UNDERSTANDING PUBLIC PERCEPTIONS TO CARNIVORES:

EXAMINING COMMUNITIES IN UPPER MUSTANG, NEPAL

by

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THESIS ABSTRACT

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The Upper Mustang region in Western Nepal is a popular trekking destination with a primarily agropastoralist population. This study attempted to explain factors contributing to recorded perceptions on carnivores. The study was conducted in settlements around the town of Lo Manthang in the Mustang District of Nepal. The entire landscape is protected under the Annapurna Conservation Area Project (ACAP), and no lethal or harmful retaliatory measures are allowed against wildlife. The area is one of various geographical, cultural, political, and social intersections, and I attempted to recognize which of these may have come into play in local perceptions to carnivores.

I talked to locals in 23 group interactions in 8 villages and collected their responses on a scaled questionnaire. All respondents owned livestock, and experienced frequent predation, most commonly by snow leopards. Most respondents (82%), however, were not in favour of lethal predation mitigation measures or population culling measures.

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I would like to dedicate this document to the many people of Upper Mustang, who remain resilient in spite of the incredible hardships they face every day. I would also like to dedicate this document to my parents, Anju and Deepak Upraity, without whom I would not be.

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CHAPTER I

INTRODUCTION

Accommodating human and wildlife needs are vital for the continued coexistence of both. Human-wildlife conflict (HWC) has been identified as one of the most critical threats facing wildlife species today, and it remains a crucial factor in the continued existence of many of the world's species (Dickman 2010). Conflict is most often caused by direct damage that wildlife causes, and HWC is becoming a more studied topic. Human wildlife conflict is also increasing as human populations encroach into previously uninhabited areas, and, in some cases as some wild species are becoming more attenuated to human presence, and "moving" into human settlements (Lamichhane et al. 2018; Rigg et al. 2011; Skogen, Mauz, and Krange 2008).

Much of HWC involves local people living alongside wildlife, and the interactions that occur while undertaking livelihood related activities. When people use lands adjacent to protected spaces, their activities can threaten wildlife nominally protected by the park (Young et al. 2015). Alternatively, this closer proximity to humans may cause negative interactions between wildlife and humans. Some of these conflict causing actions are livestock depredation, human game depredation, crop raiding, human attacks, disease transmission, and infrastructure destruction (Loe and Roskaft 2004; Ogada et al. 2014; Woodroffe, Simon, and Rabinowitz 2005; Woodroffe, Thirgood, and Rabinowitz 2005). There can be intangible costs to human wildlife conflict too—spending more time guarding livestock, for example, can negatively impact children's education; costs caused by livestock mortality may result in health problems to farmers (Barua, Bhagwat, and Jadhav 2013).

Livestock predation studies account 40% of carnivore conflict to be caused by livestock predation(Sillero-Subiri and Laurenson 2001). There could be several factors contributing to this too; domestic animals, for example, retain little of their anti-predator behavior and may be easier prey for wildlife. Alternatively, livestock may compete with wild herbivores for grazing sports, and hence put themselves in path of wild carnivore hunting too.

Depending on the socio-economic situation of the people these damages occur too, such damage can cause a detrimental impact on people's lives, livelihoods, and health. Human wildlife conflict has been studied through the scientific process, and various mitigation measures have been designed, implemented, and improved. Financial incentives, like compensation schemes, are generally used to alleviate difficulties wildlife cause on human livelihoods (Dickman, Macdonald, and Macdonald 2011).

Depending on the nature of the mechanisms used, there have been varying amounts of success. However, conflict may remain even after a reduction in damage. Human wildlife conflict is difficult to resolve because of a difficulty in assessing its true costs. Some examples of these difficulties could include difficulties in the reporting process, like overly-bureaucratic damage reporting processes, and difficulties in kill identifications. Three factors can cause this disconnect in true and perceived costs – varying perceptions of risk, disproportionate and delayed responses (based on logistic and demographic factors), and social influences (community preparedness for wildlife attacks, education levels, etc.) (Madden and McQuinn 2014; Woodroffe, Simon, and Rabinowitz 2005).

There are also species and cases, however, where scientific and financial arguments have no validity. As different people have different perceptions and values on wildlife,

resolutions must often seek a reconciliation between different interest groups. Human actors and their differing ideological identities present difficulties too in reaching equitable solutions to human wildlife conflict.

Hence, understanding what factors may cause people's perception to animals is of vital importance. Studies have been conducted in the past, and in Nepal and around the proposed region too, attempting to quantify local perceptions to wildlife and conservation (Madhu Chetri, Odden, and Wegge 2017; Wegge, Shrestha, and Flagstad 2012). A literature review also reveals that attitudes to carnivores, particularly snow leopards and wolves can be based on many factors (Anand and Radhakrishna 2017; Suryawanshi et al. 2014). This, compounded with the fact that human wildlife conflict is bound to increase, particularly in rural livestock based communities, makes this research pertinent (Khorozyan et al. 2015).

My research then builds on research done at the intersections of livelihoods and wildlife, and is important in understanding the root causes of HWC in a remote region in Nepal. This, in turn, will allow us to better mitigate HWC in the region, and hopefully provide insight into understanding the underlying factors of HWC worldwide.

Based on literature reviews of the study site, I tried to conceptualize a framework of reference prior to my study. This framework was invaluable in running comparative analysis, in that it provided certain conditions and combination of conditions that I used to test basic hypothesis – would owning lots of livestock affect perceptions, for example, or if the combination of owning lots of livestock with guard dogs would result in a better perceptions.

Based on a literature review, it was presumed then, that respondents would have high rates of interaction with predators, and would have antagonistic relations with government officials. It was also assumed that local livelihood options, given geographical isolation, would be limited, and most of the respondents would be involved in livestock rearing. It was also presumed that the carnivores, particularly snow leopards, would have a cultural significance to the respondents.

The development of this framework, through a literature review, will first be explored in this thesis. The remainder sections then explain the methodologies used, and the results found.

CHAPTER II

FRAMEWORK AND LITERATURE REVIEW

A HISTORY OF NEPAL

Nepal is a small landlocked country, between India and China. The terrain is primarily hilly; geographically, Nepal is divided into the mountainous, hilly and plains regions.

Figure 1: Map of Nepal

In rural Nepal, the reported median annual income is $936 a year compared to $2248 in urban areas (P. Sharma, Guha-Khasnobis, and Raj Khanal 2014). 54% of the population is considered food insecure (UNWFP 2012). Despite Nepal's recent

secularity, 80.62% of the population is Hindu, 10.7% is Buddhist, 4.2% is Muslim, 3.6% is Kirat, and 0.45% is Christian.

Prior to the late 1700s, Nepal was really just a collection of small kingdoms in the foothills of the Himalayas. In 1769, King Prithvi Narayan Shah of the kingdom of Gorkha united the kingdoms of Patan, Bhaktapur, and Kathmandu, forming the kingdom of Nepal in 1769. Post this colonization period, from the 1820s to the 1950s, despite being a monarchy, Nepal was run by a dynasty of Rana prime ministers, who kept the country in political and geographical isolation from the rest of the world.

The Rana family was overthrown in 1951, and the then King, Tribhuvan Shah instates a multiparty democracy with elected representatives. In 1961, however, Tribhuvan's son bans political parties and reinstates a system of traditional rule, the panchayat system. This continues till 1990, when Tribhuvan's son, Birendra steps down and multiparty democracy and democratic elections are restored.

In 1996, a ten year long People's war is launched by a communist party in Nepal. Whilst this is going , Birendra is assassinated, supposedly by his eldest son, the crown prince Dipendra, in 2002. Birendra's younger brother, King Gyanendra becomes king. Gyanendra dissolves the parliament and restores the Panchayat system in 2005 after calling a state of emergency.

Whilst this is happening in the capital, by 2005, Maoists have dominated surrounding rural areas and gained much of the local support. Gyanendra's move backfires, however, and provides an impetus for mainstream political parties to work with the Maoists. In 2006, after 19 days of the People's Movement II, parliament is restored, and Nepal is soon declared a secular nation.

On 15 January 2007, a new constitution is drafted, which is burned by political parties in the southern Terai plains, by Madhesi and indigenous activists, because of a lack of “any reference to federalism”. In 2008, the Maoist party, against all odds, wins the elections in Nepal. A constituent assembly is elected.

However, by 2012, this assembly is dissolved, without a constitution being written. It is only in 2015 in which a constitution is successfully written. This new constitution, however, sparks outrage amongst many activists and political parties in the south, again, over questions of citizenship and demarcation. This results in the deaths of policemen and activists alike. Around the same time, a series of 7+ on-the-Richter-scale earthquakes hit Nepal. This has more recently again led to a wave of international interest in Nepal.

Since it’s much talked about ‘opening’ to the world in the 1950s, Nepal has supposedly made progress. Post-civil war research suggests that Nepal is suffering from a “privileging of civil society” (Ernstson, Sörlin, and Elmqvist 2014). In particular, the growing strength of the ‘techno-bureaucratic’ doxa, a term used to describe how the opinions and knowledge of technocrats, intellectuals, bureaucrats, and scientists are internalized in governance processes (Ojha 2006). These effects spill over into its political and natural resource management sectors too.

NATURAL RESOURCE MANAGEMENT

The first legislative efforts to introduce nature conservation in Nepal occurred in the second half of the 20th century.

The first attempts at nature conservation were hunting bans, implemented by the ruling dynasty in the late 1800s (Kollmair, Müller-Böker, and Soliva 2003). This was coupled with what could possibly be the first instance of tourism too, in the form of hunting trips. The Rana regime was keen on bettering political relations with the English, and invited aristocrats from various parts of the world (Gurung 1983, Filchner 1951, Shaha 1970). Locals may have been allowed to hunt, for subsistence too, but charismatic animals were considered 'royal game'.

This changed after the implementation of the constitutional monarchy and parliament in the 1950s, with the implementing of hunting reserves specifically for the king's use. However, this period also saw large declines in the populations of various of these charismatic megafauna. Coupled with the growing international wildlife conservation movement, the National Parks and Wildlife Conservation Act was drafted in 1973, causing the formation of a formal Department of National Parks and Wildlife.

This first wave of conservation was rooted in US notions of place and nature, and conservation initially was modelled similar to national parks in Africa. The first National Park in Nepal was the Chitwan National Park, established in 1973. This was followed by several others, in the mountainous region of Nepal, like the Sagarmatha National Park, the Langtang National Park, and the Rara National Park. It was at this point itself that the DNPW realized that relocating all residents in all proposed protected spaces was an impossible task. Further amendments to the National Parks and Wildlife Conservation Act gradually increased local use of protected area resources. In particular, the categorization of certain spaces as 'Conservation Areas', and allowance of buffer zones near protected areas was done to allow the social welfare of locals (Heinen and Shrestha

2006). The army was historically used for the protection of these spaces, and during the People's War in Nepal, protection to national parks was greatly diminished. Post conflict, more focus has been diverted again into wildlife conservation and protected area management.

Community based conservation (CBC) methods have been developed and implemented to help prioritize local people relations. This has included forming legal authorities and committees in governing natural resources, as well as physical infrastructure development, and livelihood trainings (Lund et al. 2014; McDougall et al. 2013; Society 1994).

As a framework of reference, it may be useful adopting Firey's conceptual framework of resource use. Hence, CBC methods are thought to be effective as they effectively balance three primary factors – ecological, economic, and ethological (Firey 1960). Despite differences in economic and social needs and access to natural resources, CBC methods are effective as they balance the needs, and perceptions of need, for various social groups and actors. There has been a growing body of evidence to suggest that the local support of CBC programs is based on perceptions of cost and benefit in living in such areas (Khadka and Nepal 2010; Mehta and Heinen 2001).

