BI-MONTHLY OUTREACH JOURNAL OF NATIONAL TIGER CONSERVATION AUTHORITY
GOVERNMENT OF INDIA

stripes

Volume 5 | Issue 2 | Jan-Feb | 2014

LANDMARKS | STRATEGIES | EVALUATION | ACHIEVEMENTS | PERSPECTIVES | INITIATIVES

Volume 5
Issue 2
Jan-Feb
2014

Profile
Panna Tiger Reserve
Pg 4

Resource mobilization
Tadoba Andhari Reserve
Pg 8

Appraisal
Valmiki Tiger Reserve
P 10

Best Practices
A unique way of learning
P 9

EDITOR
Dr Rajesh Gopal

EDITORIAL COORDINATOR
S P YADAV

CONTENT COORDINATOR
Inder MS Kathuria

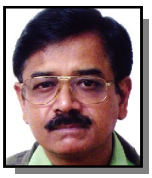
FEEDBACK
Annexe No 5
Bikaner House
Shahjahan Road
New Delhi
stripes.ntca@gmail.com

Cover photo
S P Yadav

BI-MONTHLY OUTREACH JOURNAL OF NATIONAL TIGER CONSERVATION AUTHORITY
GOVERNMENT OF INDIA

stripes

note from the editor



PANNA is an important tiger source area in the North Central Indian region of Madhya Pradesh. After facing local extinction of tiger due to targeted/non-targeted killings, the reserve has successfully fostered the reintroduced tigers. The protection has been stepped up with 24X7 monitoring. Several important initiatives, including voluntary relocation of villages within the core have been rewarding. The peripheral areas of buffer urgently require active management to address resource dependency, while actively monitoring dispersing tigers to ensure their protection. This calls for close coordination with linking forest divisions within the State and in the adjoining State of Uttar Pradesh. A profile of this reserve highlights its attributes.

Valmiki is the only tiger reserve in Bihar which also makes border with the neighbouring tiger range country of Nepal. There are inherent corridor linkages with protected areas of Nepal and Uttar Pradesh. These require ongoing monitoring and protection. Forest resource dependency in the southern portion of the reserve also requires an ongoing co-occurrence agenda to elicit local public support. An independent appraisal of this reserve by the NTCA has been presented.

Tiger conservation requires the active support of local people as they co-occur with the tiger. This calls for an 'inclusiveness' in management. Under Project Tiger, the States are supported to innovatively evolve a co-occurrence model to benefit tiger and people. Highlights of such initiatives in the Tadoba Tiger Reserve of Maharashtra are encouraging.

There are several best practices ongoing in tiger reserves. The e-learning institutionalized for tribal children in the residential school at the Anamalai Tiger Reserve is praiseworthy, which needs to be emulated by other reserves.

Dr Rajesh Gopal
Member-Secretary, NTCA

Advanced technologies in tiger conservation

Breaking Ground With Deployment Of Drone And Sensor Networks In Surveillance & Monitoring Of Tiger And Other Species in India

Application of modern tools and techniques have long been an integral part of wildlife research and management, the most popular being wireless communication used by forest officials on a regular basis, besides telemetry technology which has been a crucial part of several research and conservation projects.

Given that wildlife populations move beyond protected boundaries, especially large animals such as tiger, elephant and rhino, and that many of these animals are targeted by poachers, advanced sophisticated technological solutions are required to put in checks and deterrents at the earliest.

In this context, Aerial Vehicles (both manned an unmanned) have been used in western countries for surveillance, population monitoring and crisis management. In India, manned aerial vehicles have been used occasionally for animal counts (eg wild ass population estimation) and forest mapping. More recently, the 'E-Eye Surveillance Project' was implemented in Corbett Tiger Reserve.

In order to offer effective solutions to various problems encountered by forest officials and researchers, Wildlife Institute of India and National Tiger Conservation Authority (NTCA), in collaboration with World Wide Fund-International (WWF), Conservation Drones, Indian Institute of Information Technology, Allahabad (IIITA), Ohio State University, USA (OSU) and the Madhya Pradesh forest department have taken up research and development projects to integrate advanced technologies — drones or Unmanned Aerial Vehicles (UAVs) and Sensor Communication Networks (SCN) — into surveillance and monitoring activities.

Drone photo awaited

These tools and techniques are currently part of an experiment in Panna Tiger Reserve, Madhya Pradesh, and are likely to be integrated into more pilot sites across India soon.

Unmanned Aerial Vehicles or Drones: This powerful technology is being put to use far and wide globally for military and civilian purposes. These are small- to medium-sized aircrafts, supported by programmable auto-pilot and telemetry systems, capable of onboard recording and transmission of information. UAVs are expected to be deployed in surveillance in strategic places and remote areas, night patrolling using thermal cameras, radio-tracking of animals and habitat monitoring.

In April 2013, the test flight of a small aircraft known as 'Maja' was carried out in Kaziranga

Tiger Reserve, but subsequent training and integration could not be done as the Ministry of Defence refused permission. However, MoD has sanctioned the experiment at Panna Tiger Reserve till June 2014, and is expected to extend it further.

Advanced models of UAVs known as 'Caipy' and 'Vanguard' with better aerodynamics and stability are being field tested in Panna. Technically, Caipy has a wingspan of 850mm, weighs 650g has a flight time of 30 minutes, cruise speed of 45-50kmph and can optimally fly for about 20km, powered by rechargeable battery.

In comparison, the Vanguard has a wingspan of 1400mm, weighs 2,000g, has a flight time of 60 minutes, cruise speed of 45-80kmph and can optimally fly for 40km, powered by rechargeable battery.

