

Executive Summary

The 104 sq km SGNP, one of the largest protected forests found in any big city worldwide, has had leopards living amidst high human densities for long. Leopards come close in the vicinity to human settlements in search for food. Around 90% of leopard diet consists of dogs, rodents and wild boar. While, stray dogs attracted to the garbage dumped by humans on the edge of the park— constitute 60 % of leopard diet. Settlements including slums (settlements by non-indigenous people), padas (tribal settlements) and high-rise buildings continue to swell in and around the park. Few of the settlements are also present inside park. Usually after reporting of regular sighting of a leopard outside the park or after report of a conflict involving leopard, a trap is set and the animal is captured either to be translocated or to be kept in captivity. The capture of leopards in metal cages and their translocation also caused stress to the animals and resulted in leopard injuries or deaths. Between 1986 and 1996, of the 52 leopards captured in SGNP, nine died during capture (Edgaonkar and Chellam 1998) and doubtless many sustained injuries before release.

Monitoring wildlife can provide many unique insights into the health and productivity of forest. Wildlife observations and monitoring can help understand the habitat and help reach management objectives by:

1. Identifying ecologically important areas and habitat features;
2. Collecting baseline data to compare against future assessments;
3. Identifying potential problems

Monitoring of leopards under this project has been done to see the movement pattern and the frequency of movement in the Tulsi range of Sanjay Gandhi National Park. This range has extensive leopard movement and cases of conflicts between Humans and Leopards in the past.

The Objectives

- To obtain a pattern of movement of leopards in Tulsi Range of Sanjay Gandhi National Park using Camera Traps.
- To devise befitting strategies of control Human-Wildlife Conflicts in & around Tulsi Range of Sanjay Gandhi National Park

A day's training was conducted on March 20th 2017 for the staff of Sanjay Gandhi National Park to introduce them to the basics of camera trap monitoring and all its operations. The basics of camera trap operations and the importance of monitoring of leopards were elaborated to them. The methodology that was used for monitoring is based on the monitoring protocol devised by NTCA for Tigers. The steps are as follows:

1. A reconnaissance survey was initiated in Tulsi range of SGNP in the mid-March. A fifteen days leopard sign encounter survey was carried out in the Tulsi range along with the entire staff of the Range. Data was collected in the pre-developed monitoring

formats with all important attributes same as those prescribed in the Phase-IV Monitoring Protocol of NTCA for Tiger & Leopards.

2. The collected information was then compiled into Microsoft excel to generate the leopard sign occurrence maps. After overlaying the collected information on Tulsi Range using the ARC GIS, it was decided that to obtain a more accurate leopard numbers, density and their movement pattern, the prescribed grid of 4 km will not be helpful. Hence on the basis of first analysis it was decided to use 1x1 km grid to deploy the camera traps for monitoring of leopards.
3. The grid of 1x1 km was generated for the entire Tulsi Range and was overlaid with all the collected information on it.
4. Based on our two year experience of Phase-IV Monitoring at Achanakmar Tiger Reserve (Chhattisgarh), we recommended Cuddeback C1 Color (Camera Trap Model) to SGNP Management for this project. The camera trap installation was started on May 6th 2017 and 24 camera traps were installed. After installation, all the deployed camera traps left open for 20 days to get captures of leopards and other wild animals.

Session I

All the 24 pairs of camera traps locations were sampled from May 11th to May 30th 2017, continuously for a period of 20 days. Session-I camera trap sampling results were obtained by analyzing **480** trap night. **17 leopards** (individuals) were identified from 58 sets of photographs (7 female, 6 male & 3 Unknown gender) and also got captures of other prey species like Sāmbhar, Spotted Deer, Wild Boars, Common Langoor, and Bonnet Macaques etc. in good numbers. A large number of human photographs captured by the camera traps in core area also, in which many photos of so called wildlife enthusiast moving in night, trekkers and morning walkers.

During the data download of session-I, it was observed that most of the leopard had been recaptured so it was decided to shorten the period of sampling to 20 days. Therefore in continuation of Session I, on 21st day all the camera traps were removed from field. All the cameras were gradually deployed at new locations for session-II. In Session-II, camera traps were deployed in Malad & Kanheri Round at 23 locations. After 7 days, *due to heavy and continuous rain we have started removing camera traps from field.*

Session II

All the **23** pairs of camera traps locations were sampled from June 6th to June 13th 2017, continuously for a period of 7 days. The session-II camera trap sampling results obtained through **161** trap night, **8** leopards (individuals) were identified in which **4** new individuals (**3 female & 1 male**) and **4** previously captured leopards were identified. Captures of other prey species like Sāmbhar, Spotted Deer, Wild Boars, Common Langoor, and Bonnet Macaques etc. were obtained in good numbers.

A large number of human photographs captured in both session by the camera traps in core area also, in which many photos of so called wildlife enthusiast moving in night, trekkers and morning walkers.

Population Estimate

With the help of the camera trap technique, it has become simple to identify individual leopards by the help of unique rosette pattern. However due to their elusive nature it is extremely difficult to count them. By using the Capture- Recapture analytical approach, it has become possible to estimate the population of leopards of any area. The assumption behind the Mark capture-recapture method is that the proportion of the marked individuals recaptured in the second sample represented the proportion of marked individuals in the population as a whole.

The Lincoln-Peterson Index is fairly known to estimate the closed population for a bi-sample survey. All the capture data is compiled into excel and the record is used to build a capture history to import in the 'Program Mark 8.1' as prescribed by NTCA. The derived population estimate is as follows.

Occasion	N [^]	SE	95% Confidence Interval	
			Population Upper confidence limit)	Population (Lower confidence limit)
2	21	0.857	21.00	25.19

Conclusion

- It is very interesting to note that that the leopard movement is spread all over Tulsi range. However the rate of captures of leopard is not very high
- The capture rates of major prey species like Spotted Deer, wild boar and common langoor as well as the big prey like Sambhar deer is encouraging.
- The abundance of prey species recorded is high in Gundgaon and Tusli round of Tulsi Range where the biotic disturbances are less.
- The abundance of prey species recorded is comparatively low in Malad and Kanheri round where the biotic disturbances are high.
- The availability of good numbers of small prey species like Spotted Deer, Wild Boar and Common Langoor and also larger species like Sambhar in Tulsi Range might be the reason of decline in the HWC incidences in & around Tulsi Range.