Nepal's natural resource management has alternatively been praised as innovative and criticized as marginalizing. Decentralized community forestry programs, which are commonplace in Nepal, have, to some degree, increased afforestation and improved local livelihoods. This decentralization mainly involves the transfer of management power from the government, into groups of locals organized as Community Forestry User Groups (CFUGs). One third of the total population in Nepal has been organized into

community forestry groups, managing about 25% of forested area in the country (Sunam, Paudel, and Paudel 2013).

However, the dependence on foreign donors for much of conservation work, contextual constraints, and historical biases revolving around marginalization and institutions have resulted in weakened resource management systems (Shneiderman et al. 2016). Community forestry programs, and by extension, community based resource management in Nepal, have been criticized as strengthening local elites politically and financially, as well as not fully taking into account other structural inequalities, like how dependence on forest products is greater amongst more vulnerable populations (Dressler et al. 2010; Thoms 2008).

LO MANTHANG, MUSTANG, AND NEPAL

In terms of zones in Nepal, Lo Manthang is in the Mustang District in the Dhaulagiri Zone.

Lo Manthang, my study site, is a small, walled town located at an altitude of around 3750 meters in a small valley near the Nepal-Tibet border. The historic settlement is one of the highest existing walled towns in the Himalayas. (N. K. Chapagain 2007).

The region was historically a province of Tibet. In 1380, following a period of the weakening of the Khasa (Tibetan) kingdom, Ame Pal, the commissioner of the province, declared Lo Manthang's independence and established the kingdom of Lo (Dhungel 2002; Peissel 1992). This walled settlement was called Lo Manthang, and the walls that Ame Pal built stand to this day. According to locals, it was only until recently that residents in Lo were allowed to construct their homes outside these town walls.

By 1440, a palace in Lo Manthang had been built, and the kingdom of Lo wielded considerable power in the region. Lo Manthang was an important trade route, particularly for Tibetan salt traders (Bauer 2010), but also of significance to Tibetan Buddhists. Ame Pal was known as a spiritual leader, and him and subsequent rulers of the region built various Gumpas in the region. While Lo was not a significant military power, the kingdom was able to grow strength through its economic, political and cultural resources. Lo Manthang was known to be a hub for Buddhist scholars from areas as far away as Kathmandu, Kashmir, and Sri Lanka (N. K. Chapagain 2013).

However, the growing strength of the Gorkhali Kingdom, increasing skirmishes with neighbouring territories (particularly Jumla), and the growing threat of the British empire resulted in King Wangyul Dorje of Lo Manthang signing a treaty with the Gorkhali Kingdom in 1789, establishing itself as a dependency of the soon to be kingdom of Nepal (N. K. Chapagain 2013). This also resulted in a change of names, from ‘Lo’, to Mustang. Today, the Lo Manthang region is widely known as Upper Mustang, as opposed to the more southern regions of the landscape, south of the Himalayas, Lower Mustang. Lower Mustang was historically not part of the Tibetan kingdom and was ethnically Thakali.

Even though being a dependency of Nepal meant that Lo no longer had an independent ruler, the king of Lo was allowed retain his title as the king of Mustang. The move to do so was widely lauded, as the rates of dependency were nominal, and Lo Manthang gained access to the significant military strength of the Gorkha kingdom, while remaining semi-autonomous in governance (Dhungel 2002). This arrangement also

helped Lo thrive again, by providing economic benefits, like customs collections from the salt trade (N. K. Chapagain 2013).

Following the rise of the Rana ruling family in Nepal, however, the same sources indicate that Lo's prosperity began to wane. From 1846 onwards, as the ruling families in Nepal and Kathmandu gained wealth and power, the economic benefits from trade with Tibet shifted southwards towards Lower Mustang and the Capital, Kathmandu. Other trade routes to Tibet were opened and Lo's relationship with Tibet deteriorated too, as did even the symbolic power of the king.

Following the overthrow of the Rana regime in the 1950s, Lo Manthang's economic status continued to deteriorate. During the 50s and 60s, many development plans and projects designed in the capital of Nepal, Kathmandu, did not reach remote places around Nepal, and Lo was definitely one of them. In the 1960s and 1970s, Lo Manthang was a military base for Tibetan freedom fighters, allegedly supported by the CIA (N. K. Chapagain 2007).

Since the 1990s, the National Trust for Nature Conservation– with financial support from the American Himalayan Foundation – has funded cultural heritage conservation projects to restore the various cultural artifacts of Upper Mustang (Wright 2015). Locals in Lo Manthang are involved in some of these projects, at various capacities – some locals work in construction for the larger renovation work, yet others are employed as painters for intricate paintings.

Lo also holds significance because of the practice of "authentic" Tibetan Buddhism. Many facets of Buddhist culture, and technologies are believed to have been transmitted through Lo Manthang between Tibet, Nepal, and India, including Newari

architecture, the formation of the Tibetan written script, papermaking and printing, and even the relay of Buddhism itself (Beazley and Lassoie 2017).

Lo Manthang has various important historic monuments and sites, including the settlement wall of Lo Manthang, Thubchen Gompa, the Royal Palace, and Champa Gompa. Including the present king of Mustang, the kingdom has been ruled continuously by 22 generations of a dynastic monarchy. After the return of multiparty democracy in the 1990s, the king's role was merely ceremonial, but photographs of the king are still common-place and he is well respected by locals.

GEOGRAPHY & LANDSCAPE

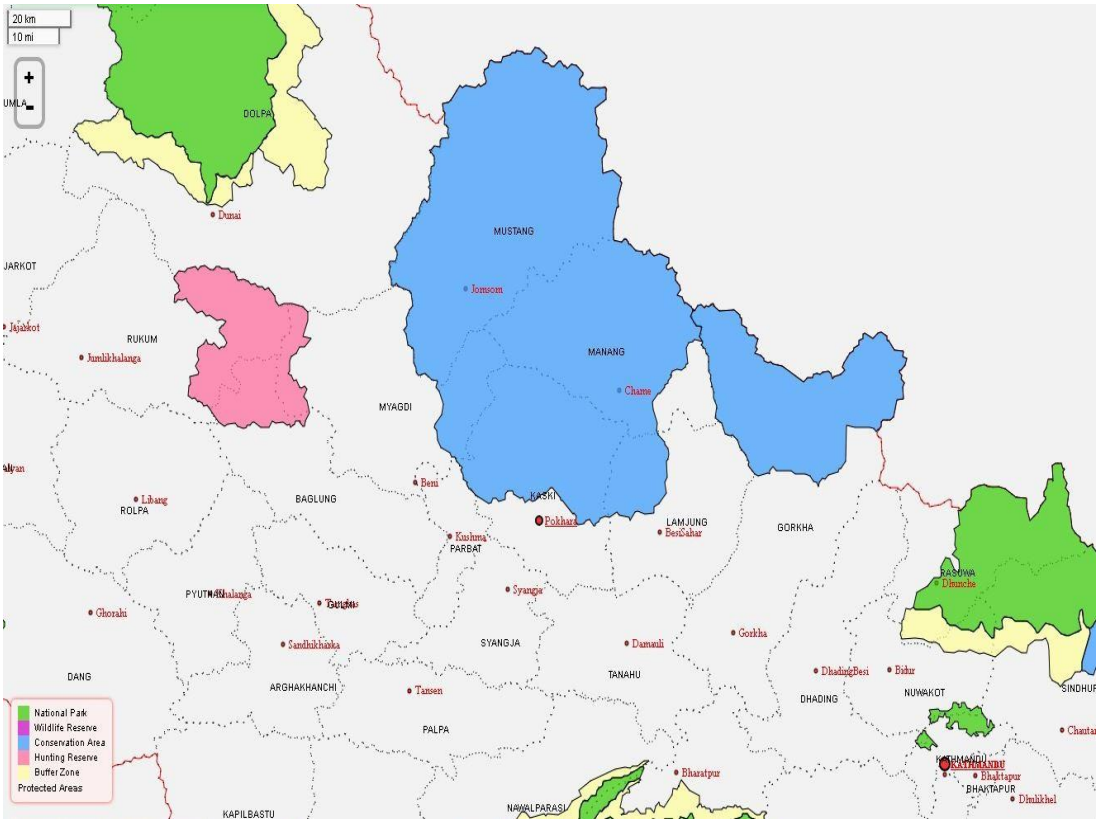


Figure 2: The Annapurna Conservation Area Project

The Upper Mustang area is primarily a high altitude mountainous desert, located north of the Annapurna and Dhaulagiri ranges in the Western Region of Nepal (K. R. Poudel 2014). The landscape is rangelands of small shrubs and grasses and tall dry hills (Subedi 2017). Grasslands cover most of the upper Mustang region, at 42%, with an equal amount of barren land. Forest cover is minimal – 0.1% - 4% potentially (Bhusal et al. 2016; G. J. Thapa and Sherchan 2016).

Rainfall is sparse, and cultivable land is limited to mostly valley floors along the river gorge. Average temperatures of the region are between 18°C in July and -12°C, in January. The whole area remains under snow for 4-5 months from November to March (Gurung and DeCoursey 2000).

Mustang has Nepal's lowest average rainfall, at 210 mm (Dangi et al. 2017), and the region suffers from water scarcities. The world's deepest gorge, the Kali Gandaki gorge, is also present in Mustang district, and the tributaries to this river make up most of the regions water source.

The region can adequately be described as a Trans-Himalayan region (N. K. Chapagain 2007). The Trans-Himalaya in Nepal is the northern frontier strip of Nepal, characterized by lying north of the Himalayas, and conjoined with the Tibetan Plateau. Mustang, and the neighbouring district of Manang are the biggest section of the Trans-Himalaya in Nepal (R. Pandey 2017).

The Mustang district covers 3176 km2 (Holmelin 2010), while the Upper Mustang region roughly covers an area of 2,567 km2, with about 20 large and small settlements. Upper Mustang is located in between N 28'47'39" to 29'19'54" and E

83’28'55" to 84’15'16" (Madhu Chetri and Gurung 2004).The average altitude of villages in the area is 3,600m (Boselli, Caravello, and Baroni 2005).

The region is known for its picturesque vistas, and is a very popular tourist destination. District political organization is similar to other places in Nepal; Mustang district has 16 VDCs, which serve as the lowest base of political authority. The locations I conducted my surveys fall in three VDCs - Lo Manthang (largest), Chhoser, and Chhonup. Also similar to other northern regions of Nepal, people migrate south in winter. Migration maybe to the closest large town of Pokhara, but also Kathmandu, and even Benares in India (Childs et al. 2014)(Notes).

Lo Manthang is about 50 kilometers away from Jomsom, the headquarters for Lower Mustang, and about 100 kilometers away from Pokhara, one of the largest cities in Nepal.

Access to the region is limited but increasing. Jomsom remains the closest airport, and was traditionally the starting point of a trekking route that circumvented the Annapurna mountains. The airport was built in the 1960s, but tourism to Lo Manthang was only allowed in controlled amounts after March 1992.

Road access was only possible after the mid 2010s, when road construction started joining Jomsom to Lo Manthang. Today, it is possible to travel by road to Lo Manthang, though road access is highly limited by weather conditions and closures are frequent. Lo Manthang is 4-8 days walk from Jomsom.

