

Pashmina production and socio-economic changes in the Indian Changthang: Implications for natural resource management

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Abstract

A unique pastoral community uses the arid rangelands of eastern Ladakh, known as Changthang, northern India. The nomadic people rear a variety of livestock such as sheep, goats, horses and yaks, which provide them with various goods and services. Nevertheless, the needs and aspirations of the people are changing. There is a trend towards increasing the livestock population, especially of a breed of goat that produces one of the finest natural fibres: Pashmina, which is the mainstay of their economy. This increase in goat population, however, is jeopardising the long-term survival of the wild herbivores in the region, and as such is not sustainable. We present information on the current trends in socio-economy, Pashmina production, wildlife conservation, and the conflicts of interest between wildlife and nomads in the region. On the basis of this information, we make suggestions for the conservation of natural resources in the region. We recommend preserving the historical societal norms and notions of the people, and capitalising on them to manage natural resources. We also recommend joint management of natural resources by the local people, State and non-governmental organisations. Our findings provide a platform on which a grazing policy for the region may be formulated.

Keywords: Changthang; large herbivores; livestock; cold desert; Trans-Himalaya; Pashmina; CBNRM.

1. Introduction

The *Changthang* region of the Indian Trans-Himalaya is a vast grazing ecosystem (about 22,000 km²) with a unique assemblage of large herbivores (Fox *et al.*, 1991a). The region is populated by *Changpas*, the indigenous people who arrived in the region from Tibet in the eighth century AD (Jina, 1995). Livestock production is the mainstay of the economy of the people in this region, as any other form of land use is less profitable due to the high altitude and aridity. The *Changpas* rear a variety of animals including yaks, sheep, goats and horses. These animals provide innumerable goods and services; *Pashmina* or cashmere wool, produced by a local breed of goat called *Changra*, is the most valuable product (Ahmed, 2004).

The *Changpas* are nomadic pastoralists, and move from pasture to pasture on a seasonal basis, although the system is changing gradually (Namgail *et al.*, 2007a; Namgail *et al.*, in press). They live in yak-hair tents, although people

in recent years have started building concrete houses in more centralised locations with good access to water. Thus, a sedentarisation process is under way in many parts of *Changthang* (Namgail *et al.*, 2007a). This is reinforced by an increasing trend of agriculture being practised relatively intensively. Agriculture necessitates people settling near crop fields, which need to be weeded, irrigated and guarded against domestic and wild ungulates. Furthermore, in some areas people are settling down to provide education for their children, since mobile schools that once operated have become rare because teachers refuse to move with the nomads. These settlements are encouraged by the Government, which finds it easier to supply food provisions and modern health facilities in these easily accessible locations (Bhatnagar *et al.*, 2006b; Namgail *et al.*, 2007a).

Although *Changthang* represents a unique ecosystem in terms of biotic resources (Rawat and Adhikari, 2005), there has been little effort to understand the abundance and distribution patterns of the flora and fauna, and new species are being added to the faunal list (Namgail *et al.*, 2005). Research work on rangeland ecology in the region has just begun (Klimes, 2003; Rawat and Adhikari, 2005; Bhatnagar *et al.*, 2006b; Namgail *et al.*, 2008). Some of these studies have highlighted the precipitous decline in the population of several mountain ungulates and emphasised the precarious

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status of several unique species including the Tibetan argali *Ovis ammon* (about 350 individuals) and Tibetan gazelle *Procapra picticaudata* (<100 individuals; Bhatnagar *et al.*, 2006a; Namgail *et al.*, 2009). Anecdotal information suggests that the wild yak *Bos mutus* (<300 individuals) and Tibetan antelope *Pantholops hodgsoni* (about 200 individuals) are also inching towards local extinction (Namgail, 2009). Many of the mountain ungulates constitute the prey base of highly endangered predators like the snow leopard *Uncia uncia* (Bagchi and Mishra, 2006; Namgail *et al.*, 2007b). Conserving the wild ungulates is thus crucial for the long-term survival of these predators (Fox *et al.*, 1991b).

