kumara & Sinha,(in press)
5	Subramanya RF	Subramanya[2]	6	1	Kumara & Sinha,(in press)
6	Yesalur RF	Yesalur[2]	1	0	Kumara & Sinha,(in press)
7	Sakaleshpur RF	Sakaleshpur[2]	2	1	Kumara & Sinha,(in press)
8	Kudremukh NP	Kerekatte	9	10	Singh et al, 2000
9	Kudremukh NP	-	44	20	Kumara & Singh, 2007
10	Mookambika WS	-	12	6	Kumara & Singh, 2007
11	Someshwara WS	-	6	4	Kumara & Singh, 2007
12	Sharavathi V WS	Kogar[3]	5	2	Kumara & Sinha, in press
13	Bhatkal RF	Bhatkal[3]	2	1	Kumara & Sinha, in press
14	Gersoppa RF	Gersoppa 1[3]	2	0	Kumara & Sinha, in press
15	Gersoppa RF	Gersoppa 2[4]	2	10	Kumara & Singh, 2004a
16	Siddapur RF	Siddapur[4]	2	2	Kumara & Singh, 2004a
17	Kyadagi RF	Kyadagi[4]	1	17	Kumara & Singh, 2004a
18	Honnavara RF	Honnavara[4]	0	3	Kumara & Singh, 2004a
19	Kumta RF	Kumta	1	0	Kumara & Singh, 2004a
	Total		116		

[1]Brahmagiri-Makut population, [2]Pushpagiri-Subramanya population, [3]Sharavathi-Gersoppa population, [4]Sirsi-Honnavara population; WS: Wildlife Sanctuary, RF: reserve Forest, NP: National Park

*** The locations of these sites have been depicted in Fig. 3.1.**

A Viable population

Large contiguous populations of the lion-tailed macaque are expected to occur only in very few regions over the entire Western Ghats (Table 3.3, Fig. 3.1) and the conservation status of the species is likely to differ across these sparse populations. The Kalakad-Mundanthurai Tiger Reserve in southern Tamil Nadu, for example, has large tracts of rainforest, amounting to about 400 km^2, and is believed to have a good population of the species (Molur et al., 2003) although a status survey has never been conducted there.

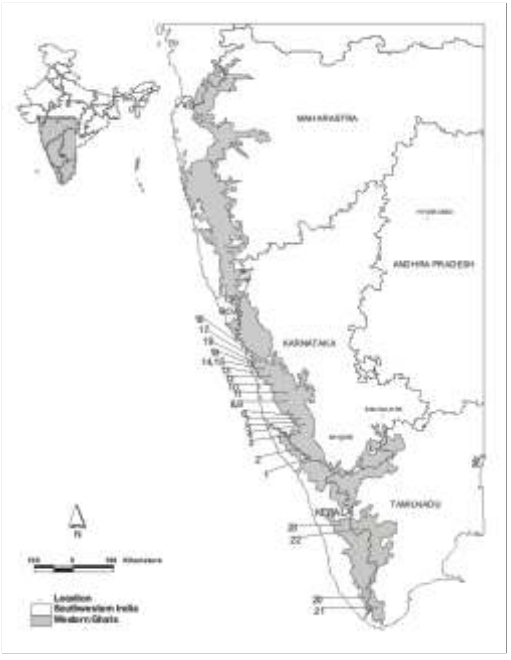


Fig. 3.1. Regions in the Western Ghats with lion-tailed macaque populations. The details of locations are provided in Table 3.2 & 3.3 (Adopted from Kumara and Sinha, in press)

Indira Gandhi Wildlife Sanctuary in the Anaimalai hills of Tamil Nadu has about 32 groups of lion-tailed macaques, all of which are restricted to severely fragmented forests (Singh et al., 2002) and, hence, the future of this population is unpredictable. The Silent Valley National Park in Kerala has, however, received the attention of the entire country because of its 14 groups of lion-tailed macaques(Joseph and Ramachandran, 1998). Ten groups of lion-tailed macaques were reported from the Brahmagiri Wildlife Sanctuary in the Western Ghats (Karanth, 1985); our studies have, however, revealed the virtual local extinction of this population due to extensive hunting (Kumara and Singh, 2004a,b; Kumara, 2005). We have observed similar drastic declines, sometimes leading to the loss of even 65 % of the existing groups, during our recent surveys of the Talakavery Wildlife Sanctuary, Pushpagiri Wildlife Sanctuary, Sharavathi Valley Wildlife Sanctuary and the adjacent ranges of each of these Protected Areas (Kumara, 2007; Kumara and Sinha, in press). Though the recent survey reveals the existence of large population in Kudremukh-Someshwara forest complex, the population size has declined (Kumara and Singh, 2007) compared to the number of troops reported in the same region by Karanth (1985). It is evident from the body of the literature there are very few known large populations left in the wild that include 32 groups in Sirsi-Honnavara (Kumara and Singh, 2004a), 24 groups in Kudremukh-Someshwara forest complex and 14 groups in Silent Valley National Park (Joseph and Ramachandran, 1998). Further, among them the largest population is Sirsi-Honnavara lion-tailed macaque population, but the forest is reserve forest not falling under any Protected area network, with many human enclosures and large agriculture land. Unfortunately, the expansion of agricultural land by encroaching the forests is a common phenomenon causing habitat loss in the region. Hence the initiation was taken to develop a conservation strategy for this population, as a foremost step indeed essential of confirming the existence of metapopulation. Thus the assessment of Lion-tailed macaque in Sirsi-Honnavara was conducted to find out the current status of population and to establish a various boundaries for the management action.

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 does not seem feasible as it requires an enormous effort. Laying of transect lines is often not possible over much of the species range. The

Table 3.3. The expected major lion-tailed macaque populations in the Western Ghats. (Adopted from Kumara and Sinha, in press; Updated with the recent findings)

Forest area	Current number of groups	Comments	Source
Kalakad-Mundanthurai Tiger Reserve, Tamil Nadu (21)*	Not known	Large tracts of ~400 km^2 of rainforest; expected to have a good population though no data are currently available	-
Indira Gandhi Wildlife Sanctuary, Tamil Nadu (22)	32	Very fragmented population, present in both protected and non-protected forests	Singh et al., 2002
Shendurney-Kulathupuzha-Peppara-Neyyar, Kerala (20)	20-25	One of the largest population in continuous forest tracts	Easa et al., 1997
Silent Valley National Park, Kerala (23)	14	Possibly a viable population	Joseph & Ramachandran, 1998
Kudremukha-Someshwara, Karnataka	24+	Large continuous forest; large population, probably viable population	Kumara & Singh, 2007
Mookambika-Sharavathi-Gersoppa, Karnataka	9+	Some of the groups have disappeared due to hunting	Kumara & Singh, 2007; Kumara & Sinha, in press
Sirsi-Honnavara, Karnataka	32	Non-protected, continuous forest; a viable population	Kumara, 2005; Kumara & Singh, 2004b

* The numbers in parentheses represent the locations of these sites in Fig. 3.1

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 approach constitutes simultaneous and repetitive walks for three to four times by many trained people in a selected grid or region. We adopted 'sweep sampling' 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.

Two researchers and couple of volunteers were made to walk in the forest on predetermined paths in the forest without cutting the line, with the help of local field assistants. The selection of the locals was done based on their knowledge of the Lion-tailed macaque presence in different ranges.

We trained the observers to walk in the forest

for getting the best sightings of the lion-tailed macaques, maintaining inter-individual distances, 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. The 63 days of survey was conducted in the region from January 28, 2008 to April 5, 2007.

Kumara and Singh (2004a) had established the most of the possible locations with lion-tailed macaque in the region, and further secondary data for the sightings in the last five years from the local people and the department personnel were pooled, and the suitable available habitat identified. This information provided the possible area for lion-tailed macaque in each of the range and helped in selecting specific areas for the survey. The trained persons made consecutive walks in each fixed areas for two to four days. In each fixed areas, walks were made using established trails and in fixed direction through undisturbed forests. During each walk, at least two to three people walked parallel to each other with a 100 m inter-individual distance. During the walk, after sighting a macaque group, sufficient time was spent to obtain a proper count of individuals and a GPS location. Since the lion-tailed macaques are canopy dwelling animals and difficult to record the age-sex of the individuals during the short period surveys, we ignored the documentation of demography of the groups, hence could not assess the viability of the population. The documentation of the numbers of the group was aided by the fact that groups of lion-tailed macaque use a common point of crossing over from one tree to another. Such cross over points was intensively studied and counts of individual groups ascertained.

Previous studies have documented the home range of a single group to be about 5 km^2 (Green and Minkowski, 1977; 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.

A total of 1056 km of walk was made during the sweep sampling in Sirsi-Honnavara, which includes 546, 56, 87 and 354 km in Kyadagi, Siddapura, Honnavara and Gersoppa ranges respectively.

Results

Population status and group size

The total number of lion-tailed macaque individuals and groups sighted during the survey period are summarized in the Table 3.4 & 3.5 (Fig. 3.2). All the groups remained in the altitudinal range between from 342 m asl to 750 m asl (Table 3.5). Using the conservative approach we estimated a total of 31 groups of lion-tailed macaques in Sirsi-Honnavara, that include 15 groups in Kyadagi range, 2 groups in Siddapura range, 1 group in Kumta range, 2 groups in Honnavara range and 11 groups in Gersoppa range (Table 3.4, Fig. 3.3). A total of 551 monkeys were sighted in 31 groups and three lone males during the survey. Group size could be recorded for only 24 groups (Table 3.5), which gave an average group size of 20.58 monkeys /group (Fig. 3.4). Thus our estimate of lion-tailed macaque population is 638 animals in 31 groups in the forests of Sirsi-

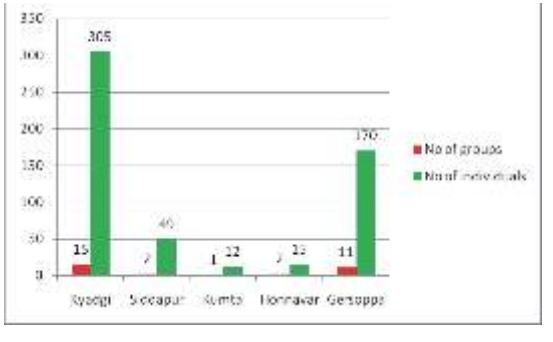


Fig. 3.2 Number of LTM groups and individuals in different ranges of Sirsi-Honnavara

Honnavara. We excluded the lone males from the population estimation. The total geographical area occupied by lion-tailed macaques is about 32479 ha, which spreads in 28 village boundaries, which include 18 villages of Sirsi and 10 villages of Honnavara divisions (Table 3. 6). Yet the 85% (27519 ha) of the total geographical area is under forest cover. The forest cover in Sirsi division (82%) and Honnavara division (86%) almost remined same. The region has wide variety of forest types viz. evergreen, semi evergreen, moist deciduous, scrub forests and different plantations, however the lion-tailed macaque groups were predominantly associated to the evergreen forests (Fig. 3.5).Though the percent of slope varied in the region, within this the monkeys were found mostly in the area with >35% of slopes (Fig. 3.6).

