

# OBSERVATIONS ON CONSERVATION OF SNOW LEOPARDS IN NEPAL

By  
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## **Abstract**

The wild populations of snow leopards are threatened in Nepal. For their effective conservation, this paper seeks to build a strategy based not only on protected enclaves but also on landscapes, using an integrated grass-roots approach that essentially reduces poverty and addresses the needs of human beings and that of wildlife. Also equally relevant in places with a strong hold by religious and cultural authorities in the decision-making processes is the recognition and possible integration of cultural and traditional belief systems in overall snow leopard conservation schemes.

## **Background**

Peter Mathiessen's famous book "The Snow Leopard" (Mathiessen 1978), in which George Schaller searches for the snow leopard *Uncia uncia* in remote alpine valleys in parts of Dolpo in west Nepal while Peter Mathiessen seeks spiritual tranquility, establishes Nepal as a haven for the elusive snow leopards. In the 1980's five snow leopards were radio-collared for the first time in the Langu valley in Dolpo by Rodney Jackson's team (Jackson and Ahlborn 1989). The early nineties witnessed a Nepalese biologist Madan K. Oli, tracking three snow leopards in Manang valley in Annapurna region (Oli 1994). Apparently, snow leopards of Nepal have caught the interest of academicians and biologists much earlier than elsewhere.

With this came the realization that the population of snow leopards in the country was under threat and hence since the early 1970s, the government has taken the necessary steps to conserve them within its territory. The National Parks and Wildlife Conservation (NPWC) Act 2029 (1973) listed the snow leopard as a fully protected species. The Fourth Amendment of this Act increased the penalties for poaching snow leopards and buying and selling its pelt and bones up to Rs 100,000 (approx. US\$ 1,300) or five to fifteen years in prison, or both (Kattel and Bajimaya 1995). Also, by signing in 1975, Nepal became one of the first signatory countries for CITES implementation.

Although the country is in the frontline in terms of promoting enlightened conservation legislation and practices since 1973 (Heinen and Yonzon 1994), a major breakthrough in practical conservation of high altitude wildlife including the endangered snow leopard has not yet occurred to the degree required, compared to some of the successful campaigns initiated for charismatic mammals such as the Royal Bengal tiger and rhino in lowland *Terai*.

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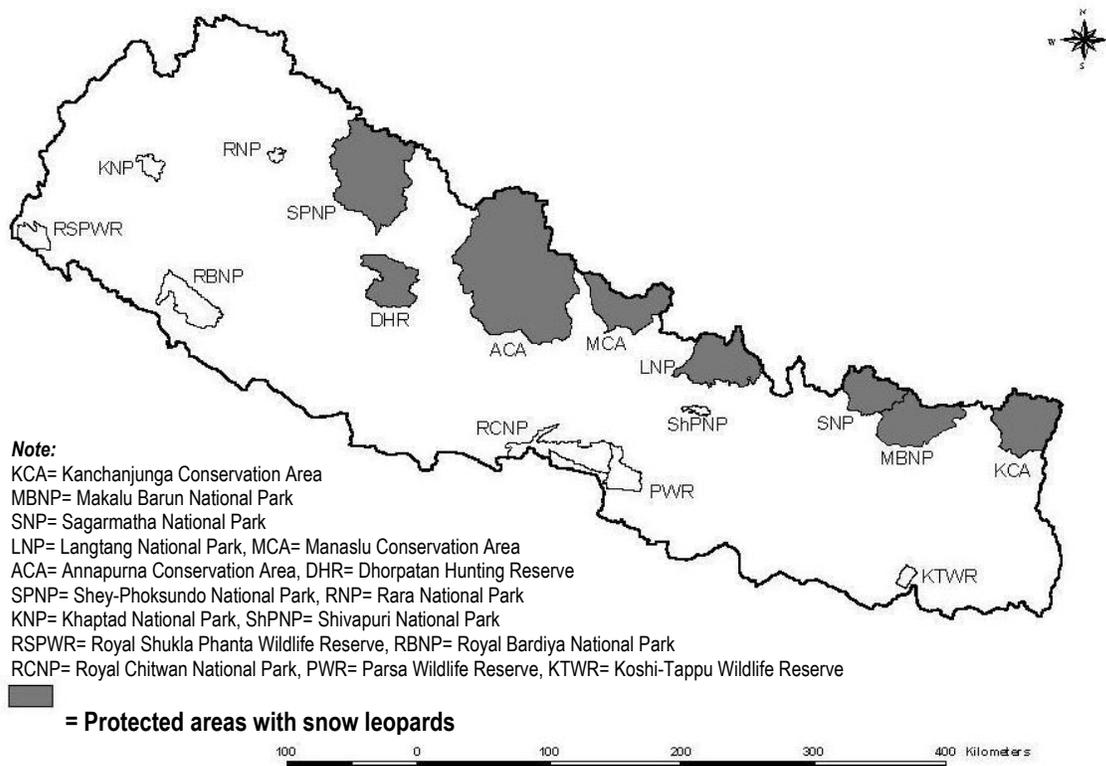
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This may be because of a number of reasons such as remoteness and the harsh environment where snow leopards live, lack of resources such as trained manpower, and ineffective law enforcement in particular outside of protected areas. Killing in retribution for livestock depredation and poaching for pelts and bones are the main threats to snow leopard survival in Nepal. Also, their small and fragmented sub-populations (Jackson and Fox 1995) may be subject to genetic drifting, inbreeding and depression that further aggravate this situation.

