# Final report to 21st Century tiger

## Role of cultural norms in conserving tigers: A case study from Arunachal Pradesh, India

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### *Summary and Introduction*

There is unanimous agreement in the conservation community that tigers need three basic elements to thrive - large areas of habitat, freedom from human persecution and high densities of large bodied prey. Conventionally, well-guarded protected areas (PAs) run by governments and NGOs have been used to meet these preconditions for most viable tiger populations. However, there are strong indications that tigers in a remote region in Arunachal Pradesh (the largest state in Northeast India) are thriving without the classical PA approach. The region, known as Dibang Valley, is characterized by low human density, stable community land ownership system, restricted access by outsiders and strong cultural beliefs related to hunting of wild animals.

Dibang Valley spans 13,500 km$^2$ and is dominated by the Idu Mishmi people (Fig 1). 2011 Census estimate the Idu population at about 13,000 making Dibang Valley the least populated district (1 pers/km$^2$) in the entire country (National Census, Govt. of India, 2011). Typical Idu lifestyle involves small scale shifting agriculture supplemented with occasional hunting and gathering of wild foods. Idus have elaborate rules and taboos regarding hunting of large animals that is connected to the idea of cosmic retribution. Idus rear a domesticated form of wild gaur, locally called 'mithun', which are kept in semi-feral conditions and are allowed to forage in the forest. Mithun is a ceremonial animal not used for dairy or draught however, it plays an essential role in socio-economic and cultural life of the Idus. Tigers hold a special place in Idu cosmology and are considered human kin.

However, the region faces serious impending threats. An ambitious plan by the Government of India envisions the transformation of Arunachal Pradesh into India's powerhouse by large scale hydropower development. About 14 hydroelectric projects of varying sizes are planned alone on Dibang River and its tributaries (Vagholikar & Das 2010). Dams will be connected via a labyrinth of new roads (Inter-Ministerial Report, GOI 2010). Reservoirs will inundate some valleys by up to 500 meters. Dam related development, still in the planning stage, will have a two-fold impact on the region wildlife – direct impacts on the habitat, prey base and tigers; and long term impacts due to change in local culture.

This interdisciplinary PhD project investigates ecological, socio-cultural and political factors that have allowed tigers to exist outside a conventional protected area framework. Because no baseline information was available, initial fieldwork (partially supported by 21st Century Tiger) focused on extensive camera trapping to understand tiger and prey population status. Carnivore scats were collected opportunistically during camera placement to understand dietary preference of tigers, dependence of large predators on mithun and, dietary niche overlap between tigers and other large predators. The second half of fieldwork concentrated on studying the layered relationship between local culture and wildlife. A detailed longitudinal hunting survey was conducted with 110 households over 9 months to empirically evaluate the impact of cultural taboos on regulating hunting of wild animals. I conducted 50 in-depth interviews with people from a range of socio-economic, religious and educational backgrounds to gather perspectives on tigers, tiger conservation, hunting taboos, cultural change, dams and protected areas. I mapped land use, tenure and ownership in all of

the study villages to understand how traditional land use and tenure influenced wild habitat, and how it is changing recently. Finally, I performed a detailed analysis of shamanic chants and folklores to understand cultural and historical underpinnings of Idu-tiger and Idu-nature relationship.

### *Objectives*

The study is divided into three main objectives and their respective sub objectives stated below. This is a multiyear PhD project funded by a various donors. Funding from 21st Century Tiger primarily targeted the first two objectives – camera trapping and scat sample analysis.

1.  **Tiger and prey population monitoring:** Estimate tiger and prey population density in key areas of Dibang Valley:
    A.  Estimate tiger population size/density using Spatially Explicit Capture-Recapture (SECR) Models.
    B.  Estimate the density of medium to large bodies prey - barking deer, wild pig, serow and takin using the Random Encounter Model (REM) approach (Rowcliffe et al. 2008).

2.  **Importance of mithun in tiger diet:** Test the hypothesis that tigers rely on mithun as a major prey during the winter months when other large bodied prey are harder to find:
    A.  Estimate densities and spatial patterns of habitat use of mithun.
    B.  Measure the proportion of mithun in tiger diet vs. wild prey.
    C.  Measure seasonal variation in the diet composition of tigers.

3.  **Dam impacts on tigers:** Impacts on tigers will be more serious if there is a greater degree of spatial overlap between tigers and their primary prey, and dam infrastructure. If tigers are primarily restricted to high elevations and use valleys occasionally then dam development, which will be concentrated in the valleys, may not impact them as much as opposed to the case when valleys are used just as frequently as the ridges:
    A.  Analyse temporal differences in use of valleys vs. ridges by tigers and major prey species.
    B.  Assess the degree of overlap between areas of high habitat use by tigers and prey and centres of dam development.

