SUMMARY REPORT

Status of Tiger and Prey-Base Population in Nepal, 2013

Government of Nepal
Ministry of Forests and Soil Conservation
Department of National Parks and Wildlife Conservation
Department of Forests

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SUMMARY

This report highlights the major findings of the national tiger *(Panthera tigris tigris)* and prey-base survey carried out in 2013. The major objective of the survey was to estimate tiger and prey population in Nepal. The survey was jointly conducted by Department of National Parks and Wildlife Conservation (DNPWC), Department of Forests (DoF), National Trust for Nature Conservation (NTNC) and WWF Nepal from 5th February to 4th June, 2013. To estimate the tiger population, camera traps were deployed systematically in 1,039 grids of 2 km x 2 km with an intensive camera trap effort of 15,585 trap days covering 4,841 km2. Similarly, 544 line transects measuring 1,659 km were surveyed to estimate prey abundance. Likewise, several survey routes totaling 2,319 km was surveyed for estimating tiger occupancy across the Terai Arc Landscape (TAL). Data collection was made possible by the unprecedented effort of 268 trained personnel associated with DNPWC, DoF, NTNC, WWF Nepal, International Trust for Nature Conservation (ITNC), Nepal Army, Nature Guide Association, Buffer Zone User Committees and universities over 17,628 man-days. The financial and technical support for the survey was provided by WWF Nepal, NTNC and USAID-funded Hariyo Ban Program.

A total of 142 individual tigers (Chitwan-78; Bardia-44; Suklaphanta-13; Parsa-4; Banke-3)[1] were identified through careful examination of 7,699 tiger photographs obtained from camera traps. The data was analyzed using the program, SPACECAP (version 1) employing the spatially explicit capture recapture (SECR) approach. The total estimated tiger population in Nepal was found to be 198 (163-235) including 120 in Chitwan (98-139), 50 in Bardia (45-55); 17 in Suklaphanta (13-21); 7 in Parsa (4-13) and 4 in Banke (3-7) with a density estimate of 3.84, 3.38, 3.4, 0.65 and 0.16 tigers/100 km2 respectively. Prey-base density was found to be the highest in Bardia with 92.6 animals/km2 followed by Suklaphanta (78.62), Chitwan (73.63), Parsa (25.33) and Banke (10.27). Occupancy survey has confirmed tiger presence in 12 Terai districts including two additional districts (Dang and Kapilvastu) which were devoid of tiger signs when surveyed in 2008/09. Tiger population in Nepal has increased by 63% over the 5-year period with an annual growth rate of 12.7%. The increment in the tiger population justifies the current conservation efforts in Nepal.

BACKGROUND

Tigers are masterpieces of nature and a symbol of power. They are the umbrella species and an indicator of healthy ecosystems. During the turn of the century, global tiger population was estimated to be 100,000. They could be found from the forests of eastern Turkey and the Caspian region of Western Asia, all the way to the Indian sub-continent, China, and Indochina, south to Indonesia, and north to the Korean Peninsula and the Russian Far East. Unfortunately, the adverse human activities such as habitat destruction, loss of prey, poaching and illegal trade in tiger parts are causing serious threats to tigers with the global population declining to as low as 3,200 by 2010 (GTRP 2010). Once distributed widely, tigers are now confined to 7% of their historical range in 13 countries of the world. To address this global tiger crisis, a Global Tiger Summit (2010) was held in St. Petersburg where the heads of Governments of the 13 tiger range countries committed to double the wild tiger population by 2022 and endorsed the Global Tiger Recovery Program (GTRP). As per the global pledge, the Government of Nepal committed to double the tiger population by 2022 and has been implementing the National Tiger Recovery Program (NTRP) since 2010.