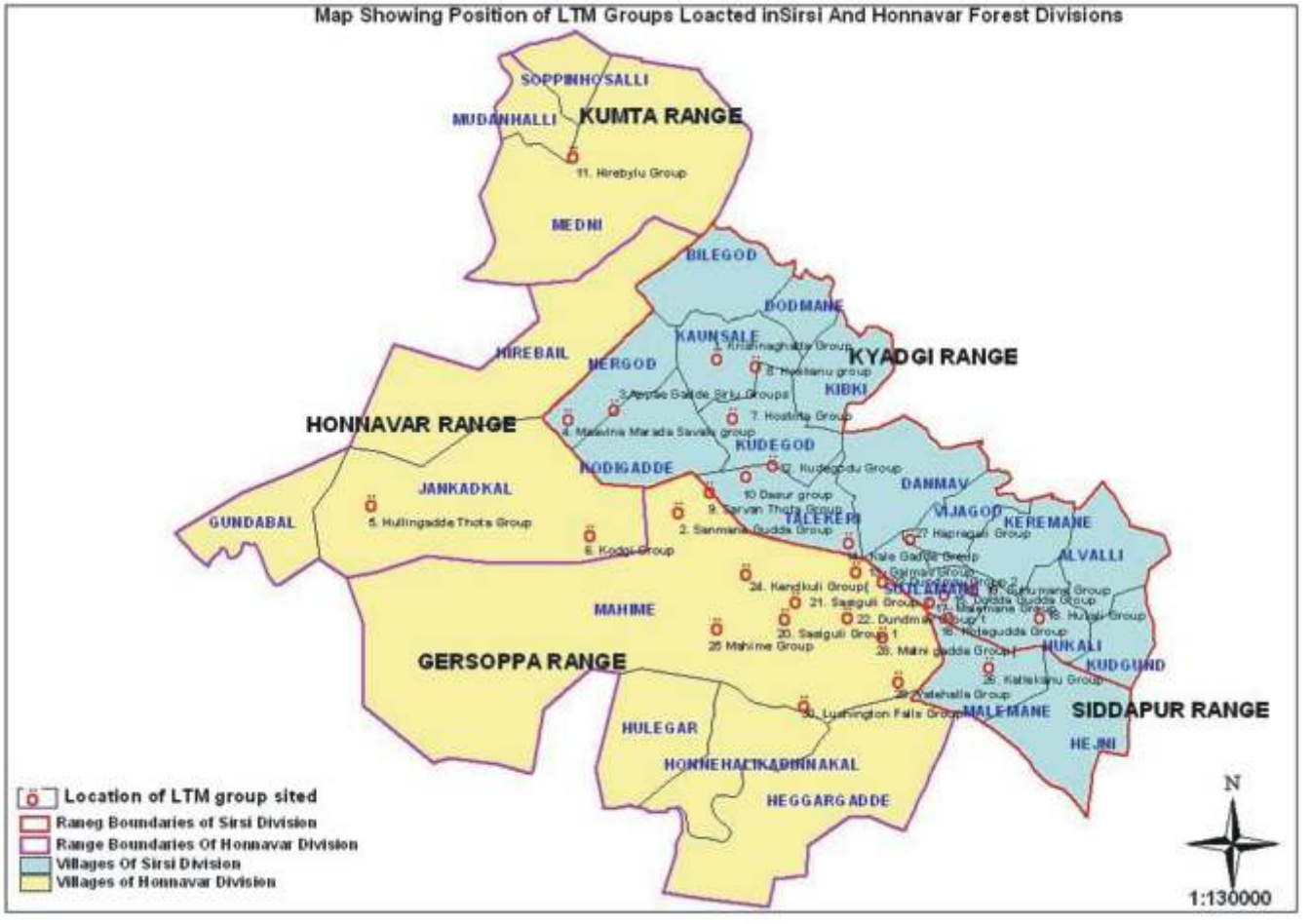


Fig. 3.3. Location of the lion-tailed macaque groups in the forests of Sirsi-Honnavara

Table 3.4. Effort and the lion-tailed macaque sightings

Range	No. of km walked	No. of groups sighted	No. of estimated groups	No. of LTM sighted in estimated groups
Kyadagi	546	27	15	305
Siddapura	56	2	2	49
Kumta	20	1	1	12
Honnavara	67	3	2	15
Gersoppa	367	16	11	170
TOTAL	**1056**	**49**	**31**	**551**

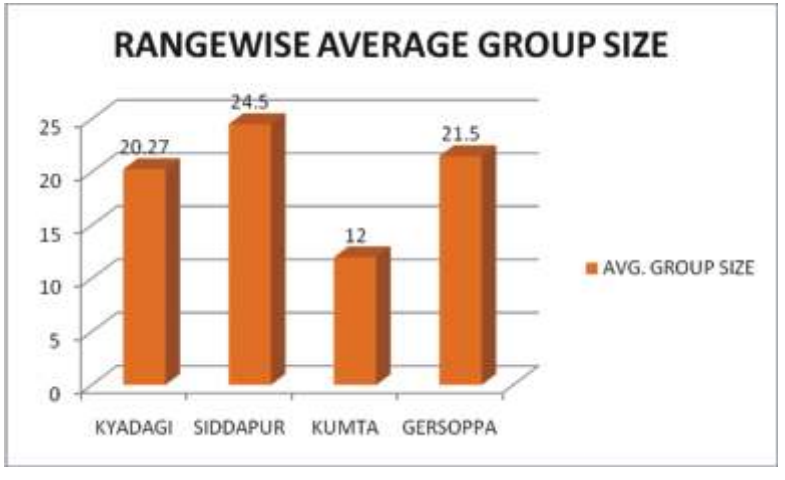


Fig.3.4. Mean group size of lion-tailed macaques in different ranges of Sirsi-Honnavara (Honnavara range is excluded from this due to no proper count of all the groups)

Table 3.5. Details on the lion-tailed macaque groups in Sirsi-Honnavara

GROUP ID	PROBABLE GROUP	GROUP SIZE	LAT-LONG	ALTITUDE (m)
HV1	SANMANE GUDDE	6+	N14º18'48.1" E74º39'24.5"	437
HV2	MAAVINA MARADA SAVALU	9+	N14º20'14.8" E74º37'35.5"	335
KU1	HIREBYLU	12	N14º24'18.5" E74º37'8.3"	342
KD1	HOSKANU(chiksuli)	17	N14º21'4.2" E74º40'30.5"	569
KD2	KRISHNAGHATTA	24	N14º21'10.9" E74º40'0.8"	551
KD3	HOSATOTA	17	N14º20'18.4" E74º40'13.4"	430
KD4	SARVAN THOTA	20	N14º19'9.2" E74º39'53.6"	436
KD5	APPAEGADDE SIRLU(salikanu)	30	N14º20'26.8" E74º38'31.8"	532
KD6	DASUR	26	N14º19'19.9" E74º40'26.4"	460
KD7	KUDEGODU	22	N14º19'38.0" E74º41'5.2"	515
KD8	HAPREGOLI	15	N14º18'25.0" E74º42'56.4"	750
KD9	KALEGADDE	20	N14º18'19.8" E74º42'3.0 "	690
KD10	GALMAV	15	N14º17'54.5" E74º42'8.5"	530
KD11	SUTHLUMANE	19	N14º17'36.4" E74º44'0.9"	625
KD12	DODDAGUDDE KANU	19	N14º17'31.9" E74º43'37.2"	698
KD13	KOTEGUDDA	17	N14º17'16.9" E74º43'32.0"	703
KD14	HUKKALI	22	N14º17'17.6' E74º45' 0.7"	744
KD15	TORMAI	21	N14º18'44.5' E74º41' 35.1"	-
KD16	HEGDEGADDE HALLA	1	N14º19'48.1" E74º38'57.0"	460
SD1	MALEMANE	35	N14º17'16.7" E74º43'20.4"	644
SD2	KATLEKAANU	14	N14º16'25.4' E74º44'16.9"	502
GR1	HASUVALLI	7+	N14º18'55.2" E74º34'28.0"	433
GR2	KODGI(KERI GADDE)	25	N14º18'23.4" E74º37'55.5"	438
GR3	KENDIKULI	9+	N14º17'57.5" E74º40'26.9"	544
GR4	MAHIME	-	N14º17'16.7" E74º43'20.4"	646
GR5	SASIGULI 1	13	N14º17'15.1" E74º41'3.2"	542
GR6	SASIGULI 2	33	N14º17'25.2" E74º41'12.7"	508
GR7	DUNDMAV 1	14	N14º17'11.1" E74º42'3.6"	466
GR8	DUNDMAV 2	23	N14º17'45" E74º42'17.5"	563
GR9	MATNI GADDE	21	N14º16'53.9" E74º42'38.9"	540
GR10	VATEHALLA	17+	N14º16'15.7" E74º42'56.8"	542
GR11	VATEHALLA	1	N14º16'15.7" E74º42'56.8"	542
GR12	VATEHALLA	1	N14º16'15.7" E74º42'56.8"	542
GR13	LUSHINGTON FALLS	6+	N14º16'36.4" E74º42'17"	502

HV-Honnavara; KU-Kumta; KD-Kyadagi; SD-Siddapura; GR-Gersoppa

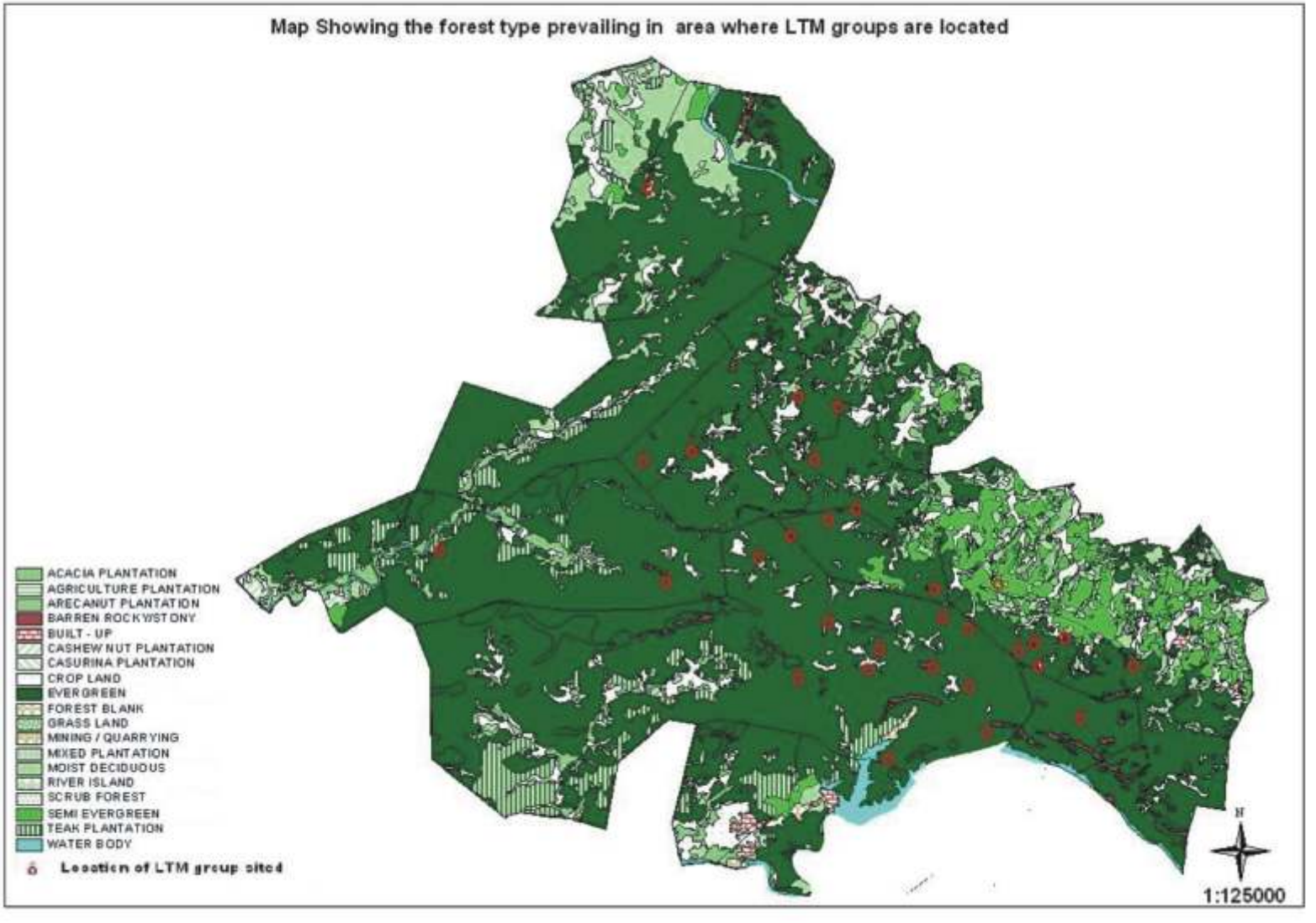


Fig. 3.5. The forest types in the region with group locations of lion-tailed macaque

