RECENT POPULATION TRENDS AND MANAGEMENT OF LION-TAILED MACAQUE (*MACACA SILENUS*) IN SILENT VALLEY NATIONAL PARK, KERALA, INDIA

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Introduction

The Lion-tailed Macaque is an endangered primate species, endemic to the rain forests of the Western Ghats. The total wild population is estimated less than 4,000 individuals distributed in the three Southern Indian States of Kerala, Karnataka and Tamil Nadu. However, Silent Valley and Ashambu hills are the only two viable habitats in their entire range of distribution (Green and Minkowski, 1977).

Various stochastic events and catastrophes along with human interferences have been affecting seriously the Lion-tailed Macaque population through the ages. Factors such as habitat fragmentation, reduced habitat size, isolation of populations leading to inbreeding depression and vulnerability to random events make the Lion-tailed Macaque a highly endangered species despite its relatively large scattered population (Kumar *et al.*, 1995). Even if small fragmented populations facing severe problems of local extinction, their counterparts existing in the large contiguous protected areas like Silent Valley show better signs of population status (Ramachandran and Joseph, 1997). 'Population and Habitat Viability Analysis Workshop' for the species held at Madras in 1993, strongly suggested the need for long-term monitoring of the species in its viable habitat. Such population monitoring data will definitely be helpful in the effective management of the species.

Silent Valley National Park and adjacent areas are situated in Palghat District of Kerala State and located at 10° 15' to 11° 25' N latitude and 76° 21' to 76° 33' E longitude. Silent Valley National Park is one of the prime habitats of the endangered Lion-tailed Macaque and Nilgiri Langur, both endemic to the Western Ghats of India. Silent Valley represents one of the core areas of Nilgiri Biosphere Reserve. The habitat is tropical wet evergreen forests. Aiyar (1932) identified seven major tree associations in the area. Kunthipuzha, a tributary of river Bharathapuzha drains the entire undulating terrain of Silent Valley.

Methods

Status and ecology of Lion-tailed Macaque were studied in Silent Valley National Park for a period of three years from 1993 to 1996. Repeated census walks were conducted on foot through the existing

trails and Elephant paths randomly in the evergreen forests. Frequent stops were made to get the characteristic contact call of the Lion-tailed Macaque in the vicinity of the transect. The located troops were followed and continuous observations were made until the troop was reliably counted or until the troop could not be followed. Complete troop counts were made at least twice in a year for every troop.

Animals were classified as four major categories such as adult males, adult females, sub-adult males and immatures. Adult males were identified with stouter body and long canines. The tail tufts were having slightly lifted carriage. Adult females were identified by the presence of elongated nipples and baggy breasts. Although, sub-adult males were having fully developed musculature and comparatively shorter canines. Rest of the individuals including sub-adult females, juveniles and infants were grouped into a single category as immatures.

Demographic data was collected from 9 troops in 1993, 11 troops in 1994, 12 troops in 1995 and 14 troops in 1996. Of these, seven troops were monitored continuously throughout the study period.

Results

Figure 1 shows location of various Lion-tailed Macaque troops in Silent Valley and adjacent areas. Fourteen distinct troops were identified from Silent Valley and adjacent areas when the field study ended in 1996. Among the fourteen different troops, eight of them ranged East of Kunthipuzha river and the rest towards the western side.

Two troops each in Punnamala (PUN I; PUN II), Aruvampara (AV I; AV II), and Panthanthod (PAN I; PAN II) regions and one each in Sairandri (SAI) and Parathod regions (PAR) formed the resident troops East of Kunthipuzha river. Three troops in Chembotty areas (CHE IA; CHE IB; CHE II) two troops in Nilikkal areas (NKL I; NKL II) and one troop in Puchapara (PUC)

