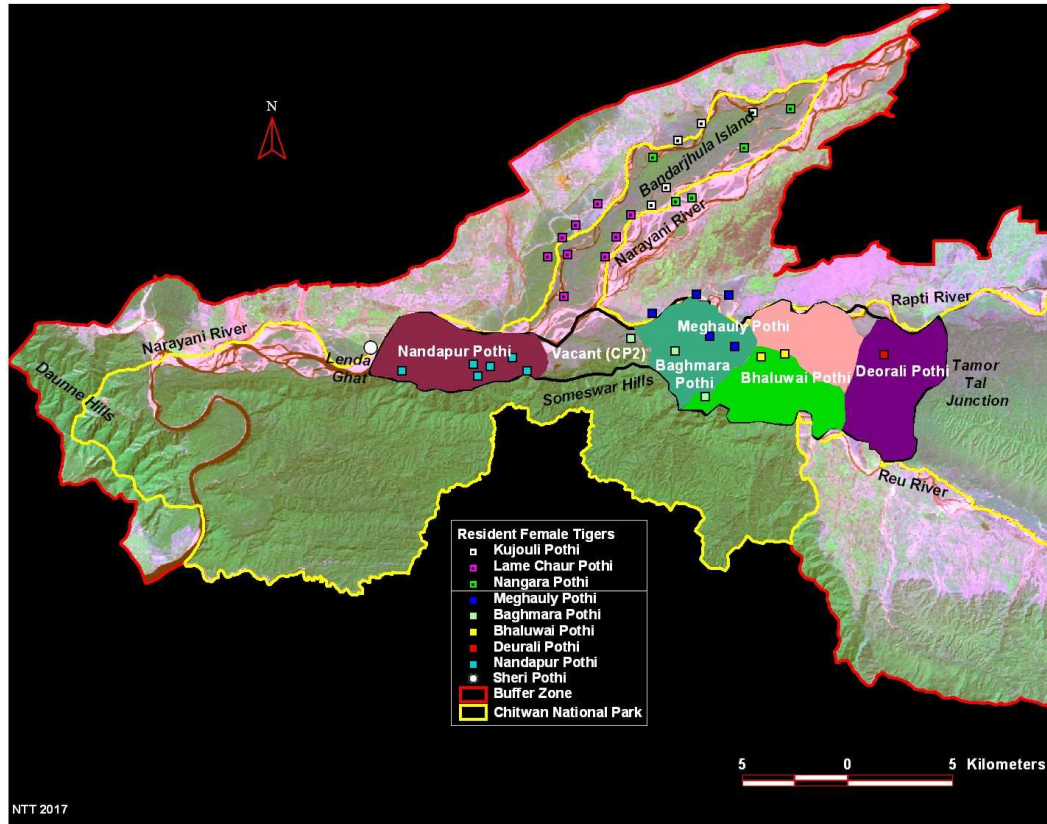


LONG TERM TIGER MONITORING AT CHITWAN NATIONAL PARK  
AND BUFFER ZONE, NEPAL

An Annual Report 2016-17



Submitted to  
Department of National Parks and Wildlife Conservation, Kathmandu  
Chitwan National Park, Kasara

By  
Bhim Gurung, Prakash M Shrestha, Dhan Bdr Tamang,  
Baburam Mahato, Raju Kumal

NEPAL TIGER TRUST, BHARATPUR- 27, MEGHAULY, CHITWAN,  
NEPAL

## DEDICATION

This report is dedicated to Dr. Charles McDougal, who died in Kathmandu – Nepal, on May 11, 2016 at the age of 86 years. He devoted half of his later life in tiger research and its conservation. His unconditional love for tigers, devotion, enthusiasm and great support for tiger conservation has made this project a success. We sincerely acknowledge Dr. McDougal initiating this long term tiger monitoring project four decades ago. We thank him for his dedication and commitment to conserving the Tigers of Nepal. His outstanding effort in tiger research and monitoring has significantly enhanced our understanding of tiger behavior, population dynamics, life histories, reproduction and other aspects of tiger biology. His exceptional long term monitoring of individual tigers in prime tiger habitat in Chitwan NP has contributed significantly to maintaining the stable and healthy tiger population. He was our guru, great mentor, associate and excellent role model for others to emulate. He was a highly respected tiger expert around the world and will be deeply missed by all of us.