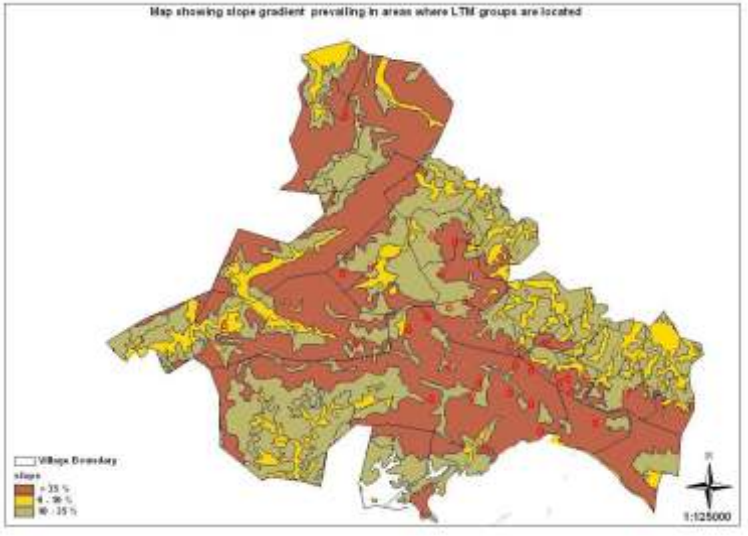


Fig. 3.6. The percent of slope in the region with group locations of lion-tailed macaque

Table 3.6. Geographical area and forest cover are projected for each village with in the lion-tailed macaque habitat

Sl no	Division	Range	Village	Total geographical Area (ha)	Forest Cover (Ha)
1	Sirsi	Kyadgi	Bilegod	763.53	585.69
2		Kyadgi	Nirgod	618.28	581.93
3		Kyadgi	Kodigadde	845.04	742.36
4		Kyadgi	Kaunsale	673.81	535.41
5		Kyadgi	Dodmane	284.96	204.12
6		Kyadgi	Kudegod	726.12	639.23
7		Kyadgi	Kible	614.12	449.07
8		Kyadgi	talekeri	767.30	684.28
9		Kyadgi	Danmav	956.34	742.94
10		Kyadgi	Sutlamane	459.37	410.97
11		Kyadgi	Vajgod	401.55	296.00
12		Kyadgi	Keremane	537.25	414.99
13		Kyadgi	Hukali	584.96	495.43
14		Kyadgi	Alvalli	673.39	468.25
15		Siddapur	Malemane	653.06	580.31
16		Siddapur	Hejni	941.53	810.79
17		Kyadgi	Kudgund	399.63	308.68
18		Kyadgi	Masalmakki	37.65	31.56
	Sub Total			10937.89	8982.01
19	Honnavar	Kumta	Soppinhosalli	380.20	281.61
20		Kumta	Mudanhalli	377.25	291.44
21		Kumta	Medni	3087.70	2868.54
22		Honnavar	Hirebail	2290.99	2011.80
23		Honnavar	jankadkal	2932.07	2597.39
24		Gersoppa	Mahime	7502.29	6726.93
25		Honnavar	Gundbal	822.56	640.31
26		Gersoppa	Hulegar	977.24	653.92
27		Gersoppa	Honnehalikabinnakal	895.81	582.45
28		Gersoppa	Heggargadde	2275.39	1883.51
	Sub Total			**21541.50**	**18537.90**
	Grand Total			**32479.39**	**27519.91**

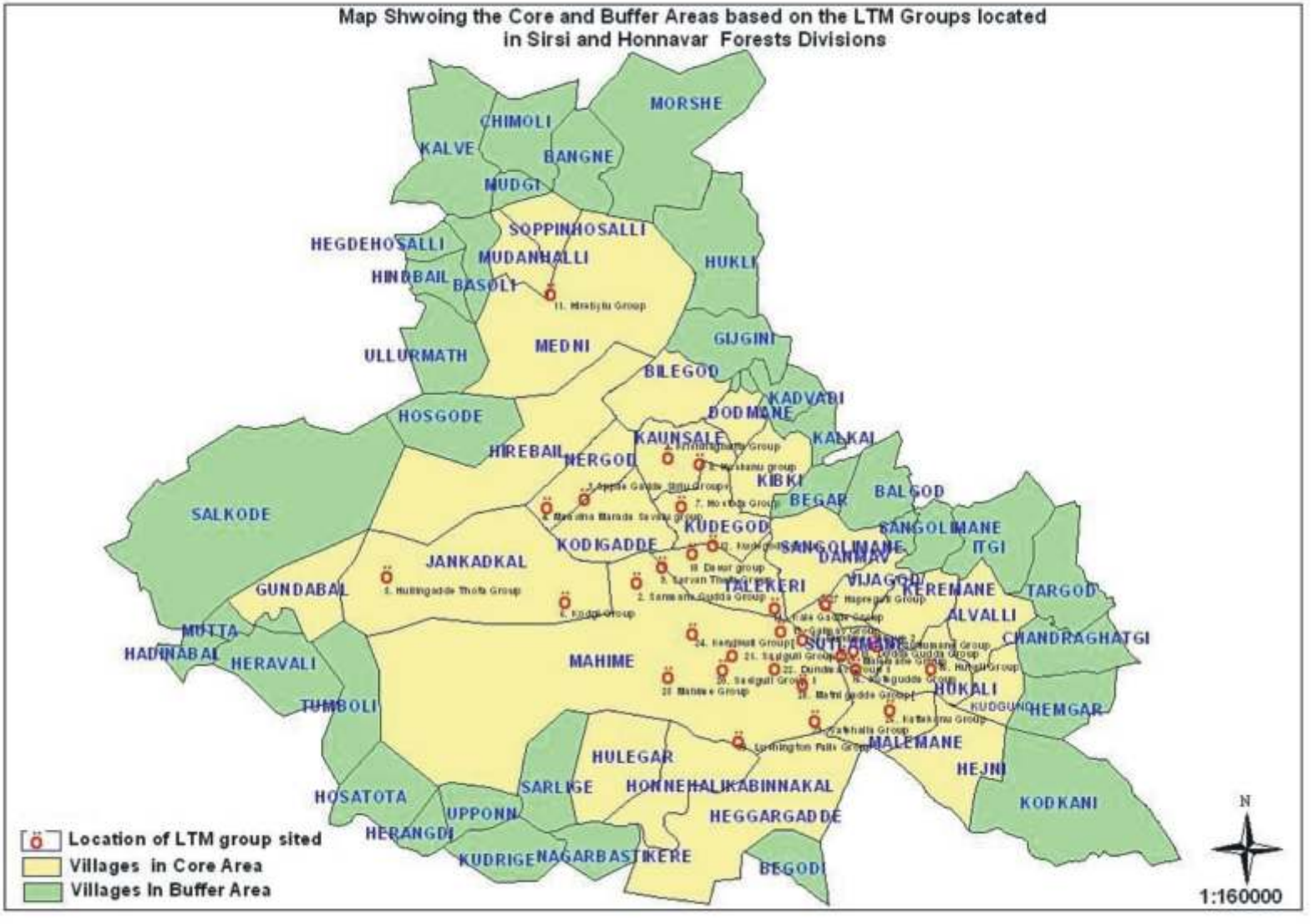


Fig. 3.7. Core and buffer area for identified Wildlife Habitat

Boundaries for the Conservation

All the sighted groups were plotted on the village map of the study area and developed the polygon by connecting all the outermost groups. All the forests of villages with in and associated to the polygon were considred as a '**core area**' (Fig. 3.7). Further the forests of the villages boarding outwardly to the core area were considered as '**buffer area**'. The details of the core area are provided in Table 3.6. The buffer region include forests of 35 village boundaries. Since the river Sharavathi acts as a barrier for the lion-tailed macaque population to move further south, the river can be considered as a southern boundary to notify the protected area.

Threats

During the survey, eight groups (Table 3.7) were found to be very shy and did not give proximity to observers, among them six groups were from Honnavara division. Several attempts to follow the groups in different days were also not successful, hence the proper group count of those groups could not be collected. This has made us to suspect in existence of threats in the region.

Table 3.7. Lion-tailed macaque groups which did not give a proximity

Range	Group name	Group size
Kyadagi	Suthlumane	19
Siddapur	Katlekaan	14
Kumta	Hirebylu	12
Honnavara	Sannamane gudde	6
	Mavinamarada savalu	9
Gersoppa	Vatehalla	17
	Kendikuli	9
	Lushington falls	6

We documented the visible and apparent threats in the region during the survey some of which are summarized here.

I. Habitat loss and fragmentation due to agriculture

i. Encroachment

The peculiar practice of cultivation of areca plants in the valleys in the study area has resulted in a pernicious practice of encroaching the valleys where water is found all round the year. The steady increase in such encroachments has resulted in honeycombing of valleys for extension of cultivation; this has resulted in pockets of human habitation throughout the study area. This in-turn has resulted in fragmentation of forests and this fragmentation inhibits the movement of wildlife. Such encroachments are also prone to wildlife damage and thus creating foci points of human-animal conflict. Most often snares laid for crop protection leads to catastrophic effects on the wildlife on ground dwelling mammals. The low incidence of ground mammals is mainly attributed to this practice of snaring for crop protection which has been going on for centuries.

An endemic dragonfly recorded in the study area.

The recent issues of relocation of people due to developmental projects like the Sharavathi tail race and the Gersoppa hydel project has led to an influx of people occupying areas in forests.

ii. Extension of existing farmland

Traditionally the areca-nut cultivators, the cultivation is often done in valleys adjoining forest land have been encouraged by providing certain privileges like '*Soppina Betta*' land i.e., for every acre of areca-nut cultivated 7-9 acres of adjoining forests are designated as '*Bettas*' where rights over green manure by lopping of trees is allowed including other benefits like NTFP's on the land. These farmers although possess legal ownership of a portion of the land tend to encroach adjoining forest land for extending their acreage wherever areca nut cultivation is possible. This extension encroaches upon the prime habitat of the lion-tailed macaque.

II. Habitat loss and fragmentation due to developmental activities

i. Dams

The present policy of having more number of hydel projects has a catastrophic effect on the lion-tailed macaque populations as it fragments the habitat. Even the run of the river hydel projects affect the habitat as not only the project per se disturbs the habitat but also the peripheral development which is associated with such projects.