Excessive grazing by a burgeoning population of livestock (about 200,000), mostly the Pashmina producing goats, has had an impact on the decline of wild ungulates (Namgail *et al.*, 2008). In addition, the nomads of Changthang have witnessed a spate of developmental programmes in recent years, which pose a threat to the long-term survival of the large herbivores. These developmental initiatives are associated with the Government's strategy to encourage the people to stay in these remote areas on the border between India and China. One of the major drawbacks of these programmes, however, is that their execution often ignores the consequences to the fragile environment. The authorities usually lack the necessary information on people's needs and aspirations, land-use patterns and socio-economic status. Hitherto, only a few studies have been carried out on these issues (Chaudhuri, 2000; Ahmed, 2004; Goodall, 2004; Hagalia, 2004; Namgail *et al.*, 2007a). These studies addressed issues ranging from resource use patterns and socio-economic structure to the migrations of people to urban centres. Nevertheless, information on natural resource extraction and its impact on wild animals in these pastoral regions remain rudimentary. Unless such information is made available to policymakers, it will be difficult to formulate rules to manage the rangelands.

Over the years, it has come to light that for successful conservation programmes in the Trans-Himalaya, it is crucial to have the support of the local people that extract natural resources for subsistence (Mishra *et al.*, 2003). At a global scale, several such programmes have proven successful in managing natural resources especially in the developing world (Abensperg-Traun, 2009), despite some drawbacks (see Prins, 1992; Leach *et al.*, 1999). In any case, there are idiosyncrasies among societies and cultures, and one model of natural resource management cannot work everywhere. Many conservation programmes fail because of a lack of understanding of the local administration, production system and social and cultural dynamics. Therefore, it is crucial to have a better grasp of the local setting before initiating any community-based or other conservation programme.

The main objectives of this paper are therefore to understand: 1) the socio-economic structure and

transformation of the people of Changthang; 2) the livestock (Pashmina) production system; 3) the wildlife status and conservation; and 4) the natural resource management system. Drawing on the results of this and our other ecological and conservation studies in the region over the last decade, we suggest ways of integrating the human resource-use patterns into conservation goals.

2. Methods

Changthang is characterised by extreme aridity, high solar radiation and strong winds. The saucer-shaped valleys are located at an average altitude of 4,500 m above sea level. Due to the low precipitation, plant growth is minimal (Rawat and Adhikari, 2005). The growing season is confined to a short period in summer (June–August), and the vegetation is characterised by alpine steppe communities with medium to sparse cover (about 20%). There are no trees except for the willow *Salix* in and around villages. Ladakh was opened to tourists in 1974, but Changthang was opened only twenty years later.

For the purpose of the survey, the Changthang region (Figure 1) was divided into four areas: 1. Rong, 2. Tangtse-Chhushul, 3. Hanle-Kuyul and 4. Kharnak-Korzok. Sixteen villages in these areas were opportunistically visited over a period of four years between January 2004 and July 2008. Whenever a village was visited, the headman, or any other member of the village administration who was well conversant with the village affairs, was interviewed. Apart from the members of the village administration, we also interviewed ordinary people, whenever possible, to confirm the information provided by the headman. They were asked open-ended questions regarding the villages's socio-economic structure, livestock production system, conflicts of interest between wildlife and people, and traditional natural resource management system. A total of 43 individuals from the 16 villages were interviewed. We contacted an additional 15 elderly people to gather information on socio-economic changes. Information on the livestock population and the Government's support to the people for livestock production was gathered from annual reports of the Sheep Husbandry Department, Leh. In addition, representatives from five non-governmental organisations (NGOs) active in Changthang such as the World Wildlife Fund (WWF)-India, Ladakh Ecological Development Group (LEDeG) and Ladakh Environment and Health Organisation (LEHO), were interviewed in June 2008 about their activities in the region.

3. Results and discussion

The Tangtse-Chhushul and Hanle-Kuyul areas are situated close to the border with China (Figure 1). People in both these areas practise agriculture to complement livestock

