

Securing the future of Nepal's tigers

Building a tiger stronghold in Parsa Wildlife Reserve and its bufferzone

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Report Preparation Team

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Project Background

Globally, tiger numbers have declined by 95% compared to the beginning of the 20th century and their habitat is restricted to only 7% of its original extent. To ensure that tigers continue to thrive in the wild there is a strong need of a global conservation effort. As part of ZSL's tiger conservation programme, our society is supporting the Government of Nepal to achieve its commitment to double tiger numbers by 2022 (i.e. to reach 250 tigers, based on 2012 national estimates of 125 tigers). Nepal is currently on track to meet this goal, with population estimates of around 198 tigers according to national census of 2013.

Nepal is one of the four range countries supporting a breeding population of Bengal tiger. The protected areas along the foothills of Himalaya provide the prime habitat for the remaining number of tigers. In Nepal tigers are only found in the lowland districts within the Terai Arc Landscape (TAL) areas. Chitwan National Park (CNP) has the highest tiger population in Nepal, indicating a success story for wildlife conservation efforts. The Chitwan-Parsa Tiger Complex is one of the highest priority landscapes for biodiversity conservation in Nepal, comprising nearly 2000 km² of contiguous habitat, it is home to nearly 500 rhinos and 130 breeding tigers and has been assessed as a Level 1 Tiger Conservation Landscape (TCL). Parsa Wildlife Reserve (PWR), contiguous with CNP in the east, was gazetted as a wildlife reserve in 1984. With the latest addition of 128 km², PWR in total adds 628 Km² of pristine sub-tropical forest to the available tiger habitat. Bufferzones of CNP and PWR comprise nearly 1048 km² which act as dispersal ground for young tigers. However, a burgeoning human population, along with habitat loss, has led to escalating human-wildlife conflict in the region – without, as yet, any systematic documentation of these problems.

Parsa Wildlife Reserve supported only 4 adult tigers, compared to Chitwan National Park's 120 in 2013 (DNPWC 2014). At the same time, there had been no scientific estimates for Bara Forest, although its contiguous to Chitwan-Parsa landscape. It is however noteworthy that now part of Bara Forest is included within the core area of PWR. The huge difference in density between Chitwan National Park and PWR is likely due to the lack of protection against the human disturbance and degradation. Additionally, while Chitwan National Park and Parsa Wildlife Reserve were fully protected under the National Parks and Wildlife Conservation Act 2029 (1973), Bara Forest had been given only a medium level of protection – which was not sufficient for holding any resident tiger populations and its prey species. The forest had been heavily exploited, with illegal cattle grazing and heavy human disturbance all time. Therefore, the threat was that any transient tiger in Bara Forest could become an easy target for poachers.

The proposed project aimed to support DNPWC to tackle these issues and secure a longterm stronghold for tigers in Parsa-Chitwan landscape, through ecological monitoring of the tiger and its prey base in Bara Forest as well as by establishing Community Based Anti-Poaching Units around Bara to prevent poaching. In the past Bara Forest, and to a lesser extent Parsa Wildlife Reserve, have acted as a sink for the tigers that disperse from Chitwan National Park, instead of allowing them to colonise and breed. However, the connectivity among CNP, PWR and Bara Forest has been excellent and with the proposed interventions though this project, as well as ZSL's ongoing efforts towards improving the habitat of Parsa and Bara the latter two sites can accommodate an additional 30-40 tigers. This has been a



part of long term ZSL initiative, providing a quantifiable contribution to tiger conservation in Nepal and globally.



Fig 1: Map of Nepal showing the project area.

- B. Objectives:
 - 1. Reduce poaching threats to tigers by establishing two Community Based Anti-Poaching Units (CBAPU) in Bara Forest.
 - 2. Monitor the status of tigers and their prey in Bara Forest through yearly systematic camera trapping and transect surveys.



Project activities carried out

- 1. Reducing poaching threats to tigers by supporting Community Based Anti-Poaching Units (CBAPUs)
- a) Support to the government to secure additional habitat for tigers

ZSL field team visited Bara Forest several times in February and March 2015 for supporting the DNPWC in delineating the boundaries for proposed extension. During the visit local people were seen collecting grass, fodder, firewood, fishing and logging even in the core areas of the forest. There were also many tractors sand mining along dry river beds and 40 to 50 of these moved daily in the area. ZSL firmly backed the government in securing the Bara forest under the protected area management by providing needed technical and facilitating the visits by key staff from the government to the site. The



Hon. Minister for Forests and Soil Conservation visiting Bara forests prior to its inclusion into protected area system

Government of Nepal included part of the Bara forest (129 km²) into the protection as core area of the Parsa Wildlife Reserve. Major areas of human disturbance were also identified during the visits. CBAPU's were formed around Parsa Wildlife Reserve focusing on areas of high disturbance to check the inflow of people.