Lion tailed macaque electrocuted - Transmission line threat

ii. Roads

One of the primary requirements for the lion-tailed macaque is the presence of unbroken natural canopy of the forests. Creating new roads inside the forests break the canopy and thus restrict movement of these arboreal mammals leading to shrinkage of home ranges.

iii. Transmission lines

With the extension of hydel power generation from existing dams, new transmission lines criss-cross the study area, the main transmission lines originate from Linganamakki dam and also Gersoppa dam. These high power transmission lines require a clearance width up to 50 m. This results in a break in the canopy which is detrimental to the habitat of the lion-tailed macaque.

Fragmentation of forests due to dam construction

III. Direct loss

i Hunting

Local hunting is wide spread in the region including lion-tailed macaque. The more details are documented earlier and published elsewhere (Kumara and Singh, 2004b).

Discussion

The population of lion-tailed macaque in Sirsi-Honnavara was first identified during the 2002 survey (Kumara and Singh, 2004a), later which has been pointed out as one of the largest and viable population among the known populations in the wild (Kumara and Sinha, in press). The present survey reconfirms the existence of largest population of monkeys in the region. The mean group size is not too different from the other populations in the wild e.g. Indira Gandhi Wildlife Sanctuary (Singh et al., 1997) and Silent Valley National Park (Joseph and Ramachandran, 1998), and also sightings of several lone males in the region reveals the possible emigration of individuals between the groups. Hence, we consider the population in Sirsi-Honnavara as viable. However to strengthen this fact further data is required on the age-sex ratios of some groups.

From the short duration study in the region it is clear that within the identified habitat there is an uneven distribution of the groups, many groups located in a small area and groups spaced far apart although similar habitat exists in the entire habitat. It is therefore essential to have a long term study mainly to ascertain the parameters on the occurrence of such high density of lion-tailed macaques is certain localities, whether it can be attributed to availability of food or due to least biotic disturbances.

Over exploitation of black dammer

While tracing the history of human ecology in the Western Ghats, hunting for pot by local people has been considered as one of the major activity by inhabitants (Chandran, 1997). Kumara and Singh (2004b) reported the persistence of trap hunting in the study region, mostly targeting terrestrial

Philautus neelanethrus, an endemic frog recently described to science from the study area

mammals. Though at smaller scale, the gun hunting is also in practice by many local people. Fortunately the >90% of the inhabitants in the study area are Hindus and who believe in the god *Hanuman*, due to this taboo attached to the all species of diurnal primates they are not been hunted. However, during the present survey, we came to know by many local people that people (from Kerala) who have settled in neighbouring taluks in the coastal area and also in Shimoga district, are venturing to the area using local hunters and bagging the primates, sambar and gaur. This will become detrimental for the entire wildlife chain of the area, which can cause local extinction of many large mammals. Such local extinction and sharp decline in the lion-tailed macaque population in different pockets of Karnataka has been recorded (Kumara and Sinha, in press). Hence the local hunting has been considered as one of the major threat. The other developmental activities should not be allowed to takes place in the region, which can cause population fragmentation, access to more number of people that can increase the rate local hunting and also disturb the behaviour aspects of the metapopulation.

We produced various maps keeping the lion-tailed macaques as a center, that include forest, non-forest, forest types, slope and villages. Based on these maps, we produced the boundary to develop the protected area for the conservation of lion-tailed macaques, which cover possible core area and buffer area. We expect that this will help in further conservation activities of this population. The details of the actions required are provided in Chapter 5.

References

Ali, R. (1985). An overview of the status and distribution of the lion-tailed macaque. In The Lion-tailed Macaque: Status and Conservation (ed. Heltne, P.G.). Alan R. Liss, New York, USA, pp. 13-25.

Chandran, M.D.S. (1997). On the ecological history of the Western Ghats. *Current Science*, 73: 146-155.

Easa, P.S., Asari, P.K.S. and Basha, S.C. (1997). Status and distribution of the endangered lion-tailed macaque *Macaca silenus* in Kerala, India. *Biological Conservation*, 80: 33-37.

Government of Kerala (1993). Forest Statistics. Department of Forests, Government of Kerala, Thiruvananthapuram, India.

Green, S.M. and Minkowski, K. (1977). The lion-tailed macaque and its south Indian rainforest habitat. In Primate Conservation (eds. Bourne, G.H. and Rainier, H.S.H.). Academic Press, New York, USA, pp. 289-337.

IUCN (2003). 2003 Red List of Threatened Species. www.redlist.org, accessed on October 15, 2004.

Joseph, K.J. (1985). *Macaca silenus*, the lion-tailed macaque: its status and conservation. (ed. Heltne, P.G.). Alan R. Liss, New York, USA, pp. 27-39.

Joseph, G.K. and Ramachandran, K.K. (1998). Recent

population trends and management of lion tailed macaque (*Macaca silenus*) in Silent Valley National Park, Kerala, India. *Indian Forester*, 124: 833-840.

Karanth, K.U. (1985). Ecological status of the lion-tailed macaque and its rainforest habitats in Karnataka, India. *Primate Conservation*, 6: 73-84.

Karanth, K.U. (1992). Conservation prospects for lion-tailed macaques in Karnataka, India. *Zoo Biology*, 11: 33-41.

Krishnamurthy, R.S. and Kiester, A.R. (1998). Analysis of lion-tailed macaque habitat fragmentation using satellite imagery. *Current Science*, 75: 283-291.

Kumar, A. (1988). Decreased population in the Western Ghats and active conservation measures. *Liontales*, 5: 2.

Kumar, A. (1987). Ecology and population dynamics of the lion-tailed macaque (*Macaca silenus*) in south India, Ph.D. Dissertation, Cambridge University, Cambridge.

Kumar, A. (1995). The life history, ecology, distribution and conservation problems in the wild. In The Lion-tailed Macaque: Population and Habitat Viability Assessment Workshop (eds. Kumar, A., Molur, S. and Walker, S.). Zoo Outreach Organization, Coimbatore, India, pp. 1-11.

Kumara, H.N. (2005). An ecological assessment of mammals in non-sanctuary areas of Karnataka. PhD Thesis, University of Mysore, Mysore, India.

Kumara, H.N. (2007). Impact of local hunting on abundance of large mammals in three protected areas of the Western Ghats, Karnataka. Technical Report, submitted to Rufford Maurice Laing Foundation, UK. National Institute of Advanced Studies, Bangalore.

Kumara, H.N. and Singh, M. (2004a). Distribution of primates and conservation of *Macaca silenus* in rainforests of the Western Ghats, Karnataka, India. *International Journal of Primatology*, 25: 1001-1018.

Kumara, H.N. and Singh, M. (2004b). The influence of differing hunting practices on the relative abundance of mammals in two rainforest areas of the Western Ghats, India. *Oryx*, 38: 321-327.

Kumara, H.N. and Singh, V.R. (2007). Estimation of lion-tailed macaque *Macaca silenus* population in Kudremukh forest division, Karnataka. Technical Report, Kudremukh Wildlife Division, Karkala, India.

Kumara, H.N. and Sinha, A. (in press). Decline of lion-tailed macaque populations in the Western Ghats, India: Identification of a viable population and its conservation in Karnataka state. *Oryx*.

Kurup, G.U. (1978). Distribution, habitat and status survey of the lion-tailed macaque, *Macaca silenus*. *Journal of the Bombay Natural History Society*, 75: 321-340.

Molur, S., Brandon-Jones, D., Dittus, W., Eudey, A., Kumar, A., Singh, M., Feeroz, M.M., Chalise, M., Priya, P. and Walker, S. (2003). Status of South Asian Primates: Conservation Assessment and Management Plan (C.A.M.P.) Workshop Report, 2003. Zoo Outreach Organization/CBSG-South Asia, Coimbatore, India.

National Research Council (NRC) (1981). Techniques for the Study of Primate Population Ecology. National Academy Press, Washington, DC, USA.

Singh, M., Kumara, H.N., Kumar, M.A., Sharma, A.K. and DeFalco, K. (2000). Status and conservation of lion-tailed macaque and other arboreal mammals in tropical rainforests of Sringeri Forest Range, Western Ghats, Karnataka, India. *Primate Report*, 58: 5-16.

Singh, M., Singh, M., Kumara, H.N., Kumar, M.A. and D'Souza, L. (1997a). Inter- and intra-specific associations of non-human primates in Anaimalai Hills, South India. *Mammalia*. t.61:17-28.

Singh, M., Singh, M., Kumar, M.A., Kumara, H.N., Sharma, A.K. and Kaumanns, W. (2002). Distribution, population structure and conservation of lion-tailed macaque (*Macaca silenus*) in Anaimalai Hills, Western Ghats, India. *American Journal of Primatology*, 57: 91-102.

Umapathy, G. (1998). Impacts of habitat fragmentation on the arboreal mammals in the wet evergreen forests of the Anaimalai hills in the Western Ghats, South India, Ph.D. thesis, Bharathiar University, Coimbatore, India.

White, L. and Edwards, A. (2000). Conservation research in the African rain forests: a technical handbook, Wildlife Conservation Society, New York.

Whitesides, G.H., Oates, J.F., Green, S.M. and Kluberdanz, R.P. (1988). Estimating primate densities from transects in a West African rain forest: a comparison of techniques. *Journal of Animal Ecology*, 57:345-367.

Chapter 4

The local people

Local farmer in traditional rain gear

The above described habitat of lion-tailed macaque in the forests of Sirsi-Honnavara are legally classified as 'Reserve forests', since the area do not fall under any protected area network thus the wildlife protection is not an area of focus. With the shortage of frontline staff there is a tendency to post the available staff to more smuggling prone areas. It is generally believed that the evergreen forests do not have economical timber yielding trees as compared to the moist deciduous forests which have a high density of hardwoods and economically high returns species like Matti, Teak and Nandi. This has resulted in further reduction of the diversion of existing staff from low populated evergreen areas to smuggling prone moist deciduous forests . The present management of these reserve forests is tilted towards managing the forests to meet the social demands.

Table 4.1 Human population in different villages of Sirsi-Honnavara

Sl. No.	Division	Range	Village	Men	Women	Total
1	Henagar	Henagar	Gondbal	668	675	1343
2	Honnavar	Honnavar	HireBail	601	469	1070
3	Honnavar	Gersoppa	Heggargadde	8	5	13
4	Honnavar	Gersoppa	Hulegar	565	561	1126
5	Honnavar	Honnavar	Jankadkal	687	574	1261
6	Honnavar	Gersoppa	Mahime	1181	1126	2307
7	Honnavar	Gersoppa	Honnehalli kabinahakkal	581	185	766
8	Honnavar	Kumta	Mudanahalli	90	99	189
9	Honnavar	Kumta	Medni	132	122	254
10	Honnavar	Kumta	Soppinahosalli	164	61	225
	Sub Total			**4677**	**3877**	**8554**
11	Sirsi	Siddapur	MaleMane	5	5	10
12	Sirsi	Kyadgi	Kodigadde	162	139	301
13	Sirsi	Kyadgi	Danmav	547	542	1089
14	Sirsi	Kyadgi	Vajgod	156	167	323
15	Sirsi	Kyadgi	Hukali	85	88	173
16	Sirsi	Kyadgi	Keremane	285	291	576
17	Sirsi	Kyadgi	Talekeri	76	78	154
18	Sirsi	Kyadgi	Suttalmane	129	121	250
19	Sirsi	Kyadgi	Alavalli	417	380	797
20	Sirsi	Kyadgi	Kudagunda	166	165	331
21	Sirsi	Kyadgi	Kibli	370	348	718
22	Sirsi	Kyadgi	Bilegod	224	216	440
23	Sirsi	Kyadgi	Nirgod	14	12	26
24	Sirsi	Kyadgi	Kaunsale	224	210	434
25	Sirsi	Kyadgi	Doddamane	265	222	487
26	Sirsi	Kyadgi	Kudegod	154	115	269
27	Sirsi	Siddapur	Hejni	53	56	109
28	Sirsi	Kyadgi	Masalamakki	-	-	-
	Sub Total			**3332**	**3155**	**6487**
	Grand Total			**8009**	**7032**	**15,041**

These continuous forests have in between many human enclosures, with large extent of agriculture fields. The major ethnic communities in the region include *Naika*, *Vokkaliga, Gowda*, *Harijana* and *Brahmin*. Most of them own the lands either legal or encroached forests, and practice rain dependent agriculture. They used to live in the joint family system, but now as the family size swells they opt nuclear family system. In consequence, it has resulted in more number of houses. As the family splitting up process progressed the land available for each family decreased, this has accelerated the pressure for new suitable area and encroachment of forest land for agriculture in the last couple of decades. Except the slope of the Ghats, people have gone to every corner of the forest and have established the agriculture fields. Human density in the core area of the lion-tailed macaque habitat varied between the divisions, the density in Sirsi division was 59.31 people/km^2 (6487 people) where the density in Honnavara division was 39.71 people/km^2 (8554 people), however the overall human density in the region was 46.31 people/km^2 (Table 4.1).

