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People-wildlife conflicts in the trans-Himalaya

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Introduction: Wildlife-related crop and livestock damage is emerging as a leading source of conflict between local communities, protected areas and park managers throughout India and the Himalayan region (Kharel 1997, Mishra 1997, Saberwal et al. 1994 and Sekhar 1998). For example, a comprehensive household-level survey of herders living in Nepal's Annapurna Conservation Area suggested that predation accounted for 63% of all livestock mortality over a 18-24 month period, mostly attributable to snow leopard (Jackson et al. 1996). Oli et al. (1994) reported the predation rate at 2.6% of the stockholding, with losses representing as much as 25% of the average household's per capita income. Hardly surprisingly, most local people held strongly negative attitudes toward snow leopard and wolf. In the Kibber Wildlife Sanctuary in Lahaul-Spiti, Mishra (1997) reported that 18% of the livestock holding were killed over a 18 month period, amounting to 1.6 animals per household per annum, with an estimated total value of US $ 128 per family per year. Villages received compensation in only 28 of 131 reported cases. According to local residents, predation rates in the sanctuary had increased markedly since its establishment. Mishra (1997) attributes this to a dramatic increase in livestock numbers accompanying a shift from subsistence to a more commercially-based animal husbandry pattern.

The purpose of this presentation is to provide an overview of livestock damage from wild carnivores and how protected area managers could best approach this contentious issue. The author uses Hemis National Park as a case study example, focusing on baseline information gathering, and past, current and proposed remedial actions for reducing losses and compensating livestock owners.

Livestock Depredation - Causes and Patterns: Diverse and complex biological and environmental factors are associated with livestock depredation, including livestock size and kind, guarding patterns, predator species, type of stalking or escape cover, habitat brokenness, and in the case of the snow leopard, distance from a cliff (Jackson et al 1996, Linnell 1996). Socio-economic factors related to animal husbandry practices further complicate the situation.

Thus, it should not be surprising that depredation rates loss rates vary widely with respect to locality and type of livestock, as well as year to year, as suggested in Table 1. Small-bodied stock like goats and sheep are most vulnerable, being taken by a wider range of predators, from fox (lambs only) to lynx, snow leopard and wolf. By comparison, fully-grown yak are rarely killed, except by large wolf packs. Surveys in Nepal, India and Mongolia suggest that horses are especially vulnerable to snow leopards, being taken in significantly greater proportion than their relative abundance. Their high economic value only intensifies the level of anger toward predators and fuels feelings for retribution among the affected herders (Oli et al. 1994, Schaller et al 1994). Investigators have independently concluded that retaliation may be driven by *perceived* loss as much as *actual* loss. Predators are frequently blamed for losses due to other sources of mortality, such as disease, consumption of poisonous plants or accidents. In Ladakh and elsewhere, repeated predation almost inevitably results in some or all households seeking to hunt, trap and kill the culprit or cuplrits**.**

Table 1: Examples of Livestock Depredation Rates across the Snow Leopard's Range

Nepal:
Annapurna Conservation Area - averages 2.6% but up to 20% for horses in depredation "hotspots" by snow leopard (Oli, 1994; Jackson et al 1994)
Eastern Nepal - 10.6% sedentary sheep/goat; 3-5% of migratory flocks (Braun et al. 1991)
India:
Hemis NP - 2.3% of sheep and goats by snow leopard (Fox et al. 1991)
Kibber WS - 18% by snow leopard & wolf. Mostly sheep and goats, then yak, horse and donkey (Mishra 1997)
Pakistan:
Khunjerab National Park - 10% by snow leopard and wolf. Mostly sheep and goats. (Wegge 1989)
Mongolia:
Altai /Great Gobi area: 0.3-0.4% sheep and goats (up to 10% in "hotspots") by snow leopard and wolf (Schaller et al 1994)
China:
Taxkorgan Nature Reserve, Xinjiang: 7.6% sheep and goats by snow leopard (Schaller et al. 1987)
Tibet's Qomolangma Nature Preserve - less than 1% - 9.5%, by snow leopard, lynx and wolf. Mostly goats and sheep, some sub-adult yak with definite "hotspots" (Jackson 1991).

