High prey density observed in village evacuated area: A case study from Padampur of Chitwan National Park

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Abstract

We studied prey density using line transect survey in ~ 21 km^2 of Padampur village evacuated site in Eastern Sector of Chitwan National Park during April 2016. A total of 20 north-south transects of 1 - 3 km length were laid across the Padampur area at the interval of 500m. Each transect was surveyed twice i.e. early morning (06:00 - 09:00) and late afternoon (15:30 – 18:30) when animals are active. A total of 507 animals of eight species were recorded from134 observations with 55.66 km survey effort. Data was analysed in distance sampling framework in Distance software (version 6.2). Detection probability was calculated and density parameters such as cluster density, animal density and confidence intervals of five major prey species (Chital, sambar, hog deer, wild boar and barking deer) were estimated. Density of a species was also estimated with > 40observations i.e. Chital and hog deer. Overall prey density was found to be 132prey animals /km^2 whereas density of chital & hog deer was 88.2 ± 29.29 & 44.97 ± 20.11 respectively. The prey density in Padampur was found relatively higher compared to the overall prey density in Chitwan National Park. This proves that creating additional habitat by resettlement is beneficial for wildlife. Recent grassland management interventions in Padampur also positively contributed for the higher prey density.

Keywords: Prey density, grassland Padampur, village relocated site, Chitwan National Park

A. Introduction

Grasslands have great ecological significance providing shelter and food for wide range of wildlife. Alluvial grasslands of Teraiare known to support one of the highest tiger and prey densities in the world (Lehmkuhl et al. 1988). Government of Nepal has committed internationally to double tiger population during an international tiger summit in 2010 and set the target of 250 tigers by 2022 in Nepal (GTI, 2011). There is very limited possibility to increase the habitat for tigers but there is ample opportunity to better manage the remaining habitat to meet the national target (Aryal et al., 2015) Tiger density is highly correlated to prey density (Karanth et al., 2004). Thus increasing better management of the grasslands to increase prey density is the most important step to achieve the national target of doubling tigers. Grasslands are very important ecosystem in Chitwan National Park. A recent survey shows that grasslands are shrinking in alarming rate in Chitwan National Park with only 12 % of the park remaining as grasslands.

Grassland management has been carried out by Chitwan National Park as one of the major activities for tiger conservation (CNP 2015). Periodic assessment of the prey populations is crucial to measure the benefits from such interventions. As a part of this, a prey-base survey was carried out in Padampur grassland in eastern partof Chtiwan National Park. The Padampur grassland was emerged after evacuation of a village called Padampur in early 2000s. Objective of the study was to estimate the prey density in Padampur grassland in Eastern sector of Chitwan National Park. The report highlights the findings of the survey in April 2016.

B. Methods

C.1. Study Area

The study was conducted in old Padampur village relocated site (known as Old Padampur) in the Eastern sector of Chitwan National Park. The Old Padampur covers an area of approximately 21 km^{2}in the Northern part of the Park adjacent to Rapti River. The village relocation was completed in 2002. After evacuation, Old Padampur is converted to short and tall grassland. Few patches of riverine forests are emerging in recent years. The area has abundant water from the streams flowing from the Southern Churia hills. Few wetland sites like Patna lake, Marchaulighol also provides crucial wallowing place for rhinos and drinking

water for other wild animals. Recently (2016), government declared this area as core of CNP.

