



Study of ecology of leopard (*Panthera pardus*) in Lakhari valley wildlife sanctuary, Gajapati district, Odisha, India

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ABSTRACT

Monitoring tiger, co-predator and their habitat in tiger reserves and sanctuaries is not only a protocol but also an intensive survey methodologies to analyze the wildlife status; mostly predator animals with relation to the prey base of the forested landscape. The tigers and leopards are wide ranging large carnivores covering a large landscape which may include forests of different administrative boundaries within or outside the state of Odisha. A survey was undertaken from November 2015 to February 2016 in Lakhari valley wildlife sanctuary through camera trap and rigorous field surveys on foot inside the sanctuary and also the periphery forest area to track the movement and study the ecology of leopards. From camera trap study, 2 numbers of leopards were captured which confirmed the presence of leopards, but no traps of Royal Bengal Tigers noticed. The result through camera trap and field surveys through pug marks, scat etc. showed that the population density D was 6 ± 2 leopards in 300 square km area. The individual leopards were differentiated according to the size of the pugmark. In a sampling area of 30 sq km under camera trap surveillance for other prey species have also been recorded.

Key words: Camera trap surveillance, Lakhari valley wildlife sanctuary, leopard, prey base

INTRODUCTION

There is a habitat linkage for leopards along the Ramagiri range forests of Lakhari sanctuary and Tumba beat area of Samantiapalli range of Berhampur forest division. During the last tiger census of 2014, sign of three individual leopards were recorded from Samantiapalli and Digapahandi ranges. These are the migratory large carnivores from Lakhari forests and occupied the peripheral forest area of other division. No other specific studies have been undertaken for monitoring large carnivores and their prey base except the all India tiger monitoring work 2005, 2010, 2014 and state level tiger monitoring survey works. Because of

varied causes, it has been extremely difficult to carry out research on leopards and its genetic makeup in different races in India. The body size and colouration also vary from region to region throughout India (Prater, 1971). Hence, the conservation of the leopards is more difficult in forest fringes bordering human dominated landscapes other than the protected areas, sanctuaries and national parks.

MATERIALS AND METHODS

Lakhari wildlife sanctuary is situated in the north eastern part of the Gajapati district of Odisha.

The geographical co-ordinates within which Lakhari Valley Sanctuary is located are $19^{\circ} 15'$ to $19^{\circ} 25'$ N latitude and $84^{\circ} 15'$ to $84^{\circ} 25'$ E longitude. The sanctuary is constituted of mostly the hilly tracts ranging from 8m to 700m of elevation endowed with flat valleys and sloppy drainages. It was declared as sanctuary vide Notification No. 8 (F) W-37/85-2333-FFAH dated 8.2.1985. The main objective of the declaration is to protect the flora, fauna, zoological, ecological and geo-morphological value of the valley.

At the time of declaration, the entire area of Chandragiri Reserve Forest (RF), Allarara-Ramaguda P.R.F. and Dhobadhoboni P.R.F. combine to cover a total area of 18586.72 ha. Later, the entire area of Dhobadhoboni P.R.F. was excluded and an extent of 373.15 ha. of revenue area was added to the sanctuary. Thus, the present sanctuary area covers 17495.80 ha. In the sanctuary area, there are three main revenue villages namely Balliganda, Kamarakhal and Manikapur (Fig. 1 to Fig. 4).