b) Setup of and capacity building training for CBAPUs around Parsa Wildlife Reserve

The project supported establishment of thirteen CBAPUs identified around the Parsa Wildlife Reserve including newly extended core of PWR. Financial support was provided for the official registration of these units within PWR system. The constitution of CBAPUs were prepared and registered in Parsa Wildlife Reserve as a sub -committee of Buffer Zone User Committees (BZUCs). All the units are now legally established and recognised by PWR. Orientation workshop was organised in June 2015 for the CBAPU members. During the workshop, Chief Conservation Officer and Company Commander of Nepal Army stationed for the site security of PWR highlighted the importance of CBAPU in Wildlife Conservation and its contribution to Nepal's success in celebrating Zero Poaching Years. The CBAPU training was conducted in October 2015. A total of 93 participants (34 female and 59 male) from 13 CBAPUs was trained on SMART patrolling. The training also focused on GPS handling, animal sign identification, patrol record keeping and patrol database sharing with PWR office. Trainings were organised at four different locations (Aadhavar, Gaduwa post, Padam Pokhari and Handi Khola) covering several CBAPUs at a time. At the end of the training, reporting mechanism and protocol was discussed and agreed among the CBAPUs and PWR management. Each CBAPU has been supported with essential field gears (GPS,



camera, back pack, torch, water bottle, patrol logbook for data recording etc.). The project will also support CBAPUs for one year operation (communication, field logistics and local mobility costs etc) via PWR.



Fig 2: CBAPU members ready to take photo after the completion of training along with PWR staff and ZSL team (@PWR office, Aadhavaar).



Fig 4: ZSL Field staff assisting CBAPU members to handle GPS.





c) Mobilisation of CBAPU for increased protection around PWR (Sensitive Information)

CBAPUs are working under the coordination of BZUCs and supervision of the reserve and its posts conducting regular patrols. ZSL staff provided technical assistance and needed support to the units in data collection and coordinating with the reserve and posts. A total of 13 CBAPUs has now 145 members; 89 male and 56 female) in the villages of 11 Village Development Committees (VDCs) or municipalities within PWR buffer zone. The ID cards of members are issued by Parsa Wildlife Reserve. To smoothly run the CBAPU patrols, basic stationeries support and a minimum cost for patrol team snacks has been provided through PWR. PWR through its Buffer Zone Management Committee is playing key role to mobilize these CBAPUs in various anti-poaching and conservation activities. Below is the summary and the records of the patrols conducted by the CBAPUs.



S.N	Name of CBAPU	Number of team members	Number of patrol made	Illegal activity recorded
1	Janahit Users Committee	11	15	Illegal firewood collectors
2	Amleshwor Users Committee	13	17	Firewood collectors; axes, <i>Khukuries</i> (Traditional Nepali Blades) confiscated from them.
3	Churiya Mai Users Committee	11	1	Illegal firewood collectors
4	Sunakhari Users Committee	11	19	Illegal logging of Rosewood (D. Latifolia) & Saal (Shorea robusta)
5	Panchamukhi Users Committee	13	2	2 logs of rosewood and 1 dead spotted deer found in national forest
6	Kusum Batika Users Committee	11		Illegal firewood and NTFP collection
7	Nirmal Users Committee	11	6	NTFP and firewood collection
8	Padam Milan Users Committee	09	15	Smuggling of timber
9	Ujwal Bhabisya Users Committee	13	31	Illegal firewood collection.
10	Lokpriya Users Committee	13	14	Timber smuggling and illegal fishing
11	Manahari Users Committee	09	26	Reported a poaching suspect in BZCF, illegal fishing by electrification in Rapti river.
12	Lokhit Users Committee	09	25	Illegal firewood collection
13	Prakritik Samrakchan Users Committee	11	6 long patrols	Illegal firewood collection and logging, fishing

Table 1: CBAPU patrol records





Fig 6: Army personnel investigating at site based on the information supplied by CBAPU patrol team



Fig 7: Vehicle used by loggers caught by the PWR protection team and brought to headquarters for further investigation



Fig 10: Confiscated bicycles



Fig 11: Persons arrested with illegal firewood

2. Monitor the status of tigers and their prey in Bara Forest through yearly systematic camera trapping and transect surveys.