## Issues in Snow Leopard Conservation

Snow leopards in Nepal are associated with steep, broken mountainous habitat in alpine and sub-alpine zones where vegetation is sparse (Schaller 1977, Jackson and Ahlborn 1989, Oli 1994). These habitats are patchy and fragmented across the range because of the insular nature of mountain ranges (Fox 1994). Although the snow leopard density is estimated at 5-10 per 100 km<sup>2</sup> in the prime habitat of Langu valley (Jackson and Ahlborn 1989), there are perhaps less than 0.1-0.5 snow leopards per 100 km<sup>2</sup> in the majority of Nepal (Bajimaya 2000). Based on Habitat Suitability Index model, Nepal's total population is 300-500 (Jackson and Ahlborn 1990) but this figure needs to be confirmed by field surveys. They are reported to occur in eight mountain-protected areas in Nepal (figure 1) that provide less than 50% of the snow leopard's potential range (Jackson and Ahlborn 1990). Because more than half of the snow leopard area falls outside of the protected areas, any snow leopard management plan should incorporate protected areas as well as outside of protected areas with snow leopards; this forms the first thesis of this paper.

Figure 1: Protected areas in Nepal



The high mountains of Nepal where snow leopards occur have long supported an assortment of large mammals and livestock, which is a clear indication that wild animals and livestock can coexist as elsewhere in the Himalayan region (Brower 1991, Fox et al. 1994, Schaller 1998). However, this balance between herbivores and plants is now increasingly threatened because of habitat degradation partly due to heavy grazing pressure following the closure of the Tibet border. Grazing and constant trampling by ever increasing numbers of livestock have led to widespread degradation of fragile alpine meadows and shrubland ecosystems, which has influenced the survival of the region's wildlife such as snow leopards (Fox et al. 1994, Jackson et al. 1996). Because of the inter-linkage of rangeland, wildlife and animal husbandry, any conservation strategy to conserve large mammals such as snow leopards should be based on an integrated grass-roots approach incorporating all three components, with a strong focus on reducing poverty. The second thesis of this paper advocates this need.

One cultural characteristic of the region is that people of Tibetan origin have been living in this region of Nepal for centuries, with their own traditional lifestyle. The culture of this zone remains medieval and is based on the beliefs of Tibetan Buddhism. Several monasteries with unique wall frescoes and other historical monuments that date back several centuries display the arts, skills and prosperity of the area. The perpetual organic nexus between Tibetan Buddhism practices and nature is reflected in their practices. However, recently the weakening of indigenous institutions, the erosion of cultural values and the deterioration of religious monuments are slowly dissolving this historically link between Buddhist philosophy and a respect for nature. Unless the conservation plans harness these deep-rooted cultural and religious belief systems, the efforts may not be very sustainable in the long run. This reasoning comprises the third thesis of this paper.

## **Conservation Measures Initiated to Date and challenges**

### **From Species Approach to Landscape Protection Paradigm**

Although the modern conservation era in Nepal began with the first wildlife law published in 1957, a rhino sanctuary was declared only in 1964 in part of what is now the Royal Chitwan National Park. Thus, Nepal initiated its conservation era with a "species approach". With the implementation of the NPWC Act, 1973, several of Nepal's existing parks and reserves were established in different parts of the country (HMG 1973, Heinen and Kattel 1992), under the management authority of the Department of National Parks and Wildlife Conservation (DNPWC). Protection of the species of global significance was an impetus to create some of these parks, e.g. Royal Chitwan National Park for tiger and rhino, and Shey Phoksundo National Park for snow leopard.