C.2. Field survey

Line transect based distance sampling method (Thomas et al., 2006) was used to estimate the prey density in evacuated Padampurarea. Total of 20 north-south transects of 1 - 3 km length were laid across the Padampur area at interval of 500m (Fig 1) using ArcGIS 10. Endpoints of the transects were uploaded to GPS.
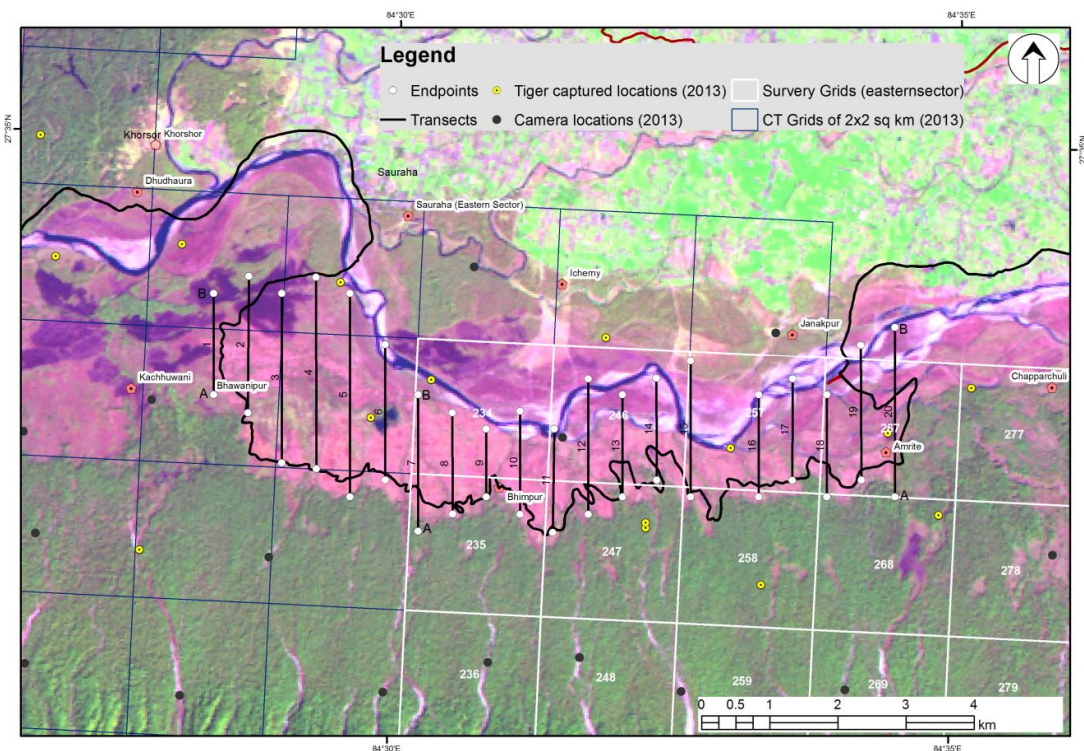

Figure 1: Line transects overlaid in map of Padampur grassland of Chtiwan Naitonalpark. Twenty transects of 1-3 km length were surveyed from elephant back duing April 2016.

Trained wildlife technicians of NTNC and gamescouts of CNP (called 'observers' hereafter)conducted the survey on these transects from the elephant back. Observers ride on elephant back and elephants walk along the transect (from start to end pointusing GPS) quietly on the observers instructions. When they observe the animal, take note of number of animals with demography, bearing and distance to the animal (location of first sight). Additionally, time of sighting, habitat and GPS location were also recorded in a standard

data form. Survey was conducted coinciding active period of prey species i.e. early morning (06:00 - 09:00) and or late afternoon (15:30 - 18:30). Field survey was conducted between 07 to 24 April 2016.