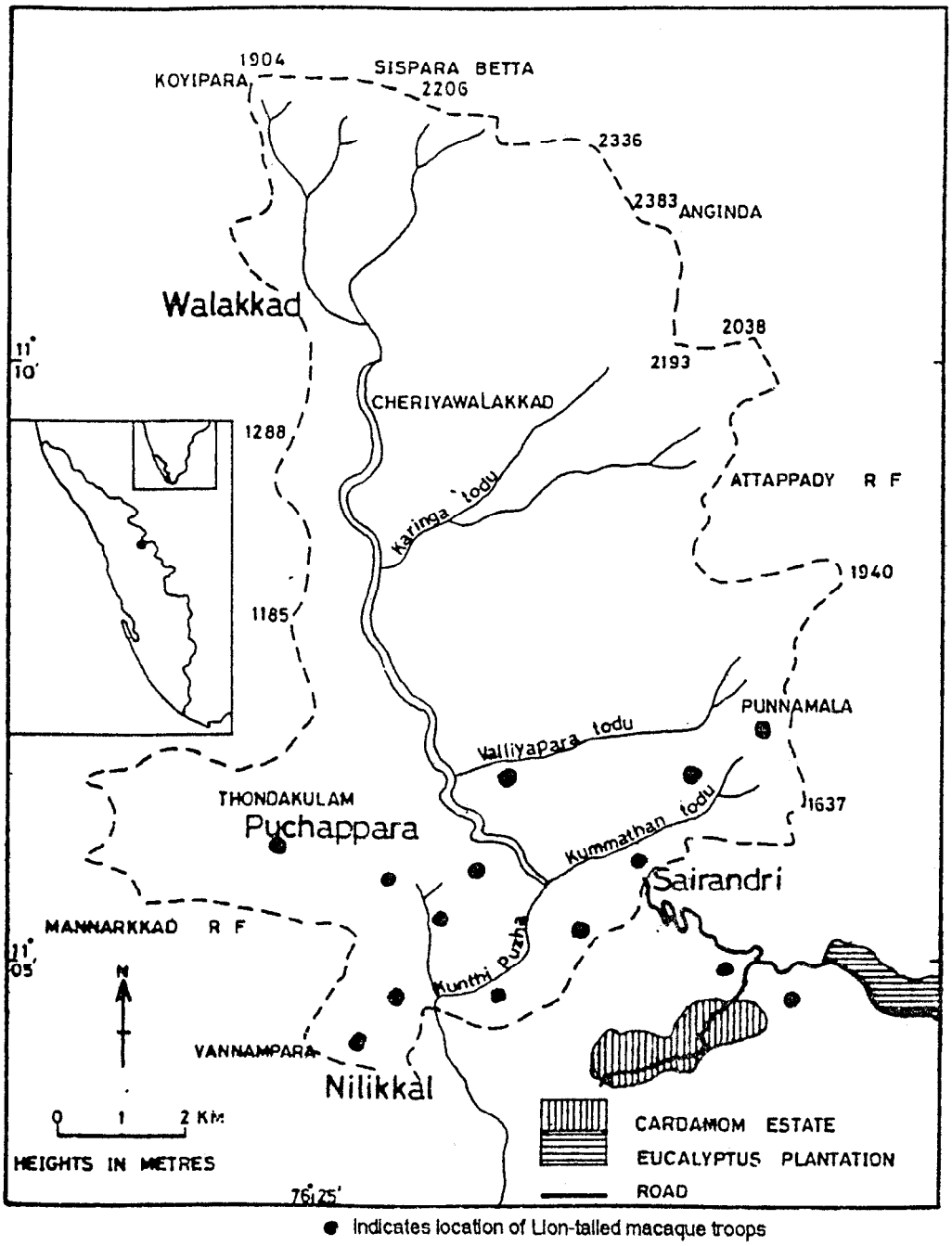
Table 1

Population structure of Lion-tailed Macaque troops

Troop name (Location)	AM	SAM	AF	IMM	Total
SAI (Sairandri)	2	3	16	13	34
PUN I (Punnamala)	2	2	10	6	20
PUN II (Punnamala top)	1	1	7	12	21
PAN I (Panthanthod)	2	1	9	8	20
PAN II (Panthanthod)	1	1	6	8	16
AV I (Aruvampara)	1	2	7	4	14
AV II (Aruvampara)	1	-	5	7	13
PAR (Parathod)	1	-	4	4	9
PUC (Puchapara)	1	1	6	8	16
CHE IA (Chembotti)	2	1	7	6	16
CHE IB (Chembotti)	2	1	10	7	20
CHE II (Chembotti)	2	1	11	7	21
NKL I (Nilikkal)	2	3	17	14	36
NKL II (Nilikkal)	2	-	9	8	19
Total	22	17	124	112	275

AM = Adult male, SAM = Sub-adult male, AF = Adult female, IMM = Immature.