The major crop of the area are paddy, areca nut, sugarcane and cashew nut. They follow traditional way of cultivation and use organic manure. Long back when the land was given to people for agriculture, some forest was also given in a specified ratios as "*Soppina betta*" to extract the litter for manure. People collect the litter on the ground and it is mixed with the cow dung, later the same is dumped to the crop field as manure. Nowadays, due to less availability of such areas as a result of splitting of families and also the land, lopping of the branch for litter is prevalent in most of the region. Though limited number but most of the families hold small number of cattles and buffaloes for milk and to plough the field, and these livestock are usually sent to forest for grazing. Since the large carnivore species are less in number not much depredation has been reported.

Since people here live amidst of forests, the dependency to forests is apparent for their requirements, this may be litter for crop field, firewood for domestic use, grazing by livestock, hunting for bush meat, wood for construction or collection of 'non timber forest produce' for livelihood. Since the region receives heavy rainfall for four to five months during the monsoon, during the end of dry season people collect the fire wood and store it for the wet season. During the survey we also noticed severe extraction of timber from the region. Collection of 'non timber forests produce' are usually leased out to people on bid, and for them collection of certain officially fixed NTFPs are permitted. We have encountered people with gun during the survey. People own mostly unlicensed muzzle loading guns and hunting of wild animals is prevalent in the entire region. People belonging to some ethnic communities do not hunt the primates; hence primates are more abundant than other animals in the region.

People in the study area depend on paddy as main food crop

Chapter 5

Conserving the Bio-diversity of Sirsi-Honnavara

The forests of Sirsi-Honnavara, being a 'Reserve forest' the entire region has many villages and agriculture land. Nevertheless, the review of literature and present study confirms the region is one of the very critical forest in the Western Ghats having largest population of lion-tailed macaques, and also, the compilation of other flora and fauna reflects the high bio-diversity in the region. Hence, we suggest strategies for conservation of the region and urgently required research to enhance the conservation measures.

Whittakers'Boa - one among many interesting snakes encountered in the area

Strategy for Conservation

Long term:

It is beyond doubt that the study areas needs to be recognized as a important eco-system for the endangered, endemic mammal the lion-tailed macaque. In the long term interest of the species it is pertinent to notify the area as a "**Conservation Reserve**". In order to provide this fragile eco-system a conservation canopy it is very important that long term and legally lasting solution with a primary focus on conservation of the Lion-tailed macaque and its habitat and along with it the protection of various ecologically important species which are discussed above needs to protected by notification for conservation. This notification will help in containing the threats listed above.

With a proper notification in place we should strive to maintain the habitat in its present form and should have a vision of intervention only when nature needs it. Human intervention including habitat improvement needs to done with utmost caution. This should be the guiding principle in managing this eco-system in the long term.

Short term:

The immediate requirement to attend to the needs of conservation of the area is the

understanding of the various components of this eco-system especially those of other mammals and how they are interdependent on it. It is also important to know the impact of lower life forms like herpetofauna and others in this eco-system.

It is also important that large scale awareness especially in the study area needs to be done. The local villagers who are also the stakeholders in this habitat need to have a sense of belongingness to this pocket of bio-diversity otherwise it would lead to alienation of the locals from the conservation needs. The use of the existing VFC's to highlight the Important Wildlife Habitat needs to be done intensively so that the message of conservation of this study area can reach one and all.

Along with this it is desired to have a continuous updation of our knowledge in the study not only about the lion-tailed macaques but also about various other important flora and fauna.

Interventions for Conservation

The following interventions are required on priority in the said area:

Proper demarcation and survey with boundary stone fixing in the identified area.

Separate administration unit with focus on conservation needs to be created to manage the identified area.

Working Plan of both the Territorial divisions should incorporate recommendations for conservation for the identified area as if made by the Working Plan itself.

Forest areas should be made free from encroachments.

Regulate and control the collection of NTFP's and intensive patrolling in the study area.

Inventory of licensed and unlicensed weapons should be done and all illicit hunting to be treated seriously.

Watershed works based on principles of proper rainwater harvesting techniques should be adopted.

Future Research

To confirm the population as viable, more information is required on various aspects of the population i.e.

i **Demography** – indicates the health of the population

ii **Feeding ecology** - This provides the trees most required by the macaques. Once the trees are identified, it can regulate the NTFP collection accordingly

Fejervarya mudduraja **- An endemic frog occuring in the Study Area**

and also help in protecting those trees.

iii **Home range** - which help in planning the conservation boundaries.

These information are very vital to develop proper conservation plan for the population. We suggest to begin with, atleast one year study to establish above scientific information.

- The regular population assessment atleast once in five years should be done.
- Some groups should be monitored every year, which reflects the dynamics in the population.
- Bio-diversity assessment is required to strengthen the protection status.
- Wildlife-Human interaction needs to be documented
- Avenues for least impact Eco-tourism needs to studied.

Conclusion:

Going through the report is but clear that the project area is an unique Western Ghat eco-system and provides a crucial and important habitat for the lion tailed macaque *Macaca silenus*. The habitat is also an amphibian hotspot and possesses a high degree of endemic herpetofauna. It is clear that rare and endangered avi-fauna and mammals also find shelter in this habitat. In view of the above it is important tho bring this habitat under an 'umbrella of conservation' in addition to the fact that these are already constituted as Reserve Forests. It is thereby recommended to constitute the above area as Conservation Reserve under the Wildlife Protection Act, 1972.

Conservation Reserve

Under section 36A of the Wildlife (Protection) Act 1972, the State Government may declare any area owned by the Government, particularly the areas adjacent to National Parks and Sanctuaries, as a conservation reserve for protecting landscapes, seascapes, flora and fauna and their habitat. This is a classic case of protecting one of the endangered species of wildlife and its habitat.

Conservation Reserve Management Committee

The section 36B of WLP Act 1972, emphasizes on constituting a committee to advise the Chief Wildlife Warden to conserve, manage and maintain the conservation reserve. Therefore, it is suggested to form a committee with the following composition.

Chairman Conservator of Forests, Kanara Circle.

Member - Secretary Deputy Conservator of Forests, Sirsi.

Members - Deputy Conservator of Forests, Honnavar

Deputy Conservator of Forests, Dandeli Wildlife.

Range Forest Officer, Kyadgi.

Range Forest Officer, Siddapur

Range Forest Officer, Gersoppa

Range Forest Officer, Honnavar

Representatives of VFC.

Assistant Director of Animal Husbandry, Siddapur.

Assistant Director of Agriculture, Siddapur.

Representative from KPCL.

Local Zilla Panchayat Member

3 representatives from NGOs to be nominated by the Chief Wildlife Warden.

Noted subject specialist to be nominated by Chief Wildlife Warden (on the recommendation of the local universities or ZSI)

Jurisdiction:

The area of the conservation reserve comprises of the Northern banks of Sharavathi river and the catchment of the Aghanashini river, 18 villages of Sirsi division and 10 villages of Honnavar division comprising an area of 32,479 Ha. A detailed map of the area is enclosed in the report.

Appendix 1 List of plant species and its status in Sirsi-Honnavara

Sl. No.	Plant species	Family	Habit	Threat status
1	*Acacia concinna*	Mimoseae	liana	
2	*Achronychia pedunculata*	Rutaceae	tree	
3	*Actinodaphne hookeri*	Lauraceae	tree	
4	*Adenia hondala*	Passifloraceae	climber	Vul
5	*Adiantum sp.*	Adiantaceae	herb (fern)	
6	*Ageratum conyzoides*	Asteraceae	Herb	
7	*Aglaia roxbhurgiana*	Meliaceae	tree	
8	*Agrostistachys longifolius*	Euphorbiaceae	shrub	
9	*Ailanthus malabarica*	Simarubaceae	tree	
10	*Alangium salvifolium*	Alangiaceae	shrub	
11	*Albizzia odoratissima*	Papilionaceae	tree	
12	*Allophyllus cobbe*	Sapindaceae	shrub	
13	*Alpinia galang*	Zingeberaceae	Herb	
14	*Alseodaphne semicarpifolia*	Lauraceae	tree	
15	*Alstonia scholaris*	Apocynaceae	tree	
16	*Amphelocissus tomentosa*	Vitaceae	climber	
17	*Anamirta cocculus*	Menispermaceae	climber	
18	*Ancistocladus heynianus*	Ansistrocladacea	shrub	
19	*Antidesma menasu*	Euphorbiaceae	shrub	
20	*Apama siliquosa*	Aristolocaeae	shrub	
21	*Apananthe cuspidata*	Meliaceae	tree	
22	*Aphanomixis polystachy*	Meliaceae	tree	Vul
23	*Aporosa lindleyana*	Euphorbiaceae	tree	
24	*Archieodendron monodelphum*	Papilionaceae	tree	
25	*Ardesia solanaceae*	Myrsinaceae	shrub	
26	*Arenga wightii*	Palmae	palm	
27	*Argeria nervosa*	Convolvulaceae	climber	
28	*Aristolochia tagala*	Aristolocaeae	climber	Vul
29	*Artabotrys odoratissima*	Anonaceae	shrub	
30	*Artocarpus heterophyllus*	Moraceae	tree	
31	*Artocarpus hirsutus*	Moraceae	tree	
32	*Asparagus racemosus*	Liliaceae	climber	
33	*Atlantia racemosa*	Rutaceae	tree	
34	*Beilschmedia wightii*	Lauraceae	tree	
35	*Bigonia sp.*	Bigoniaceae	herb	
36	*Bischofia javanica*	Euphorbiaceae	tree	
37	*Bombax ceiba*	Malvaceae	tree	
38	*Bridelia scandens*	Euphorbiaceae	climber	
39	*Bulbophyllum sp.*	Orchidaceae	orchid	
40	*Calamus thwitessii*	Palmae	palm	
41	*Calicarpa tomentosa*	Verbinaceae	shrub	
42	*Calicopteris floribonda*	Combretaceae	liana	
43	*Calophyllum apetalum*	Clusiaceae	tree	Vul
44	*Calophyllum tomentosum*	Clusiaceae	tree	
45	*Calotropis gigantea*	Asclapiadaceae	shrub	
46	*Canarium strictum*	Simarubaceae	tree	Vul
47	*Canthium angustifolium*	Rubiaceae	climber	
48	*Canthium dicoccum*	Rubiaceae	shrub	
49	*Capparis heyneana*	Capparidaceae	shrub	
50	*Carallia brachiata*	Rhizoporaceae	tree	
51	*Careya arborea*	Myrtaceae	tree	
52	*Carissa carandus*	Apocynaceae	shrub	
53	*Caryota urens*	Palmae	palm	
54	*Casearia ovata*	Flacourtiaceae	tree	
55	*Casereia rubicans*	Flacourtiaceae	shrub	
56	*Cassia tora*	Papilionaceae	herb	