Both these UAVs carry GoPro video camera and other forms of data collection units can be integrated. The flight paths could be programmed by marking waypoints and can also be controlled manually through a telemetry modem. Currently, a video system is being used and in a few months, thermal and mapping cameras will also be used.

The utility of these drones can be enhanced further by manual launching in the field even in remote places, and using rechargeable batteries that can be charged even with car batteries. The tentative cost of each unit is Rs 6-8 lakh.

The team in charge of the project comprises Dr K Ramesh of Wildlife Institute of India; Dr Christy Williams of World Wide Fund-International; S P Yadav of National Tiger Conservation Authority and Dr Lian Pin and Simon Wunderlin from Conservation Drones.

Sensor Communication Networks (SCN): This project is aimed at using sensor and communication networks to set up virtual fences and identify and monitor select regions of the forest where the inhabitants or the environment is threatened.

Several sensing modalities are being explored such as Pulse-Doppler Radar (PDR), Passive Infra-Red (PIR), Acoustic and Buried Cable. With these sensors and communication networks, sensitive regions of the reserve or its entire area could be covered effectively. Sensors placed 1km apart are capable of receiving signals of any intrusion or animal activity and transmitting the information to a base station that could be either at beat level, range level or at the head quarters. Currently, experiments are being carried out with encouraging results for detecting human intrusion, animal movement out of the forest boundary, tiger monitoring, noise detection for digging and woodcutting and detecting road crossing of animals.

> UAVs are expected to be deployed in surveillance, night patrolling using thermal cameras, radio-tracking of animals and habitat monitoring. Sensors will help set up virtual fences and identify and monitor regions of the forest where the inhabitants or the environment is under threat

One working solution is expected to be arrived at in a few months' time for Panna and subsequently, the project will be taken up in other parts of the reserve and in other reserves across the country. This technology has multiple functions, ranging from day-to-day monitoring to quick-response to deal with offences. Simultaneously, efforts are on to integrate UAV with SCN to bring about effective use of these technologies in open as well as canopy habitats.

The team in charge of this project comprises Dr K Ramesh of Wildlife Institute of India; Dr M Radhakrishna of IIIT, Allahabad; Dr Anish Arora of Ohio State University and Dr. Anurag Kumar of Indian Institute of Science.

Mitigation measures proposed on NH37 for wildlife conservation

The Government of Assam has submitted a proposal for long-term mitigation measures to protect wildlife from the risks posed by National Highway 37, a stretch of which passes along the southern boundary of Kaziranga National Park — which has been blamed for several animal deaths.

BACKGROUND

The Ministry of Environment and Forests granted conditional environmental clearance to Numaligarh Refinery Limited for a refinery project in Golaghat district of Assam on May 31, 1991. One of the conditions related to denotification of the stretch of NH37 from Jakhalabandha to Bokakhat and the diversion of the highway from Kaziranga National Park (KNP) before the commissioning of the project. The project was commissioned in 2000, but adequate measures related to NH37 were not implemented because of which an application under section 14 and 15 of the National Green Tribunal Act 2010 was filed by Rohit Choudhury.

In response to the directives of the National Green Tribunal (NGT), the Government of Assam submitted a proposal — 'Suggested strategies to overcome the barrier effect of National Highway 37 on the Wildlife of Kaziranga National Park' — and the National Tiger Conservation Authority on December 18, 2013, constituted a committee to review it.

The terms of reference of the committee were:

- To review the proposal regarding safeguarding wildlife vis-a-vis NH37 passing through periphery of Kaziranga Tiger Reserve
- To review proposed crossing structures in terms of their design, suitability and appropriateness of locations to reduce

barrier effect of roads on wildlife movement and prevent mortality of animals on the road and injury to people

- To propose additional measures/options to avoid, reduce and address ecological impact of NH37 on the wildlife of the area pertaining to animal movement to and from Kaziranga to the forests of Karbi Anglong

REVIEW APPROACH

The review is based on first-hand understanding of wildlife-related concerns and issues associated with roads. The committee members undertook a field visit from January 10-16. During the visit, committee members interacted with the Assam Public Works Department (NH), officials of the forest department and representatives of the conservation community.

IMPORTANCE OF KARBI ANGLONG HILLS FOR KAZIRANGA LANDSCAPE

The landscape of Kaziranga National Park/Tiger Reserve (World Heritage Site, KNP/TR) is the creation of natural forces of silt deposition and erosion by the Brahmaputra over centuries. This is an ongoing process, which becomes acute during the floods that occur at regular intervals during the monsoon season.

In the past, the forests of Karbi Anglong and the grasslands of KNR formed one ecological unit, ideal for a wildlife habitat, with very few human habitations. But with the gradual opening up of the area on the southern side of the current NH37, mostly by settlers from outside and tea planters, the forest cover has diminished and become fragmented, resulting in the loss of continuity of the natural wild habitats between the Park and the Karbi Anglong hills.

The Kaziranga flood plains are highly dynamic. The survival of wildlife here depends on the movement of animals to Karbi Anglong and surrounding hills. The ecological integrity and long-term survival of wildlife in this area will depend on maintaining these as a single landscape complex. The Karbi Anglong hills adjoin the park on the south and constitute an ecological extension of the park.

During flooding, these hills provide the refuge to the wildlife from the flood plain. The NH37, with increasing traffic, is a barrier to this crucial animal movement. The changing habitat attributes influence the animals' movement between grasslands and woodlands to avoid flood waters. The 54-km stretch of the highway running parallel to the southern boundary of KNP, between Bokakhat to Ghorakati range, divides the landscape in the north and the south.

On one side of NH37 are the low-lying grasslands of KNP which provide forage to the animals almost all year, and on the other are the Karbi Anglong Hills which provide essential refuge to the animals during flooding.