# Contents

DEDICATION .....	i
BACKGROUND.....	2
METHODOLOGY .....	5
RESULTS.....	7
DISCUSSION .....	10
ACKNOWLEDGMENTS.....	13
LITERATURE CITED.....	14
FIGURES .....	15
APPENDIX .....	19

## **BACKGROUND**

Chitwan National Park (CNP) has the longest data set of monitoring individual tigers in the world (McDougal et. al. 2016). Since the establishment of the CNP in 1973, McDougal and his associates have been monitoring the individual tigers for more than forty years, in an area of approximately 100 km<sup>2</sup> in the western part of the CNP.

In 1980 McDougal initiated a Long Term Tiger Monitoring (LTTM) to understand the population dynamics, life histories and reproduction of individual tiger. The project was designed as a follow up of intensive studies of tiger's behavior, population structure, and dispersal using radio telemetry between 1974 to 1980, under the auspices of the Tiger Ecology Project supported by Smithsonian Institution and World Wildlife Fund. The LTTM project was also a continuation of his (McDougal 1977) own research that he had initiated in 1973, coincided at the same time as the Tiger Ecology Project and the establishment of CNP.

From 1980 to 1995, pugmark tracking was used to monitor tiger movement pattern and its association with other tigers. An individual tiger was identified using any of their four pugmark's diagnostic features. As a cross check, ad-hoc camera trapping was used to identify the individual animal from its facial and body stripe markings to that of pugmark's unique feature/s. During this period LTTM project was supported by International Trust for Nature Conservation (ITNC) and National Zoological Park-Smithsonian Institution.

Since 1995, camera trapping was used to obtain tigers photos for identification

and monitor its survival and reproduction over time. Additionally, pugmark monitoring was also used as it provides more detail information on the tiger movement and signs they leave in the environment. Camera traps were placed in frequent tiger travel routes and frequent habitat use areas identified by the pugmark tracking. Attempts are made to obtain both sides of the tiger photos by placing two camera traps at one location. Individual tiger are then identified using their unique stripes or facial marking. Additionally, tiger pugmarks at the trap sites are also recorded and matched with tiger stripes. ITNC continued supporting this LTTM project in association with The Fund for the Tiger and pugmark tracking was replaced with camera trapping.

Over the years several research articles covering different aspects of tiger biology has been published using the LTTM project data set. However, the entire dataset of more than forty years from 1973 to 2015 relating to life histories of resident female tigers and its reproduction has been summarized by McDougal et al. (2016). The authors concluded that the Chitwan tiger population has been stable for a long time due to high reproductive success and constant number of breeding females in the study area.

Unlike in Chitwan NP, tiger populations in many tiger range countries have been declining around the world. In 2010, to overcome this declining trend, Nepal, along with 12 range countries has adopted a challenging goal of doubling the tiger population by 2022 (DNPWC 2016). Given the degree of stability concluded by the LTTM project, one cannot expect dramatic increase in tiger population. Furthermore, it seems tiger and prey base in Chitwan NP are in sync with the habitat. As such more tigers require more prey and to increase prey base is to increase tiger habitat.

Nepal has taken positive conservation actions in this direction by establishing 550 km<sup>2</sup> of Banke National Park in 2010, extension of 127 km<sup>2</sup> area of Parsa Wildlife Reserves in 2015, and prioritizing conservation activities in the buffer zone community forests and corridor habitats. Additionally, the core tiger habitats in protected areas are also getting special conservation measures such as habitat improvement, participatory wildlife protections and regular monitoring of tigers.

Community forests in the buffer zone have provided an additional tiger habitat as well as corridor habitat for tigers living outside the CNP. Tigers have established their territories in these buffer zone forests and have increased the overall Chitwan tiger population, a step towards doubling the tiger population of Nepal. Additionally, stability of breeding tigers in the buffer zone forests to raise offspring successfully is critical to maintain the larger tiger population. Furthermore, continuous forests beyond these buffer zones serve as an additional tiger habitat and a dispersal corridor to connect Chitwan tiger with other tiger populations in Nepal and India. Therefore, the objective of this study was to: @ determine the status of resident tigers in the LTTM area, core habitat; @ establish the baseline status of residents tigers in the BandarJhula Island, core and buffer zone habitat; @ determine the habitat use by tigers in the Daunne Hills, corridor habitat; and @ Report the prey, associated species and disturbance factors in each camera trap blocks.

## **METHODOLOGY**

### **Camera Tapping Area**

The camera trapping area encompasses most of the western portion of the CNP and its associated buffer zone community forests (Figure 1). This season, we covered LTTM area, BandarJhula Island and Daunne Hills. We divided LTTM area into four blocks: LTTM Block II, LTTM Block X, LTTM Block XX and Meghauily Block. Meghauily block community forests are adjacent to LTTM area and same tigers from LTTM use this habitat as an extension of their territory, as such is included in LTTM block. Trapping blocks are different than in previous seasons; however, the camera traps were set in the same vicinity as before.