### *Methodology and fieldwork*

The fieldwork was conducted over 24 months. Please refer to the attached mid-term report for a detailed account of methodology and results from the first year of fieldwork relevant to 21st century tiger funding cycle.

### *Projects output*

As mentioned, this proposal submitted to 21st Century Tiger formed part of a 4-year PhD project that was divided into many objectives with a joint focus on understanding tiger ecology and the anthropology of human-tiger relations. Funding from 21st Century Tiger covered two essential activities – camera trapping and diet analysis. While some of the data collected has been analyzed, others are being processed. The results of the datasets that are still being processed with shared with 21st Century Tiger as they become available. The analysis of the remaining datasets will be finished latest by Oct 2016 – the deadline for thesis submission. The outputs stated in the proposal and their progress in detailed in the table below:

| | Stated Output | Progress update | Results |
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| 1 | Identification of critical tiger use areas within the landscape and first ever estimate of tiger density in an unprotected area. | As reported in the mid-term report, three out of the four sites that were camera trapped revealed photographic evidence of tigers. These included two community forests and one site within a protected area. No photographic evidence of tigers was found in another site within the protected area however genetic analysis of scat samples collected from the site turned out tiger positive. Camera traps and genetic evidence combined showed that tigers were present in all the sites surveyed. | Analysis is underway to calculate tiger densities using SECR and SPACECAP from all the sites. This analysis will be included as a chapter in my thesis. A report based on this analysis will be sent to 21st Century Tiger in the upcoming months. |
| 2 | Absolute abundance of large ungulates using new methods that allow for that allow for density estimation of species using camera trap photos where individual identification is not possible. | This was the first study to apply the REM method to estimate animal densities a. in a mountainous landscape, b. in India and, c. the third REM study worldwide till date. The findings of the study are significant in many respects – a. it will help develop standardized protocols on implementing REM in a wide range of field conditions, b. these will be the first density estimates for some little studied species such as takin, serow and Gongshon muntjac. Very little is known about the ecology and distribution of these species in the wild, c. field placement of camera traps allowed for testing the robustness of REM estimate under varying constraints e.g. non-randomly placed cameras. | Analysis is underway. Over two years of camera trapping I gathered over 170,000 images. At the moment, I am tagging the images with ancillary information. Tagging should be finished by mid-Feb after which I will proceed to REM analysis. This is a lengthy process because each image has to be digitized separately to calculate animal movement rates, camera field of view and captures – necessary inputs in the density equation. I am looking to hire 2 interns to help with this process. I expect to finish the analysis by mid-May (contingent upon availability of interns). I will share the results when they become available. |
| 3 | Spatially and temporally explicit distribution maps of wild ungulate species that would aid in identifying critical ungulate habitats. | Field sites were selected to allow for extrapolation of density estimates to areas that were not surveyed. Once the REM estimates are available, they will be extrapolated to the entire district using predictor variables such as human population density, altitude, habitat and distance to roads. Areas with high predicted density will be identified using this map. | This analysis will be performed after the REM density estimates are available. The timeline for this analysis is July 2016. The results will be shared with 21st Century Tiger once they become available. |
| 4 | Feeding ecology of | 28 carnivore scats were collected | Master's thesis attached. |

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| | tigers and seasonal importance of domestic livestock in the diet. | during fieldwork. The samples were analyzed at the Center for Cellular and Molecular Biology, Hyderabad (India) by an Imperial College master's student. Sixteen of 28 scat samples had usable DNA. The scat samples were analyzed for diet composition, dietary overlap between tigers and other carnivores and dependence of large carnivores on domestic livestock. The results were compiled in the thesis that was submitted to Imperial College London. | |
| 5 | Analysis of the impacts of impending dam construction on tigers in Dibang Valley. | The impacts of hydroelectric dam construction on wildlife will be threefold – a. direct impacts on forest habitat due to infrastructure development and land conversion to house in-migrant labor, b. indirect impacts in the form of increased hunting and illegal sale of wild meat to in-migrants, c. long term cultural transition due to sudden demographic change in which outsiders will significantly outnumber the local Idu population. Idu culture enforces several restrictions on extraction of wild resources and traditional livelihoods maintain wild habitat. There is evidence from my research that these have allowed the wildlife to thrive in the area. It will be extremely difficult to predict the impact of last two factors on tigers because of the variability involved in such process. The direct loss of habitat is easier to predict however, details of the area under development are not available for all the projects. Detailed reports are only available for 3 of the 14 projects proposed in Dibang Valley. | I will digitized the area under development for the projects for which such information is available and add a 500 meter buffer on it to calculate the projected habitat loss directly due to infrastructure development. I will share the results when they become available. |
| 6 | Results will be published as 3-4 journal articles on the following themes: a. Tiger and prey abundance in a community forest b. Role of cultural norms in tiger conservation in Northeast India | These articles will be written over the 13 months and copies will be shared with 21st Century tiger as they become available. | |