The pattern of wildlife accidents on the highway along KNP and Kaziranga tiger reserve can be distinguished in two seasonal frames — during rains from June to August (which sometimes extends to September-October) and the rest of the year when natural movement takes animals to neighbouring linking habitats in search of forage and for other life processes.

IDENTIFYING VULNERABLE ROAD SEGMENTS AND POTENTIAL CORRIDORS

Bonal and Chowdhury (2003) and Rajvanshi *et. al.* (2012) surveyed the 54-km stretch of NH37 and identified vulnerable road segments, using road kill sites, animal use, greenway linkages and human disturbance as criteria. From analysis of road kill data, they identified four potential corridors, which, with their estimated width, need ensured protection against habitat loss and encroachment. These corridors are:

- Kanchanjuri–Burapahar (4 km)
- East Haldibari–Bagori (5 km)
- Borjuri–Panbari Beat (5 km)
- Burapahar–Deosur Nala (4 km)

Most of the subsequent reports by WWF, WTI and the state forest department also cited these corridors as potential sites to mitigate the barrier effect of NH37 on the movement of the animals.

Of the total length of 54 km surveyed, the present committee has identified two additional flyovers and one canopy-linkage bridge for gibbon crossing and has also suggested realignment of the road near Deosur hill from its present northern side to southern side.

These are in addition to the four corridors already identified. However, the committee has redefined the length of the four identified corridors. The gibbon crossing corridor near Kukrakata will be an estimated 2km long; the Amguri West corridor 1km; Amguri East 0.3km; realignment near Deosur Hill 2.5km; Burapahar-Deosur Nala 2.5km; Kanchanjuri-Burapahar 4km; East Haldibari-Bagori corridor 2.8km and Borjuri-Panbari 4.4 km.

MITIGATION MEASURES SUGGESTED BY COMMITTEE

- **Gibbon crossing near Kukrakata:** This is an ideal habitat for gibbons and is frequently used by them. The place is ideal for crossing as both flanks of the highway are elevated.

- **Amguri East corridor:** This small proposed flyover is very critical for safe passage to animals especially hog deer, swamp deer and elephants during flooding. The site has been reported to be used extensively by these species during rains.

■ **Realignment near Deosur Hill:** The committee suggested realignment of the road after Deosur Nala towards Guwahati via the south of Gajaraj View Point Hill (Deosur Hill). This will provide highland during peak flooding season in the park. As of now, to reach this highland, animals have to cross NH37.

This issue was discussed with the executive engineer and nodal officer of the Environmental Cell, APWD, Govt of Assam. A technical feasibility survey has to be conducted by highway authorities for the realignment.

■ These four critical wildlife corridors are essential for maintaining the integrity of the Kaziranga –Karbi Anglong Landscape. Most of the reports from the area suggest that these corridors have long-term conservation value. The committee recommends all these corridors on priority-basis with viaduct of 10m height.

MODELLING WILDLIFE TRAVERSABILITY

Wildlife Institute of India, in one of its studies, estimated a traffic volume of 5371 vehicles per day on NH37 in 2011. During the field visit by the committee, the exercise was repeated to estimate the magnitude of traffic. As of January 2014, at a conservative estimate, as many as 6326 vehicles used the road every day. On an average, 264 vehicles pass by every hour — at a minimum of 158 vehicle an hour and a maximum of 391. This represents an increase of 20% in the traffic volume on NH37 between 2011 and 2014.

Traversability Model:
Considering an animal, a rhino for instance, requires 10 seconds to cross the road on which average traffic volume is 200 vehicles an hour with an average speed of 45 kmph, the committee used the Poisson Probability model to estimate the probability of the animal being hit by a vehicle in a given road condition with specific traffic volume and speed. The model can be used to suggest traffic management options on the highway till mitigation work is completed.

In traffic engineering, the calculation of headway distributions, i.e. the frequency of the length of gaps between successive vehicles in a traffic flow at a given cross-section is commonly based on the assumption of a Poisson distributed process (Haight, 1963; Daganzo, 1997).

The Poisson distribution is a discrete distribution that describes the number of events during a given time period. Here, the event is a vehicle arriving at a given location. The number of events in sequential time periods of an equal length are independent stochastic drawings. For a given traffic volume, the probability of a certain number of arrivals within a fixed time period depends only on the length of this period, and is thus, constant for periods of equal length. When the number of arriving vehicles in a sequence of fixed time periods is Poisson distributed, their headways are (negatively) exponentially distributed and independent of each other. To be Poisson distributed, the vehicles must approach a certain location in a so-called undisturbed flow.

During the field visit we estimated traffic volume, average speed in heterogeneous traffic conditions on different stretches of the road to validate the Traversability Model. We considered a road with paved and unpaved shoulders, with and without rumble strips, to estimate the possibility of an animal being hit by the vehicle at specific traffic volume and speed.

Model Conditions:
■ On an average, an animal takes 10 seconds to cross the road
■ The average speed of the vehicle was arrived at by estimating the average speed of 500 vehicles of different kinds on NH37
■ Average vehicle length of 4m was assumed for this model to

keep it simpler. Otherwise in heterogeneous traffic, vehicles of different lengths use the road.

CONDITION 1

Animal on 7 m road having 1.5 m paved shoulders on both sides without rumble strips: Without any speed limit measure (rumble strips) having an average traffic volume of 264 vehicles per hour and average traffic speed of 11.15 m/s under heterogeneous traffic conditions, if an animal takes 10 seconds to cross the road, **the probability of the animal being hit by the vehicle while crossing is 38%, while chance of successful crossing is 62%**. The average distance between any two vehicles at any given time under such conditions shall be 92 m and it will take 8.25 seconds for a vehicle to cover this distance, which is 1.35 seconds less than the average time taken by the animal (10 seconds for a rhino) to cross the road. The animal still needs to cover a distance of 1.5 m before the arrival of the vehicle.