Now after the elapse of three decades in the history of nature protection, there are evidences that populations of many species have increased in the existing reserves, e.g. Himalayan tahr in Annapurna, musk deer in Sagarmatha, and tiger and rhino in Chitwan (Heinen and Yonzon 1994). With more than 18% of its total area under protection, Nepal has made a clear shift in focus from the conservation of single species in the 1960s to broader aspects of bio-diversity conservation in protected areas in the 1990s. The new millennium witnessed yet another paradigm shift in conservation policy, i.e. moving

conservation actions beyond the boundaries of protected areas into larger conservation landscapes, where the protected areas represent core refuges that are linked by matrices of “conservation-friendly” land-uses that permit species dispersal and migrations (WWF and ICIMOD 2001). Adequate spatial areas will have to be provided for the wide-ranging large mammals such as snow leopards that require a large habitat to maintain viable populations. Besides, protection measures confined only to protected areas are not sufficient for snow leopard conservation in Nepal, because more than half of snow leopard territory falls outside of the protected areas (Jackson and Ahlborn 1990), the management of which lies with the District Forest Office under the Forest Act 1993. Management and protection of snow leopards in protected as well as outside protected areas is the most preferable strategy to meet the long-term conservation of snow leopards in Nepal. This should be complemented by trans-boundary cooperation for linking protected areas in neighboring countries. This necessitates surveys to identify potential corridors between reserves with snow leopards. A major effort initiated in 1995 in this direction has been to initiate the integration of Kanchanjunga Conservation Area, Everest National Park, Makalu-Barun National Park and Langtang National Park of Nepal, with Qomolangma Nature Preserve in Tibet, China. As a follow up program, a joint study team from Nepal and China has completed a study and recommended designing activities to strengthen linkages between the protected areas of both countries, reducing transboundary wildlife poaching and improving local livelihoods (Bajimaya 2002).

Another such option available within the country is to link Shey Phoksundo, Dhorpatan with the Annapurna Conservation Area. The rain shadow of the Nepal-Himalaya is an area with less than 400 mm of annual rainfall, which lies north of Kanjiroba, Dhaulagiri and the Annapurna massifs. This is where both Mustang (Annapurna Conservation Area) and Dolpo (Shey Phoksundo National Park) form one contiguous area (8,793 km<sup>2</sup>) that also includes the area connecting them (Tscharka Bhot) (Yonzon 2001). This region may provide a very good contiguous habitat for snow leopards. Also, Shey Phoksundo National Park and Dhorpatan Hunting Reserve, which lie close to each other, can potentially support an estimated 246 animals (WWF and ICIMOD 2001), based on a density of 5 animals per 100 sq km from prime habitat (Fox 1994). Then Shey Phoksundo, Annapurna and Dhorpatan, when linked with corridors, form an arc which may provide the largest contiguous habitat for snow leopards in the country that may support their viable population, which is estimated at 250 (see Jackson and Ahlborn 1990, Fox 1994). Now it is time for this idea to be explored in detail and management intervention implemented accordingly for the long-term conservation of the country's snow leopards.

### **From People-Exclusive Strict Protection to People-Led Integrated Participatory Management Model**

In the conservation arena in Nepal, in particular from 1980's to 1990's, there was a change in focus from the traditional people-exclusive model of park management (in which strict protection is done by Royal Nepal Army guards) to a community-based conservation model. This is in recognition of the fact that conservation efforts must be reconciled with human resource needs and economic development. Subsequent amendments to the 1973 act have hence evolved more in the direction of an integrated holistic approach to conservation, to incorporate the participation of local people. These amendments have

allowed greater rights to rural villagers and the designation of conservation areas and buffer zones around strict national parks and wildlife reserves

The establishment and, to date, successful management of three conservation areas (Annapurna, Manasulu and Kanchanjunga) under the Conservation Area Management Regulations 1996, was an example that areas can be protected without army guards. King Mahendra Trust for Nature Conservation (KMTNC), a non-governmental organization devoted for conservation of biodiversity and community development, has been playing a leading role in this approach since 1986. The fact is that while the government assumes full responsibility for all national parks and wildlife reserves including buffer zone management, it relies on non-governmental organizations in managing conservation areas like Annapurna Conservation Area to link conservation with the local economy (Yonzon 1997). KMTNC's Annapurna Conservation Area Project in Annapurna Conservation Area is establishing legal local committees that are encouraged to manage wildlife, including target species such as snow leopard (see Box 1), with the consensus from its community members.

The success model of the conservation area, in particular the Annapurna Conservation Area (Gurung 1992) and community forestry, encouraged the government of Nepal to promulgate the Buffer Zone Management Regulations 1996, on the basis of section 3 of NPWC Act. This includes a provision to allocate 30-50% of the park revenue (mainly from tourism) directed to conservation and development activities in the buffer zone. At present there are 6 buffer zones in the country and 5 more have been proposed. Snow leopards occur in four of these protected areas with buffer zone. With a buffer-zone management approach, the intensive snow leopard-livestock conflict that exists in these strict protected areas will hopefully be reduced to a desirable level.