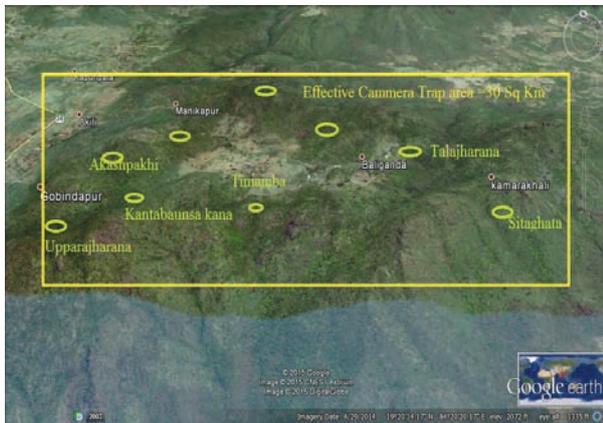


Fig. 1. The surveyed area of Lakhari valley sanctuary in satellite imagery

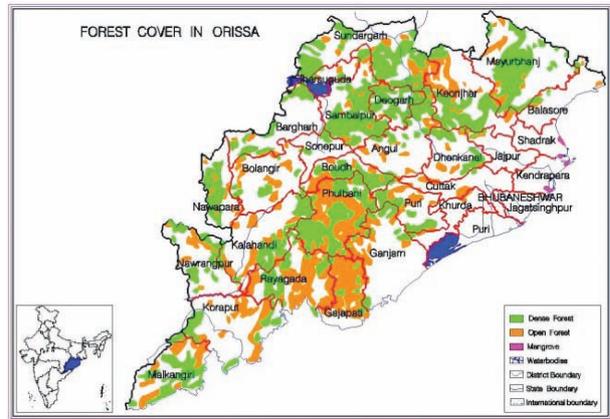


Fig. 2. Map of Odisha showing forest cover

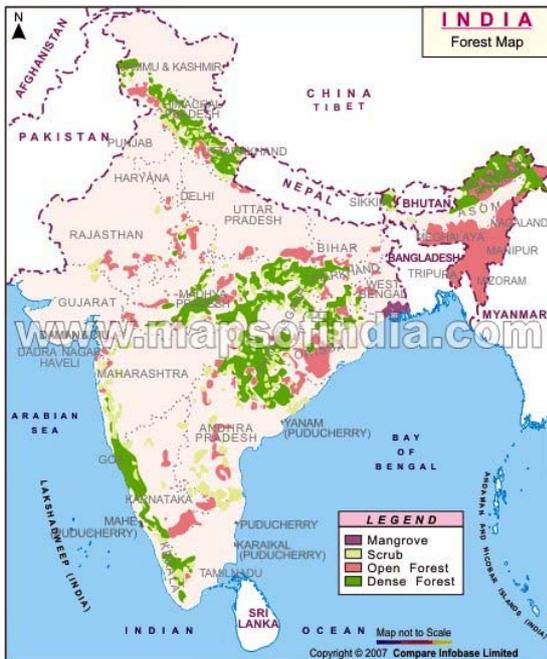


Fig. 3. Forest cover map in India



Fig. 4. Yellow portion of the forest division map showing the Lakhari sanctuary area

To capture the movement of leopards, specialized cameras were installed at different selective pockets. Cudde Back Digital camera (Infra red, long range, 20 mega pixel, model no. 1248) was fixed in a special designed wooden sized pole and carved to fit within. The camera happens to be highly sensitive and its range covers a distance of 10-12 m. For a clever and sensitive animal like leopard, the camera post was well camouflaged along the forest trail and fitted in pair by facing to each other. Both the two cameras were well alligned. Hence, there would be no miss in capture either by one of the camera instantly within fraction of 2-4 seconds. Here, the camera delay was kept minimum 5 seconds. The front opening of the camera box was covered with iron fabrication work. In other cases, the camera may be closed from the back side of the pole. And in both cases the camera traps were locked to avoid theft. It was decided to keep minimum of 2 kms distance from one working unit to the other and a range of 4 sq km to be covered by one unit of camera in the forest. In order to avoid trap shyness by animals, in a particular location, the camera had to be shifted a little distance in the same trails or in the same water body or salt lick area. This, actually helped more captures of the same or new animals providing more results in the capture- recapture procedures.

RESULTS AND DISCUSSION

The animals were recorded either on camera trap or through vocalisation, spotting of fresh scat or pug marks by field surveys and informations collected from working staff. At some of the important spots in the core area of the Lakhari sanctuary such as Akashpaki, Bamboo coupe road, Tiniamba, Talajharan, Uperjharan, Kamarakhala, Kanta baunsa kana, Jhirijhira, the leopard signs were encountered more frequently. Table 1 shows the effect of the camera traps in trap nights which overlap the lapse day periods before and after deployment of camera traps.