CONDITION 2

Animal on 7m road with 1.5 m paved shoulders on both sides with rumble strips: With speed limiting measure (rumble strips) having an average traffic volume of 264 vehicles per hour and average traffic speed of 9.49 m/s under heterogeneous traffic conditions, if an animal takes 10 seconds to cross the road, **the probability of animal being hit by the vehicle while crossing is 55%, while chance of successful crossing is 45%**. The average distance between any two vehicles at any given time under such conditions shall be 89.68 m and it will take 9.45 seconds for a vehicle to cover this distance, which is 0.25 seconds less than the average time taken by the animal to cross the road. This means more vehicles on the road at any given time to increase the probability (time spent by vehicle on road increases which leads to barrier effect).

CONDITION 3

Animal on 7m road having 1.5 m unpaved shoulders on both sides without rumble strips: Without any speed limit measure (rumble strips) having an average traffic volume of 264 vehicles per hour and average traffic speed of 9.84 m/s under heterogeneous traffic conditions, if an animal takes 10 seconds to cross the road, **the probability of the animal being hit by the vehicle while crossing is 55% while chance of successful crossing is 45%**. The average distance between any two vehicles at any given time under such conditions shall be 80.77 m and it will take 8.20 seconds for a vehicle to cover this distance, which is 1.40 seconds less than the average time taken by animal to cross the road.

CONDITION 4

Animal on 7m road with 1.5 m unpaved shoulders on both sides with rumble strips: With speed limiting measure (rumble strips) having an average traffic volume of 264 vehicles per hour and average traffic speed of 7.12 m/s under heterogeneous traffic conditions, if an animal takes 10 seconds to cross the road, **the probability of the animal being hit by the vehicle while crossing is 56% while chance of successful crossing is 44%.** The average distance between any two vehicles at any given time under such conditions shall be 57.45 m and it will take 8.07 seconds for a vehicle to cover this distance, which is 1.53 seconds less than the average time taken by animal to cross the road.

The traversability model is an important tool to evaluate the effectiveness of various speed limiting measures as a tool to reduce the barrier effect created because of volume of traffic and in determining the probability of successful chances of crossing road by the animal.

As is evident from traffic volume data, there is a 20% increase in the volume of the traffic between June 2011 and January 2014. With increasing traffic volume, speed regulation measures as a tool to reduce probability of animal hits is not an effective measure but is going to be more detrimental both in terms of increasing probability of hits by reducing distance between consecutive vehicles and allowing them to spend more time on the road, thus, creating a barrier effect.

In one of the studies conducted by Wildlife Institute of India, it was found that signages are not effective in reducing animal mortalities because of many reasons. The studies recommended more effective mitigation measures to prevent animal mortality and promote connectivity for animal movement.

RECOMMENDATIONS

- The proposal submitted by the state government identified four potential corridors, which are frequently used by wildlife
- The committee identified two additional corridors and also identified location of a canopy bridge to facilitate the movement of the Hoolock Gibbons in the landscape. The additional corridors identified by the committee members are:

Amguri East (300 m)
Amguri West (1km)
Gibbon crossing near Kukrakata

- The crossing proposed by the state government and additional areas recommended by the committee shall safeguard wildlife movement vis-a-vis NH37. As long-term measures, the committee recommends construction of overpass, flyover and bridge instead of underpasses and ecoducts.
- The engineers proposed that the flyover should be 10 m high. The design seems to be reason-

able, considering the wildlife of the area. However, at some places, realignment is needed to reduce disturbance and ease animal movement during construction.

- The committee also suggested realignment of the road after Deosur Nala towards Guwahati via the south of Gajaraj View Point Hill (Deosur Hill). The possibility of animal crossing structures needs to be evaluated for the realigned road section.
- For safe passage of animals through proposed crossing structures and to reduce conflict while crossing, there is need to secure the land across the park area. As of now, in the Burapahar–Deosur Nala Corridor, there are some human settlements adjoining the road. The growth of this settlement will hinder the movement of animals across the landscape. There is linear growth all along NH37 and the state government needs to arrest this development for the wellbeing of animals along all proposed corridors.
- The Kaziranga flood plain is highly dynamic. The survival of wildlife here depends on the movement of animals to Karbi Anglong and surrounding hills. The ecological integrity and long-term survival of wildlife in this area will depend on maintaining the Kaziranga flood plain with Karbi-Anglong hills and surrounding hills as a single landscape complex.
- The committee suggests effective traffic management on this road, especially during the monsoon season, to safeguard the movement of animals across the landscape till flyovers are constructed. Traffic management may include reducing traffic volume at peak hours (4pm-8pm) which coincides with peak animal activity. Night traffic may be stopped, especially during monsoon season.
- With increasing traffic volume, speed limiting measures such as rumble strips, humps and barricades are not effective for reducing probability of animal hits. These measures in fact increase the time spent by vehicles on the road thus, increasing chances of a hit by reducing distance between two consecutive vehicles and increasing barrier effect. It is not the road which acts as a barrier, but the traffic. On an average, there is a 7% increase in traffic on NH37 over the past three years and if this continues, the existing measures shall not be effective. Therefore, the committee strongly recommends flyover and bridges for vehicles.
- The width of the proposed flyovers should be exactly the same as that of the existing road to avoid any funneling effect at the beginning and end of the flyover.