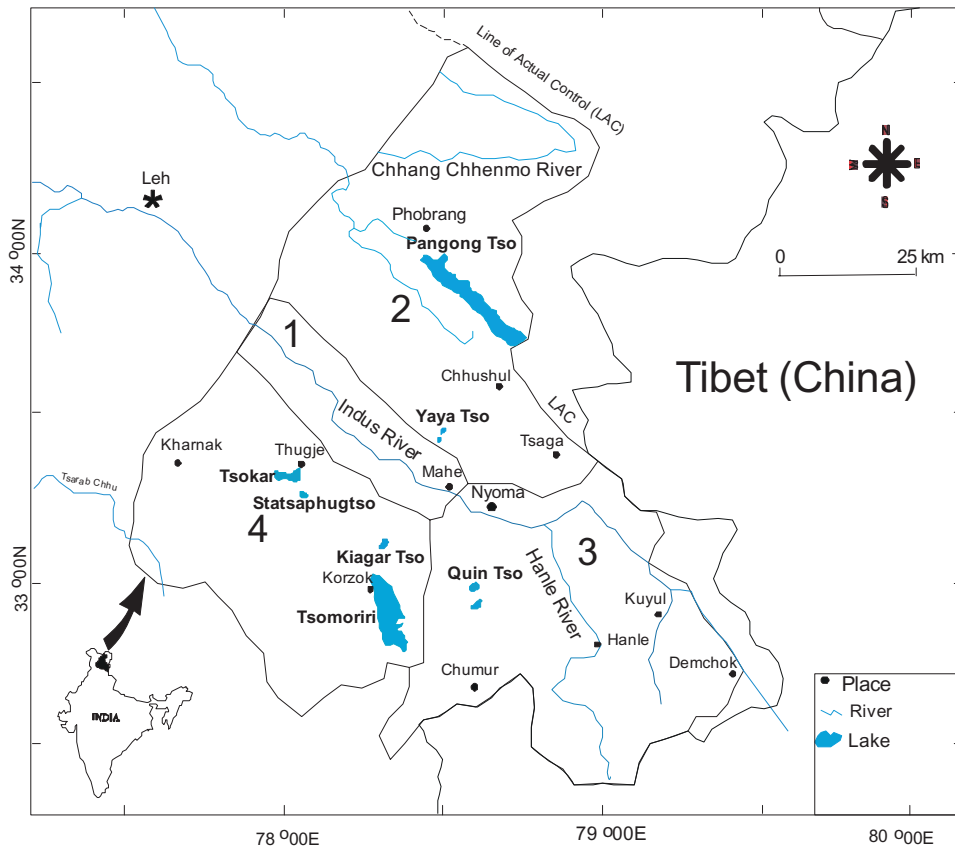


Figure 1. Map of Changthang, Ladakh, showing the four surveyed areas (1 = Rong, 2= Tangtse-Chhushul, 3 = Hanle-Kuyul, 4 = Kharanak-Korzok).
Source: Authors' elaboration.

production. Nevertheless, Pashmina production is the backbone of the economy. Both areas have military outposts at various locations. Some areas of Tangtse-Chhushul are open to tourists, while the Hanle-Kuyul area is out of bounds for foreign tourists, and non-Ladakhi Indian visitors need special permits. The Kharanak-Korzok and Rong areas are situated in the interior areas of Changthang (Figure 1), and see a greater influx of tourists every year. Military camps are largely confined to the Rong area, with a few posts in the Kharanak-Korzok area. People increasingly practise agriculture in the Rong area while only two settlements practise agriculture in the Kharanak-Korzok area, which is thought to be the prime location for Pashmina production in Changthang.

3.1. Socio-cultural milieu

The Changpa people are Buddhists and have a close cultural and linguistic affinity with Tibet. There are thousands of Tibetan refugees in Changthang (75% of the 16 villages surveyed had Tibetan refugees), who fled from China during the Cultural Revolution in that country in the 1950s. The Changpas have a patriarchal society where the eldest son inherits the property from his father. The family is the

basic unit of production. Traditionally, each family sent one son to the monastery to practise celibacy and learn the monastic ways, but this tradition is disappearing. Originally, these traditional social practices helped prevent the subdivision of the scarce land, and perhaps kept the population below the level at which the use of rangeland resources would become unsustainable.

Most of the villages in Changthang have monasteries, especially in their winter settlements. The monks perform rituals on special occasions, and based on the Tibetan astrological predictions they recommend auspicious days for herd movements to different pastures. Changpas live in yak-hair tents, known as *Rebos*, except in their winter settlements where they have one-room structures made of stone and mud. They sometimes indulge in cultural festivals especially during *Losar* (the New Year) where a special dance called *Zhabro* is performed.