Sl. No.	Plant species	Family	Habit	Threat status
57	*Cassine glauca*	Celastraceae	tree	
58	*Cayratata sps.*	Vitaccae	climber	
59	*Celastrus paniculatus*	Celastraceae	climber	Lrnt
60	*Celtis phillphinensis*	Urticaceae	tree	
61	*Centella asiatica*	Umbelliferae	herb	
62	*Chassalia curviflora*	Rubiaceae	shrub	
63	*Chassalia ophioxyloides*	Rubiaceae	herb	
64	*Chenomorpha fragrans*	Apocynaceae	liana	En
65	*Chilocarpus atriviridis*	Apocynaceae	climber	
66	*Chionanthus malabarica*	Oleaceae	tree	
67	*Chromolina oderata*	Asteraceae	herb	
68	*Chrysophyllum lanceolatum*	Sapotaceae	tree	
69	*Cinnamomum malabathrum*	Lauraceae	tree	Vul
70	*Cissus javanica*	Vitaceae	climber	
71	*Clausena wildenovii*	Rutaceae	tree	
72	*Cleidon speciform*	Euphorbiaceae	tree	
73	*Clematis gouriana*	Rananculaceae	climber	
74	*Clerodendron viscosum*	Verbinaceae	herb	
75	*Combretum latifolium*	Combretaceae	liana	
76	*Combretum ovalifolium*	Combretaceae	liana	
77	*Connarus wighti*	Combretaceae	shrub	
78	*Croton malabaricus*	Euphorbiaceae	shrub	
79	*Curcuma Spp.*	Zingeberaceae	herb	
80	*Cyclea peltata*	Menispermaceae	climber	
81	*Cymbidium biclor*	Orchidaceae	orchid	
82	*Cyperus rotundus, Linn*	Cyperaceae	grass	
83	*Dalbergia horrida*	Papilionaceae	liana	
84	*Dalbergia rubiginosa*	Papilionaceae	liana	
85	*Dalberiga tamerindifolla*	Papilionaceae	liana	
86	*Debregasea longifolia*	Urticaceae	shrub	

Sl. No.	Plant species	Family	Habit	Threat status
87	*Dellinia pentagyna*	Dilliniaceae	tree	
88	*Dendrobium macrostachy*	Orchidaceae	herb	
89	*Dendrobium Spp.*	Orchidaceae	orchid	
90	*Derris scandens*	Papilionaceae	liana	
91	*Derris uliginosa*	Papilionaceae	liana	
92	*Desmodium triquetrum*	Papilionaceae	herb	
93	*Desmos lawii*	Anonaceae	shrub	
94	*Dimocarpus longan*	Sapotaceae	tree	
95	*Dimorphocalyx beddomei*	Euphorbiaceae	tree	
96	*Dioscorea bulbifera*	Dioscoriaceae	climber	
97	*Dioscorea oppositifolia*	Dioscoriaceae	climber	
98	*Diospyros buxifolia*	Ebenaceae	tree	
99	*Diospyros candolleana*	Ebenaceae	tree	Vul
100	*Diospyros crumenata*	Ebenaceae	tree	
101	*Diospyros oocarpa*	Ebenaceae	tree	
102	*Diospyros paniculata*	Ebenaceae	tree	Vul
103	*Diospyros pruriens*	Ebenaceae	tree	
104	*Diploclisia glaucansis*	Menispermaceae	climber	
105	*Diploclisia palmatus*	Cucurbitaceae	climber	
106	*Dipterocarpus indicus*	Dipterocarpaceae	tree	En
107	*Dracena terniflora*	Liliaceae	herb	
108	*Drypetes confertiflorus*	Euphorbiaceae	tree	
109	*Dysoxylum malabaricum*	Meliaceae	tree	En
110	*Elatostemma lineolatum*	Urticaceae	herb	
111	*Eleagnus conferta*	Eleagnaceae	shrub	
112	*Eleocarpus serratus*	Urticaceae	tree	
113	*Elephantophus scaber*	Asteraceae	herb	
114	*Embelia ribes*	Myrsinaceae	liana	Vul
115	*Embelia tsjeriun -cottam*	Myrsinaceae	shrub	Vul
116	*Emelia sonchifolia*	Asteraceae	herb	

Sl. No.	Plant species	Family	Habit	Threat status
117	*Epiprinus mallotoformis*	Euphorbiaceae	shrub	
118	*Eranthemum sps.*	Acanthaceae	herb	
119	*Erycibe paniciulata var. wightiana*	Convolvulaceae	climber	
120	*Eryciebe paniculata*	Convolvulaceae	climber	
121	*Eugenia macreocephala*	Myrtaceae	shrub	
122	*Euodia-luna anakanda*	Rutaceae	tree	
123	*Euonymus indica*	Celastraceae	tree	
124	*Euphorbia hirta*	Euphorbiaceae	herb	
125	*Ficus callosa*	Moraceae	tree	
126	*Ficus drupacea*	Moraceae	tree	
127	*Fucyus heterophylla*	Moraceae	tree	
128	*Ficus hispida*	Moraceae	tree	
129	*Ficus nervosa*	Moraceae	tree	
130	*Ficus racemosa*	Moraceae	tree	
131	*Flacourtia montana*	Flacortiaceae	tree	
132	*Flacourtia sepiaria*	Flacortiaceae	shrub	
133	*Garcinia gummi-gatta*	Clusiaceae	tree	Lrnt
134	*Garcinia morella*	Clusiaceae	tree	Vul
135	*Garcinia talbotii*	Clusiaceae	tree	
136	*Glochidion mlabaricum*	Euphorbiaceae	shrub	
137	*Glochidion velutinum*	Euphorbiaceae	tree	
138	*Glycosmis pentaphylla*	Rutaceae	shrub	
139	*Gnetum ula*	Gnetaceae	liana	
140	*Gomphandra tetrandra*	Icacinaceae	shrub	
141	*Goniothalamus cardiopetalus*	Anonaceae	shrub	
142	*Gouania microcarpa*	Rhamnaceae	liana	
143	*Gymnocranthera canarica*	Myristicaceae	tree	Vul
144	*Gymnostachium sp.*	Acanthaceae	herb	
145	*Hemidesmus indica*	Apocynaceae	climber	
146	*Hibiscus furcatus*	Malvaceae	shrub	

Sl. No.	Plant species	Family	Habit	Threat status
147	*Hippocrateya grahami*	Hippocrataceae	liana	
148	*Holigarna arnottiana*	Anacardiaceae	tree	
149	*Holigarna grahami*	Anacardiaceae	tree	
150	*Homalium zeylanica*	Flacourtiaceae	tree	
151	*Hopea ponga*	Dipterocarpaceae	tree	
152	*Hoya ovalifolia*	Asclapiadaceae	climber	
153	*Hydnocarpus pentadra*	Flacourtiaceae	tree	Vul
154	*Hyminodictyon obvatum*	Rubiaceae	tree	
155	*Ichinocarpus fruitiscence*	Apocynaceae	climber	
156	*Ixora brachiata*	Rubiaceae	shrub	
157	*Ixora lanceolata*	Rubiaceae	shrub	
158	*Ixora nigricans*	Rubiaceae	shrub	
159	*Ixora polyantha*	Rubiaceae	shrub	
160	*Jasminum malabaricum*	Oleaceae	climber	
161	*Knema attenuata*	Myristicaceae	tree	Lrnt
162	*Lagestroemia lanceolata*	Lythraceae	tree	
163	*Lansium annamalayanum*	Meliaceae	tree	
164	*Leea indica*	Leeaceae	shrub	
165	*Legenandra sp*	Araceae	herb	
166	*Litsea floribunda*	Lauraceae	tree	
167	*Litsea mysorense*	Lauraceae	tree	
168	*Lobelia nicotifoliana*	Lobeliaceae	herb	
169	*Lophopetalm whightianum*	Celastraceae	tree	
170	*Luvanga sarmentosa*	Rutaceae	climber	
171	*Macaranga peltata*	Euphorbiaceae	tree	
172	*Madhuca neerifolia*	Sapotaceae	tree	Vul
173	*Mallotus phillippinensis*	Euphorbiaceae	tree	
174	*Mallotus stananthus*	Euphorbiaceae	shrub	
175	*Mallotus tetracaucus*	Euphorbiaceae	tree	
176	*Mangifera indica*	Anacardiaceae	tree	

Sl. No.	Plant species	Family	Habit	Threat status
177	*Margaratiera indica*	Euphorbiaceae	tree	
178	*Maytenus rothiana*	Celastraceae	shrub	
179	*Melastoma malabathrum*	Melastomaceae	herb	
180	*Memecylon malabaricum*	Melastomaceae	shrub	
181	*Memecylon terminale*	Melastomaceae	shrub	
182	*Memecylon umbellatum*	Melastomaceae	tree	
183	*Mesa indica*	Myrsinaceae	shrub	
184	*Mesua ferrea*	Clusiaceae	tree	
185	*Meyna Laxiflora*	Rubiaceae	tree	
186	*Mimosa pudica*	Mimoseae	herb	
187	*Mimusops elengi*	Sapotaceae	tree	
188	*Molluva spicata*	Papilionaceae	climber	
189	*Morinda citrifolia*	Rubiaceae	shrub	
190	*Musenda frondosa*	Rubiaceae	shrub	
191	*Myristica dactyloides*	Myristicaceae	tree	Vul
192	*Myristica fetua*	Myristicaceae	tree	
193	*Myristica malabarica*	Myristicaceae	tree	Vul
194	*Neolitsea zeylanica*	Lauraceae	tree	
195	*Nergamia alata*	Rutaceae	herb	
196	*Nothapodytes nimmoniana*	Icacinaceae	shrub	En
197	*Nothopegia racemosa*	Anacardiaceae	tree	
198	*Oberonia sp.*	Orchidaceae	orchid	
199	*Ochlandra rheedi*	Graminae	grass	
200	*Olea dioca*	Oleaceae	tree	
201	*Ophiorhiza mungo*	Rubiaceae	herb	
202	*Ophiorhiza pumila*	Rubiaceae	herb	
203	*Osyris arborea*	Santalaceae	shrub	
204	*Oxalis corniculata*	Oxalidaceae	herb	
205	*Palaquium ellepticum*	Apocynaceae	tree	
206	*Pallidata pallida*	Orchidaceae	Herb	
207	*Pandanus tectorius*	Pandanaceae	shrub	
208	*Peramigyna monophlly*	Rutaceae	shrub	
209	*Persea macrantha*	Lauraceae	tree	En
210	*Pinanga dicksonii*	Palmae	palm	
211	*Piper sps*	Pipreraceae	herb	
212	*Polyaithia fragrans*	Anonaceae	tree	
213	*Pongamia pinnata*	Papilionaceae	tree	
214	*Pothos scandans*	Araceae	climber	
215	*Psychotria dalzelli*	Rubiaceae	shrub	
216	*Psychotria flavida*	Rubiaceae	shrub	
217	*Psychotria nigra*	Rubiaceae	shrub	
218	*Pterocarpus marsupium*	Papilionaceae	tree	
219	*Pterospermum diversifolium*	Teliaceae	tree	
220	*Pterospermum reticulatum*	Teliaceae	tree	
221	*Randia dumentorum*	Rubiaceae	tree	
222	*Randia rugulosa*	Rubiaceae	climber	
223	*Rhyncostylis tomentosum*	Orchidaceae	herb	
224	*Rubia cordifolia*	Rubiaceae	climber	
225	*Rubus fockei*	Rosaceae	climber	
226	*Saraca asoca*	Papilionaceae	tree	
227	*Scheflera venulosa*	Araliaceae	climber	
228	*Semicarpus kathlekanensis*	Anacardiaceae	tree	Cr.En
229	*Smilax zeylanica*	Smalacaeae	climber	Lrnt
230	*Solanum xanthocarpum*	solanaceae	shrub	
231	*Sterculia guttata*	Sterculiaceae	tree	
232	*Strereospermum personatum*	Bignoniaceae	tree	
233	*Strobillanthus Spp.*	Acanthaceae	shrub	
234	*Strombosea zeylanica*	Olacaceae	tree	
235	*Strychnos wallichiana*	Loganiaceae	shrub	
236	*Stmplocos racemosa*	Symplocaceae	tree	