**BOX 1: Integrated conservation and development approach for snow leopard conservation in Nepal: A case study from Manang district, Annapurna Conservation Area**

King Mahendra Trust's Annapurna Conservation Area Project (ACAP) has geared some efforts towards snow leopard conservation since 1993, using integrated grass-root approaches. Eight local snow leopard conservation committees (under legal Conservation Area Management Committee) are in charge of conserving snow leopards in remote Manang district (area approx. 2,200 km<sup>2</sup>, population 6,000) (see figure 2). ACAP was designed to protect natural resources of 7,681 km<sup>2</sup> of land area surrounding the Annapurna massif. In the past, the government used park funds for other purposes, and little money trickled down to the local level. Here in the Annapurna Conservation Area, the government has mandated the Trust to levy 'entrance fees', at present Rs 2,000 (US\$ 26) per visitor, which is ploughed back to the communities. ACAP strives to make local conservation bodies self-functioning. The local snow leopard conservation committee is one of such conservation bodies designed to be capable of self-sustenance. At present, this committee owns more than half a million rupees (approx. US\$ 8,000) as an endowment fund, set aside for the welfare of snow leopards and livestock. Using the fund whenever necessary, these committees are responsible for such activities as hiring communal herders (in three communities), development of alternative pastures (two pastures improved by developing water holes in them), and deterring poachers and hunters (Ale 1995).

The project, mobilizing several hundred active members of its 56 main conservation area management committees in the entire area and sub-committees such as snow leopard conservation

committee and forest management committees, integrates needs of the people with those of wildlife. Hundreds of awareness camps and education programs targeted to both outsiders and local inhabitants have been conducted to date. In order to mobilize the people into the main stream of conservation, i.e. wildlife conservation, many schools and health posts have been constructed and hundreds of adult literacy classes run through hundreds of formal mothers' committees, as an integrated conservation and development package program.

In Manang, hunting has now stopped; the blue sheep, the major prey of the snow leopard, is not directly threatened. To make the area as a model site for innovative snow leopard management in Nepal, since 1999 ACAP, in collaboration with the Earthwatch Project (USA) and technical expertise from the University of Illinois at Chicago (USA), has initiated research work on monitoring livestock, blue sheep and snow leopard populations. The research work is integrated with the snow leopard management scheme, to support the management work by establishing a long-term database. This data will be correlated with rangeland parameters (e.g., vegetation composition). The recent 1999 data revealed a mean density of 5.9 blue sheep per km<sup>2</sup>, and fresh signs (pug-marks) of two snow leopards (one adult and another sub adult), thus indicating the presence of more than two snow leopards in the total study area of 61.2 km<sup>2</sup> (Ale 2000 a). Some 5-7 snow leopards per 100 km<sup>2</sup> have been reported to occur in this valley (Oli 1994). The autumn 2000 monitoring indicated that there were four snow leopards roaming in the study area.

Following the KMTNC's experience, i.e. people-led conservation initiatives, there have been special efforts in other protected areas as well (e.g., Shey Phoksundo) by the DNPWC, with supports from WWF Nepal, to conserve snow leopards with maximum participation of local people. Separate committees have been formed and through them intensive conservation awareness campaigns have been conducted along with baseline data gathering (Bajimaya 2000).

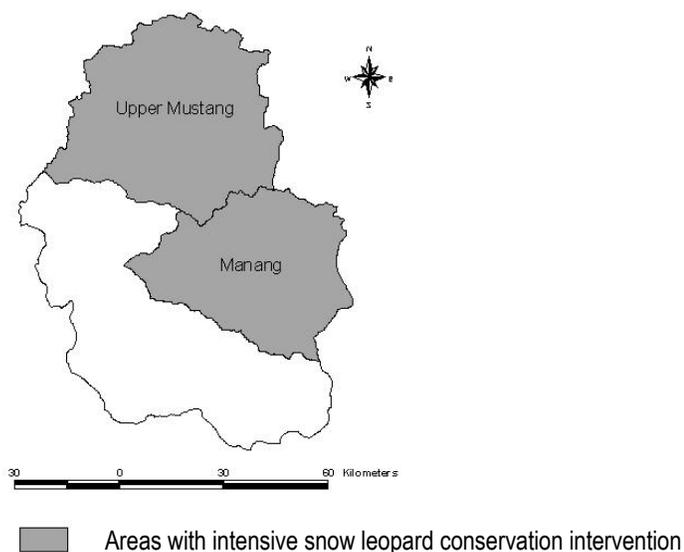


Figure 2: Annapurna Conservation Area

## Bio-Diversity, Poverty and Snow Leopard

The northern region, in particular the western part of Nepal, is a cold and arid mountainous landscape, characterized by sparse vegetation with predominantly alpine and steppe