3.1.1. Socio-economic transformations

The socio-economy of Changthang is unique, having evolved over centuries without outside influence. This has been changing since the 1970s, however, due to the opening of Ladakh for tourism, the Cultural Revolution in China and the border conflicts between the two countries. With the

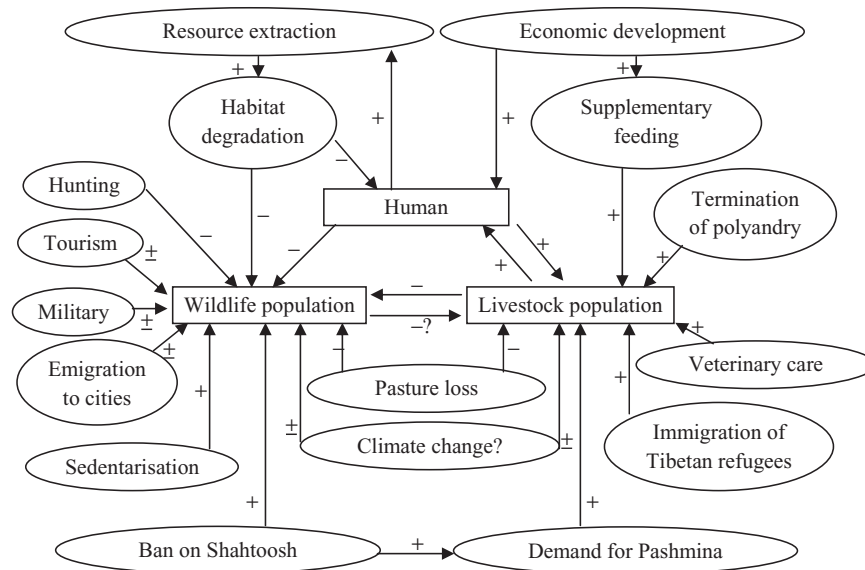


Figure 2. Relationship between wildlife, livestock and human populations and various potential causal factors. A positive sign indicates a positive effect while a negative sign indicates a negative effect, and question mark indicates uncertainty. *Shahtoosh* is natural fibre produced by the wild Tibetan antelope while Pashmina is produced by a breed of domestic goat.

Source: Authors' elaboration.

greater mobility of people due to tourism and military associated infrastructural development, Changpas are increasingly exposed to outside cultures. The social structures of the Changpa people are also changing. For example, the polyandry system, which perhaps served as a population control mechanism in the past, is on the decline. All the elderly people interviewed mentioned that polyandry is diminishing. This is because the younger generation began to regard polyandry as a primitive system. Therefore, more and more nuclear families are forming. This is one of the reasons that the livestock population is increasing (Figure 2), as brothers are holding different herds to sustain their nuclear families.

Changthang's economy has been constantly changing over the last decade (Figure 2). Sixty-two per cent of the respondents related socio-economic change with military presence, while others attributed it to growing tourism (25% of the respondents) and increasing Pashmina production (13% of the respondents). The military established a road network that increased the mobility of the Changpas, exposing them to the outside world, which thus contributed to the changes to their socio-economy. Further, many Changpa nomads are finding it difficult to sustain the nomadic way of life due to scarcity of pastoral resources, and are thus resorting to other livelihoods.

Certainly the needs and aspirations of the people of Changthang are changing as a result of their exposure to the outside world. For instance, the Changpas go to urban areas like Leh, the capital city of Ladakh, and see people using an assortment of modern technologies, such as jeeps, to do the most laborious jobs, and they yearn for and buy such technology. The Government of India is also providing

financial and other support to the people, a strategy to encourage them to stay in these areas to maintain a clear claim on the border areas. This also contributes to the changing socio-economy of the people.

3.1.2. Emigration of Changpas

Many Changpas move to urban centres to look for alternative sources of income. In areas where tourism is flourishing, young people find work as guides, cooks and camp helpers. Many also work in Leh as agricultural labourers, although this trend has been declining as many nomadic people find it difficult to adapt to city life and choose return to nomadic life (Tashi Morup, personal communication, 2008). Migration to urban centres is more common in the Kharnak-Korzok area (Goodall, 2004); there are few reports of people emigrating from the Hanle-Kuyul area. This discrepancy is perhaps due to the tourism industry, since the former area is open to all tourists while the latter is restricted to foreign tourists. Since the tourism industry is growing in Ladakh (Geneletti and Dawa, 2009), this migration pattern may continue in the future, which in fact might benefit wildlife populations in the long run (see Figure 2).