We are only beginning to learn which factors contribute most to a predator becoming a problem animal. Livestock is relatively easy to "lift"in part because they lack finely-tuned anti-predator instincts found in

wild ungulates. Furthermore, domestic livestock usually often far outweigh natural prey in both number and biomass in many areas, including Hemis National Park. In the Annapurna Conservation Area of Nepal blue sheep biomass totals 330 kg/square km compared to 1,700 kg for domestic yak, sheep, goats (Jackson et al. 1996). Thus, by sheer chance along a predator will likely have a greater likelihood of encountering domestic animals compared to its natural prey. Furthermore, livestock depredation may be learned from parents bringing their offspring to a kill, as is fairly common in the case of snow leopard.

Research on this and other felid species suggests adult males are more likely to kill livestock than adult females, along with the old, infirm and injured (Fox and Chundawat 1988). Inexperienced juveniles lack the more finely tuned hunting skills of adults and are more likely to be dispersing through unfamiliar territory. Females with their first litter may have trouble feeding their cubs. But at this stage it is impossible to predict which individual may turn out a problem animal (Linnell et al. 1997).

Some have hypothesized that livestock herding techniques are the main element leading to problem animals. Since predators must learn to by-pass a shepherd and his or her dogs, or to cross a physical barrier to get to "concentrated food sources" (as in the case of penned livestock), problem animals and multiple killing are most likely to occur when livestock are inadequately guarded, or housed in a poorly constructed corral at night. Multiple or surplus killing is cause for special concern. These are incidents in which a large number of livestock are killed in a single incident, and generally occurs when a carnivore encounters penned or constrained livestock that cannot escape. Incidents of 5-20 animals, often sheep and goats, being killed together are common. The record is thought to be 107 by a snow leopard in Tibet (Jackson 1991). Solitary predators rarely make multiple kills of wild prey that are rarely confined and thus able to escape. Multiple predation may have a catastrophic impact upon livestock owners, and in the case of snow leopard and wolf often leads to retributive killing. Such incidents are regularly reported from Ladakh, Mongolia, Pakistan and parts of Tibet.

The solution to multiple killing is both simple and relatively inexpensive: one has to ensure that all night-time corrals are predator-proof. Other important measures are to guard livestock during the day-time and to protect the prey base, in this case blue sheep, marmot and hares. Herders should also avoid siting their corrals in prime snow leopard habitat, especially at the base of cliffs from which predator can easily jump into the pen.

Hemis National Park: This protected area was proclaimed in 198 and covers an area in excess of 3,350 square kilometers, although the actual size is disputed. Hemis NP is located immediately south of Leh in Ladakh District in the State of Jammu and Kashmir. Besides offering excellent snow leopard habitat, this park harbors four species of wild sheep and goats, giving it international status in terms of biodiversity importance.

Elevations in this stark, arid transHimalayan landscape ranges from 3,300 m to 6,400 m. The Zanskar River cuts a spectacularly deep and rugged gorge through the park (Fox and Nurbu 1990). While the canyon is impassable in summer, in winter people can walk along the frozen riverbed. Although the

vegetation is sparse, there is a diverse range of large mammals amid varied mountain and riverine habitats. There may be 30-50 snow leopards, somewhat fewer wolves and a few wild dogs and lynx. The park supports 4,000 or more blue sheep, about 300 endangered Ladakh urial, and a few very rare Tibetan argali. Hemis is located at the very edge of Asiatic ibex range (Fox et al. 1991a,b).

About 1,600 people live in the park in 16 small settlements scattered in three valleys B the Rumbak valley (4 villages); the Markha valley (7 villages) and the Shang Valley (5 villages). As agro-pastoralists, these villagers share the park's resources with wildlife. They grow barley and a few vegetables, and own more than 4,000 head of livestock, of which 81% are sheep and goats, and 11% are yaks, cattle and crossbreeds. Tourism provides an important source of supplementary income. Ladakh was opened to tourism in 1974, and the Markha Valley circuit through Hemis National Park remains the most popular trekking route, with about 5,000 visitors per year.