communities composed of such genera as *Anemone*, *Gentiana*, *Carex*, *Kobresia*, *Hippophae*, *Salix*, *Myricaria*, and *Populus*. This expansive region, ranging between approximately 3,000 m to over 6,000 m in elevation, provides habitats that support a variety of globally significant mammals. Some of the large mammals in this region, besides snow leopard, are wolf *Canis lupus*, lynx *Lynx lynx*, Tibetan brown bear *Ursus arctos*, blue sheep *Pseudois nayaur*, Tibetan argali *Ovis ammon hodgsoni*, and Tibetan wild ass *Equus hemionus kiang* (Mitchell and Punzo 1976, Koirala and Shrestha 1997, Ale 2000 b, Shah 2001). At least six of these mammal species are protected by NPWC Act 1973, and no less than 10 species are listed in CITES appendixes. This is also the region that exhibits great species richness and endemism, with a higher number of endemic flowering plants than in other region of the country (Shrestha and Joshi 1996, Yonzon 2001, Smith 1994).

These high mountains of Nepal also support human civilizations, along with thousands of livestock. Poverty is widespread here in this part of the country (World Bank 1999), with the Human Development Index ranking the lowest (0.378) against that of 0.510 in hills and 0.474 in low land *Terai* (UNDP 2002).

Subsistence economy, the major economic activity of the population, is characterized by extremely limited capital, constancy in the use of traditional production and in the commodities produced, and low productivity of land and labor. Such characteristics tend to perpetuate the existing situation, whereby harnessing of the natural resource base can easily turn into depletion of natural capital, 'mining' the soil and destroying other ecosystem services. Agriculture barely produces enough for survival, increasing destitution that leads to reliance on coping strategies, which in turn further degrades the environment and increases poverty. Apparently, in this fragile region of the country, communities are living below subsistence in the vicious circle of poverty. As a result, poverty, fertility, and environmental degradation reinforce one another in an escalating spiral (Dasgupta 1997). This shows that there is a well-established link between bio-diversity conservation and the well-being of the poor (see Dasgupta 1997 for instance). The majority of the population who are engaged in bio-mass based subsistence economy are inherently poor and their economies remain stagnant, and this is where the micro-finance delivery mechanism becomes a vital tool for the overall development of such a poverty stricken population (Wiggins, 1992, and Hulme and Mosley, 1996). This mechanism may act as a goad for conservation of the region's biota by providing alternative income generation opportunities and thus assisting in reducing poverty.

As a model, Upper Mustang Bio-diversity Conservation Project (NEP/99/G35-GEF; NEP/99/021-TRAC/UNDP) was launched in 2000 in upper Mustang (total area 2,567 km<sup>2</sup>, 33 settlements, population 5,694). The project's ultimate goal is to conserve globally significant flora and fauna in the region, in particular the snow leopard and its prey species. For this, the project has a strong focus on reducing poverty that is inherently tied with the region (see Box 2). With financial support from Global Environmental Facility, United Nations Development Program and American Himalayan Foundation (for cultural part), and technical backup from International Center for Mountain Development, the project is executed by the KMTNC.

Besides poverty alleviation, local capacity building is its second objectives. In 2001, already 621 community members and 50 staff of the project underwent training in arrays of biodiversity related subjects, including rangeland management, livestock-wildlife interactions, and practical wildlife management training (UMBCP 2001). Follow up training on these aspects, in particular livestock-wildlife interactions focused on snow leopards, have been scheduled for summer 2002, when 14 herders will participate, representing several settlements. The project is also establishing a database in the form of geographic information system based Management Information System (MIS). The MIS architecture is complete and data feeding has started. In the meantime, information collection on rangeland ecology, and wildlife and animal husbandry have been going on since 2001. For instance, the 2001 wildlife survey (phase I) discovered in upper Mustang two new mammal species for Nepal, i.e. Tibetan wild ass and Tibetan gazelle. A biodiversity conservation plan will be ready by 2003, which, among others, will demarcate high biodiversity hot spots. These hot spots in upper Mustang will be protected as “habitat refuges” for globally-significant species such as snow leopard and Tibetan argali. Designing a community based monitoring system is another vital aspect of this project. Overall, the UMBCP may serve as yet another model in the Himalayas that incorporates ecology with economy for preservation of key wildlife species.