Fig. 1



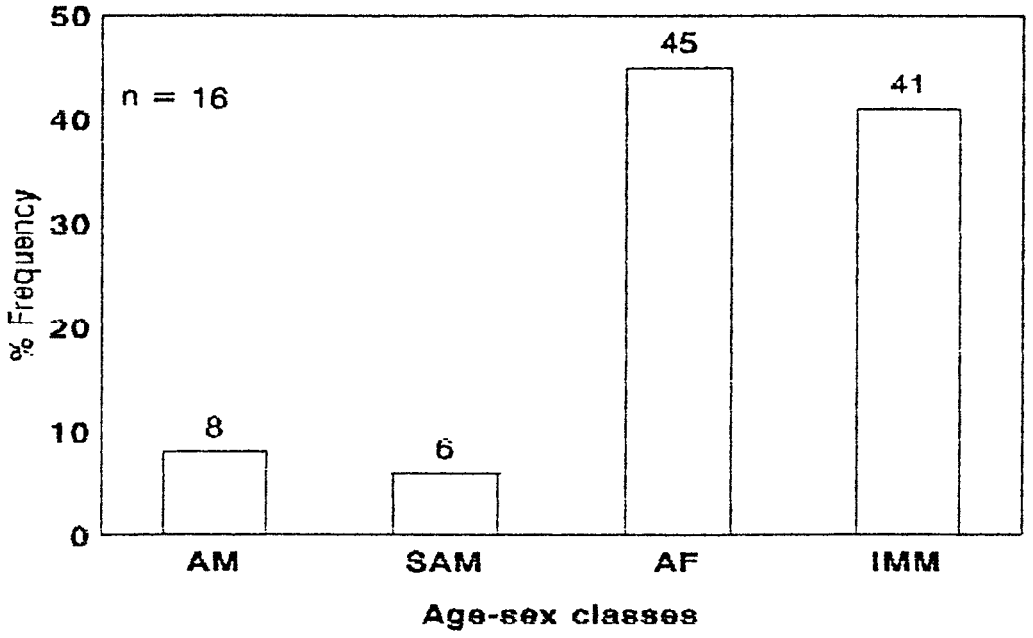
Distribution of Lion-tailed Macaque troops in Silent Valley and adjacent areas

constituted the population West of river Kunthipuzha. All the troops were distributed at an elevation ranging between 700 to 1500m.

Table 1 shows the status and population structure of Lion-tailed Macaque troops in Silent Valley forests. The troop size varied from 9 (PAR) to 36 (NKL I) in 1996. The average troop size estimated was 19.64 individuals. Among the fourteen troops monitored in 1996, eight troops were having two adult males. But seven troops had only one adult male. The number of sub-adult males varied from 1 to 3 in various troops. However, most of the troops had only one sub-adult male. Three troops were having no sub-adult males. The number of sub-adult males varied from 4 to 17 in various troops. Majority of the troops (9) had less than 10 adult females. Immatures ranged from 4 to 14 in different troops with an average of 8 individuals.