BIODIVERSITY

The entire Annapurna Conservation Area has a high biodiversity, possibly because of the large altitudinal variation from 1000 metres to 8000 metres above sea level (Mehta and Heinen 2001). The flora and fauna in the area also is primarily representative of high-altitude Tibetan grasslands (Madhu Chetri and Gurung 2004). The area has 1,226 species of flowering plants, 102 mammals, 485 birds, 41 reptiles and 23 amphibians (G. J. Thapa and Sherchan 2016).

Rangelands in Upper Mustang are habitats to various endangered Trans-Himalayan charismatic species, like the Snow Leopard, Himalayan Wolf, Himalayan Griffin, Himalayan Bear, Tibetan Wild Ass, Bearded Lammergeier, Tibetan Fox, Himalayan Lynx, Tibetan Antelope, and Tibetan Argali (R. Acharya et al. 2002; Ale et al. 2014; Aryal et al. 2012, 2018; M. Chetri and Pokharel 2006; Paudel et al. 2016; B. D. Sharma et al. 2004). Other faunal species found here at lower altitudes are the Musk Deer, Red Panda, Clouded Leopard and Common Leopard (Khadka and Nepal 2010; Spiteri and Nepal 2008).

Flora species found in the area include the Caragana species., Lonicera species., Astragalus species., Cares species, Kobresa species and Stipa species (N. Chapagain and Chetri 2006; Madhu Chetri and Gurung 2004). There are also herbs of medicinal and commercial value present here, including the seasonally (heavily) harvested Cordyceps species.

HUMAN WILDLIFE CONFLICT IN NEPAL

Given the high biodiversity of Nepal, instances of conflict have been recorded across the country (K. P. Acharya et al. 2016; Rakshya 2016). Conflict between humans and wildlife can be further compounded by the legal protection of these conflict causing animals, as is often the case in Nepal. Despite legal protection the possibility of lethal retaliation to attacks by wildlife is very real. This is particularly problematic in the case of large protected mammals, which while being protected, cause the most conflict in Nepal (K. P. Acharya et al. 2016). Similarly, penalties imposed for killing problem animals may further escalate hostilities between conservationists and locals.

The large altitudinal variation over small spatial distances in Nepal has led to a considerable amount of faunal and floral biodiversity in the country. Compared to its area, Nepal has been reported to have an unusually high concentration of globally endangered species. 23% of the country's land mass is protected, while, 29% of the forestland outside these protected areas is managed communally by locals. Most of the protected areas in Nepal are located at high altitudes (K. P. Acharya et al. 2016). Despite this, research in these areas regarding human wildlife conflict points to high instances of conflict, caused by a gap between human and wildlife needs (Khadka and Nepal 2010; Spiteri and Nepal 2008).

Whilst this study looks into perceptions in one of these high altitude protected areas, most of the charismatic megafauna in Nepal, and particularly those that have been successful in generating an ecotourism revenue, are located in the Southern plains. The main problem species in the Southern region of Nepal are (in order of damages caused pointed out by the literature) are Asiatic Elephants, Common Leopards, One-horned

Rhinoceros, and the Bengal Tiger (Carter et al. 2014; Inskip and Zimmermann 2009; Pant et al. 2016). Sloth bears, wild boars, and wild water buffaloes, as well as various species of deer, were also reported to have caused some damage to humans (K. P. Acharya et al. 2016). Conflict with Elephants and Leopards, whilst being the highest counts of human attacks (at least between 2010 and 2014) were also predicted to increase, given their long ranging habitats and movement patterns, and also the increased encroachment into their territories and migratory corridors (K. P. Acharya et al. 2016). Solving conflict in these areas will have to be through socially accepted methods of mitigating conflict.

Apart from the Dhorpatan Hunting Reserve in Western Nepal, hunting of animals is prohibited. Current mitigation methods used across Nepal include fencing (including some electrical fencing in the southern belt), enclosures, and guarding (sometimes using dogs).

Studies on carnivores, particularly snow leopards, in the Himalayan region in Nepal are becoming more common. The Himalayan, and subsequently, Transhimalayan region of Nepal have been found to be established habitats of the snow leopard. Studies on prey preference, habitats, and human wildlife conflict have been conducted in most of the Northern protected areas in Nepal, which have helped plan and implement a snow leopard conservation strategy and action plan (Ale et al. 2014; Aryal et al. 2016; Madhu Chetri, Odden, and Wegge 2017).

This study is of particular interest given the recent taxonomic findings regarding the populations of wolves in Trans-Himalayan Nepal (Madhu Chetri et al. 2016; Subba 2012; Werhahn et al. 2017). Scat analyses suggest that the species are of an older lineage than the Grey Wolf, and probably a new species, the Himalayan Wolf.

TRANSHIMALAYAN LIVELIHOODS

Rural livelihoods in Nepal are very dependent on ecosystem services. Whilst Lower Mustang was more readily open to the modern world, Upper Mustang and Lo Manthang remains relatively isolated due to geographic and political isolation (Sanders 2012).

About 120,000 people live in the Mustang region, from more than ten different ethnic groups (Khadka and Nepal 2010; K. Thapa et al. 2015). Most residents are agropastoralists (B. S. Poudel, Spooner, and Matthews 2016). According to a particular survey more than 96% of the population of the region claims that their main source of income is livestock (Madhu Chetri and Gurung 2004).

The original inhabitants of Lo Manthang were Tibetan people. This ethnic group, known as Loba, are still the majority in Upper Mustang, and Mustang as a whole is ethnically heterogenous, with the Gurung and Thakali groups compromising of the majority (~60% and ~25%). Lo Manthang is home to about 900 people (N. K. Chapagain 2013), mostly of the Loba ethnicity.

The primary occupation in Upper Mustang is livestock rearing. Though agropastoralism is the primary source of livelihood, the area is also employed in the tourism, fruit farming, medicinal herbs, and cottage industry sectors (Subedi 2017).

Unlike in other parts of Nepal, where agriculture is considered more important, the harsh climatic conditions do not support the growth of sufficient food crops or fertile soil. Agricultural production itself in the area is constrained by geographic and natural fact/ors. Hence livestock rearing is borne of necessity. The major species of livestock owned are goats, yaks, dzos (hybrid of yak and cattle), horses, and mules. Goat and sheep

trade from China is an increasing practice, as are bulk sales of livestock to city dwellers. Traditional grazing rights and indigenous rangeland activities, like rotational grazing, grazing levies, have been found in some communities in the region (Pokharel and Chetri 2006). Prior research has also highlighted the presence of nomadic travelers in the region. Every year, nomads from neighbouring states and countries bring their livestock to graze in the Upper Mustang area. These nomads do not live in any fixed, town but rather move according to their livestock and the weather (M. R. Pandey and Chetri 2006).

Scarcity of water, irregular irrigation infrastructure, periodical low temperatures, and low rainfall all contribute to a lower than average agricultural output. Farming starts around March, till October (Holmelin 2010)(Notes). The majority of the land (55.65%) is uncultivated and barren, yet is used as grazing land (Pokharel and Chetri 2006). Millet, buckwheat, oats, barley, wheat, potato, peas and mustard are the major agroproducts (Bhusal et al. 2016; Holmelin 2010)

Most land is used as rangeland for livestock. Rangelands are the primary terrain in Upper Mustang, covering more than 98% of total land use and comprising 48% of natural vegetation and 50% bare land according to early estimates (LRMP 1986). These rangelands also provide ecosystem services for locals, including biofuels and fodder, and construction material (Joshi et al. 2013).

Mustang's population density is 3.78 people per square km, compared to a national average of 180 people per square km (K. R. Poudel 2014). There is also a high proportion of working population in the region, 65.75% in the 15-59 age group.

The entire Mustang area, according to a 2014 survey, had 84 schools – 66 primary schools, 18 secondary schools, and one campus. Mustang also had 5 monastic schools.

Mustang also has a total of 21 health service providers of various sizes and capabilities. The one hospital is in Ghemi, which is close to the Upper Mustang region. Traditional healers were said to be present in many villages too (K. R. Poudel 2014).

There is a reported, and visible difference, between how 'developed' Upper and Lower Mustang are in comparison to each other. Lo Manthang receives electricity between 5 and 6 months of the year from the national grid; locals supplement energy needs with a variety of consumer solar electronics, or in the case of hotel owners, generators. The same time line can be applied to the motorable road (K. R. Poudel 2014).

Locals extensively use forests for firewood, fodder, timber, grazing, and other forest products for subsistence purposes. As in many other regions of Nepal, local user groups manage community forests.

THE ANNAPURNA CONSERVATION AREA PROJECT

There is supposedly a difference in conservation outcomes in the North and South of Nepal. The northern regions, with their panoramic views, are heavily visited by trekker tourists. Hence, the stress on protection of wildlife in the north of Nepal is not as strong as in the south, and focuses more on maintaining Himalayan ecosystems (Kollmair, Müller-Böker, and Soliva 2003).

The Annapurna Conservation Area and the subsequent Annapurna Conservation Area Project (ACAP) were established in 1986, under the administrative umbrella of the National Trust for Nature Conservation. This was the first attempt by the Nepal government to incorporate conservation and development (through tourism revenue) in the area, and all of Upper Mustang falls within its jurisdiction (Baral, Stern, and Heinen

2010). The project was first established as a small-scale pilot project in Ghandruk, and was extended significantly in the late 1980s and early 1990s because of its continued success (Wells 1994). The Annapurna Conservation Area was the first protected area in Nepal to allow local residents to live within a protected area and use the resources present, albeit in controlled and detailed amounts, and today is the largest protected area space in Nepal (Spiteri and Nepal 2008).

ACAP allowed for the creation and continuance of formal, grassroots-level institutions with the responsibility of managing community forests. These created Conservation Area Management Committees (CAMCs) have the legal rights to use and manage designated forested areas based on membership opinions and needs. The members of CAMCs themselves are local users of the natural resources (Baral, Stern, and Heinen 2010) .

ACAP was launched with the objective of fostering positive attitudes towards conservation through incentivization and livelihood opportunities (Michael, Smriti, and Sanjay 2016). Projects themselves have been decided through a participatory approach, and the ACAP has also realized a liaison role between the public and (international) donors (Spiteri and Nepal 2008). The independence of projects is key; projects are only accepted and implemented if they are deemed to be financially and socially maintained once external support is removed. This is distinct from how national parks are managed in Nepal; community run projects and initiatives see the local public as ultimately the custodians of natural spaces as compared to national parks. Currently, ACAP runs programs on tourism training, alternative trekking route development, garbage collection, heritage support, seed distribution, and alternative livelihoods training (G. J. Thapa and

Sherchan 2016), along with human capital development exercises, like education programs and skills development programs (Edwards, Suwal, and Thapa 2006).

ACAP collects a fee for all tourists who enter the ACA (the entire Mustang area), and these funds are redirected to conservation initiatives. Nevertheless, much of the development brought about by these conservation initiatives is only seen in areas closest to trekking routes, and the trickle down aspect of this type of conservation can be debated.

PERCEPTIONS TO CBC IN NEPAL

Previous studies have shown that residents in general are favorable of community based conservation projects in Nepal (Karanth and Nepal 2012; Silwal et al. 2017). Residents in Northern Nepal have been found to have positive perceptions to conservation projects, despite the high rates of wildlife predation on livestock, even when compared to attitudes in other CBC programs in other parts of Nepal (Mehta and Heinen 2001). This has been explained as the result of the various community building programs that the ACAP runs, as well as the personal ownership residents have claimed to have felt.