Another reason for the migration of Changpas to urban centres is the poor living conditions in Changthang (Namgail *et al.*, 2007a). Forty-three per cent of the villages surveyed did not have electricity. Drinking water is scarce in some areas. In the summer, people camping near the Leh-Manali highway can often be seen asking for drinking water from truck drivers. Further, the health situation of the Changpas is not on par with that in other parts of Ladakh: often they are attended to only by nurses and orderlies

Table 1. Population trends in domestic livestock in the Leh district including Changthang in two decades (rounded to the nearest 100).

Year	Pashmina goat	Sheep	Cattle	Yak	Dzo/Dzomo	Total
1987	108,900	56,900	23,900	18,500	11,800	220,000
1992	110,900	79,600	24,800	19,900	11,900	247,100
1997	110,300	80,500	27,900	9,300	18,500	246,500
2002	156,500	156,600	37,800	13,300	10,600	374,800
2005	227,400	178,100	33,200	18,900	10,700	468,300

Note: Dzo/dzomo is a male/female hybrid of yak and cow.

Source: Leh Statistics Handbook (2006).

because of the absence of proper healthcare centres. In cases of serious illness, a patient needs to be brought to Leh, located at a distance of about 150 km. The road to Leh passes through mountainous areas making the journey tortuous and long.

The education system in the area is also deplorable. Recently, the Government, with the help of some NGOs, started a residential school, thereby suspending all of the mobile primary schools. This was likely done in response to teachers' refusal to move around with the nomads. Presently, many Changpas lament that the infrastructure at this central school is far worse than was promised (Ishey Gyatso, personal communication). Thus, education for children is another reason for the Changpas' migration to the urban centres.

3.2. Pashmina production

Pashmina or cashmere wool is the economic mainstay of the people of Changthang, as almost 55% of the income is generated by this fibre (Nawang Norbu, personal communication). According to Changpas, the harsh environmental conditions of the region, especially during winter, provide ideal conditions for growing the fibre, although scientific studies suggest that the growth of Pashmina is slowest in mid-winter due to a shortened photoperiod (McGregor, 1998). The quality of the fibre is also determined by the availability of good quality forage such as *Eurotia ceratoides* (Uniyal *et al.*, 2005). The goats are combed once a year, and one animal produces 80 to 250 g of raw Pashmina. The present per annum production of Pashmina from Ladakh is about 35,000 kg, and the international demand for the fibre has grown considerably over the years. Even though people rear sheep that produce wool—but on a much smaller scale—the population of Pashmina goats in Changthang has been rising steadily due to this increased demand and the profitability of Pashmina compared to wool (Table 1).

Historically, the Changpas sold Pashmina to middlemen from Leh, who in turn sold it to traders from Kashmir. Raw Pashmina is processed in Kashmir by dehairing, i.e., separating hair from the underwool. The processed Pashmina is then woven into exquisite shawls, which are exported to markets all over the world. The dehairing is the

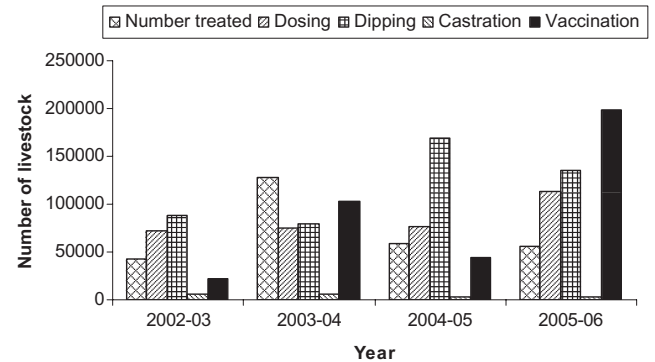


Figure 3. Veterinary services provided to Changpa pastoralists by the Sheep Husbandry Department, Leh. Number treated refers to the number of livestock treated for various diseases like Peste des petits ruminants (PPR) and foot-and-mouth disease.