The first national level assessment of tiger population was conducted in 2008/09 that established a baseline of 121 (100-191) adult tigers in Nepal including 91 in Chitwan, 4 in Parsa, 18 in Bardia and 8 in Suklaphanta (Karki et al. 2009). The information generated through the study resulted in leveraging major changes in policy as well as tiger conservation in Nepal. The major conservation successes included the declaration of Banke NP, addition of buffer zone in Bardia NP, declaration of major corridors as protection forests, establishment of the National Tiger Conservation Committee (NTCC) under the chairmanship of the Prime Minister and Wildlife Crime Control Bureau (WCCB), creation of a special tiger conservation fund and the commitment to double the tiger numbers by 2022. Following the decision made at the 3rd NTCC meeting, the second national level tiger and prey-base survey 2013 was conducted using the latest science and technology.

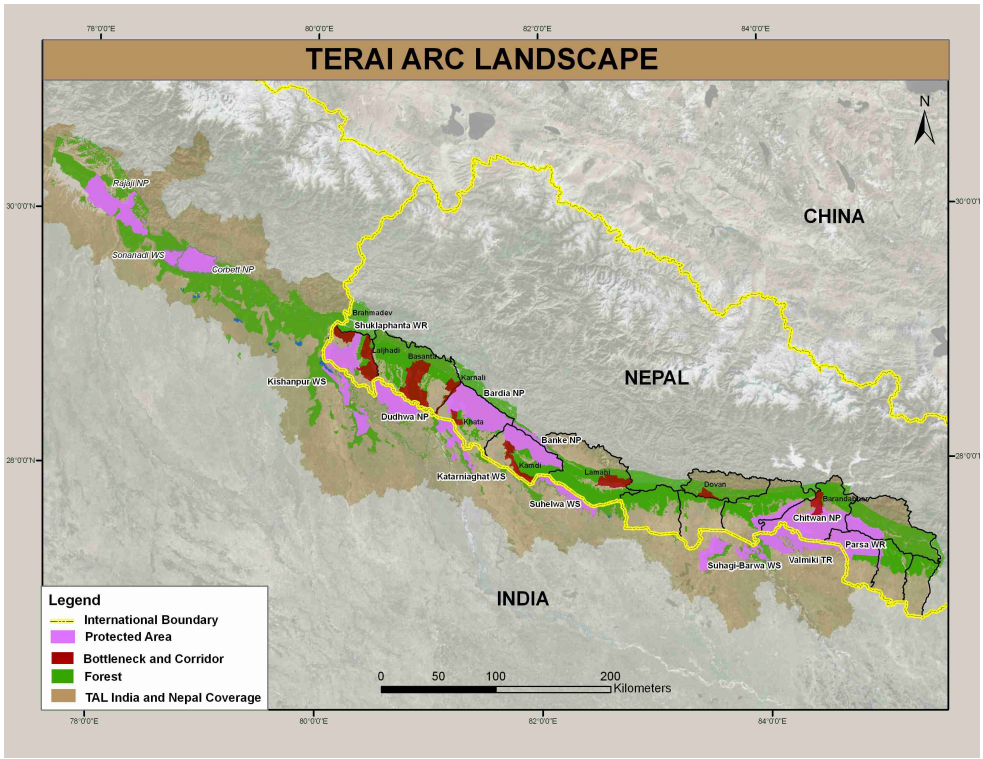
OBJECTIVES

The objectives of the survey were to estimate tiger population and prey densities, and measure the habitat occupancy of tigers across Nepal's Terai Arc Landscape.

[1] *Chitwan, Bardia, Suklaphanta, Parsa, Banke refer to respective Protected Area, bufffer zone and adjoining forest areas*