With increasing traffic volume, limiting speed is not effective as this increases the time spent by vehicles on the road, thus, increasing chances of an animal getting hit by reducing the distance between two consecutive vehicles and increasing barrier effect. It is not the road which acts as a barrier, but the traffic

Tiger Monitoring in Terai Arc Landscape

A meeting on tiger monitoring in the trans-boundary Terai Arc Landscape was held between India and Nepal on 20-21 January 2014, at Wildlife Institute of India (WII), Dehradun.

As agreed at the 6th consultative meeting in Dudhwa Tiger Reserve in January 2013, India and Nepal will come out with a joint monitoring report for tigers in the Terai Arc Landscape.

WII worked as a technical collaborator in the said exercise. Nepal and WWF-India deputed two people at WII for approximately two weeks from 27th January 2014 to assist in feeding data and preparing the final report.

The partners from Nepal and WWF-India will provide camera trap pictures for Tiger ID for comparing and archiving in the EXTRACT-COMPARE software. The comparison was completed and a draft report was prepared by 20th February 2014.

The draft report will be shared with the Governments of India and Nepal for their concurrence and suggestions, if any, and will be released jointly by India and Nepal at the forthcoming stock-taking conference at Dhaka.

The proposed report will present minimum number and estimated population of tigers from the TAL in India and Nepal, and also enumerate the common individuals present in the trans-boundary Terai Arc Landscape.

Credit would be given to all partners, including NTCA, UP Forest Department, Bihar Forest Department, WWF-India, and WII from India, and DNPWC, Dept. of Forests, NTNC and WWF-Nepal from Nepal. The cost of preparation of the report will be shared by WWF and Global Tiger Forum.

Nodal officers for the task will be: S P Yadav, DIG (NTCA) from India (for all partners in India); Dr Maheshwar Dhakal from Nepal (for all partners in Nepal) and Dr Y V Jhala, on behalf of WII.

A database will be put together by WII and shared with NTCA, WWF-India, DNPWC, NTNC, and WWF-Nepal. Partners will be provided will full access for conservation and analytical purposes.

Any kind of publication, be it newspaper or magazine article, journal manuscript or monograph, that uses data from the database should seek written approval from the primary data owner or contributor and/ or include the primary data owner or contributor as a co-author.

This condition will be applicable for any other database that this data becomes a part of, such as the NTCA's National Tiger Data Repository.

A rapid field survey of tiger & prey in Dibang Valley district

The Idu Mishmi tribe that lives in Dibang Valley district of Arunachal Pradesh considers the tiger their brother. Though the local community has long been claiming the presence of tigers in the region, unfortunately, no efforts were made by the line departments, academicians or conservationists to assess and monitor the tigers, their prey and habitat in this region.

It was only in December 2012 that three tiger cubs were rescued from a dry well in Angrim Valley by the Arunachal Pradesh forest department and the Wildlife Trust of India. Out of three cubs, one cub died during the rescue operation and the two cubs (named Ipra and Chipi) were shifted to Roing mini zoo and later to Itanagar zoo. This rescue, coupled with the virtually unknown status of tigers and their prey in Dibang Valley District, led the National Tiger Conservation Authority (NTCA) to commission a rapid assessment survey by the Wildlife Institute of India in September 2013.

A combination of methods — including over 103 km of trekking, 24 interviews with locals and officials and more than 320 km of vehicle survey — was used to assess the status of tigers, their prey and habitat. This rapid assessment survey was conducted in an expedition

mode from 23 December 2013 to 22 January 2014.

The all-India tiger population estimation within the North Eastern Hills and Brahmaputra plains in 2006 revealed 84-118 tigers while in 2010 it revealed 118-178 tigers. But this seems to be a low estimate as systematic coverage of the entire landscape has not been performed.

Arunachal Pradesh has had minimal coverage and efforts were concentrated in Pakke and Namdapha TRs. There is a need to document other source populations in Arunachal as these represent historical entry points to the Indian subcontinent and would have high conservation and genetic value.

Neither the 2006 nor the 2008 all India tiger estimation programme assessed the Dibang Valley District for tigers, co-predators and prey. Limited ecological information exists on tiger ecology in Arunachal in general and Dibang Vally District in Particular. In order to fill this gap this rapid assessment survey with the following objectives was carried out:

- Generate baseline distribution data for tigers and their prey in Dibang Valley District landscape
- Identify suitable tiger habitats for conservation in the Dibang Valley District landscape

STUDY AREA

Literature suggests that the geographical range of the royal Bengal tiger (Panthera *tigris tigris*) and the northern Indochinese tiger (Panthera *tigris corbetti I*) may overlap in northeast India and Myanmar. Hence, post the rescue of tiger cubs from Angrim valley which lies close near the Chinese border where the distribution range of royal Bengal tiger and the northern Indochinese tiger overlaps, a genetic analysis was carried out by WII to ascertain the sub-

species level identification of rescued tiger cubs. The WII study concluded that the tiger cubs were indeed royal Bengal tiger and not the northern Indochinese tiger.

The Dibang Valley district is the largest (9129 sqkm) and also the least populated district (1 person/sqkm) in Arunachal Pradesh. It encompasses the Dibang Wildlife Sanctuary which covers an area of 4149 sqkm. Anini is the district headquarters and is located at an elevation of 1968m. The district shares international borders in the north, northwest and eastern sides with Tibet (China), the southwestern region is bound by Upper Siang district and the southern side is bound by Lower Dibang Valley District.