We also redesigned the BandarJhula Island camera trapping blocks to capture better coverage. Trapping area was divided into four blocks: Parasi Block III, Island Block IV, V and VI. Parasi block entirely covers the buffer zone community forests, whereas remaining blocks covers most of the Park core area and its adjacent community forests. Finally, Daunne Hills had only one block with camera sites been located in same proximity to last season.

Total nine blocks were designed which were successively camera trapped from December 22, 2016 until June 26, 2017 (Figure 1, Table 1). In each block 7 to 10 camera sites were established and GPS locations were recorded. The cameras traps were placed for 24 hours and it was monitored regularly by wildlife technician, game scouts and respective buffer zone forest guards. In nine blocks, total trap locations were 96 and number of camera trap days varied from 14 to 25 days per location. Camera trapping effort is shown in Table 1.

**Table 1 Block wise camera trapping effort in the western portion of Chitwan National Park during the 2016-17 season.**

<b>Block No</b>	<b>No of Camera Locations</b>	<b>Trap Night</b>	<b>Date range</b>
Daunne Block I	8	332	22 Dec to 13 Jan
LTTM Block II	9	270	16 Jan to 1 Feb
Parasi Block III	10	299	4 Feb to 20 Feb
Island Block IV	10	315	26 Feb to 15 Mar
Island Block V	10	290	16 Mar to 31 Mar
Island Block VI	10	320	3 Apr to 20 Apr
Meghauly Block VII	7	350	22 Apr to 17 May
LTTM Block X	16	508	27 May to 12 Jun
LTTM Block XX	16	460	12 Jun to 26 Jun

We identified individual tigers from the photos using their unique stripe and facing markings and compared it with previous year's pictures. We then mapped the resident tigers camera trapped locations and overlaid on 2014-15 tigers territory for LTTM area. Additionally, we mapped the non-territorial tigers to understand their basic distribution. We also identified different species of animals photographed in the trap sites. Furthermore, we counted the number of prey species, domestic animals and human in each camera locations to get basic understanding of these factors on tiger distribution.



## RESULTS

**TIGERS:** We obtained 29 different tigers photos from the camera trap areas. Of these 9 were resident females (Figure 2), 4 were resident males (Figure 3) and remaining 16 were transients, sub-adults and large cubs (Figure 4). We also verified four cases of human killings incidents by tigers; two in the study area and two outside in the national forest (Figure 4). The tiger distribution based on areas is listed below:

### **LTTM AREA - Tiger Population Structure: (Total 20 tigers)**

#### **Resident Female      6**

- 1: Baghmara Pothi
- 2: Bhaluwai Pothi
- 3: Deurali Pothi
- 4: Meghauly Pothi
- 5: Nandapur Pothi
- 6: Sheri Pothi (outside LTTM area)

#### **Resident Male          3**

- 1: Dhruba Bhale
- 2: Gaida Khawa Bhale
- 3: Panch Pandav Bhale

#### **Transient Male            2**

#### **Sub-adult Male            3**

#### **Sub-adult Female         5**

#### **Sub-adult unknown sex   1**

## **BANDARJHULA ISLAND - Tiger Population Structure: (Total 9 tigers)**

**Resident Female**      3

1: Kujauli Pothi

2: Lamichour Pothi (4 large cub – below)

3: Nangara Pothi

**Resident Male**      1

1: Lamichour Bhale

**Sub-adult Male**      1

**Large Cub**            4 (3 male and 1 female)

## **DAUNNE HILLS**

No tiger photographed but old tiger tracks observed and one incident of human-killing by tiger has been recorded in this Hills.

## **ASSOCIATED SPECIES AND DOMESTIC ANIMALS**

The total numbers of wild animals counted in the photographs obtained from the camera locations are summarized on block basis are shown in Table 2.

**Table 2 Number of prey species photographed per block inside the Chitwan National Park and its buffer zone community forests during 2016-17 season.**

<b>Block</b>	<b>Rhino</b>	<b>Wild Elephant</b>	<b>Samber Deer</b>	<b>Spotted Deer</b>	<b>Hog Deer</b>	<b>Barking Deer</b>	<b>Wild Boar</b>	<b>Gaur</b>	<b>Common Langur</b>	<b>Rhesus Macaque</b>	<b>Rabbit</b>
Daunne Block I	1		4			2	4				
LTTM Block II	56	6	4	87	6	3	17	15	1	11	
Parasi Block III	58		1	80	7	23	11			11	4
Island Block IV	27			36	11	19	3			4	
Island Block V	24		5	28	27	8	9			1	
Island Block VI	20		5	27	13	14	2			3	
Meghauily Block VII	22			116	52		44			3	
LTTM Block X	9		10	20	1	3	5			1	
LTTM Block XX	20	10		37		4	10	2	1		

Likewise, Table 3 shows the number of other associated species photographed in each block.