Sl. No.	Plant species	Family	Habit	Threat status
237	*Synadeniurm grahami*	Euphorhiaceae	shrub	
238	*Syzygium caryophyllatum*	Myrtaceae	tree	
239	*Syzygium cumuni*	Myrtaceae	tree	
240	*Syzygium gardneri*	Myrtaceae	tree	
241	*Syzygium hemispericum*	Myrtaceae	tree	
242	*Syzygium laetum*	Myrtaceae	tree	
243	*Syzygium zeylanica*	Myrtaceae	tree	
244	*Taebernmontana heyniana*	Apocynaceae	tree	
245	*Terminalia paniculata*	Combretaceae	tree	
246	*Tetrameles nudiflora*	Dasticaceae	tree	
247	*Thunbergia fragrans*	Thunbergiaceae	tree	
248	*Toddelia asiatica*	Rutaceae	climber	
249	*Tragia hispida*	Urticaceae	climber	
250	*Trema orientalis*	Urticaceae	tree	
251	*Trichelia connaroides*	Papilionaceae	tree	
252	*Tridax procumbens*	Asteraceae	Herb	
253	*Uvaria narum*	Anonaceae	shrub	
254	*Vateria indica*	Dipterocarpaceae	tree	Cr.En
255	*Venda Sp.*	Orchidaceae	orchid	
256	*Ventilago calculeata*	Rhamnaceae	shrub	
257	*Ventilago maderaspatensis*	Rhamnaceae	shrub	
258	*Vepris bilocularis*	Rutaceae	tree	
259	*Vitex altissima*	Verbinaceae	tree	
260	*Vitis discolor*	Vitaceae	climber	
261	*Walsura trifolia*	Meliaceae	tree	
262	*Wendlandia thyrsoides*	Rubiaceae	shrub	
263	*Xanthophllum flavoscens*	Xanthophyllaceae	shrub	
264	*Xantolis tomentosa*	Sapotaceae	tree	
265	*Zanthoxylum ovalifolium*	Rutaceae	shrub	
266	*Zingeber cervunum*	Zingeberaceae	Herb	
267	*Zizyphus oenoplia*	Rhamnaceae	shrub	
268	*Zizyphus rugosa*	Rhamnaceae	Herb	

Cr.En- Critically Endangered; En- Endangered; Vul- Vulnerable; Lrnt-Lower risk near Threatened

Appendix 2 Some important butterflies of Sirsi-Honnavara

Sl. No.	Common Name
1	Common Mime
2	Common Jay
3	Tailed Jay
4	Common Bluebottle, , ,
5	Common Mormon
6	Five-Bar Swordtail
7	Malabar Branded Peacock,
8	Red Helen, ,
9	Giant Redeye
10	Lime
11	Common Palmfly, ,
12	Common Sailer
13	Short Banded Sailer
14	Chestnut-streaked Sailer,
15	Blackvein Sergeant,
16	Indian Palm Bob
17	Rustic,
18	Chestnut Angle
19	Tamil Yeoman
20	Common Cerulean
21	Western Centaur Oakblue
22	Common Leopard
23	Common cerulean
24	Common Silverline,
25	Common Banded Awl
26	Large Oak Blue
27	Brown Awl
28	Water Snow Flat
29	Grass Demon

Sl. No.	Common Name
31	Common Baron
32	Indian Palm Bob
33	Conjoined Swift
34	Common Branded Demon,
35	Giant Red Eye,
36	Dark Palm Dart
37	Common Red Eye
38	Chestnut Bob
39	Paris Peacock
40	Madras Ace
41	Indian Ace
42	Great Evening Brown
43	Common Emigrant, ,
44	Three-spot Grass Yellow
45	Mottled Emigrant
46	Common Grass Yellow
47	Three-spot Grass Yellow
48	Common Hedge Blue
49	Dark Cerulean
50	Plains Cupid
51	Common Sergeant
52	Grey Count
53	Baronet
54	Redspot Duke
55	Double-branded Crow
56	Brown King Crow
57	Banded Blue Pierrot
58	Zebra Blue
59	Malayan

Sl. No.	Common Name
61	Plains Cupid
62	Western Centaur Oakblue
63	Large Oak Blue
64	Long Banded Silverline
65	Western Centaur Oakblue

Appendix 3 List of frogs from forests of Sirsi-Honnavara

Sl. No.	Family	Name	Endemism
1	Icthyophiidae	*Ichthyophis bombayensis*	Endemic
2		*Ichthyophis malabarensis*	Endemic
3	Bufonidae	*Duttaphyrnus melanostictus*	Non-endemic
4		*Pedostibes tuberculosus*	Endemic
5	Microhylidae	*Microhyla ornata*	Non-endemic
	(Sub-family: Microhylinae)		
6		*Microhyla rubra*	Non-endemic
7	Micrixalidae	*Micrixalus saxicola*	Endemic
8	Ranixalidae	*Indirana beddomii*	Endemic
9		*Indirana semipalmata*	Endemic
10	Dicroglossidae	*Euphlyctis cyanophlyctis*	Non-endemic
	(Sub-family: Dicroglossinae)		
11		*Fejervarya brevipalmata*	Endemic
12		*Fejervarya caperata*	Endemic
13		*Fejervarya granosa*	Endemic
14		*Fejervarya kudremukhensis*	Endemic
15		*Fejervarya mudduraja*	Endemic
16		*Fejervarya rufescens*	Endemic
17		*Fejervarya sahyadris*	Endemic
18		*Hoplobatrachus tigerinus*	Non-endemic
19		*Sphaerotheca leucorhyncus*	Endemic
20		*Sphaerotheca breviceps*	Non-endemic
21	Rhacophoridae	*Philautus cf. bombayensis*	Endemic
	(Sub-family: Rhacophorinae)		
22		*Philautus neelanethrus*	Endemic
23		*Philautus cf. ponmudi*	Endemic
24		*Philautus cf. tuberohumerus*	Endemic
25		*Philautus cf. wynaadensis*	Endemic
26	Nyctibatrachidae	*Polypedates maculates*	Non-endemic
27		*Polypedates cf. pseudocruciger*	Endemic
28		*Rhacophorus malabaricus*	Endemic
29		*Nyctibatrachus cf. aliciae*	Endemic
30	Ranidae	*Nyctibatrachus cf. humayuni*	Endemic
31		*Nyctibatrachus cf. major*	Endemic
32		*Nyctibatrachus cf. petraeus*	Endemic
33		*Clinotarsus curtipes*	Non-endemic
34		*Sylvirana aurantiaca*	Endemic
35		*Sylvirana temporalis*	Non-endemic

Appendix 4 Checklist of birds in the forests of Sirsi-Honnavara

Sl No	Common name	Scientific name	IUCN Category
1	Grey Junglefowl	*Gallus sonneratii*	
2	Indian Peafowl	*Pavo cristatus*	
3	Lesser Whistling-duck	*Dendrocygna javanica*	
4	Grey-capped Pygmy Woodpecker	*Dendrocopos canicapillus*	
5	White-bellied Woodpecker	*Dryocopus javensis*	
6	Lesser Yellownape	*Picus chlorolophus*	
7	Common Flameback	*Dinopium javanense*	
8	Greater Flameback	*Chrysocolaptes lucidus*	
9	Heart-spotted Woodpecker	*Hemicircus canente*	
10	White-cheeked Barbet	*Megalaima viridis*	
11	Brown headed Barbet	*Megalaima zeylanica*	
12	Crimson-fronted Barbet	*Megalaima rubricapilla*	
13	Coppersmith Barbet	*Megalaima haemacephala*	
14	Malabar Grey Hornbill	*Ocyceros griseus*	RR, Endemic
15	Great Hornbill	*Buceros bicornis*	
16	Malabar Pied Hornbill	*Anthracoceros coronatus*	
17	Common Hoopoe	*Upupa epops*	
18	Malabar Trogon	*Harpactes fasciatus*	
19	Indian Roller	*Coracias benghalensis*	
20	Common Kingfisher	*Alcedo atthis*	
21	Blue eared Kingfisher	*Alcedo meninting*	
22	Stork-billed Kingfisher	*Halcyon capensis*	
23	White-throated Kingfisher	*Halcyon smyrnensis*	
24	Pied Kingfisher	*Ceryle rudis*	
25	Blue-bearded Bee-eater	*Nyctyornis athertoni*	
26	Green Bee-eater	*Merops orientalis*	
27	Blue-tailed Bee-eater	*Merops philippinus*	
28	Chestnut-headed Bee-eater	*Merops leschenaulti*	
29	Common Hawk Cuckoo	*Hierococcyx varius*	
30	Indian Cuckoo	*Cuculus micropterus*	
31	Banded Bay Cuckoo	*Cacomatis sonnerati*	
32	Asian Koel	*Eudynamys scolopacea*	
33	Greater Coucal	*Centropus sinensis*	
34	Vernal Hanging Parrot	*Loriculus vernalis*	
35	Rose-ringed Parakeet	*Psittacula krameri*	
36	Plum-headed Parakeet	*Psittacula cyanocephala*	
37	Blue winged Parakeet	*Psittacula columboides*	RR, Endemic
38	Asian Palm Swift (Palm Swift)	*Cypsiurus balasiensis*	
39	Alpine Swift	*Tachymarptis melba*	
40	Crested Treeswift	*Hemiprocne coronata*	
41	Rock Eagle Owl	*Bubo bubo bengalensis*	
42	Spot belied Eagle Owl	*Bubo nipalensis*	
43	Brown Wood Owl	*Strix leptogrammica*	
44	Sri Lankan Bay Owl	*Phodilus assimilis*	
45	Sri Lanka Frogmouth	*Batrachostomus moniliger*	
46	Grey Nightjar	*Caprimulgus indicus*	
47	Rock pigeon	*Columba livia*	
48	Oriental Turtle Dove	*Streptopelia orientalis*	
49	Spotted Dove	*Streptopelia chinensis*	
50	Emerald Dove	*Chalcophaps indica*	
51	Pompadour Green Pigeon	*Treron pompadora*	
52	Yellow-footed Green Pigeon	*Treron phoenicoptera*	
53	Green Imperial Pigeon	*Ducula aenea*	
54	Mountain Imperial Pigeon	*Ducula badia*	
55	White-breasted Waterhen	*Amaurornis phoenicurus*	
56	Purple Swamphen	*Porphyrio porphyrio*	