The district is part of the Eastern Himalayan Biodiversity hotspot and has a matrix of varied vegetation ranging from bamboo forests (dominated by Phyllostachys *bambusoides*, Arundinaria *spp* and Cephalostachyum *spp*), temperate broad-leaved forests (dominated by Michelia *spp*, Castanopsis *spp*, Quercus *spp*, Coptis *teeta* and Magnolia *spp*), temperate conifer forests (dominated by Rhododendron *arboreum*, Taxus *baccata* and Pinus *wallichiana*) to alpine forests Saussurea *spp*, Sedum *spp* and Saxifraga *spp*).

These diverse habitats harbour some of rare, endemic and threatened faunal species like tiger (Panthera *tigris)*, Clouded Leopard (Neofelis *nebulosa)*, Common leopard (Panthera *pardus)*, Snow leopard (Uncia *uncia)*, Asiatic Golden cat (Catopuma *temmincki)*, Marbled Cat (Pardofelis *marmorata)*, Leopard cat (Prionailurus *bengalensis)*, Fishing cat (Prionailurus *viverrinus)*, Jungle cat (Felis *chaus)*, Asiatic wild dog (Cuon *alpinus*), Takin (Budorcas taxicolor *taxicolor)*, Goral (Naemorhedus *goral)*, Musk deer (Moschus *fuscus)*, Barking deer (Muntiacus *muntjak)*, Himalayan Serow (Capricornis *thar)* and the semi-domesticated, free-ranging Mithun (Bos *frontalis)*.

This district was chosen to survey for tigers and their prey due to the recent rescue of tiger cubs from the district in Angrim Valley during December 2012. Our survey confirms the occurrence of tigers in the District. We camera trapped the first ever image of an adult tiger from the Dibang Valley Wildlife Sanctuary on 2nd January 2014. We also observed 10 pugmarks and collected 11 scats in and around the WLS.

All 24 local people whom we informally interviewed claimed the presence of tigers in the WLS and reported either having had a direct sighting, observing indirect evidences or hearing about livestock depredation incidents by tigers.

~~With increasing traffic volume, limiting speed is not effective as this increases the time spent by vehicles on the road, thus increasing chances of an animal getting hit by reducing the distance between two consecutive vehicles and increasing barrier effect. It is not the road which acts as a barrier, but the traffic~~

Preliminary assessment of prey suggest that the WLS holds a good diversity and abundance of prey like Takin, wild pig, Goral, musk deer, barking deer, Himalayan Serow and Mithun which can sustain a good population of tigers.

The WLS has the potential to become a tiger reserve in future as it may harbour a very important source population of tigers in this region. However, the next immediate priority must be to ensure that this vital tiger population is protected and continuously monitored. This can be achieved by a collaborative effort between NTCA, WII and GoAP and most importantly the local people by conducting long term research to establish robust ecological and genetic baselines that can aid in long-term conservation and monitoring of tigers, co-predators, prey and their habitats in this unique landscape that is part of a global biodiversity hotspot.

METHODS

Initial planning for survey, obtaining field permits and consultation with specialists was carried out in WII. Later during the field visit, experts at WTI, forest officials at Roing, Anini and wildlife enthusiasts at Roing, Anini and local villagers at Anini were consulted to gather information on the status of tigers, their prey and habitats in Dibang Valley District. Considering the limited time available, vastness, remoteness and lack of proper logistic facilities in the landscape, the survey was planned to be conducted in expedition mode wherever it was logistically feasible.

We targeted the Dibang Wildlife Sanctuary and some other valleys outside the sanctuary (Mathun, Ange Pani, Malinye, Ahi and Emra). Four kinds of surveys were carried out:

- Sign surveys to detect indirect evidence of tigers and their prey
- Camera trapping
- Village surveys
- Vehicle-based survey.

Sign surveys: Based on the secondary information obtained, efforts were be made to trek to different area with local guides/

villagers in search of direct and indirect evidences of tiger and prey. Existing major forest trails were chosen for survey due to the largely inaccessible and harsh terrain.

Camera trapping: We used nine automatically-triggered Spy Point IR cameras randomly during our treks. These were deployed in potential locations according to the carnivore signs obtained. A total of four cameras were installed on the bank of Dri river and five were placed in Apeaw river and on the forest trail. The cameras were left in field for four days between 31 December 2013 and 3 January 2014.

Village surveys: Trekking to all the localities, especially to the interiors, and talking to the local people were crucial for this study. On reaching a locality, village heads, local vilagers and other knowledgeable people were consulted and information on tiger presence was collected. Pictures of tigers and their prey were shown to them for recognition/identification. A standard set of informal questions (open ended) were used during interaction with local villagers and village headmen. During the surveys, socio-economic data on family members, education levels, income levels, land ownership, occupations, religion, festivals and culture were also collected. Special emphasis was laid on understanding wildlife occurrence with reference to tigers and their prey in the area, recent sightings, livestock depredation incidents, hunting records etc were collected.

Results

DRI-VALLEY, DIBANG WILDLIFE SANCTUARY

A total of 15 km of riparian forest and riverine stretch was surveyed in Dri Valley. The Dri valley gets its name from the Dri river that originates from the Indo-Tibetan Himalayan region and assumes the name Dibang downstream. The river forms a major part of the sanctuary. Dri valley starts at Dumbuen (Achecho village) 3 km ahead of Angrim valley. The dominant forest tpe was temperate broad leaved forests with dominant tree species such as pine, oak, Tirs, Birch, Mashi (local name) etc. The forests also have thick bamboo patches and grasslands. The altitude varied from 1700 to 2000m with highly undulating terrain.