Three pairs of camera were under operation for 7 different places in 3 different phases, described in 3rd column of Table 1. For 7 places,

in total 20 days and nights were covered. In some day times, camera was taken off for recharge of batteries and cleaning of moisture and fungus. Hence, total camera traps for 7 different places from 3 pair of cameras in 3 different phases were recorded to be 108 trapped days. But since, less failure in night traps, the total trap nights became 122. The animals captured and recaptured have been calculated from the above recordings Table 1.

The preybase for the leopard in LWS were found to be langur, rhesus monkey, wild pig, barking deer, giant squirrel, hare, peafowl, porcupine, jungle fowl etc (Fig. 6 to 10). Instead of such prey base in the forest, occasional small cattle kill and the predation of goats and sheep occurred in the sanctuary peripheral villages. In a particular location, the camera had to be shifted little distance in advance or back in the same trails and some times it was to back in the line of same water body or salt lick area to avoid camera trap shyness. The movement of animals initially was affected by the flash light of the camera at night by exposures to cameras. After number of captures, they were accostomed to the flash lights. In few occasions, there were instances of avoidance to the camera post by the clever animals like leopards and tigers in the trap deployed place or path. In large cats, the studies were seriously affected due to trap shyness affecting the results (Wegge, 2004; Karanth and Nicols, 2002). Hence, practice of shifting of cameras helped more captures of the same or new animals (tiger or leopard) providing better results in the capture- recapture procedures. As noted in various studies the photographic recapture method is most reliable for population estimation of creptic animals like leopard and tigers (Karanth and Nichols 1998, 2000, 2002)

To meet the assumptions of a closed population, the camera trap study period should be kept for 8-12 weeks (Karnth and Nichols 1998). Wild prey density always acts as indicator over the population of leopards, as leopard population is directly proportional to available prey base and cattle population. The above study shown that there were no Royal Bengal Tigers in the study area. Apart from leopards, the capture of other animals in the study area was presented in Table 2.



Fig. 5. Hanuman langur; prey base of leopard in LWS, Paralakhemundi division, Odisha



Fig. 8. Barking deer; prey base of leopard in LWS, Paralakhemundi division, Odisha



Fig. 6. Hare; prey base of leopard in LWS



Fig. 9. Rhesus macaque under camera trap



Fig. 7. Group of young wild pigs in saltlick trail



Fig. 10. Fresh leopard scat in survey route

Table 1. Details of camera trap deployment period

Sl. No.	Study / trap sites	Days/ dates of operation(For 3 pair camera units)	Total Trap days	Trap nights per camera pair
1	Akashpaki,	6 Nov 2015 to 15Nov 2015	10	18Nights
2	Tiniamba	6 Nov 2015 to 15 Nov 2015 and 1 Feb 2016 to 7 Feb 2016	17	18Nights
3	Talajharana	6 Nov 2015 to 15Nov 2015 and 1Feb 2016 to 7 Feb 2016	17	18Nights
4	Kamarakhala	15Nov 2015 to 26 Nov 2015 and 1Feb 2016 to 7 Feb 2016	19	20 Nights
5	Uperjharana	15Nov 2015 to 26 Nov 2015 and 1Feb 2016 to 7 Feb 2016	19	20 Nights
6	Kantabaunsa kana	15Nov 2015 to 26 Nov 2015 and 1Feb 2016 to 7 Feb 2016	19	20 Nights
7	Bambo coupe road and other temporary sites	1Feb 2016 to 7 Feb 2016	7	8 Nights
Total		Camera trap deployment period 29 days	108 Trap days	122 Trap nights

Table 2. Details of animals captured in camera traps during survey period

Main Camera trap sites and survey routes	Total no. of animal species captured in cameras									
	Leopard	Barking deer	Wild pig	Hare	Percupine	Langur	R. monkey	Junglefowl	Peafowl	cattles
Akashpaki	1	2	4	2	1	0	0	1	2	1
Tiniamba	0	1	6	0	0	5	1	2	0	0
Talajharana	1	2	2	0	0	7	6	1	0	1
Kamarakhala	0	0	2	1	0	3	0	1	1	0
Uperjharana	0	2	5	0	0	2	4	2	0	1
Kantabaunsa kana	0	1	2	0	0	0	2	2	2	10
Total	2	8	21	3	1	17	13	9	5	13