Conservation efforts often come at a high cost for rural, subsistence-based communities in developing countries. Protected areas often arise as a resource only the wealthy and privileged are allowed to access. This in turn, has been shown to lead to resentment on local part, and high traffic protected areas often report reduced biodiversity (Bowen-Jones 2012; Vaccaro, Beltran, and Paquet 2013)

In a different study, 46% of respondents reported receiving some form of benefit from the ACAP. These benefits included cleanup, garbage control, sanitation management, bridge construction, and access to drinking water (Spiteri and Nepal 2008). The same study showed that 44% of surveyed households reported receiving some benefit from the added tourism that the ACAP brought. Findings also suggested an appreciation of the intrinsic values of conservation. Furthermore, residents reported an equal distribution of benefits spatially; no distinction between benefits received was reported in groups of different ethnicities. However, in the decision-making process and participatory processes marginalized groups were found to be more inactive.

Similarly, in another study, few locals in Lower Mustang claimed to have directly received an income from tourism (14%) (Bajracharya, Furley, and Newton 2006). While locals agreed that there were benefits to conservation, mainly sustained increases in natural resources, locals thought that there were costs, like increased crop damage and (but decreased livestock predation).

TOURISM

Despite the initial push for tourism, even published responses to the opening of the region then were lukewarm (Shackley 1994). Reasons for this included the "proliferation of small enterprise", as well as a worsening of problematic environmental concerns (Shackley 1994).

While seasonal migration is very common in the area, the concept of tourism was really introduced only in 1992, with the comparative mass arrival of tourists (N. K.

Chapagain 2007). This increase in tourism may have ultimately been responsible for the implementation of the Annapurna Conservation Area Project.

Tourism is especially important in the ACA, which is one of the most travelled to region in Nepal. The Lower Mustang region, with its very popular Annapurna circuit attracts many trekkers to Nepal. The Mustang trekking route is also one of the more popular trekking routes in the country – in 2016, there were 3984 trekkers in the region, mostly around the months of October, September and August (Ministry of Culture Tourism and Civil Aviation 2016). The number of tourists to the region has also been increasing every year (K. Thapa et al. 2015). Because of its rich Tibetan Buddhist heritage, Lo Manthang also receives tourists interested in cultural artifacts.

The Lo Manthang area is more restricted; currently, for non Nepalis, access to the region costs $500 for a ten day stay, with each additional day costing 50$. Sixty percent of these fees go directly to ACAP for distribution amongst communities.

Locals in the Mustang region mainly benefit from tourism by providing services, including room, board, transportation, and guide and porter services. Tourism has also led to a burgeoning cottage industry and handicraft market.

The benefits of tourism are mixed; environmentally, tourism was found to negatively impact forest extent in Lower Mustang, but positively affect it in Upper Mustang (i.e., Upper Mustang had bigger forests closer to tourist centers than Lower Mustang). The authors of this spatial analysis also suggest that proximity to tourist centers in Lower Mustang has led to increased access to larger markets, which may cause more deforestation (Chaplin and Brabyn 2013).

The seasonality of tourism, and livelihood pressures, have caused deforestation around the areas of Lo Manthang. The development of trails, lodging, and public infrastructure have altered wildlife habitats and ecosystems (Nepal 2007). Demand for firewood in lodges in Lower Mustang were ten times higher than farming households (Nepal 2008). It must be noted however, that deforestation and soil erosion were problems in the region even before tourism, because of local livelihood pressures.

ETHNICITY, GENDER, AND MARGINALIZATION

Marginalization based on ethnicity and gender is commonplace in Nepal. Nepal's natural resource policy is alternatively considered progressive yet marginalizing.

CBC and CF efforts attempt to address these socio-economic and ecological limitations. Management initiatives now attempt to distribute benefits to local communities, benefits like social access, agricultural improvements, and tourism revenue.

Despite this, even well-designed conservation efforts may result in unequal sharing of benefits and an unequal distribution of costs. Groups and individuals with higher social statuses may be best positioned to benefit the most, at the expense of the most marginalized groups. This inequality may be exacerbated by climate change too.

The entire ACAP region is regarded as one of the most culturally diverse regions in the world (Nepal 2007). Contrary to expectations, previous research, however, has shown that traditionally marginalized ethnic groups have had some success in holding official positions in the ACA region. Gurungs, the predominant ethnicity in the region (and traditionally considered on a lower caste tier) have held higher positions in local governance and implementation of project activities, as well as have more favorable

attitudes to project activities (Spiteri and Nepal 2008). Whilst this phenomena may be spatially related, in regards to favored tourist destinations, the project seems to have successfully incorporated the public decision making processes. However, some research has been shown that in VDCs with a Hindu majority population perceive themselves as receiving fewer benefits from the ACAP.

Women in these conservation areas, and elsewhere in Nepal for that matter, are often involved in a range of economic activities that may not seem to contribute to project management, like collection of fuel, agriculture, animal husbandry, and food processing (Allendorf and Allendorf 2012). Based on the findings of this research, it can be assumed that women may have a greater sense of responsibility regarding resource extraction in protected areas, yet still (when asked) claimed to know less than they did. More seminal studies report that women's participation in conservation projects was marginal. The ACAP has attempted to improve women participation by providing adult literacy classes, as well as forming women specific institutions like "mother's groups" (which is quite common in other VDCs in other parts of Nepal). Upper Mustang, as of 2016, had 15 women's groups (G. J. Thapa and Sherchan 2016). However, in studies in Lower Mustang, women involvement in local governance was lower than men (52% vs 84% for involvement in more than one governance group) (Dahal and Schuett 2014). Women involvement was seen as customary more than influential, this was something I had seen in previous research too (Mishra et al. 2017). Dalits, a historically marginalized group in Nepal were also less informed about governance issues despite almost equal participation. Participation in governance is also harder for less-economically stable members of local populations.

In some research conducted on tigers in Southern Nepal, found that marginalized people and less educated people had worse perceptions of tigers (Carter et al. 2014). This can be traced back to the greater reliance on ecosystem services by marginalized people.

CHAPTER III

METHODS

The outcome of this comparative study on perceptions was to produce some insight on potential combinations of factors that could lead to a positive perception of carnivores.

Data collection was mainly collected through Focus Group Discussions and interviews with respondents who lived around the city of Lo. Survey design was done in accordance to various previous studies on human wildlife conflict, and included questions on livestock, mitigation measures, knowledge on policy, physical interactions, and other potential external factors to gauge respondent knowledge and attitude regarding carnivores (Ausband et al. 2014; FitzGibbon and Jones 2006; Karanth and Nepal 2012; Rich et al. 2013)

Qualitative Comparative Analysis (QCA) was used as a method of statistical analysis, because of the small sample size of the study, as well as QCA's ability to "provide a middle ground between case studies and statistical analyses" (Jordan 2012; Mishra et al. 2017). QCA allows a systematic comparison of a large number of potential cases, while addressing and accounting for large within- case complexity(Legewie 2013). QCA, then, with the correct parameters, can identify the various pathways (one or more condition(s) or their combination(s) – that are necessary or sufficient for a certain outcome to occur. An important outcome in QCA is the calculation of a model that defines the singular or multiple outcome(s) of interest, and the prevailing conditions that may be relevant to the production of this outcome (Roig-Tierno, Gonzalez-Cruz, and Llopis-Martinez 2017; C. Q. Schneider and Grofman 2006).

QCA is recently becoming more and more accepted as a method for understanding case based research in the social sciences. Some recent informative studies include examinations of governance strategies in support of biodiversity and ecosystem services (Kenward et al. 2011), social mentions and branding (Capatina et al. 2017), and design rules for successful government payments for ecosystem services (Meyer et al. 2015).

Data was collected at the community level on indicators of a favorable conservation outcome and the multiple conditions hypothesized to explain these outcomes. The choice of conditions to use and analyze is a combination of theoretical premises (from secondary sources) and the empirical data collected.

QCA uses set-relational theory to determine how 'in' or 'out' of an outcome set the computed factors are, instead of covariation (Ragin 2007; Zschoch, Ragin, and Rihouz 2011). QCA also relies on pre-existing complex causality in its calculations, hence its applicability to issues in the social sciences.

QCA mainly differs from mainstream quantitative methods in this; its focus on causal complexity. QCA regards the absence of presence of a factor in determining the absence of/ or presence of an outcome (Kruijf 2018). Furthermore, unlike traditional statistical techniques, QCA eschews additivity in its analysis, and allows for the possibility of separate factors leading to single outcome(s) simultaneously (Hudson and Kühner 2013).

Crucial to QCA, and fundamental to its premise, is the construction of individual scales of data, and the allocation of responses to a set of membership. Unlike other statistical methods, these scales are based on empirical data, but are valued subjectively

(based on the empirical data), and recalibrating scales at various points in the analysis process is not only assumed but also expected (Roig-Tierno, Gonzalez-Cruz, and Llopis-Martinez 2017). In the sets for this data, the qualitative data collected was transformed into a set where a value of 0 implied no membership (full exclusion), 0.33 and 0.66 implied a progressively higher degree of partial membership, and 1 implied full membership (full inclusion).

Data collected for QCA purposes has to be calibrated to either 'crisp' or 'fuzzy' sets. Crisp data refers to data with more precise boundaries separating differences, while fuzzy data refers to data with more subjective boundaries regarding membership in the outcome sets. (C. Schneider and Wagemann 2010; Schwerpunkt, Goethe-universit, and Fachbereich 2013)The data collected for this study may be calibrated to fuzzy sets, because of the minute differences in how in or out of a set the conditions and outcomes are. Hence, the scales can be decided as 0 for being completely out, 0.33 for somewhat in more out, 0.66 for somewhat out, more in, and 1 for being completely in. Once data is collected and calibrated, it will be cross-referenced and triangulated with secondary sources to finalize the parameters of fit. This stage may also require aggregation of variables into larger variable conditions that can then be set as the conditions for specific outcomes. The mean was accepted as an acceptable aggregatory statistic because responses were not correlated (in this case, all interactions had completely different people).

The outcomes determined from this study will be instrumental in changing the design and implementation of conservation policy and programs in rural areas. Hopefully, the results from this study and similar studies will influence policy makers to

focus and redirect resources to factors found to be more impactful. A focus on context-specific factors at the community level may allow local participants to feel more involved in the conservation process as well.

Using this methodology will allow a deconstruction of the various factors that may have led to a good program and good perceptions to carnivores. This study may also highlight the disconnect between factors previously assumed to be important and outcomes.

Data analysis was done in R, using various packages. The R QCApro package allows for QCA analysis. Some sources were found to be particularly helpful (Alrik, Baumgartner, and Dusa 2018; Dusa 2018; Thiem and Dusa 2013; Thomann et al. 2017; Wittwer 2018).

The outcomes of this study were to measure perceptions to carnivores. Perceptions were divided into 6 main categories, based on the data collected.

Variable	Question asked	Scale Explanation
P_ATTITUDE	Would you be interested in working towards conserving and cohabiting with carnivores?	1- Yes, I am interested 0.66 – Yes, but only if I have too, or if I have access to any resources 0.33 – No, I do not have the time or the resources 0 – No, not at all
P_PREDATION	How do you think livestock predation should be handled?	0- More methods needed, lethal 0.33 – More methods needed, non-lethal 0.66– No new methods needed, better implementation of old methods 1 – No change needed in current predation handling
P_ATTACK_RIGHT	Do you think that carnivores that pose a threat to livelihoods have a right to live?	1- Yes, completely 0.66 – Yes, however we must find a way to decrease predation 0.33 – No, we must find a way to decrease predation and lethal methods might be necessary 0 – No, carnivores in this area are huge threats to our livelihoods
P_HW_ECOSYSTEM	What effects do you think wolves have on their prey species populations and the ecosystem?	1- Wolves contribute to the ecosystem by controlling prey species 0.66 – Lack of wolves is "bad" for our environment. 0.33 – Wolves have contributed to the death of many local species and this will continue 0 – Wolves kill everything they find on sight, very bad
P_PI_CARNIVORE	If you saw a carnivore in the wild how would you react?	1- wonder, amazement 0.66 – Appreciation 0.33 – Fear, I would try to get away 0 – Fear, would chase it away (active removal)
P_SL_ECOSYSTEM	What effects do you think Snow Leopards have on their prey species populations and the ecosystem?	1- Snow Leopards contribute to the ecosystem by controlling prey species 0.66 – Lack of Snow Leopards is bad for our environment. 0.33 – Snow Leopards have contributed to the death of many local species and this will continue 0 – Snow Leopards kill everything they find on sight, very "bad"

A survey was designed which questioned respondents directly on these outcomes, but also had a more extensive list of possible factors (61 factors). These variables were categorized into headings for ease of explanation.