- Pugmarks of tiger, small cats and Dhole footprints were found during the survey. Tiger and dhole pugmarks were found in Apew on the river bed, tiger, jungle cat, dhole signs were also found in Chello-pani. Scat was collected from the main forest trail near the landslide zone ahead of Ekage Milli hut and also from the adjacent areas of Chello-pani camp.
- The vegetation was mainly grasslands (Saccharam *spontaneum*, Imperata *cylindrica*, Cynodondectylon *spp*, Cyperusrotundus *spp*, Vetiveria *zizanioides* etc), bamboo thickets (Phyllostachys *bambusoides*) and dense valley forests consisting of mainly pine, oak, mashi (local name) etc. Among shrubs there were different types of ferns, rhododendrons, Clerodendron

spp, aimo (local name) etc.

- A tiger was photo captured in a camera trap 50m ahead of Chello camp on the bank of the Dri. One Dhole was captured at Apew. Alarm calls of barking deer were also heard near Apew.
- A fresh carcass of a takin was found on 4 January 2014 on a nearby ridge roughly 900m from Chello camp where the camera trap image of the tiger was obtained.

MATUN VALLEY

A total of 51 km riparian forest and riverine stretch was surveyed. A total of 17 scats of carnivores — six tiger scats, nine leopard scats, 1 wild dog scat and one unidentified small cat's scat — and ungulates' fecal pellets were observed and collected. Tiger scats were mostly found in the riverine beds. Leopard pugmarks, footprints of wild dog, bear and otter spp were frequently found along the riverine beds where tiger pugmarks were not found. Hoof marks of goral, wild pig and barking deer were numerously found in the forested trails as well as on the banks of the river. Alarm calls of barking deer were recorded twice. Gorals had the highest encounter rate, followed by barking deer, wild pig and Himalayan Serow. The interviews conducted with the local people revealed that the whole stretch of Matun valley has potential for tigers, takin and musk deers. However, we did not get any evidence of takins and musk deer during our trek.

ANGE PANI

A total distance of 17.84 km of riparian and mountain forest was surveyed. The forest type is temperate broad leaved forest and terrain is hilly and highly undulating. Carnivore signs, dominant vegetation, human disturbance signs and important locations were recorded. No human habitations were present along the trek route. Overall encounter rates of carnivores were low during this trek. We encountered a tiger pugmark at the elevation of 2045m (28°53'1.2"N and 9602°38"E).

MAAPAANI, DRI VALLEY, DIBANG WILDLIFE SANCTUARY

A total distance of 18.5 km riparian forest and mountain forest was surveyed. Previously from Dumbuen village to Chelo pani camp was surveyed. This trek was carried out from Chello Pani camp to further upper reaches. The signs of carnivores, ungulates, vegetation survey, human disturbance indices and important locations such as *nallahs*, rivers, and falls were recorded. The forest type was temperate broad-leaved forest and the terrain was highly undulating.

A total of 17 scats of carnivores comprising of 4 tiger scats, 6 leopard scats, and 7 unidentified small cat scats were collected. Tiger scats were mostly found in the riverine beds and bamboo thickets. Encounter rates of tigers were highest as pugmarks of tigers were found almost all along the whole river bed from Chello to Maapani. Leopard pugmarks and scats were also found in the riverine

beds and mountain forests. Bear and otter encounter rates were comparatively low. Hoof marks of goral, barking deer were found in the mountain forest as well as on the bank of the rivers moderately. The call of barking deer was recorded twice near Chello-Pani and Chigu Pani.

A total of 17 carnivore scats were collected, comprising two fresh tiger scats, two fresh leopard scats and one fresh jungle cat's scats for genetic analysis. Fresh pugmark track was found near Chigu Pani on our return.

CONCLUSION

The results of this rapid survey have confirmed the presence of tigers in Dibang Valley District, especially in Dibang Wildlife Sanctuary. Despite the short duration of the survey, hampering of field work due to certain logistic reasons like non-availability of fuel for the vehicles and incessant rains during the survey days, we managed to record sufficient number of tiger and their prey evidences. The survey also resulted in capturing the first-ever image of a tiger from Dibang Wildlife Sanctuary at an altitude of 1765 m at Chello-Pani camp and we also recorded a tiger scat at an elevation of 2065 m in the Ange Pani trek.

Our preliminary results suggest that the Dibang Wildlife Sanctuary holds a good sizeable population of tigers. Preliminary assessment of prey suggest that the Dibang Wildlife Sanctuary holds a good diversity and abundance of prey like takin, wild pig, Goral, Musk deer, Barking deer, Himalayan Serow and Mithun which can sustain a good population of tigers. Tigers may also be found in further upper reaches of the sanctuary. The highest elevation that we managed to reach during this survey was 2065 m and we did get a tiger evidence at this elevation. The survey results clearly indicate that the Dibang Wildlife Sanctuary holds the highest elevation range for tigers in India.

~~With increasing traffic volume, limiting speed is not effective as this increases the time spent by vehicles on the road, thus increasing chances of an animal getting hit by reducing the distance between two consecutive vehicles and increasing barrier effect. It is not the road which acts as a barrier, but the traffic~~

The sanctuary is currently managed by the Divisional Forest Officer (Social Forestry) at Anini. The sanctuary should have a sperate wildlife division considering the vast and unique landscape with a Wildlife Range Forest Officer at Anini and beat guards at the entry points of the Dibang Wildlife Sanctuary viz. Malinye, Mippi and Dambeun.

Future systematic long-term research and monitoring of tigers, their co-predators and their prey for the entire landscape needs to be carried out with the collaboration of the NTCA, WII and Government of Arunachal Pradesh (Department of Forests and Environment and the Dibang Valley District Administration).

The Idu Mishmi community appears to have long co-existed with tigers and they regard the tiger as a big brother. The tigers in Dibang do not face any threat from locals. However, the local people feel that the government needs to address the livestock depredation by tigers on a priority basis. Tigers often predate on the highly valued (both socio-culturally and economically) Mithun. It is imperative to garner the support of the local communities here, if we have to conserve tigers in this landscape. This could easily be done by providing adequate compensation packages to the Mithun depredation cases.

