

WILDLIFE CONSERVATION IN THE HIGH ALTITUDES OF WESTERN ARUNACHAL PRADESH, EASTERN HIMALAYA



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Wildlife conservation in the high altitudes of western Arunachal Pradesh, Eastern Himalaya

A report submitted to **The Rufford Foundation, UK**

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Project initiation: November 2004

Expected completion: June 2006



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Background

The Eastern Himalayan state of Arunachal Pradesh (83,743 km²) is arguably the richest biodiversity region of India. This landscape of global conservation importance is located within the Eastern Himalayan Biodiversity Hotspot, and is also listed among the 200 Globally Important Ecoregions (Olson & Dinerstein 1998; Myers et al. 2000). The wide altitudinal range (100 m to > 6000 m) within Arunachal has brought about a great diversity of habitat and forest types, and a rich diversity of animal and plant life. Arunachal's unique location at the junction of biogeographic realms further enriches the region's biodiversity, harbouring biological elements from both the Palearctic and Indomalayan realms (Mani 1974). The state is estimated to have nearly 50 % of the total flowering plant species in India (Rao & Hajra 1986; Procter, Haridasan & Smith 1998; Chowdhury 1998). It has been designated as a globally important Endemic Bird Area, and of the c. 1200 bird species in India, nearly 600 have been recorded from Arunachal (Singh 1994). The state is home to fascinating species of large herbivores such as the takin *Budorcas taxicolor* and serow *N. sumatraensis*, several species of primates, and carnivores such as the snow leopard *Uncia uncia*, common leopard *Panthera pardus*, clouded leopard *Neofelis nebulosa*, and tiger *Panthera tigris* (Mishra, Madhusudan & Datta 2006). Arunachal is the only region on earth known to harbour all three species of goral – the Chinese goral *Nemorhaedus caudatus*, the red goral *N. baileyi*, and the Himalayan goral *N. goral* (Mishra, Datta & Madhusudan 2006).

The global biological importance of the state is also exemplified by its biodiversity-rich protected areas such as the Namdapha National Park and the Pakke Wildlife Sanctuary, that respectively harbour at least 20 and 10 large mammal species listed as Endangered or Vulnerable in the IUCN's Red List. Endangered species such as the snow leopard and the black necked crane *Grus nigricollis* found in Arunachal are listed in Appendix I of the Convention on Migratory Species. Arunachal's global conservation importance is further exemplified by the fact that new species of not just smaller taxa, but also of large mammals, are being discovered from the state even today. Our expeditions in the high altitudes of Arunachal Pradesh, part-supported by the Rufford Foundation, led to the discovery and scientific description of the Arunachal macaque *Macaca munzala*, a primate species altogether new to science (the last macaque to have been discovered being the Pagai macaque *M. pagensis* in Indonesia more than a century back Sinha et al. 2005). We also recorded the occurrence of species such as the Chinese goral *Nemorhaedus caudatus*, and the snow leopard in the high altitudes of Western Arunachal Pradesh. These high altitude regions of the state, though comprising a quarter of the state's area, have received much less conservation attention than the low to mid elevation habitats. The existing protected areas have only small sections extending into the high altitude zone, and there is no high altitude protected area in the state.

Despite the low human population density, Arunachal's fascinating biodiversity is threatened. Traditional hunting by many indigenous communities is no longer sustainable and with increasing linkages with the larger illegal wildlife trade, represents one of the most serious threats to Arunachal's wildlife today (Mishra, Datta & Madhusudan 2004; Datta 2006). This is particularly serious due to limited alternate income sources for the indigenous communities. Availability of modern arms is further intensifying hunting pressures. Human-wildlife conflicts in the form of livestock depredation by endangered carnivores such as the snow leopard and dhole *Cuon alpinus*, and their widespread retaliatory persecution, is fast depleting carnivore populations. Conflict resolution programs that could reduce, share, or off-set wildlife inflicted losses to local communities

are absent. The conflicts get further aggravated as hunting depletes wild prey populations, and carnivores increasingly switch to livestock for food. Primates and herbivores are also widely persecuted in retaliation against crop depredation.