Factor Variable	Explanations
Physical Interactions (PI)	Included questions on frequency of sightings of carnivores and their signs,
Knowledge (K)	Included questions on knowledge of predator signs and population trends, prey species, current laws, mitigation methods
Livestock (L)	Included questions on livestock richness, ownership, and shelter
External Factors (E)	Included questions on socio-cultural artifacts and external institutions

An example of some of the questions asked follows.

Corresponding variable	PI_HW_Wild	PI_SL_Wild	K_Prey_Species	K_Predation	K_Carnivore_Signs	L_Richness	L_Number	L_Shelter	L_Name	L_Commercial	L_Dogs	M_Tradition	M_Tourism	M_SL_Religion	M_HW_Medical	M_HW_Story	M_Ext_Project	M_Ext_Government
Questions	Have you ever seen a wolf in the wild?	Have you ever seen a snow leopard in the wild?	Could you name some wild animals that the wild animals here eat?	Which carnivores do you think cause the most predation?	What wildlife signs can you identify?	Livestock 'richness' present- # of species kept	How many livestock do you own?	Where do you keep your lviestock overnight?	Do you name your livestock? How do you recognize them?	Do you sell your animal products to any corporations? Or, do you sell animals in bulk to anyone?	Do you use dogs to guard your livestock?	Are there any traditional rules, regulations and norms governing the use and mangagement of natural resources?	Do you think carnivore presence positively affects tourism?	Do snow leopards have a religious signifcance?	Do wolf parts have a medical signifcance?	Do you remember any stories your elders told you about wolves? Do you remember studying about wolves in school [when you were younger]?	Do you trust wildlife project managers to make the best decisions for your livelihoods?	D you trust governmnt officials here make best decisions that balance your needs with wildlife conversation?

It was assumed that the higher the PI, K, L, and P factors (i.e., more sets with scores more inclusive) would result in a higher (i.e. better) perception of carnivores.

CHAPTER IV

RESULTS

Questions were asked specifically about two carnivores, Snow Leopards and Himalayan Wolves, based on them being the carnivores most interacted with by respondents. In total, 23 interactions were held over the time period, with 4 in the settlements of Chumjung and Chhoser, 3 in Samdzong, Nyamdo, and Namgyal, and two each in Thingar, Phuwa and Kimaling. Average interaction size was with 3.3 people, and a total of 77 people were talked to. The gender breakdown of respondents was 54 females and 23 males. The furthest community from Lo in which surveys was conducted was in Samdzong. Chhoser was the largest settlement in which surveys were conducted.

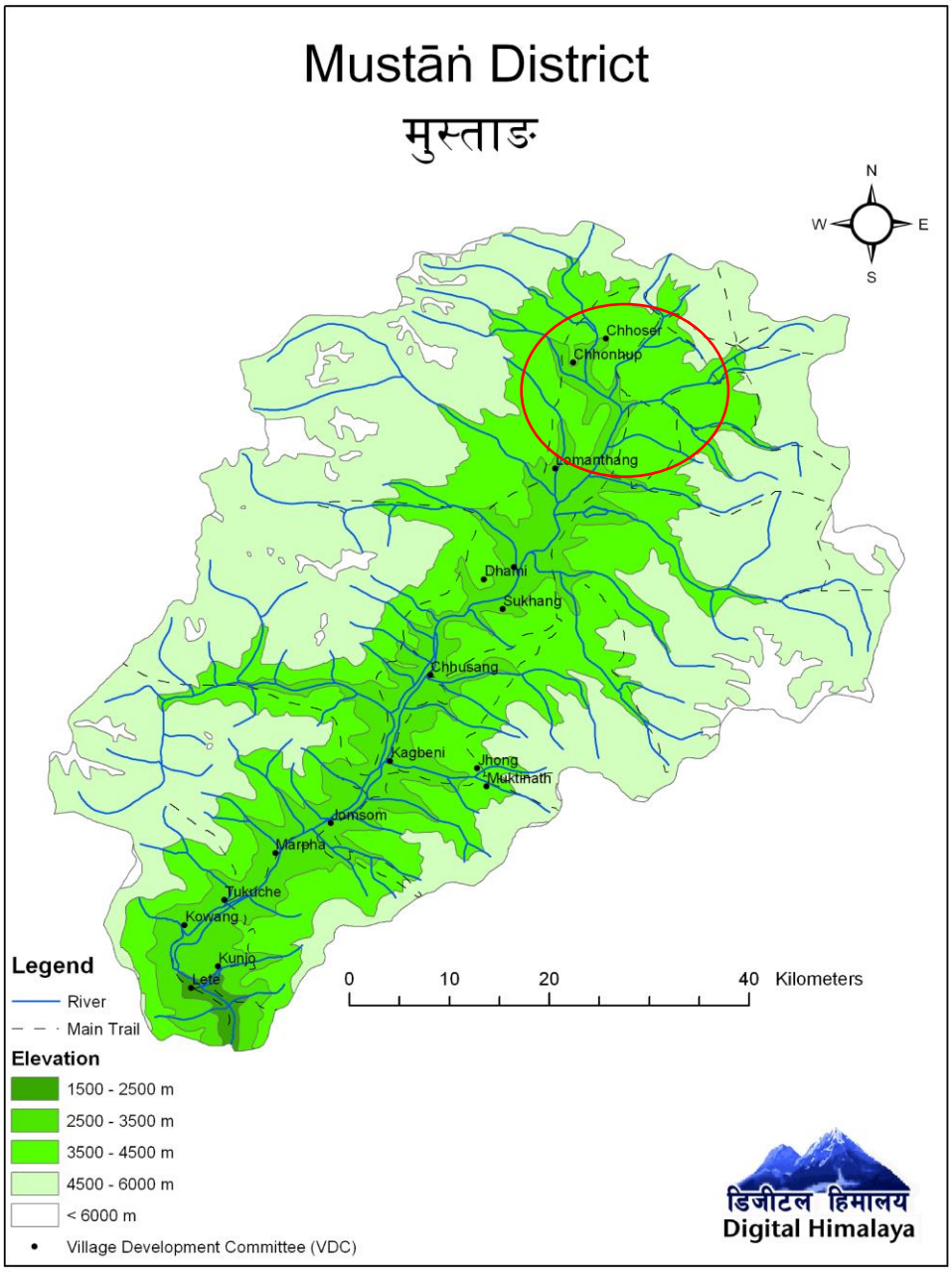
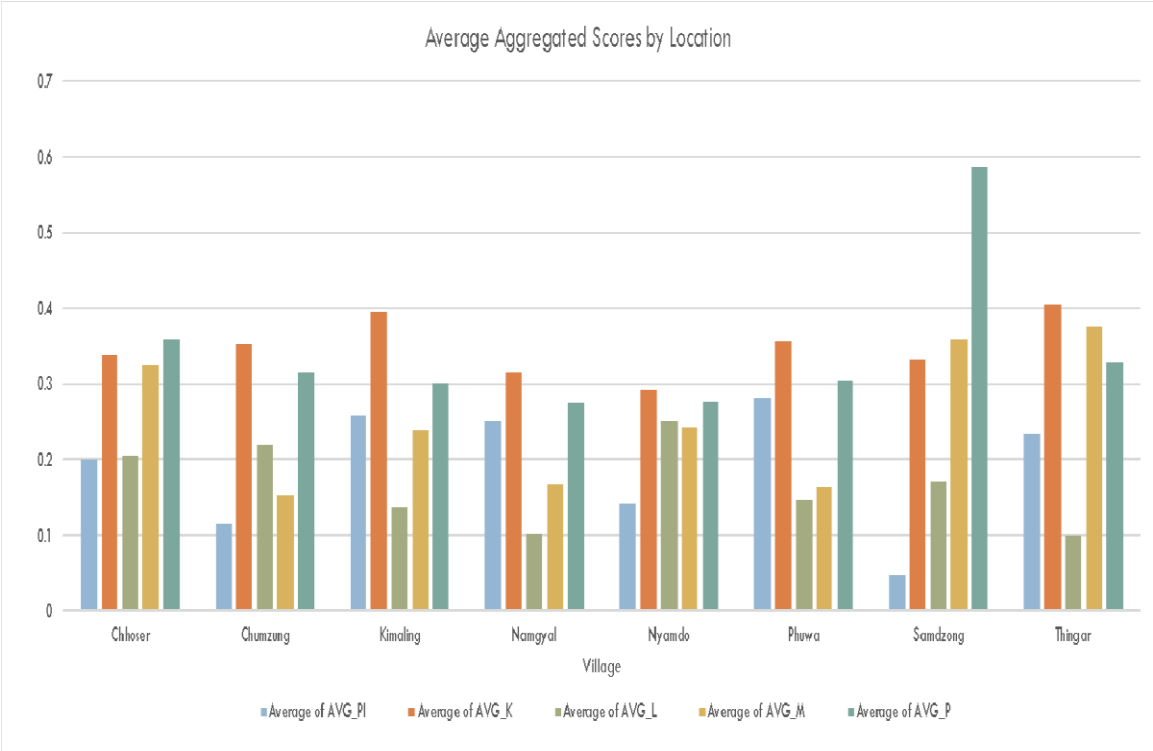


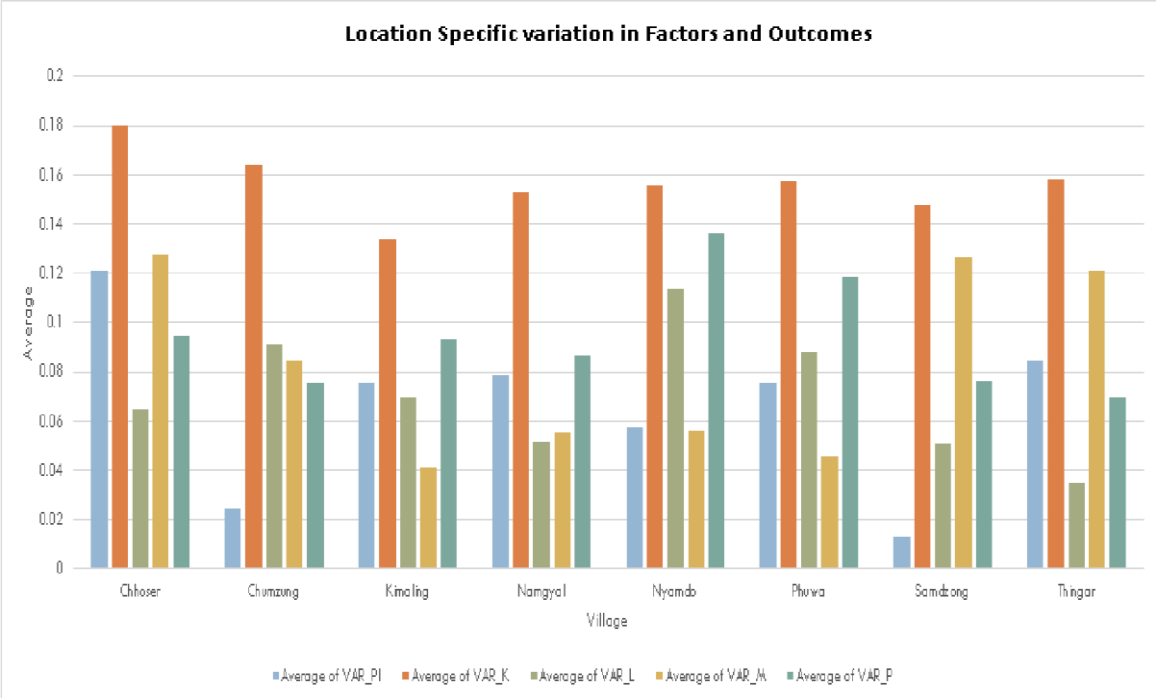
Figure 3: Approximate Study Area

Examining average aggregate scores was helpful in triangulating field observations and collected data. The scores were all reported on a scaled of 0-1, where 0 was assumed to be the most negative perception to carnivores, and 1 the most positive.