Meeting of chief wildlife wardens and field directors

A meeting of chief wildlife wardens of tiger states and field directors of tiger reserves was held from 19-21 February 2014 in New Delhi. The agenda, *inter alia*, focused on disease management and wildlife, progress relating to the Phase-I country level assessment and its convergence with the ongoing tiger reserve level Phase-IV monitoring and protection. The then minister for Environment and Forests, Dr M Veerappa Moily, presided over the inaugural session.

The minister released a Compendium of Guidelines and three Standard Operating Procedures (SOPs) for dealing with Straying Tigers, Tiger Deaths and Disposal of Tiger/Leopard Carcass. He emphasized the involvement of locals in tiger conservation, besides the need for balancing conservation and development.

While appreciating the efforts of the NTCA in bringing out Standard Operating Procedures, he urged the field officers to translating the same into local vernacular so that it becomes useful to the field staff.

The initiatives taken by the Government of India to strengthen tiger conservation was highlighted, besides the ongoing country level assessment of tiger and the independent Management Effectiveness Evaluation of Tiger Reserves. The minister emphasized accountability in targeted tiger deaths while advising field officers to face the challenges with professionalism, integrity and commitment. He also informed

about the recent decision to provide support under Project Tiger for ration allowance to field staff of tiger reserves.

The Member Secretary (NTCA) highlighted the advisories issued for prophylactic immunization and related safeguards for wild animals. It was also informed that under *in situ* field conditions, only preventive measures are possible, which needs to be ensured with the support from Project Tiger.

The importance of landscape epidemiology, site specific preventive measures vis-a-vis the sylvatic/pastoral cycles in the area, capacity building of local veterinarians, active management of buffer/peripheral area, while keeping the core of tiger reserves inviolate, safeguards from contamination through fomites, minimum human interference in wildlife habitats, avoiding handling of wild tigers/interfering with natural internecine interactions in the habitat for treating injured tigers from such combats were highlighted.

Emphasis was laid on exercising caution during translocation of wild animals from *ex situ* to *in situ* conditions. It was also informed that a list of state-level laboratories should be prepared for due capacity building to handle samples from the field, besides building up landscape level disease profile of wild tigers. The need for involving panchayati raj institutions for maintaining village level registers of livestock/pets was also highlighted.

This was followed by detailed

sessions of presentations by field directors of the tiger reserves.

The Chief Wildlife Warden, Assam, made an intervention, *inter alia*, highlighting the need for support from the regional office of NTCA, completion of e-surveillance at Kaziranga by December, 2014, use of UAV by Army (for Kaziranga), need for a meeting with SSB at the NTCA level and exploring the possibility of transferring central assistance from Project Tiger to Tiger Conservation Foundations of tiger reserves, need for declaring the Orang Wildlife Sanctuary as a Tiger Reserve, transboundary cooperation with Bhutan, need for more support from the Wildlife Crime Control Bureau and enhanced funding support.

The ADG (PT) & Member Secretary (NTCA), while appreciating the initiatives and the innovative practices undertaken by field directors wrapped up the deliberations with the following observations:-

- All forest areas should be sampled during Phase-I of the country-level tiger assessment, and the same should be completed by March, 2014.
- A minimum of 30 line transects are required even in small tiger reserves.
- Capacity building of field staff should be done in an ongoing manner for Phase-IV monitoring.
- Ensuring preventive measures for safeguarding tiger and other wild animals against disease through immunized buffer *vis-a-vis* the advisories issued by the NTCA.
- Ensuring safeguards for disease transmission through formites and sensitization of field staff.
- Constructing the disease profile of the landscape in the collaboration with the Veterinary Department *vis-a-vis* the landscape epidemiology concept.
- Ensuring minimum interventions in wildlife habitats and refraining from frequent handling of wild animals which are terminally sick or incapacitated.
- Avoiding hand feeding of wild animals and interference in their natural internecine interactions.
- Ensuring due veterinary care while attempting translocation from *ex situ to in situ* conditions to avoid translocation of diseased animals.
- Identifying State level laboratories and building up their capacity for handling field samples, besides building up disease profile of wild tigers.
- Involvement of Panchayati Raj Institutions in maintaining village level registers of livestock / pets in peripheral villages.
- Organizing workshops on animal techniques by the NTCA.
- Timely submission of Tiger Conservation Plans while complying with the suggestions from NTCA.
- Convening a meeting of Field Directors in the near future for articulating on core/buffer strategy and landscape concept.
- Building up the capacity for information gathering / networking in the context of wildlife crime while creating a database of wildlife offenders.
- Maintaining patrolling camp registers as per the NTCA protocol on a day to day basis and keeping supervisory checks on the patrolling intensity. Involvement of local workforce in antipoaching operations and capacity building of frontline staff towards antipoaching operations.

DELENG/2009/30636
STRIPES | BI-MONTHLY OUTREACH JOURNAL OF NATIONAL TIGER CONSERVATION AUTHORITY, A STATUTORY BODY UNDER MINISTRY OF ENVIRONMENT AND FORESTS, GOVERNMENT OF INDIA
VOLUME FIVE FOR FREE DISTRIBUTION ISSUE TWO

Shubranjan Sen

Published and printed by Inder Mohan Singh Kathuria on behalf of National Tiger Conservation Authority.
Published at Annexe No 5, Bikaner House, Shahjahan Road, New Delhi - 110011 and
printed at Astha Packaging, 122 DSISC Sheds, Okhla Phase I, New Delhi - 110020