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**Prey, predator, human and climate change  
interactions in the Himalaya, Nepal**

**Achyut Aryal**

**2013**

**Prey, predator, human and climate change  
interactions in the Himalaya, Nepal**

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## Abstract

This thesis evaluates prey-predator, climate change, and human-wildlife interactions in the Nepalese Himalayas and contains 12 scientific papers which were prepared from 2009-2012 to explain these interactions. The content of this thesis is categorised into four broad **themes**; wildlife ecology, human-wildlife conflict, the influence of climate change on human-wildlife interactions, and recommendations for developing strategies to balance wildlife conservation and human needs in Nepal. The findings summarized below based on their relevant themes.

- ❖ In the study of human wildlife conflict in the upper Mustang region, Nepal, I recorded a total of 1,347 km<sup>2</sup> of pasture land utilised by the local people from six village development committees, 706 livestock animals were killed during the study period by predators (equivalent to US\$44,213 every two years), and 75% of the total livestock predation was attributed to snow leopards. I also found that the movement of livestock drives the snow leopards to lower elevations and into closer proximity to villages.
- ❖ Rangelands are considered to be critical ecosystems in the Nepalese Himalayas and provide multiple ecosystem services that support local livelihoods. This study analyses the conflict over the use of rangeland by two villages in Mustang, Nepal. The conflict suggests that excessive demand for limited rangelands motivates local villagers to gain absolute control of the resources. In such contexts, external support should focus on enhancing the management and production of local foraging resources, which requires the establishment of local common property institutions to facilitate sustainable rangeland management.
- ❖ The northern Barandabhar Forest Corridor (BFC) in southern Nepal, which consists of 10,644 ha with 15 community forestry (3,184 ha) that connects Chitwan National Park to the Mahabharat range, was studied. BFC has the potential to contribute to the improvement of Nepal's ecological integrity. We propose that the northern BFC should be managed via a

new participatory scheme, the Barandabhar Forest Management Council, to foster ecological integrity of the area while providing forest products to communities.

- ❖ The presence of brown bears in the Manasalu Conservation Area and Annapurna Conservation Area of Nepal, was confirmed. Results showed that brown bears are potentially distributed between 3800 m and 5500 m in the high mountainous region of Nepal, across an area of 4037 km<sup>2</sup>. Small mammals were the preferred prey of brown bears (75%) with marmots (*Marmota himalayana*; 46%) being the largest contributor to brown bear diet. Finally, a three stage brown bear conservation programme is recommended: (a) detailed research activities both inside and outside protected areas of Nepal (b) livelihood and conservation awareness support at local and national level (c) strengthening of the local capacity and a reduction in human-wildlife conflict in the region.
- ❖ The Nepalese Himalayas provide habitat for the endangered snow leopard (*Panthera uncia*) and its principal prey species, the blue sheep (*Pseudois nayaur*). A total of 939 Blue sheep were recorded at altitudes ranging from 3209 to 5498 m on slopes with gradients of 16–60° and aspects of 40°NE to 140°SE. The upper Mustang had the lowest population density of blue sheep recorded within their distribution range in Nepal (0.86 blue sheep/km<sup>2</sup>). It is estimated that the existing blue sheep population biomass of approximately 38,925 kg in the upper Mustang region could support approximately 19 snow leopards (1.6 snow leopards/100 km<sup>2</sup>).
- ❖ Habitat suitability analyses of snow leopards in Annapurna Conservation Area (ACA), Nepal indicated that an area of 3248 km<sup>2</sup> was suitable for snow leopards. Genetics analysis of the collected scats were successfully genotyped (62%) using 6 microsatellite markers, and identified as having originated from five different individuals and suggested minimum home ranges of 89.4 km<sup>2</sup> (male) and 59.3 km<sup>2</sup> (female). Microhistological analysis of scats (n=248)

revealed that blue sheep are the primary prey species (63%) and that livestock contributed 18% of the snow leopard diet.

- ❖ The Hispid hare (*Caprolagus hispidus*) is one of the least studied endangered small mammal species in the world. The diet and habitat use of the hispid hare was studied at Shuklaphanta Wildlife Reserve (SWR), Nepal. The population density of the hispid hare was 5.76 individuals/km<sup>2</sup>. Hispid hares mostly prefer grasses (*Saccharum spontaneum* and *Imperata cylindrica*) and more than nineteen plants were identified in their pellets.
- ❖ The Himalayan marmot (*Marmota himalayana*) was found to inhabit warmer valleys close to water resources in areas between 3200m and 5300m above sea level. Plant diversity was higher in the marmot habitat. Seventeen plants were recorded in marmots scats over three seasons (summer, autumn and spring). Soil pH, organic matter and organic carbon were not significantly different in habitat occupied by marmots compared to area where marmots were absent. Phosphorus (P<sub>2</sub>O<sub>5</sub>) levels were significantly higher and potash (K<sub>2</sub>O) levels significantly lower in marmot burrow habitat.
- ❖ I found that the average annual temperature in the upper Mustang region has increased by 0.13 °C per year over the last 23 years. A predictive model suggested that the mean annual temperature will double by 2161 to reach 20 °C in the upper Mustang region. A reduction in suitable agricultural, grassland, and forest land was recorded. Furthermore, grasses and many shrub species are no longer found in abundance at higher elevations and consequently blue sheep move to forage at lower elevations which attracts snow leopard (*Panthera uncia*) from their higher elevation habitats to lower sites, where they encounter and depredate livestock. Increased crop raiding by blue sheep and depredations of livestock by snow leopards have adversely impacted the livelihood of local people.



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