In early 1999 the International Snow Leopard Trust (ISLT) sponsored a survey of depredation losses in Hemis National Park. Seventy-nine households were selected and the head of the household or another knowledgeable individual interviewed to establish herd size and losses to carnivores over the previous 12-18 month period. Results indicated that these villagers owned some 3,977 animals, mostly sheep and goats followed yak, cattle, donkeys & horses (Bhatnagar et al. 1999). Total depredation losses were reported at 492 animals or 12.4% of the total herd. Over half of the households lost 1-10 % of their herd, with the average loss estimated at 6.2 animals and valued at Rs. 12,642 (US $ 297.5). This places the total economic loss for the park at Rs. 998,750 or US $ 23,500, based upon current market rates. The primary predators were snow leopard and wolf, and over 38% of animals were taken while confined in a night-time corral. In one incident a snow leopard killed 53 sheep and goats. Over half of the 54% reported losses occurred in the three settlements of Markha (37.4%), Rumbak (9.1%) and Chokdo (7.5%). Clearly, the residents of Hemis National Park are suffering significant economic and social impact from depredation, including facing the need to invest more time in guarding their herds.

From interviews and direct observations root causes of depredation appear to be lax daytime guarding and use of nighttime livestock enclosures which were not predator-proof. Prior to the establishment of Hemis National Park, herders were able to control snow leopard and wolf damage trapping and hunting predators. Traditional traps were set for both species, and herders removed wolf pups from their dens. Now, with more children in school, small-bodied and highly vulnerable livestock are often left to graze unattended near villages. Only in the summer pastures are livestock being closely watched during the daytime. With hunting banned, predator and prey numbers are likely on the increase, as suggested by the rise in predator sightings and depredation incidents, both inside and outside of the park. As Figure 1 shows, depredation rates vary with locality, presumably reflecting differences in predator densities, habitat suitability and herding patterns.

Action taken to date: In 1994 the Ladakh Wildlife Department established a compensation program, but due to high costs and the limited operational budget of the Department, some claims have taken up to two years to settle. With an annual budget of about $ 26,000, the Ladakh

Figure 1: Map showing depredation areas, Hemis NP (from Bhatnagar et al 1999).

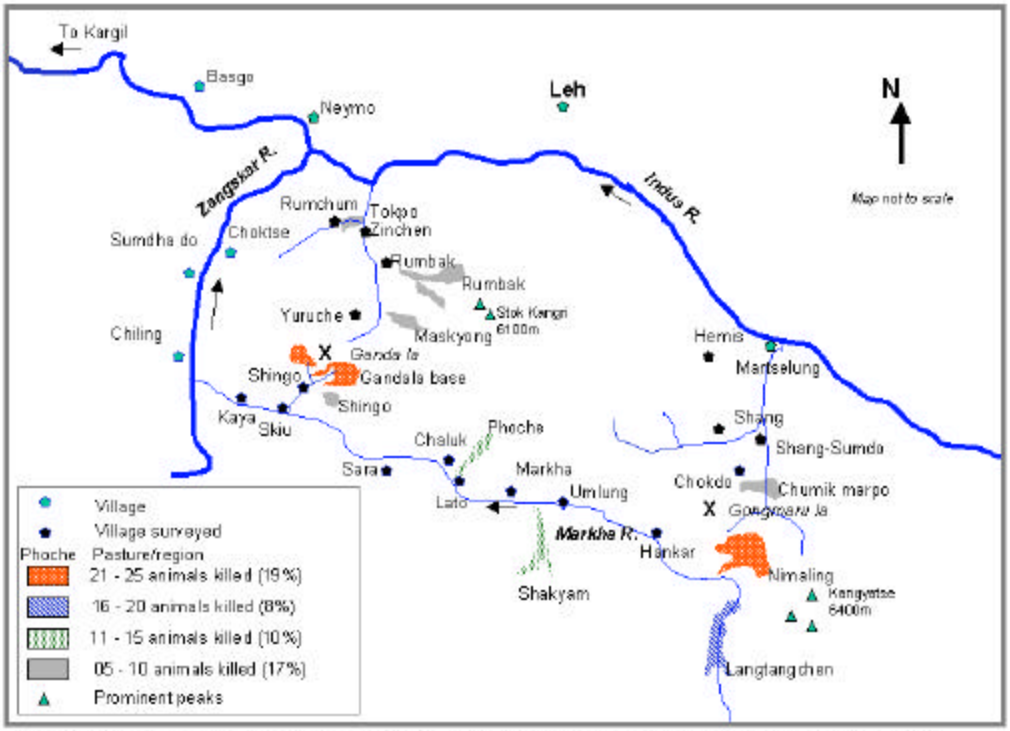

Figure 2: Depredation levels in pastures of the Hemis National Park, Ladakh, India, based on number of animals killed in the period Jan 98 -Feb 99. Depredation was spread out in a much wider area but this map shows the most affected pastures (accounting for 51 % of the 241 animals killed). Pastures were classed into five categories based on the number of animals killed there during this period. Pastures that suffered a damage of < 5 animals are not shown on the map.