The project

As a follow up to our biological expeditions in Western Arunachal Pradesh, we proposed to initiate work that would translate our research and exploration efforts into on-ground conservation. In this follow up project, we had proposed to address two objectives. These included (i) working with the Arunachal Pradesh Government to establish the state's first high altitude wildlife reserve at a site identified by our surveys to be biologically important, and (ii) initiating attempts to garner the support of the indigenous community for wildlife conservation.

We had proposed to meet the first objective by closely interacting with, advising, and assisting the bureaucrats of the state in efforts to establish the wildlife reserve. To garner the support of the local communities for conservation, we had proposed to conduct village level meetings and discussions to identify opportunities for community based conservation programmes, as well as promote awareness about conservation. We had also proposed to initiate efforts to set up community-based livestock insurance programmes in two or three villages to off-set the costs of conservation borne by people due to predation on livestock by wild carnivores.

In this report, we summarize the efforts undertaken, and the outputs of this project. We were able to successfully address our important objective of catalyzing the establishment of a high altitude wildlife reserve in Arunachal Pradesh. The process of establishment is described briefly in Chapter 2.

On the other hand, the objectives of our community based work had to be redefined after our initial meetings with the village council of Chanter, where we had hoped to initiate the first livestock insurance programme on an experimental basis. During these meetings, we realized that much more information on the human society as well as conflicts between wild carnivores and people (over livestock depredation) was needed before a conflict resolution programme could be designed and implemented. There was apparently considerable economic disparity within the community, which meant that the rich with large livestock herds would be able to participate in livestock insurance programmes, whereas the poor, for whom the loss of livestock to wild carnivores is more damaging, would be unable to (even if the premium amounts were kept low). Considering this reality, we realized that perhaps a government supported compensation programme for livestock losses to wild carnivores would be more appropriate in this case.

We therefore decided to develop a comprehensive understanding of the indigenous society, their livestock grazing practices, livestock holdings, their conflicts with wild carnivores, the extent of persecution of wild carnivores, and people's attitudes and opinions on how best to address these conflicts. We conducted extensive discussions and surveys in villages all across the region, both inside and in the fringes of the new wildlife reserve. We held meetings in 64 villages and collected information on people's perceptions of the conflict with wild carnivores. Subsequently, based on the intensity of conflict, biological importance of the area, and logistical feasibility, we conducted detailed evaluation surveys in 9 villages. All families (N = 301) in these villages were interviewed, their livestock grazing practices recorded, human and livestock censuses conducted, and detailed information was generated both on the conflicts as well as people's opinions on how best to address them. The results of this study are summarized in Chapter 3, and will

provide the basis developing a human-carnivore conflict resolution strategy for the region. We will be working with the state Government to design and incorporate the conflict resolution strategy into the management plan for the new wildlife reserve.

In addition to these contributions, as part of this project, we were able to identify and provide basic training and orientation (in conservation and conservation research) to a young veterinary doctor, belonging to one of the region's tribes. He is now continuing to work as part of our team, and is currently involved in wildlife monitoring efforts. Additionally, we published two manuscripts from our work conducted under the first phase of this project in international peer-reviewed scientific journals (Appendix I-II), and one in a national journal.

In addition to the Rufford Foundation, support for this work came from the Whitley Fund for Nature and the Chicago Zoological Society.

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Establishing a new wildlife reserve in the high altitudes of western Arunachal Pradesh

History

In 2002, we had conducted a questionnaire survey with the Forest Departments of the five Himalayan states in India to get information on the occurrence of the snow leopard, other wildlife, their habitats, and status of conservation efforts in the high altitude regions of their states. In response to this questionnaire, the Forest Department of Arunachal Pradesh (The Chief Wildlife Warden and DCF Mr. Pekyom Ringu), which manages wildlife in the state, had expressed concern over the lack of conservation efforts in the state's high altitude regions. They also expressed a strong need for exploring the high altitude wildlife of the state, and for identifying high altitude areas for conservation. All the 11 existing protected areas in Arunachal (spanning an area of 9246 km²; 11 % of the state's land area) largely cover only the low- and mid-elevation forests. Only small parts of some of these PAs extend into the high altitude zone. This was despite the fact that 23 % of the area of the state lies above 3000 m. Most wildlife surveys in Arunachal were also restricted to low- and mid- elevation forests. Although several surveys and ecological studies conducted in the state had yielded important discoveries and information, many areas, especially in the high altitudes, had remained unexplored.