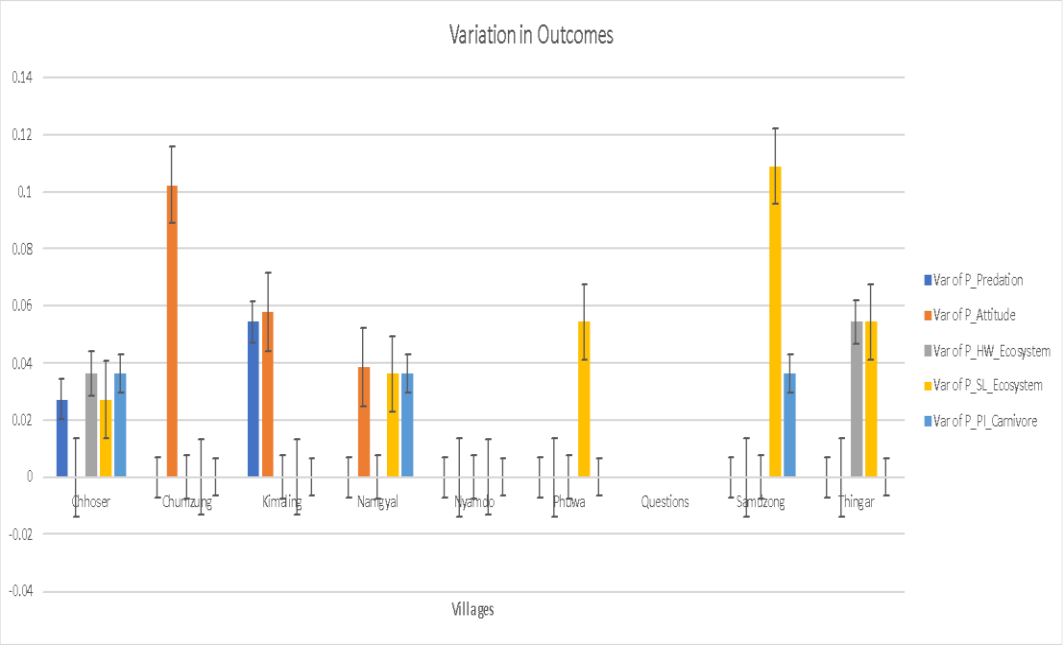
When comparing average responses to all questions (figure above), Chumzung, and Samdzong had the highest rates of physical interactions with carnivores (lowest average scores), followed by Nyamdo and Thingar. Surprisingly though, Samdzong also had the highest scores on average perception scores– implying that locals there had the best perception of carnivores. All villages' average livestock scores were below 0.33; using the scale described above, all the responses implied the worst perception towards carnivores based on livestock indices.

On average, most people had a somewhat negative perceptions of carnivores. Only communities in Namgyal and Nyamdo, however, had interactions were respondents were in favor of lethal measures (<0.33). Average Knowledge scores (orange) and livestock corroborate this finding, particularly in the case of Nyamdo.

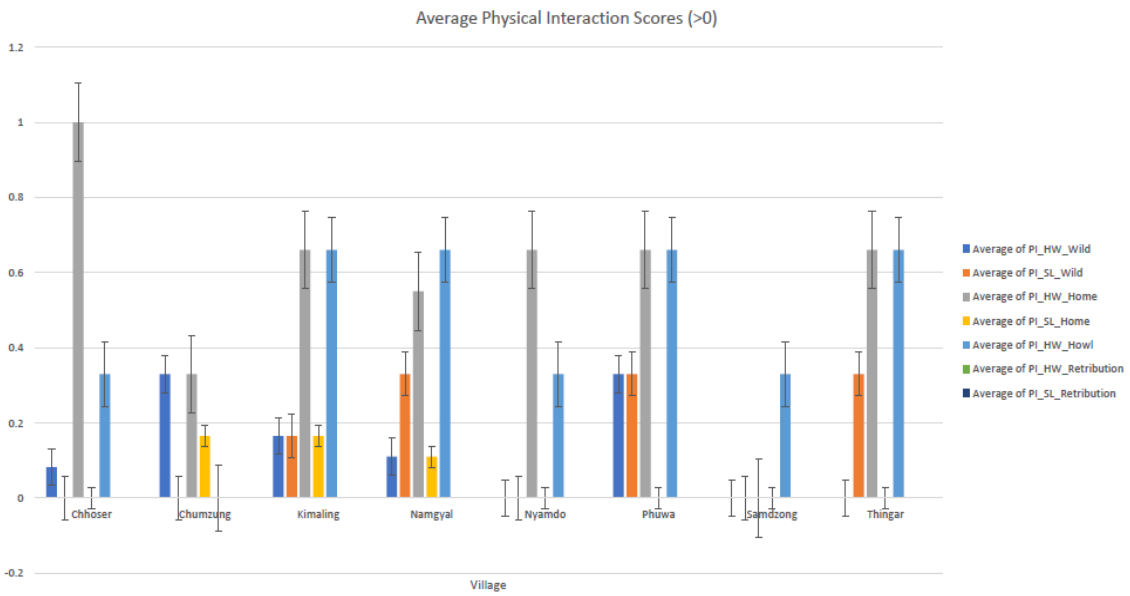


Examining the variance in all answers was informative. The variation in Physical Interaction scores was least across all communities. The variation, however, in knowledge factors was highest in each village, across all villages, so the previous finding that most residents were completely knowledgeable about carnivores should be treated with caution. Samdzong had the lowest variation in physical interaction scores, implying that most (all in this case) sampled respondents had interacted with both carnivores frequently. Nyamdo, where residents on average were all in favor of lethal measures, also exhibited the highest variation in responses to factor questions. Residents in Chhoser had

the highest variation in terms of aggregate perceptions (outcome), followed by Kimaling and Samdzong.



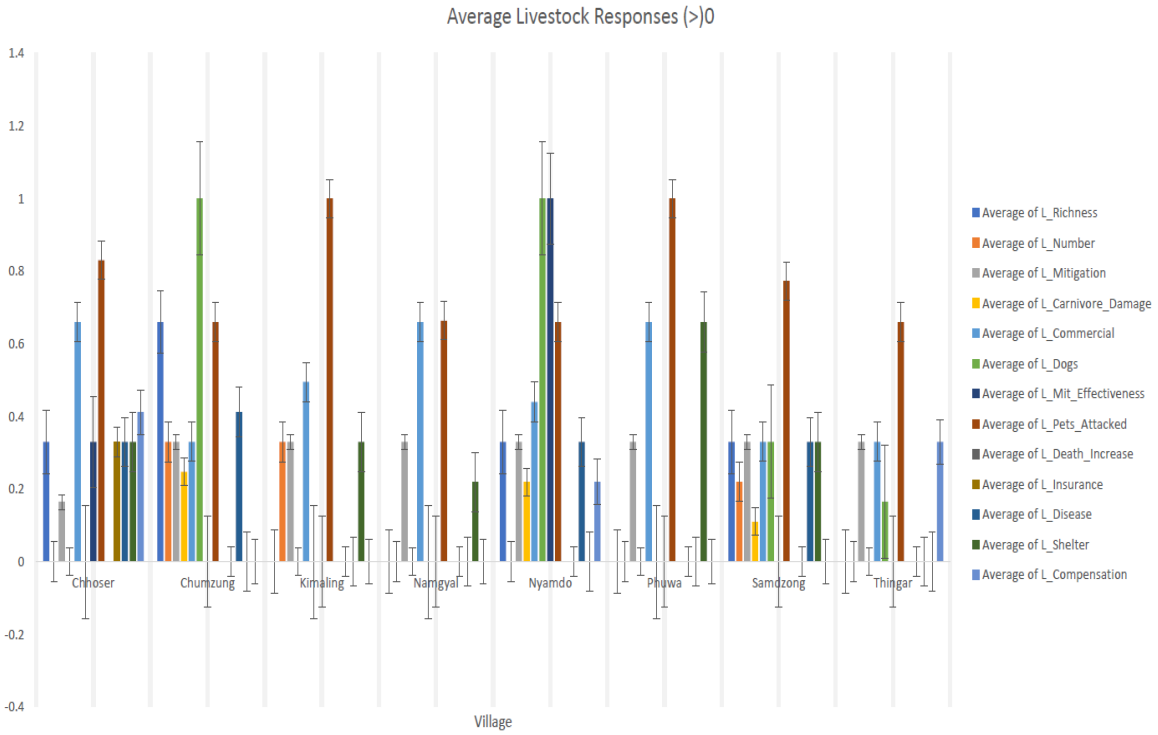
Examining within case variations in responses to outcome questions can be informative too. The least variation in responses to the 6 questions asked regarding perceptions was found in residents in Nyamdo and Phuwa. The greatest variation was seen in responses to knowledge on snow leopard ecosystems; respondents knew about this the least.



The figure shows a breakdown of the responses to questions regarding physical interactions. As seen, Samdzong scored 0 in all of these factors, save the frequency with which residents heard wolves howling, implying that Samdzong had a maximum of physical interactions with carnivores. Chosser was the only community where residents had never seen wolves in their neighbourhoods, but none of the communities save those in Samdzong had seen wolves in their neighborhood in the prior two years. Conversely, all locals had seen snow leopards in their neighbourhoods, and within the last month. All locals claimed that if a predation was witnessed or found, apart from trying to scare away the predator (with limited success), there were no other recourses taken.

As mentioned before, all respondents had high interactions with carnivores, whether those interactions were visual or auditory. There was no variation in questions

regarding retaliatory measures taken by locals. No locals anywhere did this.

