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Population study of tiger (*Panthera tigris tigris*) by trap camera photo capture in Katarniaghat Wildlife Sanctuary, Uttar Pradesh, India

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ABSTRACT

An intensive habitat survey and deployment of camera trap for photo capture of large cats was conducted for a period of 8 months (February 2007 to October 2007) in Katarniaghat Wildlife Sanctuary, Uttar Pradesh, India. This paper deals with the results obtained from the camera trap photo captures of tiger (*Panthera tigris tigris*). All the six forest ranges of Katarniaghat Wildlife Sanctuary viz. Katarniaghat, Nishangadha, Murtiha, Dharmapur, Kakraha and Motipur were surveyed for carnivore signs, ungulate encounter rate, vegetation types and photo captures of tigers by installation of camera traps. Maximum importance was given to the core areas of the sanctuary i.e. Katarniaghat and Nisangada range. A set of 20 pairs of Camera trap (Make Deercam) units were deployed in 2/ 2 km grid area location for 16 days. And the process continues in buffer area further 1 month. A total of 5 individual tigers confirmed to be resident and signs of movement of additional 3- 4 tigers found in transition zones in Nepal and Kishannagar forest division. Additional data on prey base, co-predators, and other floral composition were recorded during the study. The study also revealed the presence of rare rusty spotted cat, leopard cat and honey badger in the said wildlife sanctuary.

Key words: Camera trap, Katarniaghat Wildlife Sanctuary, photo capture, rusty spotted cat, tiger

INTRODUCTION

The flagship species like tigers, elephants, rhinoceros etc. in the sub-continent draw significant importance. Their exact population, habitat, prey base and vegetation studies are highly required to maintain the ecological balance. Fortunately, a range of new distribution and habitat data are now available for India and elsewhere (Dinerstein et al., 2006). These could be used to focus resources on areas where tigers still struggle to survive. Katarniaghat as far as Uttar Pradesh is concerned, most of the wildlife diversity is confined to the northern region in Terai arc bordering to Uttaranchal and Nepal. Apart from tiger as key species in Kataraniaghat wildlife sanctuary, many other species like leopard, spotted deer, barking deer, nilgai and sambar live in and play an equally important part in this tiger ecology (Menon, 2003). Elephant and rhinoceros which once migrated from Nepal, have now made Katerniaghat their permanent habitat. Wild boar can be easily seen here even at day time. In addition, porcupine, red jungle fowl and peacock play an important part of tiger prey base in this sanctuary. The sanctuary also has high density of ample spotted deer population which are encountered in hundreds in mass foraging in meadows of Kataraniaghat ranges. Once there are blackbuck herds seen in the sanctuary and locally extinct since 2003. It is among the few places that have retained

their natural character. The people who live within the forest are largely native tribal. They should be provided important ways to secure the financial strength of the people those have conservation will that is essential for conserving the forest and saving wild tigers and other large carnivores within these habitats (Dre `ze and Murthi, 2001). There is the need of enumeration of tigers in different forests of India as a part of ecological and habitat studies.

STUDY AREA

Katarniaghat Wildlife Sanctuary lies along the Indo-Nepal border (Fig. 1), in the district of Behraich in Utter Pradesh, India, with a 550 sq. km. of dense Terai jungle comprising of sal and teak forest, lush green grasslands, wetlands and swamps having quite a good number of wildlives (Bajpai et al., 2012). The Katarniaghat WS of West Behraich Forest Division, was declared a Wildlife Sanctuary in May 1975 and today forms a part of the Dudhwa Tiger Reserve along with Dudhwa National Park and Kishanpur Wildlife Sanctuary. There are habitat connectivity and linkages between tiger habitats of Dudhwa National Park and Kishanpur forest division of India and the Bardia National Park in Nepal.

Fig. 1. Katarniaghat sanctuary (Motipur range in view) along the Indo-Nepal border

The Katarniaghat wildlife sanctuary has got six forest ranges namely, Katarniaghat, Dharmapur, Nishangadha, Murtiha, Kakraha and Motipur. Dense forest covers the core areas of four ranges such as Katarnia, Nishangadha, Murtiha and Dharmpur, while rest two Kakraha and Motipur are situated in the buffer zone of the Sanctuary (Fig. 2).