Therefore, in response to the wildlife department's request, in the first phase of the project supported by the Rufford Foundation, we had undertaken biological expeditions in 2003 in the high altitudes of Western Arunachal Pradesh. Arunachal's forest department had provided the expedition support in terms of permissions and technical advice. Our exploration work had resulted in the documentation of 34 mammalian species, 12 of which are of global conservation importance. In addition, 150 bird species and 140 plant species were recorded. Preliminary vegetation and habitat maps were also generated for the surveyed areas. The expedition also provided a better understanding of the threats to the region's wildlife, and of peoples' dependence on natural resources, including widespread hunting. The most exciting finding of the survey was the description of a new species of primate, the Arunachal macaque *Macaca munzala*. This finding made global news and has now spurred further research on this new species and understanding its phylogenetic relationships with other macaques in the area.

While the expedition documented the occurrence of a rich wildlife assemblage with several species of global conservation importance, it was also clear that Arunachal's high altitude wildlife faced serious threats. The main threats included: a) widespread hunting (both for local consumption and to cater to the larger illegal commercial trade), b) retaliatory persecution of the snow leopard *Uncia uncia* and dhole *Cuon alpinus* for livestock depredation, c) habitat modification and loss (army establishments, continued creation of grazing land by opening up forests, timber felling), d) unregulated collection of medicinal plants and e) almost complete lack of awareness of conservation issues (including within the local administration), or the implementation of conservation laws.

One of the specific objectives of our expeditions had been to identify a suitable site for the creation of a wildlife reserve that would protect the entire assemblage of high altitude wildlife species in western Arunachal. Based on our surveys, we had identified and proposed an area for establishment of a wildlife reserve. This initially suggested area totalled 815 km² and encompassed an elevational range of 2400 m to > 6400 m. A total of

474 basins, ranging in size from 0.6 ha to 7294 ha, upstream of Mago Chu and Gorja Chu, were identified for inclusion in the proposed reserve. In this follow up project, we worked closely with the Arunachal Pradesh Forest Department to catalyze the establishment of the state's first high altitude wildlife reserve.

The establishment of the reserve

Our follow-up work began with visits to the state and close interactions with the officials of the Arunachal Pradesh Forest Department. To facilitate greater co-operation and collaborative work, we jointly drafted and signed a Memorandum of Understanding (MoU) with the state Forest Department. This MoU recognizes our mutual interest in promoting wildlife research and conservation, and facilitates the development of joint initiatives. Mr. Pekyom Ringu, the state official who had initially encouraged us to undertake the expeditions, and had supported our work, became the official-in-charge (Member Secretary) of the MoU and our collaborative work. We simultaneously started assisting him in developing a proposal for the establishment of the wildlife reserve. He began to mobilize support from within his own department, as well as the state polity, towards the establishment of the new reserve.

Our intention was to encourage the Forest Department to designate the area as a community reserve recognized under Indian law. However, it was impossible for the Forest Department to get support from either the local communities or the polity for establishing a community reserve, largely due to apprehensions amongst local political leaders of the possible curtailment of resource use as a result of the community reserve. There is general local opposition to setting up new wildlife reserves in Arunachal Pradesh due to resource use curtailment problems in existing wildlife reserves. Any new reserve would have to be established with complete agreement of the local people, and their resource use rights would need to be safeguarded, especially in this region where people are primarily agro-pastoralists. Furthermore, there is still considerable confusion regarding the legal implications of establishing community reserves, a category of wildlife reserves that has only recently been included in the Indian Wildlife (Protection) Act. It was therefore decided to propose the establishment of a biosphere reserve under guidelines laid down by the UNESCO's Man and Biosphere Program rather than create a community reserve.

Our map of the proposed reserve, developed as a result of our expeditions, was used as a starting point, and most of the biologically important area identified by us was included as the core of the proposed biosphere reserve. In consultation with the state polity, in particular a member of the state's legislative assembly, the Forest Department increased the size of the proposed biosphere reserve to c. 2000 km², and realigned its boundaries to include some culturally important sites, as well as a lower altitude wetland that hosts a small population of the endangered black necked crane in winter.