**Table 3 Number of other associated animals photographed in the Chitwan National Park and its buffer zone community forests during 2016-17 season.**

Block	Leopard	Leopard Cat	Sloth Bear	Hyena	Wild Dog	Large Indian Civet	Golden Jackal	Jungle Cat	Crab-eating Mongoose	Common Mongoose	Porcupine	Palm Civet
Daunne Block I	8	4	1	1	8	8	1	26	1		7	
LTTM Block II	3	3	7			16	3	5			7	1
Parasi Block III			1			4		7		3		
Island Block IV			1			6		2		4		
Island Block V			5			1	13	4				
Island Block VI			7			1				1		
Meghauly Block VII						1	5	1				
LTTM Block X	1		23					1		1	5	
LTTM Block XX	8	1	24			2				1	5	1

Finally, the number of domestic animals and humans photographed are shown in table 4.

**Table 4 Number of people and domestic animals photographed in the Chitwan National Park and its buffer zone community forests during 2016-17 season.**

Block	Cow	Buffalo	Goat	Dog	Human
Daunne Block I	60		818	11	652
LTTM Block II					2
Parasi Block III		1		1	100
Island Block IV					
Island Block V					36
Island Block VI					30
Meghauly Block VII				12	70
LTTM Block X					63
LTTM Block XX					

The total animal's number should not be considered as absolute number as same individual may have been counted multiple times as several photographs have been taken of the same individual at the same time by two different cameras and locations.

## **DISCUSSION**

### **Tigers in LTTM area**

During the current season 20 different tigers were photographed in the LTTM study blocks. Of these 9 were residents and remaining 11 were transient or sub-adult tigers. Of the six resident female tigers photographed five were in the LTTM area and the sixth female, Sheri Pothi reside outside the western boundary (Figure 2). She was also photographed last season. Number of resident males remained three, same as in 2014-15 season.

### **Resident Females and Males**

This season only five resident females were recorded in LTTM area, which was same as in 2014-15. Four of the resident females Baghmara Pothi, Bhaluwai Pothi, Deurali Pothi and Nandapur Pothi are from previous season and are occupying the same territories as in 2014-15 (Figure 2; Appendix). The fifth resident female, Chamka Pothi (CP2), last photographed in 2014-15 was not photographed this season. She was at least 16 -17 years old and it is not surprising that she had disappeared. However, the new female Meghauily Pothi, daughter of Baghmara Pothi is establishing her territory in her natal area along the Rapti River and Sukhibhar area (Figure 2). As Meghauily Pothi is taking part of her northern territory, Baghmara Pothi is moving away toward southern portion of her territory along Surung and Dhakre Khola.

It is interesting that none of the five resident females have cubs reported this season. In 2014-15 all four females mentioned above had cubs. Only Baghmara Pothi's offspring one male and one female were photographed. Status of other cubs

was difficult to determine as we did not camera trap last season in LTTM area.

Three resident males have been photographed this season in the LTTM area. Dhruba Bhale and Gaida Khawa Bhale both are using the same territory as in 2014-15 season (Figure 3). The third resident male, Kamal Bhale, photographed in 2014-15, in the eastern portion of the LTTM area was not photographed this season. It probably moved out and was replaced by Panch Pandav Bhale (Figure 3).

In addition to these resident males and females, we mapped the distribution of transient and sub-adult tigers (Figure 4). Of the 11 tigers in this category, sex ratio was 50%. Presence of these sub-adult females, provide possibilities of filling the vacant territory created by Chamka Pothi and making the population more stable.

### **Tigers in BandarJhula Island**

We now have a better understanding of resident tigers in the BandarJhula Island and its surrounding buffer zone community forests. This season three resident females (Lamichour Pothi, Nangara Pothi and Kujouli Pothi) and one resident male (Lamichour Bhale) were photographed. All four resident tigers have been photographed last season 2015-16.

Of the three female residents, only Lamichour Pothi has cubs. Four cubs born in December 2015 are all present this season. Of these three are males and one is female. The second resident female, Nangara Pothi has been resident in the BandarJhula Island probably more than 9 seasons. She may be the only known human killing tiger in CNP (Lamichhane et al. 2017). One of the four human reported killed this season has been killed by Nangara Pothi in the buffer zone of BandarJhula Island.