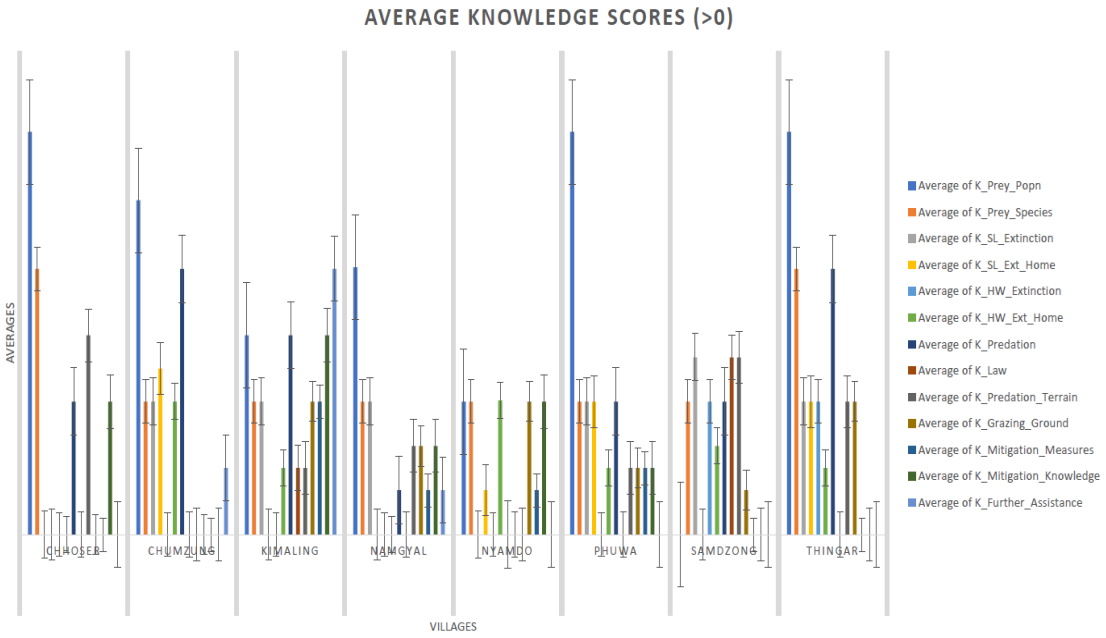


The figure above displays the responses to questions on livestock, excluding variables for which there was no variation in responses. In this case, there were 6 such variables- livestock name, difficulty of rearing livestock, increase in livestock death and increase in carnivore damages. For all of these results, answers were in the extreme for perceptions – no respondents named their livestock, while all of them said their difficulties and damages were increasing, and they would choose another profession if possible. Similarly, all respondents had lost livestock to carnivores.

In general, most of the villages surveyed had a high number and diversity in livestock. Livestock species included *chyangra* (goats) at the highest proportion, along with sheep and cows, followed by yaks and horses. This is probably because of the high

costs of yaks and horses. Similarly, most respondents' livestock suffered from various ailments and diseases.

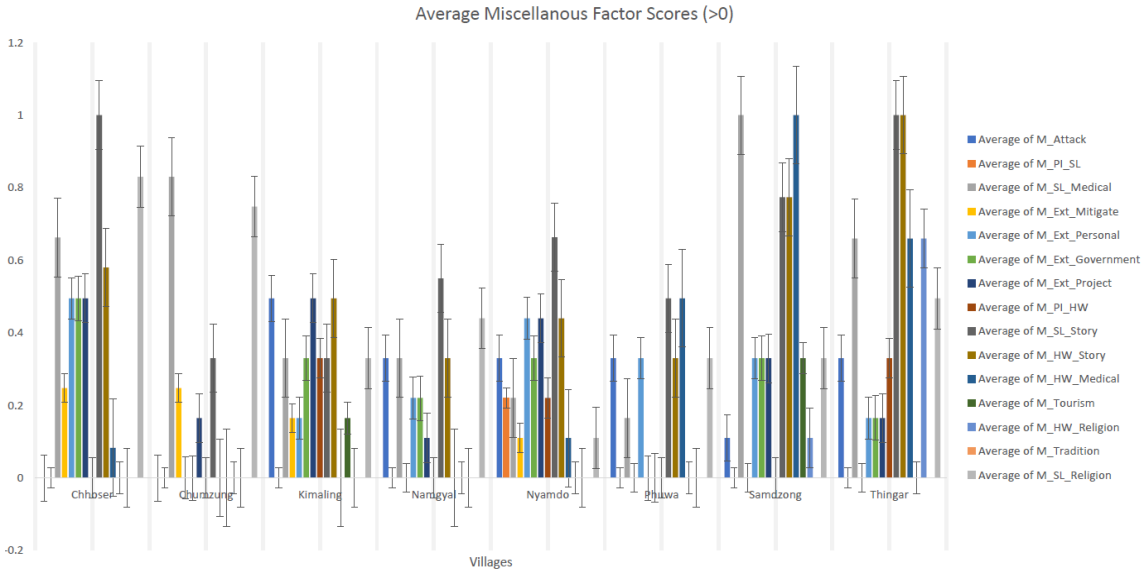
Scores of Livestock mitigation employed were also lower on average. The measures most commonly implemented were penning wildlife, with guardians present in the same pen overnight. One community had predator lights. As mentioned before, these measures seemed quite unsuccessful.



The figure above shows responses to knowledge group questions, and also excludes variables for which there was no variation in responses. In this case, there were more variables excluded than for livestock – residents were all aware of laws and the mediums by which knowledge was disseminated. Residents were all also interested in learning new methods for conservation, but wanted further assistance in mitigating conflict. Most residents, were well aware of various mitigation strategies and employed

them too. As mentioned before, all residents could differentiate between carnivore footprints and claimed to be able to visually identify predators.

Knowledge of prey species was on average low in all communities except those in Chosser and Thingar. Residents in Samdzong, but also Chumjung, Nyamdo, and Kimaling believed that prey populations were increasing, but that this was also causing an increase in predator populations and predation. Residents in all villages except Samdzong (and Kimaling) could identify predation hotspots, but residents in both these places, as well as those in Chhoser, Nyamdo, Namgyal and Phuwa felt that they had no alternative but to graze in these hotspots.



The variables excluded in this figure, (which looks at external factors possibly affecting perceptions) were generally in questions regarding snow leopards, as well as responses regarding traditional natural resource management. Surprisingly, and despite findings from the literature review, local were not able to identify any management

approaches they had devised and used themselves to combat resource scarcity. There were also no traditional norms governing natural resources – this was unexpected, and more inquiry may have been necessary, particularly given, again, the prevalence of minority of ethnic groups in Upper Mustang, as well as the pseudo demonic traits snow leopards were attributed to have.

Many residents reported believing that the snow leopard was a supernatural being or endowed with super natural powers. These stories were varied- the most common story heard was that snow leopards only drank the blood of their prey, and could be killed only when they were under a blood induced stupor. Another, less common one was about how snow leopards were reincarnations of angered gods or demons.

All residents in all samples, except Chhoser, had a dim view of officials in ACAP, and government officials. Residents in Chumjung, Kimaling, Namgyal and Thingar in particular believed that their coexistence needs were not being met well.

Respondents in all samples said they felt fear when seeing snow leopards or wolves in the wild. There was very little variance in the importance of carnivores in bringing in tourism to the region – most respondents believed that carnivores had minimal impact on tourism in the region, instead, attributing tourism to the landscapes and religious artifacts in the region. One interesting response was when a respondent sardonically mentioned how the carnivores attracted researchers that brought very little revenue to the little economy. Also, there was a high variance on whether respondents had heard stories about wolves and snow leopards, and in religious or medical significance to both the carnivores.

There was some variation on how often residents worried about attacks, with residents in Chhoser and Samdzong living in almost daily fear of attacks on their livestock. Residents in all samples, except Chhoser, had a dim view of officials in ACAP, and government officials. Residents in Chumjung, Kimaling, Namgyal and Thingar in particular believed that their coexistence needs were not being met well.

The QCA and QCApro packages in R were able to calculate certain configurations and models of factors based on data collected. It should be noted that many configurations were dropped because of very low consistency and coverage scores.

Table 1: Configuration Results (Note: italicized = Negation).

Outcome	Configuration	Cov.	Cons.	Case(s)
Future Attitudes	l richness + l carnivore damage	0.966	0.888	
	l richness + l carnivore damage*M SL RELIGION	0.865	0.908	All
Wolf Ecosystem Effect	K HW EXTINCTION + (K LAW)	0.667	0.750	
	k prey species*K PREDATION TERRAIN	0.889	0.531	Samdzong
	k prey popn*K PREDATION TERRAIN	0.667	0.600	
Lethal Measures	M HW RELIGION*M SL MEDICAL*M HW STORY + (m sl story*M EXT PROJECT + M SL RELIGION*m hw religion*M SL MEDICAL)	0.955	0.615	Nyamdo,
	m hw religion*M SL MEDICAL*M HW STORY + (m sl story*M EXT PROJECT + M SL RELIGION*M SL MEDICAL*m hw medical)	0.955	0.615	Chumzung,
	m hw religion*M SL MEDICAL*M HW STORY + (M EXT PROJECT*m ext government + M SL RELIGION*m hw religion*M SL MEDICAL)	0.955	0.597	Kimaling,
	m hw religion*M SL MEDICAL*M HW STORY + (M EXT PROJECT*m ext government + M SL RELIGION*M SL MEDICAL*m hw medical)	0.955	0.597	Chhoser
	K LAW + L DOGS	0.682	0.551	
Future Interactions	L RICHNESS + m sl religion	1	0.384	All
	PI HW HOWL + (M SL RELIGION*M SL MEDICAL + m hw medical*m ext government)	1	0.442	*Samdzong*
	PI HW HOWL + (m sl medical*m ext government + M SL MEDICAL*m hw medical)	1	0.453	*Samdzong*
	PI HW HOWL + (M SL MEDICAL*m hw medical + m hw medical*m ext government)	1	0.433	*Samdzong*

Respondents' future desire to work towards cohabitation was affected by number of livestock owned, and knowledge on carnivores, but also on ethnographic perceptions

of the snow leopard. Interestingly, the ability to distinguish which carnivore caused most predation was found to be a factor as well.

Knowledge of wolves' effect on ecosystems based on knowledge of the law, or knowledge on local wolf populations trends. It could also be based on knowledge of predation hotspots and knowledge and prey (preference and population) trends

Factors resulting in use of lethal measures include a combination of some intangible artifact factors and ethnographic perceptions (religious, cultural, or anecdotal). Knowledge of natural resource law, and the use of dogs in mitigation was also found to be important.

Frequency of hearing a wolf and a recognized presence of external agencies operating in the area was also found to be a condition in some models explaining future interactions with carnivores.

CHAPTER V

DISCUSSIONS AND FIELD OBSERVATIONS

The single largest finding I would say I found was just how much interaction people had with predators. Even given the proximity to a small town, all respondents to surveys had seen snow leopards or wolves quite often. All respondents claimed to recognize and differentiate between snow leopard and wolf foot prints. The physical interaction aggregate was the highest response across the four aggregate variables.

Predators were universally disliked. Residents identified a few carnivores apart from wolves – lynxes, bears, foxes, but the most common predators were by far (according to all local responses) snow leopards and wolves. Locals also thought the number of predators were increasing. Both, snow leopards and wolves were reported to universally prefer goats over bigger livestock. Locals also made a distinction between birds of prey, and carrion birds – vultures have a cultural significance in Transhimalayan Buddhist communities because of their role in sky burials.

The second finding for me was the importance of livestock. Life for rural agropastoralists is hard, and given the small economy of the region, lack of arable land, climate, the lack of yearlong road access to larger cities in the south, owning livestock is effectively the most common and important occupation in the region. All respondents in all villages owned some livestock, most commonly goats. About half of them own more than one species, generally cows or horses.

Livestock has multiple purposes. Larger livestock like yaks, horses and mules/donkeys can provide transportation, and also generate revenue by renting them out. Cows provide milk, dung, and were used to till fields. Goats and sheep seemed more

valuable however, because apart from the milk and meat they provide, they are also raised for sale. All respondents claimed to raise livestock for sale – the proportion of the livestock they sold varied more, but half of the respondents claimed to sell up to half of their livestock every year, to individuals from Pokhara, or China. This could be a more recent change, because historically locals in the region mostly had yaks. External demand for goats might have caused a shift in livestock preferences, which, in turn, could have other spillover effects.