The region is predominantly inhabited by the Buddhist *Monpa* community, and encompasses the birth site of the 6th Dalai Lama, the Buddhist spiritual and political leader. To honour local sentiment, the proposed biosphere reserve was named after him, as the His Holiness Tsangyang Gyatso Biosphere Reserve. Located in the Sela Range of the Eastern Himalaya, the northern boundary of the biosphere reserve is formed by India's border with Tibet. The reserve area spans the districts of Tawang and West Kameng, and comprises three administrative circles – Mukto (comprising of 15 villages), Thingbu (9 villages) and Dirang (36 villages).

Once the proposal for establishment of the Biosphere Reserve was completed with our assistance, the state Forest Department submitted it to the central Ministry of Environment and Forests of the Government of India. Soon afterwards, an NGO from the state called Future Generations organized a public meeting in Tawang, where the Chief Minister announced the intention and seriousness of the state in setting up this Biosphere Reserve. Finally, in December 2005, confirmation was received from the Ministry of Environment and Forests regarding the approval of the proposed Biosphere Reserve.

Next steps...

The present project, by facilitating the formal procedures and clearances required for establishing the Biosphere Reserve, has provided the first concrete steps towards translating our research and exploration work into on-ground wildlife conservation. The real work of wildlife conservation in this new Biosphere Reserve has to begin now. The central government is expected to sanction funds to the state Government to manage this Biosphere Reserve shortly. We are continuing to work with the state Forest Department in efforts to raise additional resources for the Biosphere Reserve. Importantly, we will now begin to assist the Forest Department in their efforts to develop a management plan for the biosphere reserve. This management plan will include a human-wildlife conflict resolution strategy, based on the results of our work summarized in Chapter 3. We will strive to ensure that the information generated by our continuing research in the area will be incorporated into the biosphere reserve management plan to make it scientifically robust.

It was the foresight of the state's wildlife managers that they invited scientists to conduct basic surveys and identify biologically important areas. The research and exploration undertaken by the scientists led not just to the identification of such areas, but also resulted in biological discoveries of global importance. The information generated through research and exploration then enabled the managers to develop a well informed proposal based on which the new biosphere reserve was approved. This project provides an illuminating example of how partnerships between wildlife managers and scientists (in this case, Government officials and NGO representatives) can promote wildlife conservation.

Assessing conflicts between humans and large carnivores in western Arunachal Pradesh, Eastern Himalaya

Introduction

An acute conflict over livestock depredation threatens the continued survival of the Asiatic wild dog *Cuon alpinus* or dhole and the snow leopard *Uncia uncia* in the eastern Himalayan Arunachal Pradesh, a biodiversity hotspot (Mishra *et al.* 2004, 2006a, Myers *et al.* 2000). The mid- and high-elevation areas of western Arunachal are inhabited by pastoral and agro-pastoral tribes. Livestock rearing is the mainstay of their economy.

During our biological expeditions in the Tawang and West Kameng districts of western Arunachal in 2003 (Mishra *et al.* 2004, 2006a, Sinha *et al.* 2005), we found evidence of widespread persecution of the dhole and the snow leopard in the region, largely in retaliation against livestock depredation.

As a follow-up, we undertook this work to establish a baseline understanding of this conflict, which could facilitate the design of appropriate conflict management and carnivore conservation strategies (see Chapter 1). Our goal is to improve the prospects for wildlife conservation through community involvement, and in particular, improve the conservation prospects for the conflict-prone large carnivores in western Arunachal Pradesh.

Our study objectives were to: (i) collect information on the extent of persecution of carnivores, (ii) quantify the extent of livestock and economic losses caused by carnivores vis-à-vis other factors, (iii) study livestock herding behaviour, and in particular, the anti-predatory herding practices employed by the herders, (iv) document the perceptions of the indigenous community towards this conflict, (v) document their suggestions (and expectations) on devising locally appropriate ways of reducing the conflict, and (vi) identify individuals and social institutions to be involved in implementing future conflict management programs.

Methods

We initially conducted an internal workshop to develop a detailed set of questionnaires and data sheets to facilitate collection of data (Appendix III). The first set of questionnaires pertained to 'perception surveys', which formed the initial phase of our field-work. These were wide-ranging, coarse-scale surveys spanning villages across the districts of Tawang and West Kameng, were meant to identify conflict hotspots where we would then undertake detailed conflict assessments.