C.3. Data Analysis

Data collected was entered into excel spreadsheet and exported as tab-limited text file. The data in text-file was imported to Distance software (version 6.2) and fitted with different models (Fig. 2). The best fit model with minimum AIC was selected and detection probability was calculated. Parameters such as cluster density, animal density and confidence intervals were estimated. For the species with enough observations i.e. Chital and hog deer, species-wise density was also calculated.
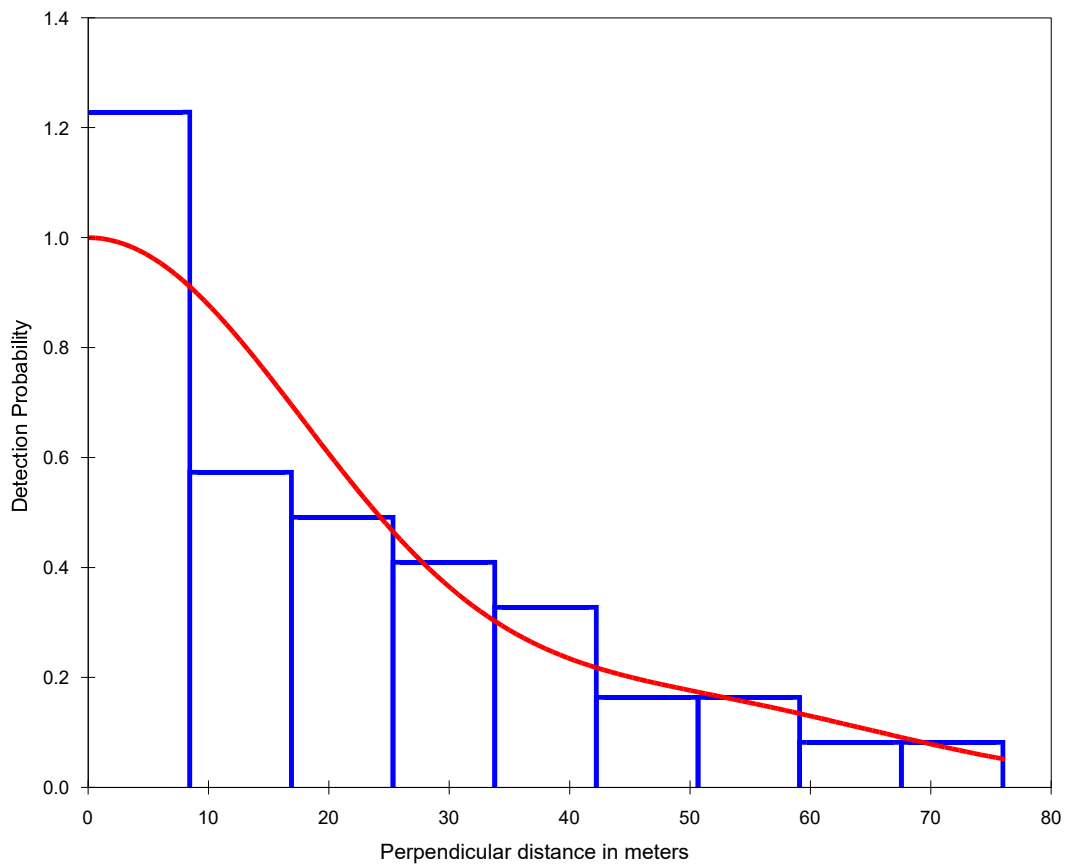

Figure 2: Half-normal cosine model fitted on the data of hog deer observation

C. Results& discussion

With total of 55.66 km survey effort, we recorded total 507 animals of eight species in 134 observations. Five major prey species of tiger such asSpotted deer, Sambar, Wild boar, Hog deer and Barking deer were recorded. Animal observation were recorded from17 out of 20 transects. Half of the transects (1 -10) were surveyed two times while others were surveyed onlyonce. Highest number of spotted deerwere observed but surprisingly very low number of Sambarswere recorded during the survey. Rhino and sloth bears were also recorded frequently. For the simplicity of analysis we removed the observations of peacock, rhino and sloth bear as these species havevery small contribution in tiger diet.