Source: Sheep Husbandry Department, Leh (2006).

most tedious work in the Pashmina industry, and historically it was done manually in Kashmir. The local government in Ladakh installed a Pashmina dehairing plant at Leh in 2004 (Bhatnagar *et al.*, 2006b). Following this, a Pashmina Growers Marketing Cooperative Society was formed in 1990, which has a representative from each village in Changthang. This society started buying Pashmina in bulk, and the middlemen were thus bypassed, making them less important in the trade. In 2006, about 18,000 kg of Pashmina was dehaired by the plant, far below its capacity of 30,000 kg (Tsering Phuntsog, personal communication). There have been reports that Kashmiri traders are thwarting the effort of the local administration to make the dehairing plant a success. This is largely because the plant jeopardises the livelihood of thousands of Kashmiri workers who make a living by dehairing Pashmina manually.

The Department of Animal Husbandry in Ladakh provides financial and other assistance to the Changpas. For instance, they provide forage and artificial feed for the livestock during severe winters, when the pastures lie under heavy snow. They also provide veterinary services that reduce the mortality of livestock (Figure 3), such as dosing and vaccination, thereby increasing the number of livestock, perhaps beyond the safe stocking rates of the rangelands (Mishra *et al.*, 2001; see Figure 2 for dynamics). The

livestock population of Changthang has nearly doubled in the last two decades (Namgail *et al.*, 2007a), putting unprecedented pressure on the rangelands. Currently, about 200,000 livestock graze on the low productive rangelands of Changthang. In such a scenario, the long-term survival of wild herbivores and the nomadic way of the people is questionable. Recent studies have shown that domestic sheep and goats displace wild herbivores and relegate them to sub-optimal habitats (Namgail *et al.*, 2007c). The increase in livestock population was further precipitated by the influx of Tibetan refugees during the last three decades (Figure 2).

3.3. Status and conservation of wildlife

Changthang harbours a unique assemblage of flora and fauna adapted to the high altitude and cold environment of the region. Nevertheless, the region's biotic resources remain little studied, and information on even large and prominent animals like the wild yak and the Tibetan wild ass *Equus kiang* are lacking, let alone on less prominent ones like pikas *Ochotona* spp. and voles *Alticola* spp. There are large mammals that have recently been added to the faunal list of the region (Namgail *et al.*, 2005). Our recent surveys also revealed that several species of large herbivores such as the Tibetan argali and Tibetan gazelle are on the verge of extinction in India (Bhatnagar *et al.*, 2006a; Namgail *et al.*, 2009).

Competition with domestic livestock is one of the major causes of the decline in the population of large herbivores (Figure 2), as domestic animals not only deplete resources but also physically displace them from more productive habitats, as mentioned earlier (Bagchi *et al.*, 2004; Mishra *et al.*, 2004; Namgail *et al.*, 2007c). This is a cause of concern for conservationists, given that the population of domestic animals is increasing due to the provision of supplementary feed by the Government during inclement weather and the availability of veterinary care (see Figures 2 & 3).

Changthang also harbours a small population of the Tibetan antelope, which is a highly threatened animal, now listed as an "Endangered" species on the IUCN red list of threatened animals (IUCN, 2008) and Schedule I of the Indian Wildlife (Protection) Act 1972. This animal produces *Shahtoosh* (*Shah* means king and *Toosh* is wool in Persian), one of the finest natural fibres in the world. Following the moratorium on Shahtoosh production in India, the Kashmir government encouraged Shahtoosh workers to switch to the allied Pashmina industry in response to protests by the displaced workers against the ban (Riyaz Ahmed, personal communication, 2007). The switching of these workers to the Pashmina industry will lead to an increase in demand for the fibre and thus domestic goat population (see Figure 2), the augmentation of which will be detrimental to the wild herbivores.

Contrary to several reports of the precipitous decline of wildlife populations in recent years (Bhatnagar *et al.*, 2006a; Bhatnagar *et al.*, 2006b), 83% of respondents stated that various wild herbivore populations are increasing. Since people claim that the increased populations of wild ungulates are degrading the pastures, a conflict of interest between wildlife conservationists and the Changpa people has become inevitable. The most problematic wild animal according to the Changpas is the Tibetan wild ass, which devours the pastural resources (Bhatnagar *et al.*, 2006b). Ten of the 16 villages surveyed complained of pasture degradation by wild ass. People believe that the population of this animal has been increasing for a number of reasons, including the termination of hunting for food on the Indian side and the animals' immigration from across the border in China where it is hunted. Nevertheless, given that the populations of wild herbivores are declining (Bhatnagar *et al.*, 2006b), the people's perception of increase in the wild ass population might be a result of the increase in their need for pastureland due to socio-economic changes.