The second set of questionnaires was for detailed 'evaluation surveys' which formed the second phase of our field-work in the conflict hotspots. Evaluation surveys were specifically meant to quantify the extent of livestock losses to the dhole vis-à-vis other causes, the resultant economic losses, livestock populations, and the extent of persecution of carnivores. The evaluation surveys also documented people's viewpoints on the efficacy of different conflict resolution options, and identified the possible human institutions to be

involved in implementing conflict resolution programs. The third questionnaire was meant to quantify, through key-informant surveys, the economic value of different livestock by age and sex. Our last set of datasheets was meant for 'pasture surveys' aimed at documenting, through participant observation, the herding patterns, and in particular, the existing anti-predatory herding practices.

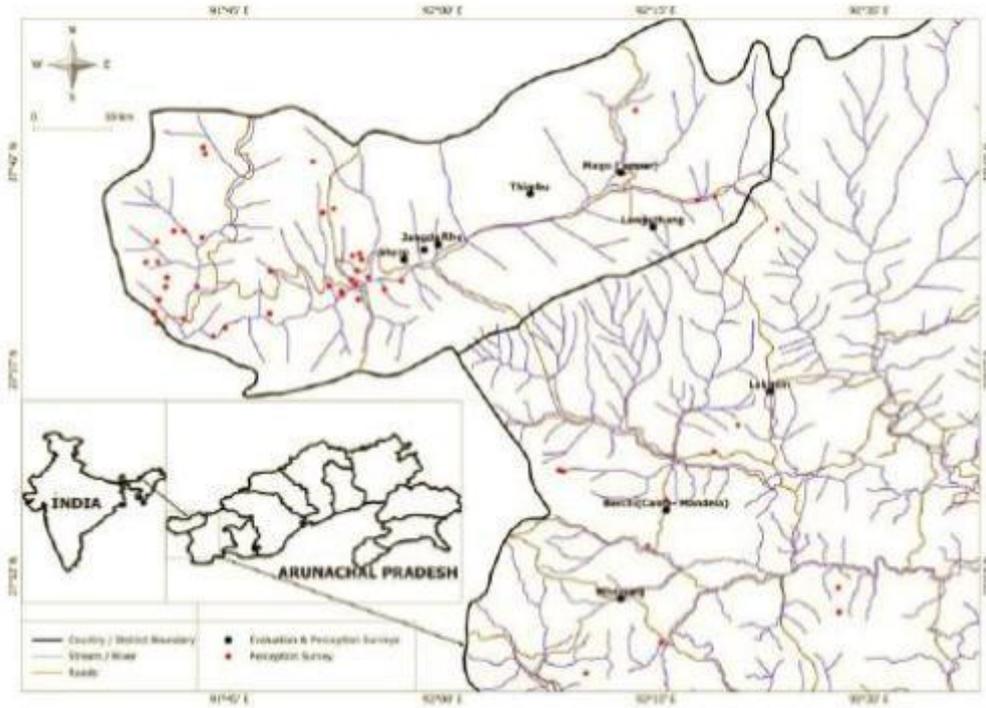


Figure 1. Map of western Arunachal Pradesh showing conflict survey locations

Field work was initiated in February 2005 over a few villages, and subsequently intensified to cover the higher elevation villages after snow-melt in April. We conducted perception surveys in 64 villages in two districts, Tawang and West Kameng in western Arunachal, which together stretch across an area of 9600 km². This involved visiting each village and interviewing two or more groups of people per village. The perception surveys were completed in September 2005.