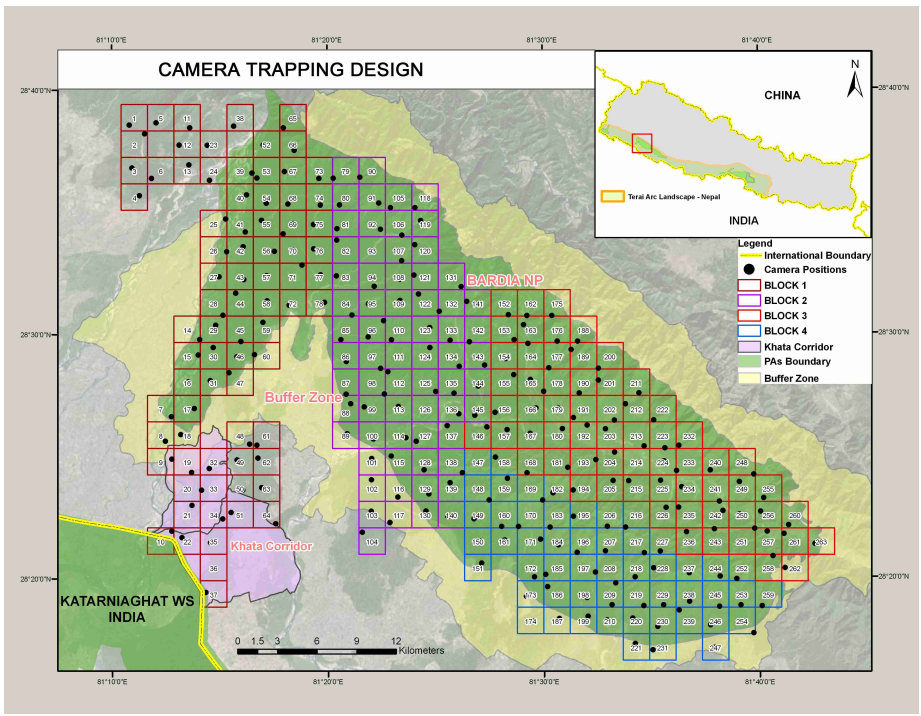
STUDY AREA

The 49,500 km2 Terai Arc Landscape (TAL) is stretched across the foothills of the Himalayas and encompasses 15 protected areas of Nepal and India. The TAL (23,199 km2) in Nepal covers 14 Terai districts from Rautahat in the east to Kanchanpur in the west (Map 1). It comprises of >75 percent of the remaining forests of the Terai and foothills of Churia. The survey was conducted across TAL including tiger-bearing Protected Areas (PAs), buffer zones and adjoining forests. Parsa Wildlife Reserve (PWR), Chitwan National Park (CNP), Banke National Park (BaNP), Bardia National Park (BNP) and Suklaphanta Wildlife Reserve (SWR) hold the core tiger sub-populations in Nepal.



Map 1: Terai Arc Landscape

METHODS AND DATA ANALYSIS



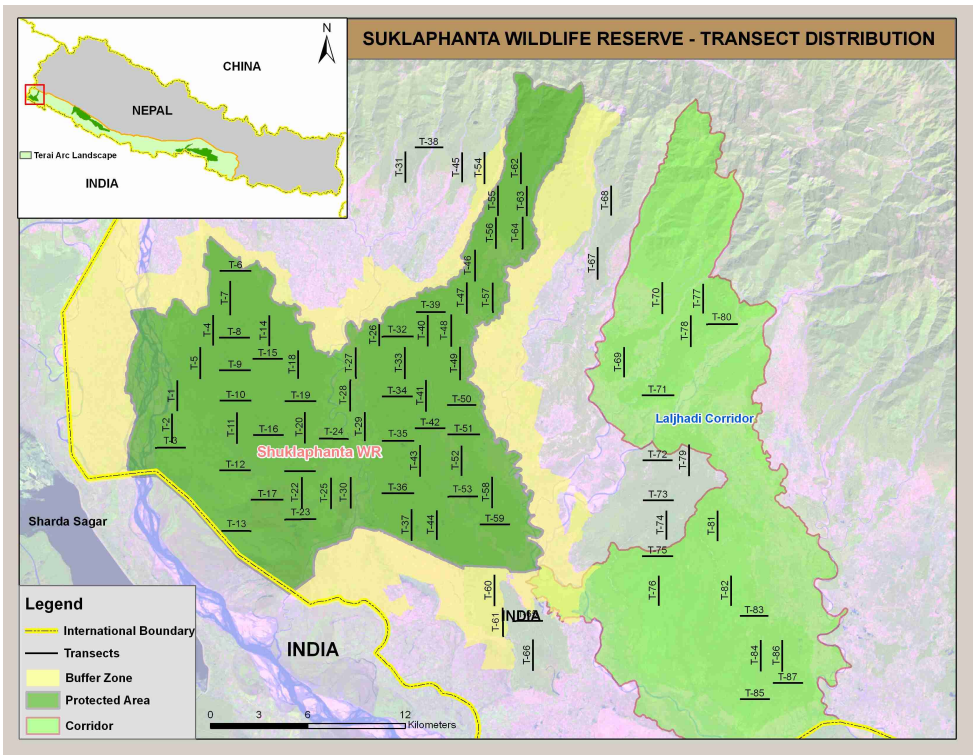
Map 2: Camera Trapping Design (2013), example from Bardia National Park