Table 3. Details of animals encountered directly in field surveys in LWS

Forest roads and survey routes	Total no of animal species and encounteredd in forest routes.									
	Giant squirrel	Barking deer	Wildpig	Hare	Percupine	Langur	R. monkey	Red Junglefowl	Peafowl	
Manikapur to Balliganda	0	3	4	2	1	19	0	2	3	
Balliganda to Kamarakhal	0	2	4	0	0	5	1	2	0	
Balliganda to Talajharana	1	1	1	0	0	7	6	0	0	
Kamarakhala to Sitaghat gorge	0	1	2	1	1	3	0	0	0	
Kantabaunsa kana to Uperjharana	0	2	5	0	0	5	4	0	1	
Kantabaunsa kana to Bamboocoupe route.	2	1	2	0	2	2	2	1	2	
Total animals encountered during survey	3	10	18	4		41	13	5	6	

Under camera traps (Table 2 and Table 3), it was noticed that pigs, monkeys, jungle fowls and pea fowls were found in good numbers. From direct sighting method, deer, monkeys, pigs were encountered in large numbers (Table 3). The result indicated that there has been a standard prey base which has been regulating the sustenance of leopard population (Fig. 5 to 9).

Activity pattern

In two trap occasions, the first capture in camera was at 22.47 hrs night on the same day of deployment of 6 Cudde back cameras on 6th Nov 2015 (Fig. 11). The second capture was at 17.45 hrs evening on dated 15 Nov 2015 (Fig. 12). Under R. Udayagiri forest range near Bursi, the leopard call was listened on 6th Feb 2016 at around 21.50 hrs. On the next day morning, the entire area was searched for any sign and a very fresh scat found in the compartment no. 1 indicating the presence of leopard (Fig. 10). One leopard was also sighted in the sanctuary on forest road through vehicle spot light during late evening. The leopards like other carnivores remain active during night as they hunt primarily after dark when their superior confers an advantage for such predators (Sunquist, 1981; Karanth and Sunquist, 2000). The leopards also frequented to the salt lick area and waterholes during night followed by preys like barking deer, wild pig, hare and pea fowls. These spots were intensively surveyed during every morning from



Fig. 11. The 1st Leopard that captured in the LWS, Paralakhemundi on 06-11-15 at 22 hrs 47 mts night, just after 4 hours of deployment of camera

5th Feb to 11th Feb 2016. This large cat predator species can co-exist with tigers by hunting smaller prey and hiding by lifting the prey in trees. They prey upon cattle, dog and even children and notoriously known as man-eaters (Menon, 2003).



Fig. 12. Capture of leopard in the LWS, Paralakhemundi on Dt. 15-11-15 at 17.45 hrs evening, during 2nd week of deployment of camera trap

CONSERVATION STRATEGIES

Source population of tigers and leopards are of great importance for its survival and their conservation and it should be best practiced in the protected areas including tiger reserves, sanctuaries and national parks. The periodicity of four years for assessing the status of tigers and leopards is too long for monitoring source population. The wildlife institute of India recommended that these source population be monitored on a seasonal basis (Jhala, 2013). Presently, the state level tiger and co-predator monitoring work were done in every two years giving more emphasis to the sanctuaries in India. But, in Lakhari valley wildlife sanctuary, the wildlife monitoring work was done both seasonally and annually.

Leopards population can be well sustained if the key prey base in LWS be conserved. From the above survey, it was found that there were good numbers of barking deer in LWS and no spotted deer. In this forested landscape, the barking deer is the only surviving ungulate prey base for leopards as they can better escape from bush hunting than

other ungulates. It does have better hiding nature and less dependent of meadow grasses. It quickly revives from population depletion due to its shorter and prolific breeding capacity. Hence, if barking deer population will be survived in LWS, the leopard population will be stabilized.

The advantages over the previously tiger occupied area by the leopards in a sanctuary like LWS in Odisha is quite noticeable because of its survival status. The smaller prey base provides a good life support system for survival of leopards in Odisha. The prey base and large predators like leopard should be conserved at any cost specially in and around the sanctuary area to maintain a healthy ecosystem.

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