Species monitoring is one of the key component of an informed conservation initiative. The information on status of species, habitats and ecosystem enables the protected area manager to effectively identify the conservation gaps and plan necessary steps. At the same time the monitoring help assess the conservation impact of given project or activities. Often impact of conservation efforts is assessed by determining variation in population size over time and space. Camera trap based tiger monitoring is one of the most robust techniques to estimate tiger density and abundance. This method suits animals which can easily be distinguished from one another such as tigers from their physical attributes. Tiger stripes (markings) are different for each individual and allowing identification of individual tiger with higher degree of certainty. Capture-recapture sampling is based on "geographic and demographic closure", with assumption that there is no birth, death, immigration and emigration of individuals during the sampling period (Otis et al. 1978). Although sampling framework has remained the same, there has been advancement in methodological approaches to analyze and model data in recent years. Spatially Explicit Capture Recapture (SECR) model and SPACECAP has been used to estimate the tiger population and density in



PWR. SECR models are developed to address the limitations of conventional approaches (Efford et al 2004, Efford et al 2009, Royle et al 2009). There are two types of SECR models developed, based on multinomial likelihood and Bayesian hierarchy. Multinomial based models (SECR package in R, Efford et al 2013) and Bayesian hierarchial models (SPACECAP package in R, Gopalswamy et al 2012) are latest advancement in estimating population abundance and density. These models are based on the fact that capture probability of animals are dependent on the distance of camera traps from the activity center of animals. Based on information of capture and recapture of animals, SECR models estimates number of activity centers within the sampled area which is ultimately used for population size estimation.

A. Field Methods & Data Analysis

A.1 Camera trap deployment

A total of 70 pairs of passive camera traps developed by Panthera (Panthera V5) was used for the tiger monitoring. For the purpose of the camera trapping, Parsa Wildlife Reserve was divided into 167 grids of 2km X 2km area. Based on the availability of the camera traps, field team composition and accessibility, all the grids were grouped into three blocks.





Fig 12: Grid setup for camera trapping survey and locations of tiger images captured

Cameras were set in each block for 21 days before moving to another block. Objective of such design was to make camera deployment easier and smooth as Parsa has rugged and undulating terrain with little road connectivity making transportation of cameras and other logistics difficult and cumbersome. Camera traps were set in pre-identified locations where there is higher probability of capturing tiger identified during recce conducted in 2014 (Fig 2). In September and October of 2014, entire Parsa Wildlife Reserve was covered intensively to find appropriate locations to put camera traps. Similar approach was also used for the newly extended core to identify suitable locations to setup camera traps in December 2015. Trained staff surveyed the new core area recording tiger signs and a GPS location for potential camera trap site. In order to obtain both flanks of individuals, one pair of camera was tied-up on trees or fabricated poles within each grid at a height of 45 cm above the ground and 5-7 meter away from the centre of the forest road.

Section removed from here

Key results of the tiger monitoring survey (2016)

- a) Tiger population estimated for the first time in extended area setting up a baseline of four tiger individuals. There had been no records of tiger from this area before.
- b) Striking results of relocation of Pratappur village has been documented. In 2013 this area had no tiger captures, but relocation of villages in 2013/14 showed remarkable change in tiger occurrence in this area. Four tiger were captured individuals in Pratappur 2014 and 3 tigers were captured again in 2015-16 survey.
- c) Another relocation site, Bhata and Rambhori had also shown positive signs of change indicated by higher tiger captures in the camera traps.

A.2 <u>Re-colonization of tiger</u>

Present survey shows remarkable change in habitat use by tigers within Parsa WR (Fig 12) especially in the newly extended core area and indicates reserve is toward the process of tiger re-colonization. Such re-colonization could have been a response of tigers toward reduced human disturbance and improved protection provided by the reserve authority. Re-colonization of tigers in newly extended Parsa WLR after its inclusion in the protected area network clearly demonstrates that many parks within Terai Arc Landscape and across other sites which are constrained at low densities can be revived given appropriate conservation initiatives are implemented. Parsa presents unique and encouraging case study indicating it can contribute in achieving national goal of doubling tiger population.



A.3 Change in Population size

Larger tiger population in Parsa WLR was estimated as compared to earlier surveys (Annex 1). Tigers have shown a quick recovery given closeness to source site, abundant prey and disturbance free environment. Wegge et al (2009) reports tiger and prey population recovery in Bardia NP after protection level was strengthened. Likewise Chitwan has also shown tiger recovery in the past (Karki et al. 2015). Several studies in India has also documented recovery of tiger population (Harihar et al 2009, Panwar 1982). Experience from Rajaji NP is striking because with relocation of *Gujjars* and their livestocks, fawn-to-female ratio of grazers increased and tiger showed remarkable increase in population size with high immigration rate (Harihar et al 2009). Documentation of population recovery from Parsa and other parts clearly indicate when conservation efforts are made population can be revived.