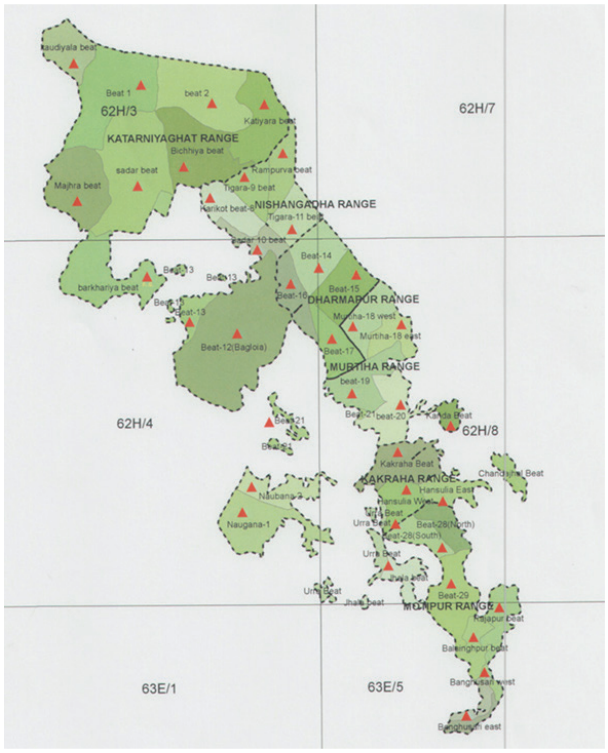

Fig. 2. Katarniaghat wildlife sanctuary showing beat and ranges with topo sheet no (Camera trap area 200 sq km)

The Terai Arc covers an area of 50,911 sq km (Nepal: 24,710 sq km, India: 26,201 sq km) and stretches across 700 km in India and Nepal (Fig. 1). The landscape contains almost 5 important protected areas in the region. These are Rajaji National Park, Corbette National Park and Tiger reserve, Dudhwa National Park and Tiger reserve, Katarniaghat wildlife sanctuary and Valmiki Tiger Reserve (VTR) in the Indian Terai region.

MATERIALS AND METHODS

The camera trap was deployed in central position of nearly 2/ 2 km area (4 sq km) in the sanctuary. The shape of the effective camera trap area is almost rectangular or square size imaginary area of about 200 sq km with varied geographic features like stream, meadow, rivers, and dense forest to village fringe areas. The camera trap work was completed in 2 phases of 100 square km area each. The 10/ 10 km area traversed and divided in grids for operation of minimum 20 units (2 cameras

in an unit) for a session of minimum 15 days (including trap nights). Then another 100 sq km is worked as the first sample area.

The Deer cam make heat sensor flash film camera was deployed for the study. No cameras were camouflaged with tree branches and grass straws. All cameras were put in natural and ideal places where the animal could not avoid the trail before captured in cameras. All photos film rolls were coded with markers as local names of the spot and have a serial number in order to avoid intermixing of photo films during washing and developing in local photo labs. There is setting in the camera itself in the form of the date and time. All the cameras were set in one time adjust up to 1 second error from common clock at base camp. There will be fractional error of time 2-3 seconds in two opposite faced cameras. But the timing of capturing photo in one unit of camera trap pair is taken as ideal and no same animal could cover the distance of few meters apart and so the same animal is trapped in different traps in different time of same or different day. It confirms the movement patterns of the animal within the study area. The camera delay was very minimum with lapse of 1 second, i.e. a photo capture can have done after a second gap by the same individual camera (Das et al., 2016). The camera efficiency was so good that it also captures 2-3 photos within 1 second with little change in postures of head region of tiger which observe the camera towards flash light. The photo receiving distance with auto focusing the images is too good and captures phots passing objects like monkey and peacock from a distance of 40 meters in a riverine where animals come for drinking. The camera also takes photo capture with heat sensors from a distance of 10 meters from each camera across wide roads. The flash light can reach and covers almost 5-10 meters at deep dark night. Cameras were set between 40 and 60 cm (more than 1-2 feet) above the ground, and perpendicular to the ground. The cameras were put in convenient locations that suited for our own operation and also placed where the spot satisfies after rigorous sign survey exercises. The actual way of working is illustrated below showing unloaded camera set, pole position of 20-50 cm high above ground and cleaning of grasses in front of camera in Terai landscape where grassland is a major sampling area. The inspecting vehicle should have stopped before camera tram location in order to avoid the unnecessary photo capture hence consuming camera role films (Fig. 3).