The 3<sup>rd</sup> resident female, named Kujauli Pothi has newly established her territory. She was photographed last season in the same area and we determine her as a new resident of BandarJhula Island (Figure 2).

Lamichour Bhale, a resident male in the Island has been photographed since last four seasons. The camera trapped locations shows his presence throughout the BandarJhula Island (Figure 3).

Camera trapping in BandarJhula has been on ad-hoc basis in the past; however, this last two seasons, we camera trapped the entire Island. It can be concluded that BandarJhula Island including buffer zone community forest can support 3-4 resident females and 1-2 resident males that stabilize the population.

### **Daunne Hills**

We have been assessing the Daunne Hills forest block for tiger habitat use these past two seasons. Both seasons, we were unable to photograph any tigers in the area. However, tiger's old tracks and one human killed incident were observed this season, indicating habitat use by tigers on ad hoc basis. Limiting factors for residency could be less number of prey species (Table 2) and more use of humans and domestic livestock (Table 3). In contrast, Daunne Block photographed more associated species than other blocks including leopard, hyena, wild dog, leopard cat etc. (Table 3).

## ACKNOWLEDGMENTS

We acknowledge the long term financial support from International Trust for Nature Conservation (ITNC) and The Fund for The Tiger for this project. Additional financial support was provided by the World Charity Foundation. We would like to thank the Department of National Parks and Wildlife Conservation for their continuous support on this project. We are also grateful to the Chief Conservation Officer of the Chitwan National Park for collaboration, coordination and providing support of Rangers, Game Scouts during the camera trapping work. We would also like to thank all the corresponding Buffer Zone User Committees for cooperation and participation of their forest guards in camera trapping in their respective community forests.

## LITERATURE CITED

- DNPWC. 2016. Tiger Conservation Action Plan for Nepal (2016-2020). Department of National Parks and Wildlife Conservation, Babar Mahal, Kathmandu, Nepal.
- Lamichhane, B. R., G. A. Persoon, H. Leirs, C. J. M. Musters, N. Subedi, K. P. Gairhe, C. P. Pokhrel, S. Poudel, R. Mishra, M. Dhakal, J. L. D. Smith and H. H. de longh. 2017. Are conflict-causing tigers different? Another perspective for understanding human-tiger conflict in Chitwan National Park, Nepal. *Global Ecology and Conservation* (11): 177-187.
- McDougal, C. 1977. *The Face of the Tiger*. Rivington Books and Andre Deutsch, London, UK.
- McDougal, C., B. Gurung, D. B. Tamang, B. Mahato, R. Kumal, and P. M. Shrestha. 2016. Stability of Tigers in Chitwan National Park, Nepal. *CATNEWS* (64): 33-36.



## FIGURES

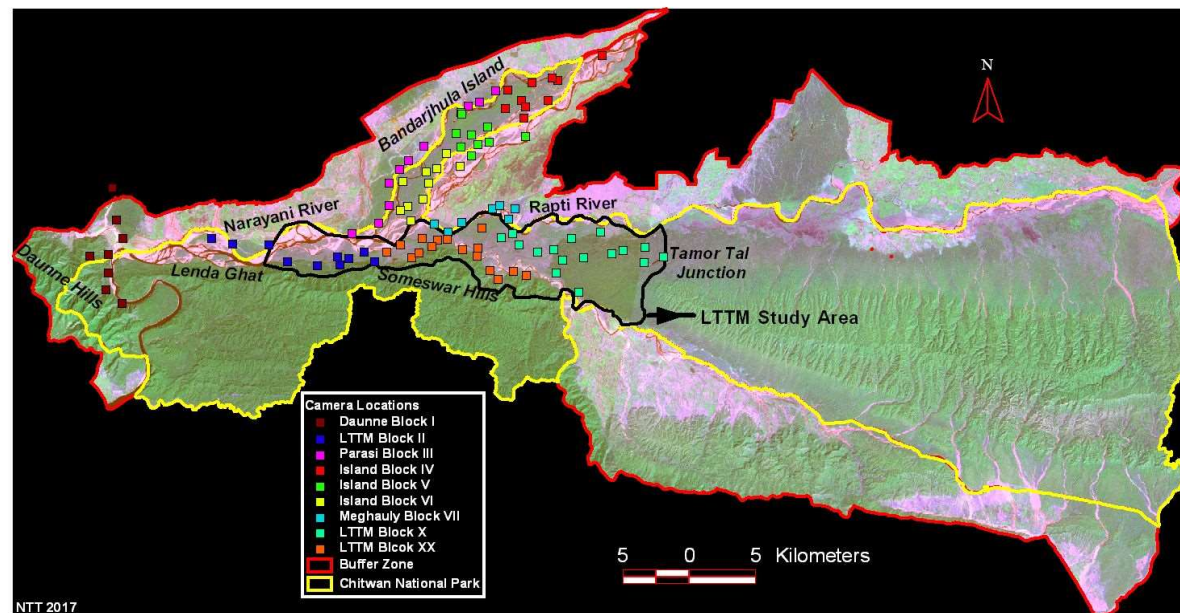


Figure 1: Block wise camera trap locations for tiger monitoring during 2016-17 season.