Camera Trapping

Camera trapping was performed to estimate tiger populations in all tiger-bearing PAs, buffer zone forests and critical corridors like Khata, Basanta and Barandabahar. Depending upon the size of the protected area, logistical constraints and availability of camera units, each of the PA and the surrounding forests were divided into 2-4 blocks. Natural boundaries such as ridges and large rivers were made a basis for block division.

Camera traps were systematically placed across the study area by super-imposing a 2 km x 2 km grid (Map 2) and deploying a pair of camera units in each grid cell over a standard sampling occasion of 15 days. This comprised of 1,039 grids (Parsa-177; Chitwan-362; Banke-118; Bardia-238; Suklaphanta-88 and Basanta-56) with an intensive camera trap effort of 15,585 trap days covering 4,841 km2. The ideal location for camera placement in each grid was searched following intensive sign surveys to maximize the chances of photo-capture.

Individual tigers were identified through rigorous examination of the unique stripe patterns on the flanks, limbs and forequarters (Karanth 1995) of photographed tigers. Capture history was developed for each individual tiger and subsequent data was analyzed using Program SPACECAP package version 1 (Gopalaswamy et al. 2012) that implements a Bayesian Spatially Explicit Capture Recapture (SECR) analysis (Royle et al.2009). SPACECAP permits for inference about the locations of uncaught animals of study, based on capture-recapture probabilities.



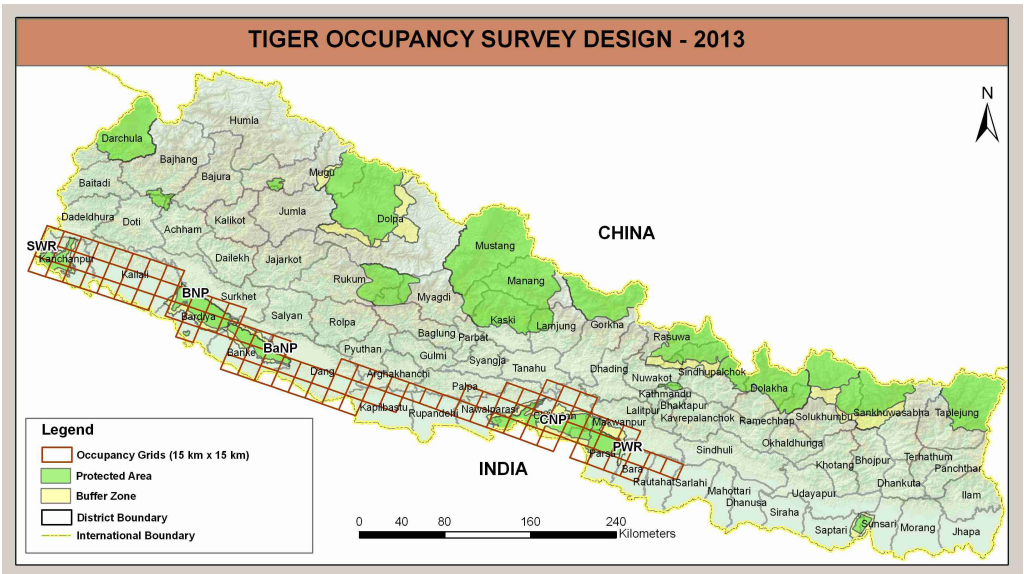
Map 3: Line transect survey design, example from Suklaphanta Wildlife Reserve, 2013

Estimating Prey Density

Prey density was estimated using line transect method (Buckland et al. 1993). Line transects of 1.5 to 2 km were placed systematically in the camera trapping grids. However, undulating and hilly terrain were avoided not to violate the basic assumptions of distance sampling. A total of 544 transects (Parsa-104; Chitwan-170; Banke-97; Bardia-121 and Parsa-52) were surveyed with sampling effort of 1,659 km. Line transect data was analyzed under the distance sampling framework by using DISTANCE 6.0 (Buckland et al. 1993).