Livestock is kept in the same pens throughout the year. The pens I noticed were close to houses in villages, about 10-12 feet tall, and generally open to the sky. The walls were all constructed of rocks, or mud, or a combination of the two. Some of the pens had added 'walls' on top of the built structures, generally wire fences, for added height protection. More enterprising people had even attached cans and other bits of metal for added sound protection.

The landscapes around Lo Manthang also have these livestock shelters even far away from villages, to provide shelter during multi-day grazing trips. These pens were always open to the sky, and generally shorter than their village counterparts. These pens were used communally.

During winter months, when most of the population migrates south, livestock is kept communally, and tended to by the few family that may remain, or locals or migrant workers. A respondent in Kimaling who was from the neighbouring region of Dolpo said it was common for locals to look for such livestock grazing and tending jobs in other villages, and even neighbouring regions.

Predation, particularly in the village occurred more frequently during these months. A distinction was made for wolves, which were reported to attack in the monsoon in five interactions. Snow leopard attacks were more common during the night, and they often enter villages and climb the short walls into livestock pens. All the respondents had lost livestock frequently to snow leopards and wolves; snow leopards, however, had gained notoriety. In contrast, while all respondents had also lost livestock to wolves, these losses never happened within their homes or villages. Wolves were all reported to have attacked when grazing livestock in the hills or plateaus. Locals also said they knew where predation occurred, but could do little to avoid using these identified spots.

In 6 of the 9 villages I went to, residents said a snow leopard had attacked livestock in the last month. Prior to my study, a few years ago, a village south of Lo Manthang recorded an incident where a snow leopard killed 94 goats in one night. Such mass killings were common, though not to that extent. Overnight killings between 7 and 20 goats in the last year were recorded, and many respondents claimed that snow leopards never only killed one animal. In contrast, wolf killings were always reported to be either a single, or two animals at the most. A resident in Chumjung claimed that snow leopards were habitual predators, repeating their attacks on the same pens.

Sentiments regarding snow leopards then, were obviously antagonistic. A respondent in Nyamdo said that “it wasn’t fair that they (snow leopards) can kill ours, but we can’t”. Nyamdo was the only village were respondents were in favor of lethal measures, and that too respondents in all interviews conducted. A local there said he

wanted guns and poison in particular, and that lethal measures would be even more necessary in the future.

The snow leopard was also credited for "always taking the best goats only" by a resident in Chhoser, who went on to incredulously describe how even sleeping in the same pens as livestock (which is also common) has no effect on deterring the snow leopards.

There was one interaction with a key informant in Thingar, in which he used the Nepali word for 'vital' to describe carnivores; this was the only instance in which any semblance to a like for carnivores was expressed.

Many residents also had some alternative views on carnivores. They believed the snow leopard only drinks the blood of the animals it attacks. A resident of Kimaling stated that snow leopards got drunk once they drank the blood of too many animals, and grew lethargic, which was the best time to kill them. All of the villages sampled had at least one interaction where the respondent(s) believed similarly that snow leopards do just drink the blood of their prey.

In all of the villages, some residents believed that snow leopards were not as frightened of women as they were of men. This was not an answer discovered through questioning either, but rather an observation that respondents volunteered themselves. In Samdzong, for example, a woman responded to questions on her feelings on seeing a snow leopard with (paraphrased) "Snow leopards aren't ever scared of women. Even when you walk towards them waving your hands. I was alone when I saw it… I got scared, I cried." A man in Namgyal did have an alternative explanation that because

women on average were smaller built than men, and softer, but this was not a common thought expressed.

There were some interesting historical and cultural stories regarding wolves and snow leopards too. A resident in Chhoser claimed that wolf tongues were used for medicine in Tibet, and that his father knew how to make alcohol with snow leopard innards.

Apart from predations, other difficulties in livestock rearing exist too. All villages had respondents reporting some instances of disease, and there is no vet in the region. This, coupled with the geographical limitations of the place, have undoubtedly resulted in some intangible costs too.

It should be noted that the entire study was conducted within a protected area. Hunting of any of the many species of wildlife here (not just charismatic carnivores, but also marmots, vultures, and ungulate species present) is illegal and punished with fines and imprisonment. Locals were all well informed regarding ACAP laws, and the prohibition of hunting.

Prior to the outlawing of hunting, residents in all villages said that snow leopards that hunted livestock were hunted, though in many of these surveys, locals followed up this statement by saying that not very many used to be killed. A resident in Namgyal told me about a general trend throughout Upper Mustang, where once a ‘problem’ snow leopard was killed, the hunter would wear it’s hide, and go from village to village asking for (and receiving) money for having gotten rid of the problem.

Mitigation methods, though not varying widely in nature, were universally implemented. These, as mentioned before, were generally in the form of open pens, with

added sound deterrents. Respondents had often built these additions, like metal wiring, with funds or donations from (I)NGOs or ACAP, but were unsatisfied with their effectiveness. One respondent had a predator light, but in the past other respondents claimed to have had them but abandoned them – a resident in Chhoser said that they had no effect on snow leopards.

While the use of dogs has been successful in mitigating human wildlife conflict in many parts of the world, this was not entirely the case in this region. In fact, the opposite was the problem. While some pastoralists did use dogs at home to guard their livestock at home, a far bigger concern were the packs of feral dogs that roam the country side, attacking humans and livestock wantonly, and in fact, killing and eating calves and foals on occasion. The occurrence of these packs was interesting – according to some locals, these dogs were pets turned wild when left during the winter months of migration. Regardless of their origins, many respondents claimed they were as harmful as snow leopards or wolves - a resident in Chumjung reported they'd killed more livestock than either of the predators, and were more dangerous because they were accustomed to humans.

According to a 2016 NTNC report, the entire Annapurna conservation area received a total of 281 compensations in the year. Compensation was provided at the rate of Rs. 1500 per horse, and Rs. 1000 for other livestock in Lo Manthang, compared to Rs. 10,000 and and Rs. 2,000 respectively in Jomsom.

What residents were confused about were the compensation schemes regarding predation. Though an official compensation scheme does exist, its implementation seemed patchy – no residents I interacted with claimed to have ever received any

compensation from the government. Residents in Thingar, for example, complained about the compensation being only Rs. 1000, and the process by which it was obtained to be tedious and inappropriate. (ACAP gives compensation (amount varying) based on photographic proof, as well as an official visiting the site. This could often be too late).

Perceptions to the government too, then, were not very positive. A resident in Samdzong stated that "…the government tells us to let snow leopards eat. Tells us keep them happy". While this was an exaggeration, it is a reflection of a common finding – that locals felt that the government was not addressing their needs in their solution to human wildlife conflict. A resident in Phuwa claimed that "there weren't many educated people here", implying that coordination with the government was a challenge too.

It is important to note though, that while they had this poor perception of officiation, residents actually were very friendly with the ACAP liaison, whom I stayed with while conducting my research. He was well liked in the Upper Mustang area, despite the normality of human wildlife conflict and the frustration people felt.

Another important observation, and factor due consideration, were comparisons to China. Residents in Thingar, Nyamdo, and Namgyal believed that China had done a good job in mitigating human wildlife conflict. It should be remembered that geographically, Tibet is much closer to this region than the closest town, Pokhara. Residents said that in China, grazing lands were fenced and delineated, and according to their friends on that side of the border, compensation was regularly provided. This sentiment was recorded, along with other field observations - the few stores present in Lo Manthang all sold a variety of Chinese goods, from solar inverters and blankets, to clothing and food items (including packaged, precooked chicken drumsticks! Because of

the altitude few people had chickens). I noticed a few Chinese motorbikes in the towns too.

While roads have increased access to and development in areas previously untouched, some discussion about them may be warranted. The processes behind which roads are constructed are detrimental to the environment in many ways. The displacement of soil necessary for constructing roads often results in significant air and noise pollution through machinery. The steepness of the inclines in mountains in Nepal, compounded with the loose types of soil result in high rates of landslides.

Roads can also have much further reaching positive and negative impacts. It is safe to assume that every rural area in Nepal wants road access (UNDP 2011). Roads can allow transportation of building materials, allowing the construction of more stable, winter resistant structures. Roads can cut transportation time for students and workers drastically. Roads can be literal life saves; connecting rural villages to health care facilities.

Roads also mean access to new markets. Prices in Lo Manthang were reported to have substantially dropped after access to roads to Pokhara. Lo Manthang also seemed to have a healthy Chinese product economy. What does this do, however, to local products? Roads can improve local access to resources, which in turn, can also change land prices, based on proximity to roads. Roads can bring about replacement in traditional livelihoods too; there is a very illustrative example of this in Mustang. Since road construction, many local residents have stopped the traditional practice of rearing horses (Beazley and Lassoie 2017), preferring cheaper-to-maintain automobiles.

Road construction is often used to employ locals too; this in turn, is sometimes a task that local or international NGOs accomplish. This is yet another insight into the way globalization has touched this area; not only are foreign funds being used, but this could also be symptomatic of the larger problems of neoliberal development work. Cultural heritage work was mainly sponsored by international agencies, resulting in, some researchers felt, the development of apathy in locals (N. K. Chapagain 2007)

Nevertheless, road access is also particularly important to locals here because of local involvement in their construction Starting in 1999, 6 VDCs in Upper Mustang financed the construction of a road from Lo Manthang to the Chinese border 20 km away.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

This study is best assumed to be an introduction to the various complex factors that may cause differences in human perceptions to carnivores, in a rural, agropastoralist population.

Primarily, it would be pertinent to conduct a comparative study of carnivore diets. Such studies have been conducted in the past in Nepal, but conducting one in the region would be beneficial in assessing the true magnitude of damage (Subba 2012).

The ineffectiveness of mitigation measures, particularly the use of dogs, which has been found to be effective in other areas of the world, highlights the need for locally sustainable and successfully mitigation measures.

Similarly, my results also reinforce the importance of the intangibles – how things like childhood stories, and the personification and anthropomorphism of animals may lead to successful conservation initiatives. Physical interactions, in particular how often locals interacted with carnivores, did not have as strong a bearing in future attitudes and willingness to work towards conservation. While this could be because of the high levels of interactions with carnivores already present, this is an interesting find, with even more interesting implications. I would argue that this is emblematic of a rural – urban divide of sorts, though this cannot be known without conducting further studies that compare residents in more urban areas that face these carnivores too.

The importance of community can not be discounted. From the communal nature of livestock tending, to the solidarity in answers found, community strength will have to be something that is developed more, in order to successfully mitigate conflicts.

This study is particularly illuminative of cultural tie ins with wildlife. In order to disseminate these factors more, an in-depth analysis of livelihoods and the Lo Manthang economy would be necessary, as well as an examination of the various tie ins between religion and international development that may have played a role in shaping perceptions.

A more anthropogenic change that can be examined that may be leading to increases in human wildlife conflict is how climate change, or larger market economies are changing livestock husbandry patterns, and potentially making more animals susceptible to predation. The importance of local indigenous knowledge can not be discounted.

Why is devising a framework based on such studies important? I believe the findings from this study will allow policy makers to continue developing the factors found effective in minimizing harmful effects to carnivores and locals: knowledge and tradition. Benevolent, historical perceptions of wildlife are prevalent today, but also under threat. Education pedagogically focusing on preserving indigenous knowledge and traditions could be beneficial in the long run.

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