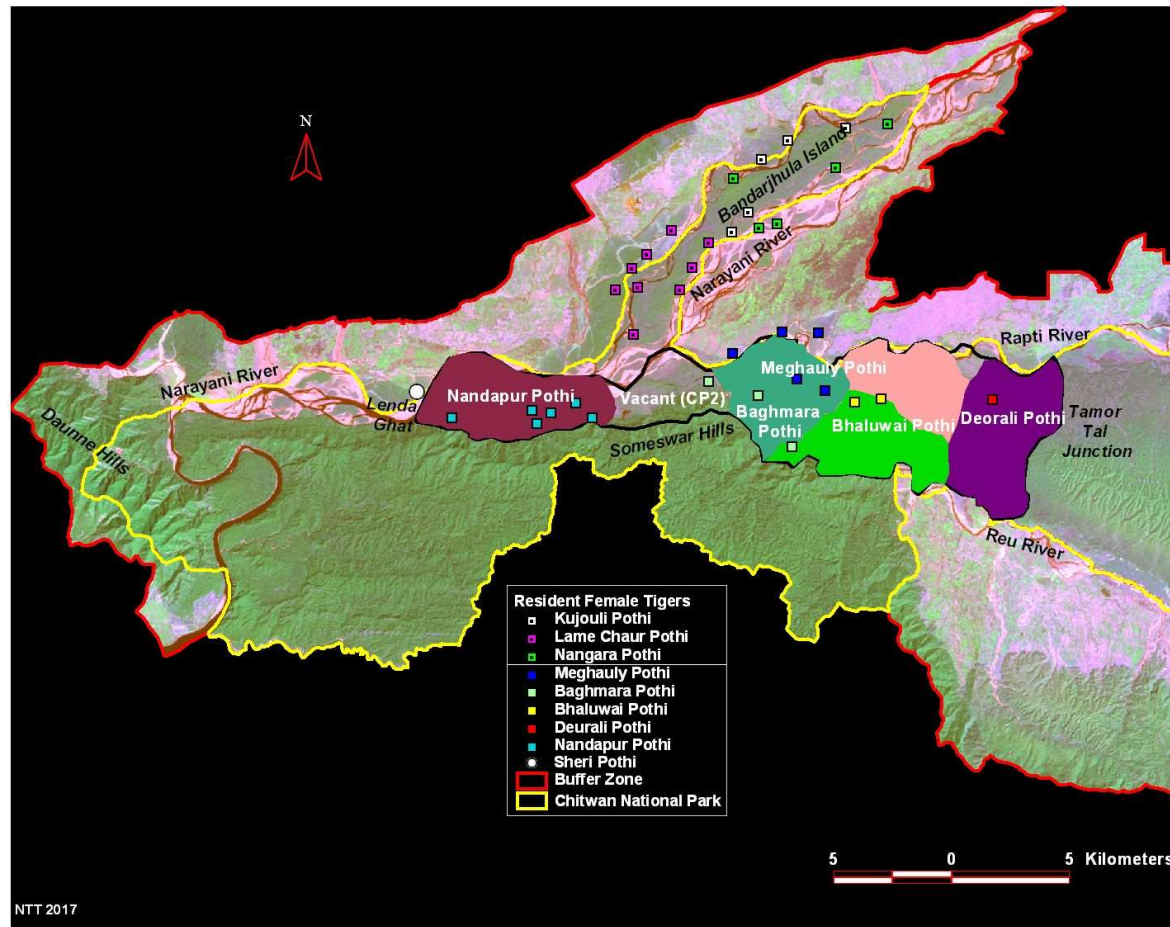


Figure 2: Name and camera trap locations of resident female tigers during 2016-17 in relation to resident females territory in LTTM area during 2014-15.