Nevertheless, there are people that are sympathetic towards wildlife. In fact, the societal norms and notions such as religious beliefs have been a major influence on people's attitude towards wildlife in Ladakh. The extent to which socio-religious notions protect wildlife in the region is not easily quantifiable, however. For example, blue sheep populations feed in the courtyard of monasteries in Zangskar (Namgail, 2004). When the rangelands of Changthang were infested with locusts, affecting almost 125,000 sheep and goats (Morup, 2008), many nomadic people resisted using pesticides, at the expense of forage for their livestock, saying that it would harm other sentient beings. Hundreds of people became vegetarian in the last decade in western Ladakh following the preaching of a prominent religious person; as a result, several families gave up livestock rearing for subsistence and relied more on agriculture. Thus, the pastural resources became more available to the wild herbivores. Given these and other examples of active support for wildlife in Ladakh, there is a hitherto little tapped potential for conservationists to capitalise on the socio-religious protection mechanisms to help the local communities preserve their religious identity. This could work well, given that India has a long history of socio-religious protection, as evidenced by protection of black buck *Antelope cervicapra* and Indian gazelle *Gazella bennettii* by the Bishnoi Community in Rajasthan (Sankhala and Jackson, 1985).

Ecotourism is another option that can be explored to help conserve the wildlife of Ladakh in future. The region is an important tourist destination in India and a large number of tourists visit high altitude lakes like Pangong, Tsokar and Tsomoriri to see wildlife; this creates important additional income generating opportunities for the local people (Michaud, 1991; Humbert-Droz and Dawa, 2004; Geneletti

and Dawa, 2009). Therefore, wildlife viewing areas should be created so that the local people can benefit from ecotourism.

4. Community-based Natural Resource Management (CBNRM)

The centralised authoritarian model of natural resource management is gradually giving way to Community-based Natural Resource Management (CBNRM), which is becoming popular across the world (Gruber, 2010). CBNRM strives to involve local communities in managing natural resources by devolving decision-making power to them. However, communities can manage their resources either on their own or in collaboration with various outside governmental and non-governmental organisations. Exclusive management of natural resources by the community was the practice in the high altitude rangelands of Ladakh until the early 1970s when the region was opened to tourism (Norberg-Hodge, 1991), and when it witnessed a large influx of military personnel following India's wars with Pakistan and China, which share political borders with India in this mountainous region. The main features of this community-based resource management were rotational grazing among the various discrete pastures in order to prevent pasture degradation and a primitive system of taxing where the village administration collected a grazing fee from livestock owners (Rs. 5/sheep head and about 250 gm of butter/yak head; 1 INR ~ 0.01 GBP; Namgail *et al.*, in press). This system served as a livestock population control mechanism. Similarly, water resources, especially in the Rong area, were managed through a cooperative farming system in which the farmers appointed a person from one family as *Chhurpon* (literally water head) on a rotational basis to manage the impartial distribution of irrigation water. These mechanisms helped to improve the standard of living, natural resource conservation and governance. Nevertheless, these systems are failing to cope with the increasing external influences on society, culture and economy as mentioned in the previous sections. In view of these current socio-economic and cultural trends, the following are suggestions for new ways of managing the region's natural resources.

4.1. Management exclusively by the community or co-management?

Although the indigenous people of Changthang draw from traditional knowledge tested over several centuries, they face new challenges associated with modern development, globalisation and socio-economic changes. Due to these changes, they need the most recent scientific data, especially those related to climate change and level of safe stocking rates (e.g., Mishra *et al.*, 2001), to better manage their resources. The traditional knowledge should be

harnessed, however, to devise innovative ways to conserve wildlife and other natural resources. The management of rangelands in the future must, therefore, be based on an amalgamation of traditional and current scientific knowledge (Njiforti, 1997).