Box 2: Income generation, insurance scheme and snow leopard conservation

To reduce widespread poverty in upper Mustang, the Upper Mustang Bio-diversity Project (UMBCP) has initiated income-generating activities for the local inhabitants, on the assumption that poverty and lack of viable alternative income generating opportunities are a cause to bio-diversity loss (UMBCP 2001) and reducing poverty positively affects biodiversity.

This project has established community owned and operated micro-finance institutions to provide a financial delivery mechanism for the local people. Project has to date invested US\$ 100,000 for the communities to start Community Trust Funds and community owned and operated Saving and Credit Groups in the region. Such a group mobilizes local savings, provides financial outreach to the locals, assists in micro-enterprise development and mitigates rural financial market failures. UMBCP supports community-based fund from outside the system. The Community Resource Action Committee (CRAC) is the sole body authorized for managing the system. The committee operates the Community Trust Fund, in which US \$25,000 has already been deposited (additional US \$25,000 will be added in 2002), for coordination and supportive works, to sustain income generation schemes. Importantly, the CRAC is a local steering body for upper Mustang for overall biodiversity conservation endeavors. All together, 19 groups in 18 settlements have been formed and each group covers over 90% of the population in its respective settlement.

The UMBCP Savings & Credit Group formation to supplement income generation at grass-root levels is unique. At the community level, the Saving & Credit Group manages a “community owned micro-enterprise” which can also be rented out. The income generated from this will financially assist the Saving & Credit Group. At individual household level, the Saving & Credit Group will lend loans for productive investments, collect interest and at the same time it will mobilize community-level savings. The Savings & Credit Group will also pay interest on the savings deposited. By introducing community-level and individual household-level transactions, the Saving and Credit Group will be in a better position to reduce risk of its loan portfolios.

The project not only seeks to reduce poverty for the conservation of biodiversity in the area, but more directly also develop a livestock insurance scheme targeted especially against livestock depredation from snow leopard. Livestock depredation by snow leopards and wolves persists in the region and snow leopards are killed in retribution. Records from 1992 to date indicate that snow leopards have been covertly killed in retaliation in upper Mustang, in spite of the presence of ACAP (Ale, in prep.). This scheme is, therefore, ultimately aiming to resolve the ailing snow leopard - people conflict and thereby help generate positive attitudes toward snow leopards. The whole idea is when farmers get compensation through insurance schemes, there would be no retaliatory killing of snow leopards.

After a year or so, when the group matures, and when they are capable of managing the saving and credit transactions independently through UMBCP trainings and when they start generating group funds, insurance scheme will be introduced by integrating it into the existing Saving and Credit Group. Premium rates and claims of the insurance scheme, like the interest rates on savings and loans, are to be determined by the locals. The aim of the insurance scheme is to take the risk away (Sloman 1999), and in this context the risk of livestock depredation from the predator, the snow leopard. Although ground works are underway, the insurance scheme is at conceptual stage and the project intends to embark upon this novel concept in 2003, where only few groups will be selected for this purpose. Initially this will be a pilot project in upper Mustang; if successful the scheme may be replicated elsewhere in Nepal.

## **Harnessing Religion and Indigenous Knowledge**

In northerly Buddhist societies, snow leopards are revered and feared equally, and they have a special place in the region's folklore and legends. Whenever opportunities exist, the KMTNC has incorporated such religious sentiments into conservation. There are religious leaders who were actively preaching anti-poaching slogans in different parts of the country, long before the initiation of nation's formal conservation activities. One such lama is *Karma Sonam Rimpuchhe* (Phu valley, Manang), who took a great conservation initiation in early 1960s. In his domain, the social penalty system for those harming any form of wildlife, including snow leopards, is very rigid (Ale 2000 a), e.g. Rs 100,000 (approx. US\$ 1,300) for killing a snow leopard. This honorable lama was honored on the auspicious occasion of 1995 Earth Day celebration, and at present he serves as one of the active members of the snow leopard conservation committee in Phu village, Manang.

### **Box 2: Religion and snow leopards**

In the northerly societies of Nepal many indigenous beliefs and shamanistic practices, reflecting local pre-Buddhist traditions, were incorporated and subsequently reworked into the Buddhist pantheon and ritual system. One such ritual in Manang connected to the snow leopard and its depredation forbids alpine herders to roast meat, for otherwise the mountain god will send its "dog", i.e. snow leopard and one has to suffer livestock losses. In Dolpo there are stories of great lamas frequently making trips to Tibet in the form of snow leopards, in search of rare medicinal herbs. Other folklore describes the snow leopard as a "fence" for the crops, meaning that in the absence of snow leopards livestock would be free ranging and thus would invade crop fields.