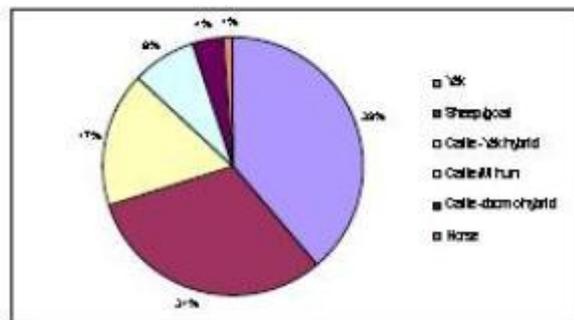
We subsequently selected 9 villages for detailed evaluation surveys. The selection was done based on three criteria in order of importance: (i) the intensity of conflict reported during the perception surveys, and (ii) the overall biological importance of the area (proximity to the wildlife reserve; see Chapter 2), and (iii) logistical feasibility. The evaluation surveys involved detailed interviews of all households in each village. Field work was completed in December 2005. We completed evaluation surveys in 9 selected villages. A total of 301 households were interviewed during the survey. Additionally, 13 pasture surveys were conducted to understand factors affecting loss of livestock in the summer pastures. During these interviews, we conducted a human and livestock census, recorded herding practices, livestock mortality to carnivores and other causes, instances of carnivore persecution, people's views on causes of depredation and conflict resolution. We also collated socio-economic information from secondary sources on all the villages in the two districts.

Results

We summarize here the main findings on the extent of livestock losses to wild carnivores, the economic losses to the community and the levels of carnivore persecution reported by villagers. Our technical report to be submitted in June 2006 is expected to provide a detailed, quantitative documentation of this conflict in terms of spatiotemporal patterns, livestock and economic losses, and carnivore persecution. The report will also describe herding patterns; identify possible conflict resolution mechanisms, additional information needs, as well as our future course of action to promote carnivore conservation in the region.

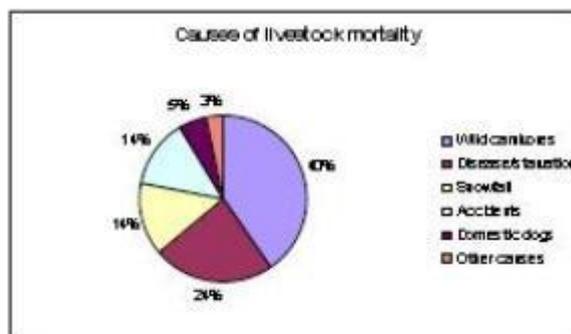
Livestock holdings

The total livestock holding in 9 villages was 4424 animals. Twentyfive% of households in surveyed villages have no livestock. Livestock composition differed between low to medium altitude (1600-3000 m) villages (n = 6 villages) and high altitude (>3000 m) villages (n = 3) with the former mainly keeping cattle, mithun (*Bos frontalis*) and cattle-dzomo hybrids which were absent in the high altitude villages. The latter mainly had yak and cattle-yak hybrids. The medium altitude villages kept some yak and cattle-yak hybrids. Horses were kept mainly in 2 villages. Yak formed 39% of the total holding, followed by sheep (31%) and cattle-yak hybrids (17%). The average livestock holdings per family were 19 livestock heads ranging from 6 to 49.



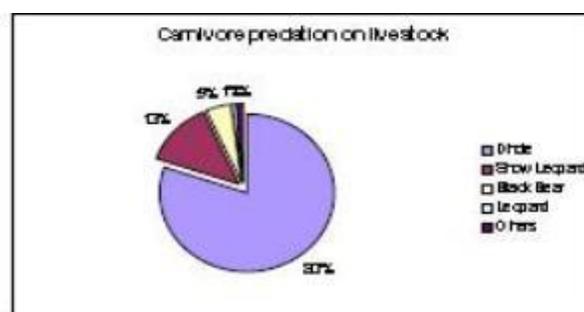
Causes of livestock mortality

The mortality factors for livestock were disease, avalanches, winter mortality due to heavy snowfall, depredation by carnivores, starvation, killing by domestic dogs and poisoning. The total number of livestock deaths recorded from 2003 to 2005 was 1482. Significantly, livestock depredation by wild carnivores was the single most important mortality factor with 40% of total livestock deaths due to wild carnivores as reported by villagers. The next most important causes of livestock deaths were due to disease/starvation (24%) and heavy snowfall and accidents (14% each). Annually, 12% of livestock holdings were lost to these mortality factors, with annual loss of livestock to wild predators being 5% of the current livestock holding.