Sl No	Common name	Scientific name	IUCN Category
57	Common Coot	*Fulica atra*	
58	Bronze-winged Jacana	*Metopidius indicus*	
59	Pheasant tailed Jacana	*Hydrophasianus chirurgus*	
60	Red-wattled Lapwing	*Vanellus indicus*	
61	Oriental Honey-buzzard	*Pernis ptilorhyncus*	
62	Black Kite	*Milvus migrans*	
63	Brahminy Kite	*Haliastur indus*	
64	Crested Serpent Eagle	*Spilornis cheela*	
65	Shikra	*Accipiter badius*	
66	Besra	*Accipiter virgatus*	
67	Eurasian Sparrowhawk	*Accipiter nisus*	
68	Crested Goshawk	*Accipiter trivirgatus*	
69	White-eyed Buzzard	*Butastur teesa*	
70	Black Eagle	*Ictinaetus malayensis*	
71	Rufous-bellied Eagle	*Hieraaetus kienerii*	
72	Common Kestrel	*Falco tinnunculus*	
73	Peregrine Falcon	*Falco peregrinus*	
74	Little Grebe	*Tachybaptus ruficollis*	
75	Darter	*Anhinga melanogaster*	NT
76	Little Cormorant	*Phalacrocorax niger*	
77	Great Egret	*Casmerodius albus*	
78	Intermediate egret	*Mesophyx intermedia*	
79	Little egret	*Egretta garzetta*	
80	Cattle Egret	*Bubulcus ibis*	
81	Indian Pond Heron	*Ardeola grayii*	
82	Little Heron	*Butorides striatus*	
83	Black-crowned Night Heron	*Nycticorax nycticorax*	
84	Oriental White Ibis	*Threskiornis melanocephalus*	NT
85	Woolly-necked Stork	*Ciconia episcopus*	
86	Painted Stork	*Mycteria leucocephala*	NT

Sl No	Common name	Scientific name	IUCN Category
87	Lesser Adjutant Stork	*Leptoptilos javanicus*	VU
88	Asian Fairy Bluebird	*Irena puella*	
89	Blue-winged Leafbird	*Chloropsis cochinchinensis*	
90	Golden-fronted Leafbird	*Chloropsis aurifrons*	
91	Brown Shrike	*Lanius cristatus*	
92	Long-tailed Shrike	*Lanius schach*	
93	Rufous Treepie	*Dendrocitta vagabunda*	
94	White-bellied Treepie	*Dendrocitta leucogastra*	RR, Endemic
95	House Crow	*Corvus splendens*	
96	Large-billed Crow	*Corvus macrorhynchos*	
97	Ashy Woodswallow	*Artamus fuscus*	
98	Eurasian Golden Oriole	*Oriolus oriolus*	
99	Black-hooded Oriole	*Oriolus xanthornus*	
100	Black-headed Cuckooshrike	*Coracina melanoptera*	
101	Small Minivet	*Pericrocotus cinnamomeus*	
102	Scarlet Minivet	*Pericrocotus flammeus*	
103	Bar-winged Flycatcher-shrike	*Hemipus picatus*	
104	White-browed Fantail	*Rhipidura aureola*	
105	Black Drongo	*Dicrurus macrocercus*	
106	Ashy Drongo	*Dicrurus leucophaeus*	
107	White-bellied Drongo	*Dicrurus caerulenses*	
108	Bronzed Drongo	*Dicrurus aeneus*	
109	Greater Racket-tailed Drongo	*Dicrurus paradiseus*	
110	Black-naped Monarch	*Hypothymis azurea*	
111	Asian Paradise-flycatcher	*Terpsiphone paradisi*	
112	Common Iora	*Aegithina tiphia*	
113	Large Woodshrike	*Tephrodornis gularis*	
114	Common Woodshrike	*Tephrodornis pondicerianus*	
115	Blue-capped Rock Thrush	*Monticola cinclorhynchus*	
116	Blue Rock Thrush	*Monticola solitarius*	

Sl No	Common name	Scientific name	IUCN Category
117	Malabar Whistling Thrush	*Myophonus horsfieldii*	
118	White-throated Thrush	*Zoothera citrina cyanotus*	
119	Eurasian Blackbird	*Turdus merula*	
120	Asian Brown Flycatcher	*Muscicapa dauurica*	
121	Red-throated Flycatcher	*Ficedula parva*	
122	Verditer Flycatcher	*Eumyias thalassina*	
123	White-bellied Blue Flycatcher	*Cyornis pallipes*	RR, Endemic
124	Grey-headed Canary Flycatcher	*Culicicapa ceylonensis*	
125	Oriental Magpie Robin	*Copsychus saularis*	
126	White-rumped Shama	*Copsychus malabaricus*	
127	Chestnut-tailed Starling	*Sturnus malabaricus*	
128	White-headed Starling	*Sturnus erythropygius*	
129	Brahminy Starling	*Sturnus pagodarum*	
130	Common Myna	*Acridotheres tristis*	
131	Jungle Myna	*Acridotheres fuscus*	
132	Hill Myna	*Gracula religiosa*	
133	Velvet-fronted Nuthatch	*Sitta frontalis*	
134	Great Tit	*Parus major*	
135	Black-lored Tit	*Parus xanthogenys*	
136	Dusky Crag Martin	*Hirundo concolor*	
137	Barn Swallow	*Hirundo rustica*	
138	Wire-tailed Swallow	*Hirundo smithii*	
139	Red-rumped Swallow	*Hirundo daurica*	
140	Northern House Martin	*Delichon urbica*	
141	Black-crested Bulbul	*Pycnonotus melanicterus gularis*	
142	Red-whiskered Bulbul	*Pycnonotus jocosus*	
143	Red-vented Bulbul	*Pycnonotus cafer*	
144	Yellow-browed Bulbul	*Iole indica*	
145	Grey headed Bulbul	*Pycnotus priocephalus*	RR, Endemic

Sl No	Common name	Scientific name	IUCN Category
146	Black Bulbul	*Hypsipetes leucocephalus*	
147	Ashy Prinia	*Prinia socialis*	
148	Oriental White-eye	*Zosterops palpebrosus*	
149	Blyth's Reed Warbler	*Acrocephalus dumetorum*	
150	Thick-billed Warbler	*Acrocephalus aedon*	
151	Common Tailorbird	*Orthotomus sutorius*	
152	Common Chiffchaff	*Phylloscopus collybita*	
153	Tickell's Leaf Warbler	*Phylloscopus affinis*	
154	Greenish Warbler	*Phylloscopus trochiloides*	
155	Indian Scimitar Babbler	*Pomatorhinus horsfieldii*	
156	Dark-fronted Babbler	*Rhopocichla atriceps*	
157	Rufous Babbler	*Turdoides subrufus*	RR, Endemic
158	Jungle Babbler	*Turdoides striatus*	
159	Brown-cheeked Fulvetta	*Alcippe poioicephala*	
160	Bengal Bushlark	*Mirafra assamica*	
161	Malabar Lark	*Galerida malabarica*	
162	Sykes Lark	*Galerida deva*	
163	Pale-billed Flowerpecker	*Dicaeum erythrorynchos*	
164	Thickbilled Flowerpeker	*Dicaeum agile*	
165	Plain Flowerpecker	*Dicaeum concolor*	
166	Purple-rumped Sunbird	*Nectarinia zeylonica*	
167	Purple Sunbird	*Nectarinia asiatica*	
168	Loten's Sunbird	*Nectarinia lotenia*	
169	Small Sunbird	*Nectarinia minima*	RR, Endemic
170	Little Spiderhunter	*Arachnothera longirostra*	
171	House Sparrow	*Passer domesticus*	
172	Chestnut-shouldered Petronia	*Petronia xanthocollis*	
173	Forest Wagtail	*Dendronanthus indicus*	
174	White-browed Wagtail	*Motacilla maderaspatensis*	
175	Citrine Wagtail	*Motacilla citreola*	

Sl No	Common name	Scientific name	IUCN Category
176	Yellow Wagtail	*Motacilla flava*	
177	Grey Wagtail	*Motacilla cinerea*	
178	Indian Silverbill	*Lonchura malabarica*	
179	White-rumped Munia	*Lonchura striata*	
180	Black-throated Munia	*Lonchura kelaarti*	
181	Scaly-breasted Munia	*Lonchura punctulata*	
182	Common Rosefinch	*Carpodacus erythrinus*	

* Ref: Nomenclature follows Birds of the Indian Subcontinent by Richard Grimett, Carol Inskipp and Tim Inskipp,1998

Appendix 5 Mammal species in the forests of Sirsi-Honnavara

Species	Occurrence report	IUCN Red List status3
Hanuman langur *Semnopithecus entellus*	P (1)	
Lion-tailed macaque *Macaca silenus*[4]	P (1)	LRnt
Bonnet macaque *M. radiata*[4]	P (1)	EN
Slender loris *Loris lydekkerianus*	P (1)	
Tiger *Panthera tigris*	P (2, 3)	VU
Leopard *P. pardus*	P (2, 3)	EN
Jungle cat *Felis chaus*	P (2, 6)	
Leopard cat *Prionailurus bengalensis*	P (6)	
Rusty spotted cat *P. rubiginosa*	N	
Dhole *Cuon alpinus*	P (1)	VU
Golden jackal *Canis aureus*	P (1)	VU
Small Indian civet *Viverricula indica*	P (2, 6)	
Malabar civet *V. civettina*[4]	N	
Asian palm civet *Paradoxurus hermophroditus*	P (1)	CR
Brown palm civet *P. jerdoni*[4]	P (1)	
Brown mongoose *Herpestes fuscus*	P (6)	VU
Stripe-necked mongoose *H. vitticollis*	P (6)	DD
Common mongoose *H. edwardsi*	P (1)	
Otter spp (2 Species)[5]	P (6)	
Nilgiri marten *Martes gwatkinsi*[4]	N	
Malabar giant squirrel *Ratufa indica*[4]	P (1)	VU
Giant flying squirrel *Petaurista petaurista*	P (1)	VU
Travancore flying squirrel *Petinomys fuscocapillus*	N	LRnt
Muntjac *Muntiacus muntjak*	P (1)	VU
Chevrotain *Tragulus meminna*	P (1)	
Wild pig *Sus scrofa*	P (1)	
Sambar *Cervus unicolor*	P (1)	
Gaur *Bos gaurus*	P (1)	
Elephant *Elephas maximus*	P (1)	VU
Porcupine *Hystrix indica*	P (1)	EN
Pangolin *Manis crassicaudata*	P (4, 5, 6)	
Sloth bear *Melursus ursinus*	P (2, 6)	LRnt
Black-naped hare *Lepus nigricollis*	P (1)	VU

[1]P : Present; A: Absent; N : No Information
[2]1: Sighted; 2 : Fecal deposit; 3 : Foot prints; 4 : Body parts; 5 : Roost sites; 6 : Local information
[3] (IUCN, 2003) -CR : Critically endangered; EN : Endangered; VU : Vulnerable; LRnt : Lower-risk near threatened; DD : Data deficient
[4]Endemic to India
[5]Based on local information only, two species are potentially present (oriental small clawed otter *Amblonyx cinereus* and common otter *Lutra lutra*), but we are not able to determine whether it is one or both of these species

Although a predominant vegetarian, the LTM diet consists a significant variety in the non-vegetarian diet too