Folk wisdom thus metaphorically suggests that the presence of snow leopard is an indicator for a good quality of livelihood. Hence the earlier reports that villagers wanted a total extermination of the snow leopard, as a solution to livestock depredation (Oli 1992), may not be entirely true. Local

inhabitants still believe that snow leopards (and domestic cats) are considered to have taken birth particularly to remove the sins of their past lives, and killing these animals means having their sins transferred to your own life. In Mustang, killing a snow leopard is considered to be more sinful than its prey species for instance blue sheep, because all sins it has committed during its lifetime by killing its preys will then be transferred to you.

Also, in Annapurna Conservation Area informal indigenous committees are strengthened and in some cases institutionalized. One such traditional committee is the seven-member *Ghamba-Ngerba* council in Manang that is still today very sensitive and responsible in conserving and regulating natural resources in the village. KMTNC/ACAP has facilitated to establish “musk deer committees” which closely work in the style of the traditional council and regulated by the council. The Council has entrusted the committees to protect the endangered musk deer, a prey base of snow leopards. There exist two musk deer committees in the musk deer population concentrated area of Manang district. Villagers have also created a fund for the welfare of musk deer, upon which the project added matching fund. The committee is responsible for fetching snares (hundreds of them per annum/season) and punishing those who are responsible for musk deer poaching. As recent as November 2001, there was a case in which the committee fined Rs 1,250,000 (approx. US\$ 16,250) for seven local poachers in Manang valley. Also in Marpha, Mustang they helped to catch three musk deer poachers in 1996. These instances indicate that harnessing of religious elements and indigenous systems with conservation connotations may be beneficial for overall conservation effort.

## **Conclusion**

From species approach conservation to protected areas management, along with promulgation of innovative conservation policies, Nepal is now beginning ground works to embark upon a new paradigm in wildlife and bio-diversity conservation, i. e. landscape approach management. The snow leopard conservation efforts in light of country’s overall conservation strategy are satisfactory, although more works are felt necessary. The role of DNPWC, as the government body, in overall conservation in protected areas, is encouraging. The country’s leading non-government organization and forefront in bio diversity conservation, the KMTNC has been also effective particularly in demonstrating successful conservation based on holistic integrated approach. In terms of snow leopard conservation and management, the experiences so far show that a whole package for conservation intervention is required, including one that binds conservation with culture, and that explores and harness poverty-conservation nexus. There still exists opportunities for further improving the existing intervention methodologies for snow leopard conservation. Although currently it is in a conceptual stage, introducing an insurance scheme targeted at minimizing snow leopard-livestock conflict may prove to be an additional effective tool for conservation of snow leopards in Nepal.

## **References**

Ale, S. B. 1995. The Annapurna Conservation Area project: A case study of an integrated conservation and development project in Nepal. In: Proceedings of the Eighth International

Snow Leopard Symposium, R. Jackson and A. A. Ahmad (eds.), pp 155-169. Islamabad, Pakistan.

Ale, S. B. 2000 a. *Conservation of the snow leopard in Nepal*. CAT News 32.

Ale, S. B. 2000 b. *Rangeland, animal husbandry and wildlife in Annapurna, Nepal: A case study from Manang valley*. C Richard, K. Basnet, J. P. Shah and Y. Rout (eds.). Grassland ecology and management in Protected Areas of Nepal, pp 45-51.

Bajimaya, S. 2000. *Snow leopard manual: Field study techniques for the Kingdom of Nepal*. WWF Nepal.

Bajimaya, S. 2002. *Sharing Nepal's experience in transboundary conservation endeavors*. Wildlife Nepal. 6 (8-13).

Brower, B. 1991. *Sherpa of Khumbu: people livestock, and landscape*. Oxford: Oxford University Press.

Dasgupta, P. 1997. *Environmental and Resource Economics in the World of the Poor*. Univ. of Cambridge and Beijer Int. Inst. of Ecological Economics, Stockholm.

DNPWC 2000. Count Rhino 2000 Initial Report. Unpub. Report, Department of National Parks and Wildlife Conservation, Kathmandu.

Fox, J. L. 1994. *Snow leopard conservation in the wild: a comprehensive perspective on a low density and highly fragmented population*. In: Proceedings of the Seventh International Snow Leopard Symposium, J. L. Fox and D. Jizeng (eds.), pp 3-15. ISLT, Seattle.

Fox, J. L., Nurbu, C., Bhatt, S., and Chandola, A. 1994. *Wildlife conservation and landuse changes in the Trans-himalayan region of Ladakh, India*. Mountain Research and Development 14: 39-60.