Fig. 3. captured from another active camera before re-collection and putting off during day time,

RESULTS AND DISCUSSION

The operation of camera trap photo records was taken up at 20 different units. All photographs were checked manually and encounters with tiger photo captures in printed mat paper copies were verified in field without computers. Tiger movements from camera trap data over intensive efforts of nearly 800 trap days(nights) covering 180 sq km of tiger habitat in core area showed 5 individual tigers were photographed by camera traps within the sanctuary and there were little movement area crossing the transboundary complexes in Nepal and India. The camera trap survey indicated that at least 11- 13 individual tigers are using the transboundary corridors that connect with Nepal and India's protected areas. While detection of individual tigers in both protected areas and connecting corridors does not confirm dispersal, the supporting evidence based on spatial areas occupied and distances covered suggest these individuals were not resident tigers with territories that overlapped across protected area and corridor boundaries, but were transient, non-resident tigers. The average territory size of female tigers in the

Terai alluvial grassland-savannahs, calculated using MCP analysis, was calculated to be approximately 20 sq km. There were also no recaptures in the same cameras or the units or other functioning adjacent camera units suggesting that these individuals did not move an established territory during short period of trapping time of 2-3 weeks long.

The distances between camera traps in which tiger were photographed in the study also confirmed that it is not necessary that tiger move in a particular trail frequently and in regular interval. The movements seemed to be only for prey base and for defending territory of its own and mating purposes. The distances travelled by individual tigers that trapped in different consecutive camera trap locations also confirms that there is overlapping territories within male and female tigers (Fig. 5, 6, 7 and 8).

Fig. 4. Capture of tiger on 10 Aug. 2007 night 23.50hrs

Fig. 5. Capture of tiger on 12 Aug. 2007 dawn 6.52hrs

Fig. 6. Capture of tiger on 16 Aug. 2007 night 09.53 hrs

Fig. 7. Capture of tiger on 19 Aug. 2007 dawn 5.19hrs

The ultimate camera trap resulted in so many gathered data on every ungulate prey base including chinkara and other ungulate species. The night camera trap revealed the presence of civet cat, jackals, jungle cat and bear, those become active and captured in photo. The camera trap also recorded photo capture of herbivores like chital, chinkara, sambar, blackbuck, nilgai, and languar etc. in the sanctuary. It confirmed the prey base diversity in the central zone of India. A tigerkill of sambar surrounded by vultures seen near boat ghat of the sanctuary confirms to support the camera trap (Fig. 8). The carnivorous species reported in trap camera include jackal, bear, leopard, wolf, stripped hyaena, jungle cat, etc (Das et al., 2019).

Fig. 8. A tiger kill (sambar surrounded by Himalayan griffon vultures) lied in the trail of Katarniaghat wildlife sanctuary near boat Ghat.

TIGER CONSERVATION STRATEGIES

Conserving large carnivores is important because they are often highly threatened and play key roles in a range of ecosystem processes. The reliable estimates of tiger numbers remain unavailable across most of their ranges in the country. Contrary to official records that indicated stable tiger populations, several protected areas were found to have vastly depleted tiger populations. This provided a sobering reminder not only of the fragility of tiger populations but also of the need for a critical reassessment of the Indian tiger conservation strategy. This particular data carries importance as some of the present Tiger Reserves in India were demarcated over 30 years ago and do not necessarily contain, or have the potential to contain, viable tiger populations today. The science of making replicable estimates of density using camera traps within a capture recapture framework has been well developed for tigers by the Wildlife Conservation Society in India. Tigers are faced with a myriad of threats. Habitat is being converted for both agricultural and commercial needs and rural people hunt tiger prey including deer, pigs, and wild cattle for subsistence or for profit, making food scarce. Without sufficient prey, tigers are unable to survive or breed. Tigers themselves are also targets for poachers seeking to supply the increasing demand for the illegal wildlife trade. Other threats include retaliation killing due to human-wildlife conflict that results from depredation of livestock, and killing out of fear about their proximity to human settlements. There is particular concern that the clearance of forest for railway track and roadways is having a dramatic impact on tigers and elephant migration in the sanctuary. However, other mitigation strategies may provide important conservation opportunities, as there are conservation issues about crop damages done by nilgai in the southern part of the sanctuary bordering to state government agricultural farms. Tiger also migrated and hide in the farm in sugarcane fields also create another negative ethos to the local farmers and driving away the animals for sugar cane harvesting also creates problems for tiger conservation efforts. There should be discouraging of other money fetching schemes like growth of Jatropha as bio fuel plantation in private farms close to sanctuary area.

Data availability statement

Analysis was based on the camera trap data from the deployed cameras and habitat occupancy data from field surveys carried out in the region. The said data have been uploaded in the National tiger individual data base at WII, Dehradun with access to park managers in the country.

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