Currently, NGOs like the Nature Conservation Foundation (NCF), Snow Leopard Trust (SLT) and the Snow Leopard Conservancy (SLC) are involved in creating conservation awareness among the people of Changthang. Ecological studies by researchers at NCF found that the Tibetan gazelle, an animal on the verge of extinction in India, is threatened by excessive grazing by a burgeoning livestock population in the region (Bhatnagar *et al.*, 2006a; Namgail *et al.*, 2008). The gazelles are at a disadvantage especially during the winter because they, unlike other wild ungulates in the region, cannot dig through the thick snow to uncover herbs. The wildlife authorities therefore arranged for supplementary forage for gazelle during the winter, which the animal did not accept (Bhatnagar *et al.*, 2007). Subsequently, NCF explored other options, and managed to convince the local people to create a small livestock-free reserve for the protection of gazelle.

The local communities are less conversant about ecological processes, which could be conveyed with the help of researchers in order to have a better management of wildlife in the region (see Mishra *et al.*, 2010). Many people do not realise that the depletion of wild herbivores will increase the depredation of livestock by wild predators, and the persecution of predators will lead to a population explosion of wild herbivores that will compete with their livestock, as mentioned earlier. Similarly, pastoral people uproot *Caragana* bushes without realising that the plant fixes nitrogen and as such is important for proper functioning of the ecosystem. It is essential that the villagers be taught about these ecological processes.

The work of NGOs and local communities are, however, often financially constrained, as many modern technology-driven management methods, e.g., solar-powered electric fencing to protect crops from wild herbivores, are expensive. Government should financially support conservation programmes that are ecologically sound. The Government's strong wish to maintain its presence directly through the military or indirectly through retaining local people in its borderlands with China, has many negative impacts on the rangelands and the region's wildlife. Therefore, the Government should set aside a budget for managing the environment. The financial help should not only be in the form of endowments but also in the form of loans with minimal interest rates (e.g., microcredit), so that the local people have a sense of agency in carrying out the natural resource management. Otherwise the monetary aid could be taken for granted, which would be detrimental to the population's long-term survival in the fragile ecosystem of Changthang. Yet, as alluded to earlier, it is the Government that should take the lead by aligning the finances associated with its intervention policies (military

exercise, road building, etc.) with the finances to mitigate the negative consequences of these interventions.

Presently, the Department of Wildlife Protection, Leh has jurisdiction over the landscape of Changthang, which was declared a wildlife sanctuary in 1987 under the Jammu and Kashmir Wildlife Protection Act, 1978. However, since the conservation laws were not strictly enforced following its establishment, the pastoralists in Changthang remained less affected and thus less aware of the legal implications of the sanctuary until 1999, when the Supreme Court of India directed all the state governments to issue a proclamation under Section 21 of the Indian Wildlife Protection Act of 1972. Currently, however, the Government is facing strong resistance from the people who are protesting against declaring the entire landscape of Changthang a sanctuary, which would restrict their resource use; they are also afraid that they will be evicted from their ancestral lands.

At any rate, the concerned Government department might not be able to manage this sanctuary on its own, because the area is enormous (about 18,000 km²; although the size and boundaries remain unclear), and the department lacks manpower and infrastructure. Until now, the people felt alienated as law enforcing agencies adopted a policing role following the overall conservation policy of the country; there were incidences where local people were fined or persecuted for killing wild animals that threatened their livelihood. Such acts may not work in the long run, especially given the fact that wildlife officials cannot patrol the region frequently. Thus, an “act of cohesion” rather than of coercion is desirable. We suggest a joint management system involving various stakeholders, such as the local people, local NGOs and state agencies, which can assist the local people with finance and scientific knowledge to complement rather than replace their traditional knowledge.

5. Conclusions

Long-term survival of wildlife hinges on the support of local people sharing natural resources. This is especially so in vast inhospitable areas like Changthang, where monitoring of wildlife by Government officials is difficult, to say the least. Therefore, it is important to consult the local population and involve them in the management of the natural resources of Changthang. Understanding and applying the local people’s traditional knowledge is also important for effective management of natural resources. Nevertheless, the recent habitat deterioration — largely a result of socio-economic, land use and climatic changes — demands more rigorous management options suitable for the current scenario. Therefore, a co-management system whereby the local people manage the natural resources with infrastructural and financial support from the Government and technical expertise from NGOs is, according to us, the best option.

Acknowledgements

The study was financed by the Wildlife Conservation Society, Rufford Small Grants Foundation and Wageningen University. We thank Yash Veer Bhatnagar for sharing information and support. We thank the officials of the Jammu and Kashmir Wildlife Protection Department for granting research permission. Thanks are also due to all the villagers for co-operating and responding to our questions.

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