Table 1: Number of observations and individuals recorded in Padampur grassland of Chitwan National Park

Species	Number of observation	Number of individuals recorded
Chital	43	353
Hog deer	60	109
Wild boar	5	7
Barking deer	3	8
Sambar deer	2	3
Rhino	14	17
Sloth Bear	3	5
Peacock	4	5
Total	**134**	**507**

Table 2: Observation of different species in each transect during prey-base survey in Parampur grassland of Chitwan National Park

Transect ID	Chital	Hog deer	Sambar	Wild boar	Barking deer	Peacock*	Rhino*	Sloth Bear*	Total
1A	56	2					1		59
1B	17	1					1		19
2A	3	2	2						7
2B	13	6	2				2		23
3A	13	13					2		28
3B	20	7							27
4A	31	1							32

									Total
4B	8	5					3		16
5A	45	2	1	1			1		50
5B	3	14					4		21
6A		2						1	3
6B		4					1		5
7A	8	1		2				3	14
7B	22	3							25
8A		2							2
9A									0
9B									0
10A									0
10B	6								6
11A	27	3							30
12A	5	3					1		9
13A	17	9			2				28
14A	17	6							23
15A	5								5
16A									0
17A	10	2				1			13
18A	25	7		2	6		1		41
19A		14				2			16
20A	2					2		1	5
Total	**353**	**109**	**3**	**7**	**8**	**5**	**17**	**5**	**507**

* Species did not included for analysis in Distance software

We analyzed the data of major five prey species of tiger and leopard i.e. Chital, sambar, wild boar, hog deer and barking deerin Distance software. pooled density for all prey species was estimated. Only Chital (n=43) and Hog deer (n=60) had enough observations to estimate the species level density. The overall prey density was estimated to be 132 ± 19.2 animals/km^2

whereas chital & hog deer density was 88.2 ± 29.29 & 44.97 ± 20.11 respectively. Following table gives the details of parameter estimates.

Table 3: Density estimates of all prey species (collective), chital and hog deer in Padampur (village evacuated site) in Eastern Sector of Chitwan National Park, Nepal.

Parameters	All prey	Chital	hogdeer
No. of observations	110	43	60
Detection probability	0.36 (0.30 - 0.45)	0.39 (0.29 - 0.54)	0.30 (0.24 - 0.37)
Encounter rate (detections per km)	1.98	0.77	1.08
Cluster size (95% CI)	4.2 (3.1 - 5.7)	6.7 (4.6 - 9.9)	1.8 (1.5 - 2.1)
Cluster density / km^2 ± SE (95% CI)	44.84 ± 16.24 (32.51 - 61.84)	12.99 ± 2.88 (8.39 - 20.13)	27.34 ± 18.78 (18.81 - 39.70)
Animal density / km^2 ± SE (95% CI)	**132.01 ± 19.20 (90.60 - 192.33)**	**88.22 ± 25.84 (45.95 - 155.81)**	**44.98 ± 20.11 (30.23 - 66.92)**
Abundance (animal number) estimate (95% CI)	2387 (1638 - 3470)	1595 (903 - 2817)	813 (95 % CI 547 - 1210)

The estimated density of all species as well as Chital and hog deer seems quite high (132) compared to the previous estimates from entire national park (73) (Dhakal et al., 2014). The estimates of entire park represents both high and low density. Padampur seems one of the pocket area of Chtiwan National Park with very high prey density. Alluvial floodplains generally have are well known for higher prey density (Chanchani et al., 2014), our result further justifies this. This also shows that grassland management interventions in Padampur well pay off for the welfare all wildlife including prey species of tiger and leopard. Mosaic of tall grasslands, short grasslands, riverine forests and sal forest make this area suitable for prey species. Moreover, abundant water flowing from Churia and man-made and natural oxbow lakes provide plenty of wetlands and waterholes for wildlife. Recent interventions of grassland management has also contributed to increase the prey density in this area.

D. Conclusions

Comparatively high prey density was observed in Padampur village evacuated site in Eastern sector of CNP. Habitat mosaics and abundant water in this area and recentgrassland management interventions are responsible for such high density of prey. Recent have also contributed to increased prey density by making the grasslands more favorable. Grasslands in Padampur is gradually shrinking due to natural succession to forest. Thus, managementinterventions should be continued for sustained increase of prey species and carnivores. Further and detailed study on prey species their habitat and predators in needed to have better understanding.

E. Acknowledgements

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