Figure 2 shows the age sex composition of Lion-tailed Macaque troops in Silent Valley. A total of 275 individuals were observed in the final census. Among these, 8% were adult males and 45% were adult females. The sub-adult males constituted

Fig. 2



Troop composition of Lion-tailed Macaque troops in Silent Valley

Table 2

Yearly variation in troop size of Lion-tailed Macaque

Troop	Troop size				Mean
	1993	1994	1995	1996	
SAI	29	29	31	34	30.75
PUN I	15	15	17	20	16.75
PUN I	-	-	21	21	21.00
PAN I	12	14	18	20	16.00
PAN II	21	13	15	16	16.25
AV	20	20	22	-	20.70
PAR	6	7	8	9	7.50
PUC	12	15	16	16	14.75
CHE I	29	31	33	-	31.00
CHE II	-	19	21	21	20.30
NKL I	28	30	32	36	31.50
NKL II	-	17	19	19	18.30
AV I	-	-	-	14	14.00
AV II	-	-	-	13	13.00
CHE IA	-	-	-	16	16.00
CHE IB	-	-	-	20	20.00
Total	172	210	253	275	19.24

6% and 41% of the total population formed immatures. The adult sex ratio estimated was 5.64 females per male.

Table 2 shows the yearly variation of troop size and mean troop size in various troops of Lion-tailed Macaque in Silent Valley and adjacent areas. The troop size varied across the succeeding years in every troops. The mean troop size computed for all the monitored years was greater in NKL I troop (31.50) when compared to all other troops. The minimum mean troop size was recorded in Parathod (PAR) troop (7.50). Majority of the troops had the mean troop size less than 20 individuals. The overall mean troop size for all the troops was estimated as 19.24 individuals.

Out of the nine troops monitored in 1993, five of them increased their total in 1994 (PAN I, PAR, PUC, CHE I, CHE II), while three of them remain unchanged (SAI, PUNI, AV). However, the troop size of a troop (PAN II) ranging in the nearby Attappady Reserve Forest, reduced from 21 in 1993 to 13 in 1994. This reduction was due to the massive trapping of 9 individuals from the troop by Muduga tribals towards the end of 1993. After the trapping incident one adult female gave birth to a young one.

A total of 11 troops were monitored in 1994 and all of them increased their troop size in 1995. The troop size was ranging from 8 to 32 individuals with a mean of 21.08 individuals in the year. Out of the 12 troops monitored in 1995, two troops (AV and CHE I) fissioned before the 1996 census. Troop size was increased in six troops in 1996, while four of them remained the same.

Discussion

Recently the conservation of endangered mammals has been greatly discussed among scientists. Unfortunately long-term demographic data has been lacking for many endangered and endemic species. This has resulted in great difficulties for drawing general inferences about the management of certain species in their specific ecological niches. Lion-tailed Macaque, being one of the most endangered primates of India, requires special attention for its long term survival. As most of the Lion-tailed Macaque habitats are fragmented, the conservation and effective management of the population in the large contiguous evergreen forests like Silent Valley deserve utmost importance.

Although, a number of surveys have been carried out elsewhere to assess the population in different periods in the

Western Ghats (Daniel and Kannan, 1967; Kurup, 1978; Green and Minkowski, 1977; Karanth, 1985; Easa *et al.*, 1997) very few long term demographical studies have been attempted so far. A population of Lion-tailed Macaque monitored since 1979 in the Varagaliyar forests remains the first step in this direction (Kumar, 1987). The present study is a novel attempt to monitor the Lion-tailed Macaque population in the Kerala part of the Western Ghats, where more than half of the total population is distributed. The findings clearly indicate that their population growth in the protected environments like Silent Valley is showing a positive trend.

The distribution pattern of Lion-tailed Macaque in Silent Valley forests follow a specific pattern in which they restrict their distribution between 700 to 1500 m elevation. The occurrence of certain tree associations like *Cullenia-Palaquium, Mesua-Palaquium, Mesua-Calophyllum*, and *Cullenia-Mesua* may have an influence on the distribution of Lion-tailed Macaque troops, as they prefer mostly these areas. Most of the major food species of these highly arboreal frugivorous Macaques are confined to these regions, and the same may be the reason behind the specificity of their distribution pattern (Joseph and Ramachandran, 1997).