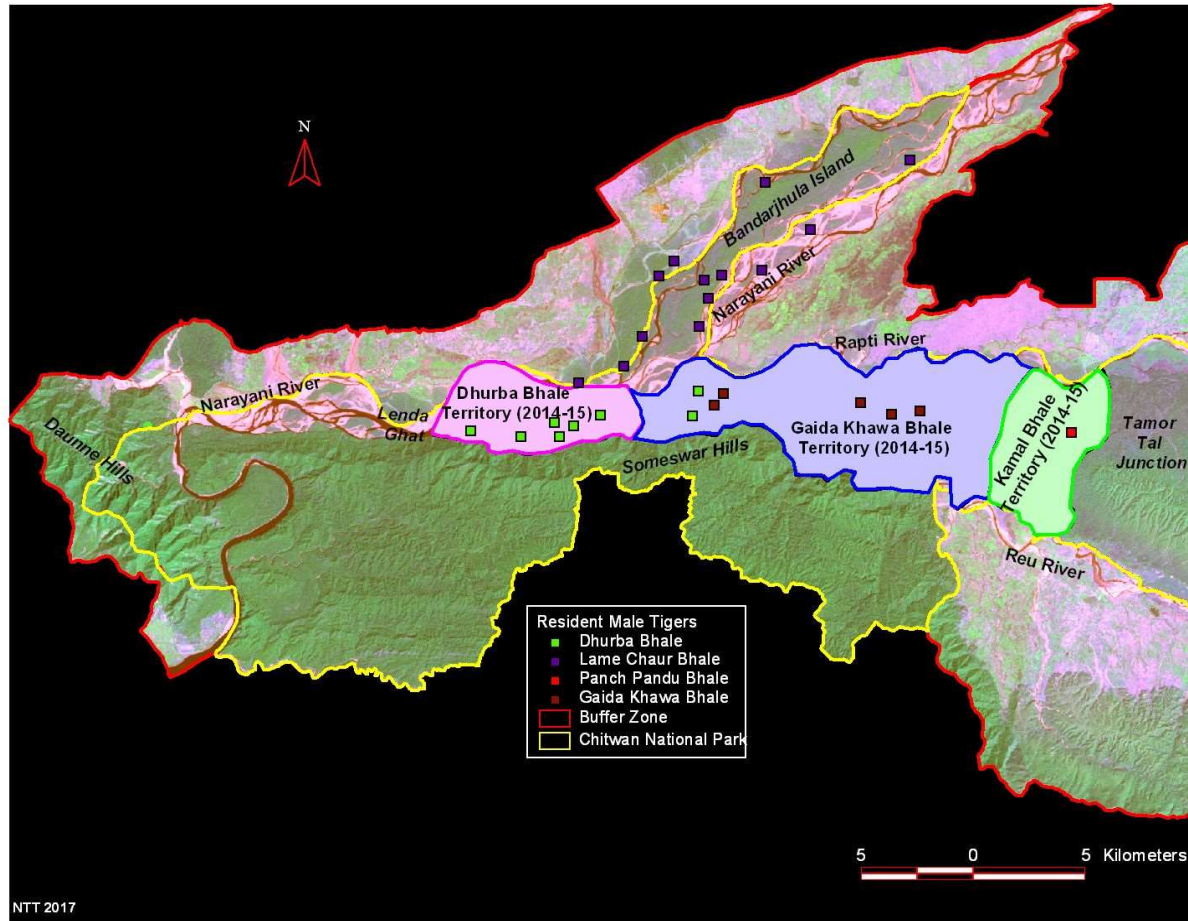


Figure 3: Name and camera trap locations of male resident tigers during 2016-17 in relation to resident male's territory in LTTM area during 2014-15 season.