Estimating Habitat Occupancy

A total of 96 grids (15 km x 15 km) were used to measure habitat occupancy of tigers. To ensure randomness, each grid cell was divided into 16 sub-cells of equal size (3.75 km x 3.75 km). In each grid cell, one sub- cell that possessed suitable tiger habitat coverage of ≥30% was selected randomly, and intensive sign survey was conducted along with the collection of habitat quality data. A total of 2,319 km was surveyed across TAL.



Map 4: Occupancy survey design, Terai Arc Landscape, 2013

RESULTS

Tiger Population Estimates

The present tiger survey estimated a total of 198 (163-235) tigers in Nepal including 120 in Chitwan, 50 in Bardia, 17 in Suklaphanta, 7 in Parsa and 4 in Banke (Table 1). This result was derived from 142 individual tigers (Chitwan-78; Bardia-44; Suklaphanta-13; Parsa-4 and Banke-3) identified through careful examination of 7,699 tiger photographs (Chitawan-2,964; Bardia-3,613; Suklaphanta-915; Parsa-35; Banke-172).

Table 1: Tiger population and density estimates in TAL, 2013

SN	Survey Areas	Estimated Population			Density/100 km^2	
		Mean	SD	95% CI	Density	SD
1	Chitwan NP, buffer zone and adjoining forests	120	10.64	98-139	3.84	0.34
2	Bardia NP, buffer zone and adjoining forests	50	2.85	45-55	3.38	0.2
3	Suklaphanta WR, buffer zone and adjoining forests	17	2.27	13-21	3.4	0.4
4	Parsa WR, buffer zone and adjoining forests	7	2.9	4-13	0.65	0.3
5	Banke NP, buffer zone and adjoining forests	4	1.2	3-7	0.16	0.1
	Total	198		163-235		

Prey-base Density Estimates

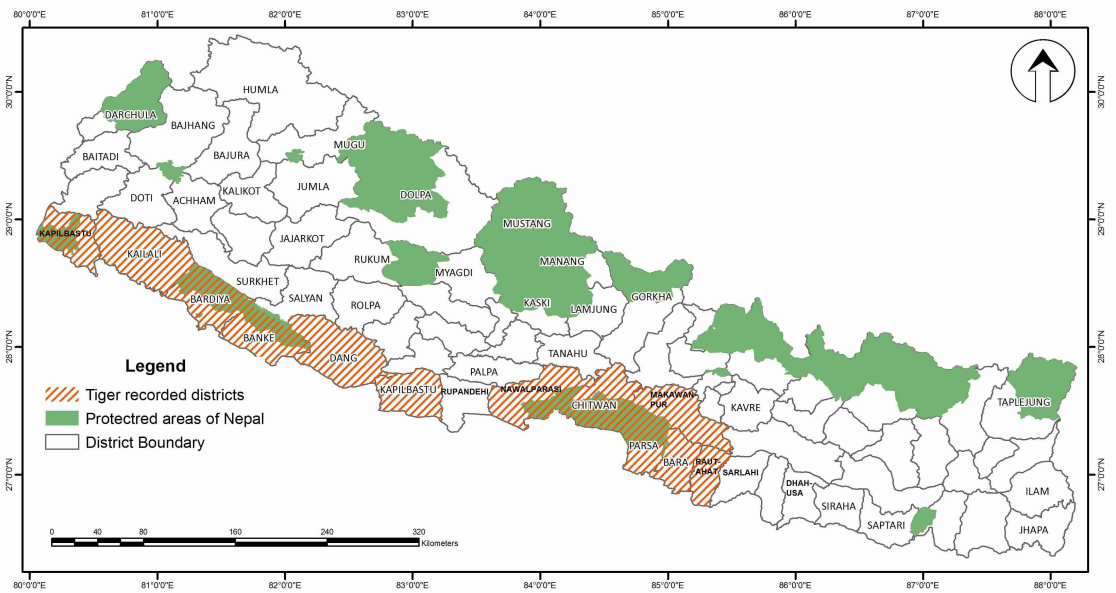
The major tiger-prey species in Nepal are chital, sambar, wild boar, hog deer, swamp deer, barking deer rhesus monkey and langur. Prey-base density was found to be the highest in Bardia with 92.6 animals/km2 followed by Suklaphanta (78.62), Chitwan (73.63), Parsa (25.33) and Banke (10.27). The details are provided in Table 2.