Vijayan and Balakrishnan (1977) made a preliminary survey of mammals exclusively in the Silent Valley forests and opined that the area would be a very good habitat for the Lion-tailed Macaque. They strongly criticised the establishment of developmental and hydroelectric project in the area and stressed the need for the total conservation of the area. The announcement of the area as a National Park in 1984 was a creative step and the subsequent acceleration of the protective measures helped a lot for the survival of the Lion-tailed Macaque troops. Later Ramachandran (1990) identified 13 Lion-tailed Macaque troops having 173 individuals. The estimates of 275 individuals in the present study clearly shows the occurrence of a good population in the area.

The low lying areas of Silent Valley have undergone drastic changes in the past and about 1/5th of the area became degraded grasslands due to wild fires. In the recent past, lots of low altitude evergreen forests adjacent to Silent Valley were wiped out by fire (Unnikrishnan, 1990). This might have had adverse effect on the population of Lion-tailed Macaque as these areas were having abundance of the food species like *Cullenia* and *Palaquium*. But after the declaration of the area as a National Park, fire has been strictly controlled inside the Park by the Forest Department, which in turn ultimately accelerated the regeneration process to progress. Although, protective measures are strict within the territorial boundaries of the National Park, things are still different to the population residing just outside the National Park. Trapping of 9 individuals from the Panthanthod troop (PAN II) in 1993 is clearly indicating the vulnerable situation occurring in the border areas of the National Park. However, such stray incidents are limited to the peripheral areas, not affecting the core zones. Panthanthod troop has recouped moderately in the succeeding years. The slow and gradual expansion of the Lion-tailed Macaque habitat during the recent years has positive implications for the population growth of the Lion-tailed Macaque. This indicates the need for adopting immediate steps for extending fresh management strategies ensuring the long term survival of the species.

Suggestions for Management

Silent Valley and adjacent areas is one of the two viable habitats for Lion-tailed Macaques. Therefore, it is necessary to conserve the entire stretch of adjoining rain forest, having good population of endangered primates, which may be added to Silent Valley National Park.

Fire lines should be made effective for protecting the continuous stretch of rain forests, as there is possibility of occasional fires from the adjacent forests devastating the rain forest continuity. Fire affected areas within and adjacent to the National Park should be monitored and maximum care be taken for the regeneration process to progress. Planting of seedlings of food species of primates in these areas is suggested.

Existing road through the Lion-tailed Macaque habitat should not be widened as it would degrade the canopy continuity which is very crucial for this highly arboreal species. A tourism zone should be demarcated outside the National Park and the anthropogenic pressure should be minimized in the core zone.

The monitoring of the endangered primates should be continued so that the effectiveness of the management actions on conservation of existing rain forest fragments can be studied.

Acknowledegments

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SUMMARY

Fourteen Lion-tailed Macaque troops were identified in Silent Valley National Park and adjacent areas with a total 275 individuals. Of these, 8% were adult females and 45% were adult females. The population was monitored for yearly variation in the troop size. An increase of troop size was noticed in most of the cases. Management strategies to ensure the long-term survival of the highly endangered Lion-tailed Macaque in Silent Valley forests are discussed.

साइलेंट वैली राष्ट्रीय उपवन, केरल, भारत में सिंहपुच्छ कपि *(मैकाका सिलेनुस)* की अधुना संख्या प्रवृतियां और प्रबन्ध

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सारांश

साइलेंट वैली राष्ट्रीय उपवन और उससे सटे क्षेत्रों में चौदह सिंहपुच्छ कपि दलों की पहचान की गई जिनकी कुल प्राणि संख्या 275 थी । इनमें से 8% वयस्क नर और 45% वयस्क मादाएं थी । इस संख्या की दलों की संख्या में पड़ने वाला वार्षिक अन्तर जानने के लिए पड़ताल की गई । अधिकांश मामलों में दल के आकार में वृद्धि होती पाई गई । साइलेंट वैली वनों में अत्यधिक संकटापन्न सिंहपुच्छ कपियों की दीर्घकालीन अतिजीविता सुरक्षित बनाने के लिए प्रबन्धगत समरनीतियों का विवेचन किया गया है ।

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