Gurung, C. P. 1992. *Conservation for sustainable development: myth or reality? A case of the Annapurna Conservation Area Project, Nepal*. In: Conservation for development, S. J. Loomis and M. J. Enzer (eds.), pp 19-30. Yale University, New Haven.

Heinen, J. T. and Kattel, B. 1992. *A review of conservation legislation in Nepal: Past progress and future needs*. Environmental management, 16 (6): 723-733.

Heinen, J. T. and P. B. Yonzon. 1994. *A Review of Conservation Issues and Programs in Nepal: from a single species focus towards bio-diversity protection*. Mountain Research and Development 14: 61-76.

HMG. 1973. National Parks and Wildlife Conservation Act 2029. Nepal Gazette BS 2029-11-28.

Hulme, D. and Mosley, P. 1996. *Finance against Poverty*. Vol.1. Routledge, London.

Jackson, R. and Ahlborn, G. 1989. *Snow leopards in Nepal-home range and movements*. Nat. Geog. Res. 5: 161-175.

Jackson, R. and Ahlborn, G. 1990. *The role of protected areas in Nepal in maintaining viable population of snow leopards*. Intl. Ped. Book of Snow Leopard 6: 51-69.

Jackson, R. and Fox, J. L. 1995. *Snow leopard conservation: Accomplishment and research priorities*. In: Proceedings of the Eighth International Snow Leopard Symposium, R. Jackson and A. A. Ahmad (eds.), pp 128-145. Islamabad, Pakistan.

Jackson, R. M., G. Ahlborn, M. Gurung, and S. Ale. 1996. *Reducing livestock depredation losses in the Nepalese Himalaya*. R. M. Timm and A. C. Crabb (eds.). Proceedings of the 17<sup>th</sup> Vertebrate Pest Conference. University of California, Davis, pp 241-47.

Kattel, B and Bajiimaya, S. 1995. *Status and conservation of snow leopard in Nepal*. In: Proceedings of the Eighth International Snow Leopard Symposium, R. Jackson and A. A. Ahmad (eds.), pp 21-27. Islamabad, Pakistan.

Koirala, A. R. and Shrestha, R. 1997. *Floristic composition of summer habitat and dietary relationship between Tibetan argali and domestic goat in the Damodar Kunda*. Agric. Univ., Norway.

Mathiessen, P. 1978. *The snow leopard*. The Viking press.

Mitchell, R. and Punzo, F. 1976. *New mammal records from Nepal*. J. Bombay Nat. His. Soc. 73 (1): 54-58.

Oli, M. 1992. *Local hostility to snow leopards*. Cat News 6: 10.

Oli, M. 1994. *Snow leopards and blue sheep in Nepal: Densities and predator:prey ratio*. J. Mammal 75: 998-1004.

Schaller, G. B. 1977. *Mountain Monarchs*. University of Chicago Press, Chicago, 425 pp.

Schaller, G. B. 1998. *Wildlife of the Tibetan Steppe*. The University of Chicago Press, Chicago.

Shah, K. B. 2001. *Bio-diversity survey of upper Mustang, Phase I report*. King Mahendra Trust for Nature Conservation/Upper Mustang Bio-diversity Conservation Project. Kathmandu.

Shrestha, T. B. and Joshi, R. M. 1996. *Rare, Endemic and Endangered Plants of Nepal*. WWF Nepal Programme, Kathmandu.

Sloman, J. 1999. *Economics*. Third edition. Prentice Hall, London.

Smith, C. 1994. *Butterflies of Nepal*. Tecpress Service, Bangkok.

UMBCP. 2001. Annual report. Upper Mustang Bio-diversity Conservation Project. KMTNC/ACAP. Pokhara.

UNDP. 2002. Nepal Human Development Report 2001: Poverty Reduction and Governance. UNDP. Nepal.

Wiggins, S. L. 1992. *Agriculture Credit in Developing Countries*. In: New Palgrave Dictionary of Money & Finance. Newman, P., Milgate, M & Eatwell, J. (eds.).

World Bank. 1999. *Entering the 21<sup>st</sup> Century*. World Development Report 1999/000. Oxford university Press.

WWF and ICIMOD. 2001. *Ec-oregion based conservation in the eastern Himalaya. Identifying important areas for bio-diversity Conservation*. WF Nepal program, Kathmandu.

Yonzon, P. 1997. *Ground truthing in protected areas of Nepal*. In: Ec-otourism for forest conservation and community development. Eds. Bornemeier et al. RECOFTC/.FAO).

Yonzon, P. 2001. *The inseparable Tibetan landscape of Nepal*. A Resource Himalaya Factfile. VIII (II).