Camera trapping exercise under Capture-Recapture Sampling is widely used (Jhala et al 2008) and is considered to be robust and reliable method to estimate and compare tiger abundance and density (Otis et al 1978; Karanth and Nichols 1998). Prior to 2008, ad hoc sampling was in practice relying on pugmark methods for estimating population abundance in Parsa WLR. Population estimation based on "pugmarks" is considered to be inappropriate (Karanth et al 2003–science deficiency). Karki (2011) and Dhakal et al (2014) had studied tiger population relying on capture-recapture sampling method in the reserve previously. These studies are basis for comparison of population change. Present study estimated population abundance of 19 (19-26 95% CI) which is 90% higher than previous study i.e. 10 (10-16 95% CI) in 2014. Such marked difference clearly demonstrated that tiger population can show remarkable change in habitat use; given proper management interventions are adopted. Such observed difference is encouraging because several parks in terai and elsewhere has suffered loss in population size in recent years (Chanchani et al 2014), and Parsa presents a case where tiger re-colonization is indicated after management interventions are undertaken.

Comparison of tiger images with last year survey has indicated that that few individuals might have been resident breeding tigers. Basis of such assumption is that 60% (4 females and 2 male) of tiger individuals photographed in 2014 survey were also captured in our present survey. Barlow et al (2009) suggests that when individuals are photographed in subsequent 2 years monitoring, these individuals can be considered to be "resident tiger". Similarly, four tigers recorded in present survey has also been recorded in Someshwar area of Chitwan National Park indicating that the tigers are moving across the landscape.

The camera trap survey was led by Parsa Wildlife Reserve with technical and financial assistance from National Trust for Nature Conservation (NTNC) and ZSL Nepal Office.

Project outputs and achievement



Objective	Outputs	Progress made							
Reduce poaching threats to tigers by establishing two Community Based Anti-Poaching Units (CBAPU) in a focal community adjacent to Parsa Wildlife Reserve and Bara Forest.	Support for tiger conservation gathered through community involvement in tiger conservation. Tiger and deer poachers deterred by presence of CBAPU.	13 CBAPUs established around PWR. At least 96 members contributing to protect tiger habitat. Zero incidents of deer and other poaching cases reported by PWR in 2015.							
	Number of arrests of poachers increases Reduced livestock grazing and human movement inside the forest.	Two poachers arrested with a musket on 18 May 2016. More than 1500 bicycles confiscated and 34 incidents with weapons, tools and gears recorded. A total of 134 loggers and grass collectors arrested by the reserve authority. A total 52 incidents of livestock grazing recorded. The area was heavily used for grazing before its inclusion in Protected area system.							
Monitor the status of tigers and their prey in Bara Forest through camera trapping and transect surveys.	Baseline of tiger population and prey base status (sambar <i>Rusa unicolor</i> , chital <i>Axis axis</i> and hog deer <i>A</i> <i>porcinus</i>) in Bara forest known. Follow up surveys designed based on results from the first systematic survey.	Report on tiger monitoring submitted to PWR and follow up survey recommended to monitor tiger population in PWR. Next survey is planned in the last quarters of 2016 and first quarter of 2017 which will also form part of the national tiger count in the country							





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Annexes

Parameters	Estimates from analyti	ical software							
	SECR	SPACECAP							
Density	1.44/100km ² (0.9-2.24)	1.34/100 km ² (1.14-1.56)							
Population (N)	19.09 (19-21)	22 (19-26) (N-Super)= including buffer area							

Annex 1: Tiger population and density estimates



Annex 2: Camera trap survey Plan

		February																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
Training and preparation																															
Camera Trap deployment BLOCK 1																															
Cameras Stations Live BLOCK 1 (21 Days)																															
		March																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Cameras Stations Live BLOCK 1 (21 Days)																															-
Camera Trap Recovery																															
Camera Trap deployment BLOCK 2																															
Cameras Stations Live BLOCK 2 (21 Days)																															
																April															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Cameras Stations Live BLOCK 2 (21 Days)																															
Camera Trap Recovery																															
Camera Trap deployment BLOCK 3																															
Cameras Stations Live BLOCK 3 (21 Days)																															
																May	,														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Cameras Stations Live BLOCK 3 (21 Days)																															
Camera Trap recovery																															
Image Processing and analysis																															



Annex 3 : Photographs



Tiger pugmarks recorded at Dudhaura Khola, Bara Forest



Vegetation around Halkhoriya daha provides best habitat for tiger prey





CBAPU members conducting foot patrol in the buffer zone area



Spotted deer recorded by ZSL recce team





CBAPU member talking with the firewood collector in Bara Forest



Some species recorded in the newly extended core of Parsa

Panthera tigris

Panthera pardus



Felis bengalensis

Felis chaus



Rhinoceros unicornis

Muntiacus muntjak



Final Report to 21st Century Tigers Zoological Society of London **Zoological Society of London**



Sus Scrofa

Axis axis



Rusa unicolor



Boselaphus tragocamelus



Hystrix indica

Mellivora capensis





Viverra zibetha