Table 2: Tiger prey-base density estimates in TAL, 2013

SN	Protected area	Estimated Details			Density/ km^2	
		Effort (km)	Number of transects	Number of observations	Density	SE
1	Chitwan NP, buffer zone and adjoining forests	497.73	261	376	73.63	9.08
2	Bardia NP, buffer zone and adjoining forests	397.58	219	571	92.6	8.8
3	Suklaphanta WR, buffer zone and adjoining forests	154.15	82	114	78.62	16.44
4	Parsa WR, buffer zone and adjoining forests	286.05	147	133	25.33	3.9
5	Banke NP, buffer zone and adjoining forests	333.74	75	55	10.27	6.34

Tiger Distribution

Occupancy survey has confirmed the presence of tigers in 12 Terai districts (Rautahat, Bara, Parsa, Makawanpur, Chitwan, Nawalparasi, Kapilvastu, Dang, Banke, Bardia, Kailali and Kanchanpur). The tiger presence was also confirmed from districts of Dang and Kapilvastu where there was no tiger record during the 2008/09 survey (Map 5).



Map 5: Tiger Distribution, 2013.

MANAGEMENT IMPLICATIONS

I. The overall tiger population in Nepal has increased by 63% compared to 2008/09 with 12.7% annual growth rate and therefore justifies the current conservation endeavours of Nepal.

II. The annual increment of tigers in Bardia at the rate of 35% is an outstanding achievement and this is mostly attributed to the improved park protection system, intensive habitat management, improved park people relationship and voluntary handover of guns. Bardia has proven to be the world's leading example in tripling tiger numbers within 5 years and should continue to maintain this standard.

III. Re-colonization of Banke NP by tigers is highly commendable. However, strict protection measures together with habitat enrichment programs are essential to increase the tiger and prey numbers.

IV. The annual increment of tiger numbers by 22% in Suklaphanta is also very promising and therefore the current conservation efforts need to be continued. However, the livestock density in Suklaphanta was found to be 21 animals/km2 which calls for effective law enforcement.

V. Chitwan tiger population showed a steady growth of 6.4% per annum. Further research on how the Chitwan tiger population is being stabilized and interacting with overall ecosystems is a requisite.

VI. Tiger population in Parsa has also increased from 4 to 7 individuals compared to 2008/09. However, the direct encounters of field teams with poachers and camera trap images of armed poachers, and the disturbance caused by extraction of sand and gravel from tiger habitats in Parsa demand effective law enforcements.

VII. Prey densities were found to be relatively higher in Bardia, Chitwan and Shuklaphanta as compared to the other tiger bearing areas in the Indian Sub-continent. This is a sign of effective management and needs to be maintained to support the viable tiger population.

VIII. Human-tiger conflict is likely to surge with increasing tiger population. It has already been a conservation challenge in Chitwan. There are several reported cases of dispersing sub-adult tigers that often leave the core areas and come in conflict with people. Therefore, appropriate mitigation measures need to be designed and implemented.

IX. The critical corridors for tiger dispersal are under immense anthropogenic pressure, mainly encroachment and unsustainable harvesting of forest resources, and needs to be addressed immediately.

X. The well-being of source population is crucial for the long term persistence of tigers within the larger landscapes. The population could deplete very rapidly due to poaching, disease and natural calamities. Therefore, annual monitoring for small populations and periodic monitoring for large populations along with ecological studies using cutting-edge technologies is recommended.

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