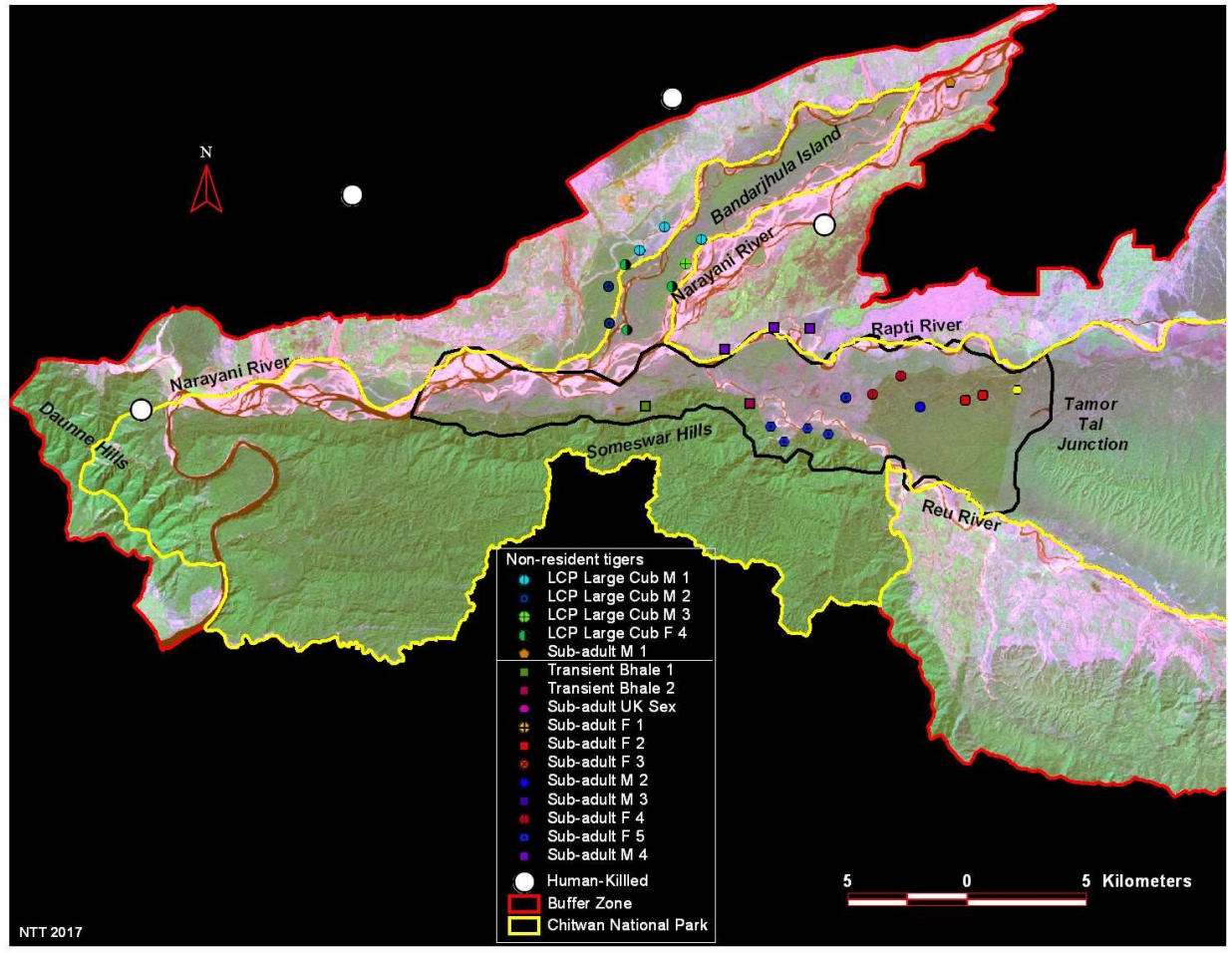


Figure 4: Locations of transient, sub-adults, juvenile tigers and human killed locations during 2016-17 season.

**APPENDIX - Photos**

**LTTM AREA: RESIDENT FEMALE TIGERS DURING 2016-17**

**Appendix 1 (a):** Baghmara Pothi photographed during 2016-17 season



**Appendix 1 (b):** Bhaluwai Pothi photographed during 2016-17 season



**Appendix 1 (c):** Deurali Pothi photographed during 2016-17 season



**Appendix 1 (d):** Meghauly Pothi photographed during 2016-17 season



**Appendix 1 (e):** Nandapur Pothi photographed during 2016-17 season



**Appendix 1 (f):** Seri Pothi photographed during 2016-17 season (Outside of LTTM area)



LTTM AREA: RESIDENT MALE TIGERS DURING 2016-17

**Appendix 1 (g):** Dhurba Bhale photographed during 2016-17 season



**Appendix 1 (h):** Gaida Khawa Bhale photographed during 2016-17 season



**Appendix 1 (i):** Panch Pandav Bhale photographed during 2016-17 season



BANDARJHULA ISLAND: RESIDENT FEMALE TIGERS DURING 2016-17

**Appendix 1 (j):** Kujauli Pothi photographed during 2016-17 season



**Appendix 1 (k):** Lamichour Pothi photographed during 2016-17 season



**Appendix 1 (l):** Nangara Pothi photographed during 2016-17 season





BANDARJHULA ISLAND: RESIDENT MALE TIGERS DURING 2016-17

**Appendix 1 (m):** Lamechour Bhale photographed during 2016-17 season



PREY AND OTHER ASSOCIATED SPECIES PHOTOS DURING 2016-17

Appendix 1 (n): Some of the prey and other associated species photographed during 2016-17