Main predators

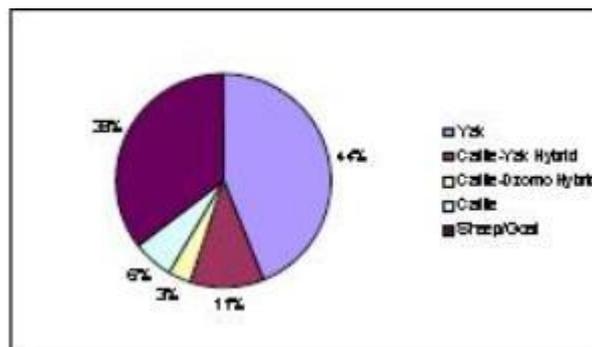
Of the total livestock deaths due to wild carnivores (2003-05), 80% were reported as being killed by the dhole or wild dog, followed by snow leopard (13%) and



black bear (5%). Other reported wild predators included leopard *Panthera pardus* and yellow-throated marten *Martes flavigula*.

Loss of livestock to predators

Yak, the most valuable among the livestock kept was the main animal lost to wild carnivore predation (44%), followed by cattle-yak hybrids (36%) and sheep and goat (11%). Therefore, livestock holdings in the 3 high altitude villages were more affected by wild carnivore depredation.



Economic losses

Based on the reported economic value of the various age/sex categories of the livestock species kept, we calculated the total economic loss and the average annual loss per family to carnivore predation. The total economic loss from 595 livestock deaths works out to almost \$ 70,000, while the average annual loss per family is Rs. 3325 (\$77).

Carnivore persecution

Over the last five years, twenty-two instances of retaliation or carnivore persecution by villagers were reported in the 9 villages. Sixteen instances were of dhole (mostly killing of pups), 2 of snow leopard and four of black bear. Instances of carnivore persecution appears to have been under-reported either due to poor recall or fear, as in many villages, people are aware of laws against hunting wildlife.

Almost all reported persecution instances were from the high-altitude villages where depredation levels and livestock holding are also higher. The meat of these killed animals was sometimes consumed; the skin/bones of dhales were mostly discarded or buried, although tails of dhole pups are usually brought back by the hunters to show other villagers as evidence. The hunters are usually rewarded with food and wine by all the villagers. Snow leopards were killed by snaring and in both reported instances the skin and bones appear to have been sold. The killings were celebrated with food and wine. However, it is not clear whether the killings were motivated only as retaliation against livestock depredation, or whether they were also motivated by the market demand.

People's viewpoint on depredation causes

Our data showed that too many livestock in the pastures and too many wild carnivores were cited by villagers as being the cause for high depredation levels, while they appeared to think it was not due to herder negligence or too little wild prey.

People's viewpoint on damage reduction

Villagers considered that stopping hunting of wild prey and compensation schemes would be the most effective ways to reduce the conflict. However, villagers' responses appeared to be contradictory. Although villagers felt that high depredation of livestock by carnivores was not due to lack of wild prey populations, when asked about measures to reduce depredation, they felt that the most important and effective way would be to stop hunting of wild prey. Similarly, although they did not consider negligent herding practices as being an important cause of depredation, they seemed to think that improving herding practices would reduce livestock losses.

Summary

Our data thus confirm the occurrence of a serious human-carnivore conflict in the higher altitudes of western Arunachal Pradesh. Very high levels of livestock depredation by wild carnivores are reported by villagers with this being cited as the leading cause of mortality. In addition, villagers lose livestock to many other causes, some of which can be prevented with better care and herding practices. This results in considerable economic losses to villagers resulting in retaliatory killing of wild carnivores. Livestock rearing is the principal source of income in these areas. Conflict resolution is needed urgently to prevent increasing persecution of these threatened wild carnivores as well as to mitigate the economic losses of villagers. We also have indications of the linkages between carnivore persecution and the larger illegal trade in wildlife products.

From our study and based on villagers' suggestions, resolution of the conflict would require several strategies and actions that could include compensation schemes, improved herding practices, curtailment of hunting of depleted wild prey, reducing livestock losses to other mortality factors such as disease and starvation through vaccination of livestock and health camps and development of pastures and demarcation of livestock grazing area. Conflict resolution thus needs a multi-pronged approach, and we now plan to incorporate the findings of our study in the form of a conflict resolution strategy in the management plan of the Tsangyang Gyatso Biosphere Reserve.

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