Wildlife Department must allocate as much as 60% of its operating budget to compensate herders for depredation losses due to snow leopard and wolf. Villagers have to walk up to three days to report each incident, and a park ranger then has to visit the site in order to verify the claim before it can be approved for payment. Payments are made at only 20- 30% of the current market value of the animal killed. Other constraints include poor communications between the park's HQ and its two ranger posts, limited and inadequately trained field staff, and the lack of standardized or transparent verification procedures. With only three rangers, the park administration cannot properly patrol this relatively large area. Hardly surprisingly, park-people relations have continued to deteriorate, thus directly and indirectly threatening wild carnivore populations. In addition, there is increasing anger over crop loss inflicted by blue sheep, the primary wild prey for snow leopard.

In October 1999, with assistance from The Mountain Institute, the International Snow Leopard Trust sponsored a 12-day workshop in the Markha Valley. The primary objectives of the workshop were: (1) Prepare an Action Plan to assist villagers and the Wildlife Department to identify cost-effective,

sustainable & ecologically compatible means for reducing livestock losses (especially from snow leopard); (2) Train representatives from local NGOs, the Wildlife Department and villagers in community planning techniques; and (3) Increase understanding and awareness about People-Wildlife relationships, in particular the importance of conserving snow leopards, their prey and habitat.

Using a highly participatory process known as APPA (Appreciative Participatory Planning and Action), workshop participants and villagers examined the root underlying causes of depredation and identified a set of options that donor expectations and maximized stakeholder buy-in and project sustainability (see companion paper title, "Community Participation - Tools and Examples", this volume). They concluded that the best solution lay in replacing Markha's four winter sheep and goat corrals at Phochey pasture with three larger predator-proof structures placed side-by-side so that they could share their inner walls. The villagers donated their labor and provided all on-site materials such as stones and mud, while ISLT provided off-site materials like wire mesh, roofing poles, and secure doors. Local technical assistance and financial management was provided under contract with the Leh Nutrition Project (LNP), a locally active NGO involved in watershed management. Construction was scheduled for spring, but this was delayed until early summer of the following year because the ground was frozen. It also turned out that the corrals would have to be 15 feet longer than the plans indicated: the villagers had deliberately underestimated their livestock holdings, fearing they would be taxed more by the government if they reported the actual herd size. Consequently, the structures could not be fully roofed before a snow leopard jumped into the unfinished corral and had killed 27 goats and two sheep belonging to seven families. Given a delay in delivering the extra materials, ISLT and SLC felt some responsibility for the loss, and a meeting was called. However, as the primary stakeholders, the villagers assumed sole responsibility for what had happened. While they attributed the cause of their loss as an unhappy "Mountain Spirit, " their strong ownership and sense of responsibility for the program is clearly evident

Table 2 indicates the type of information that is deemed helpful to developing effective preventive or remedial measures. These protocols could be applied to develop action plans for addressing livestock depredation losses in other areas. Baseline surveys are needed to establish loss by the kind of livestock, sex and age, and location. The extent of other mortality factors such as disease, accidents and winter die-offs should be quantified, at least on a relative basis. Triangulation (by interviewing third parties or from direct observation) is critical in order to assess the accuracy of information derived through household interviews. Field observations help establish the seasonal depredation loss patterns, along with the predator responsible and supporting evidence for predation as cause of death. The latter is best determined from a post-mortem examination of carcass remains, supplemented by sightings of animals, pugmarks, droppings or hair at the kill-site. Information on the characteristics of kill sites is helpful in identifying depredation-prone sites or conditions (Jackson et al. 1996). Key contributing factors (such as lax herding practices, disease, pasturing in depredation prone areas, etc) are identified as the basis for developing sound, environmentally appropriate and cost-effective measures for reducing losses in the future. By mapping depredation "hotspots," one can target the most vulnerable producers for remedial action.

Table 2: Information Useful for Developing Effective Remedial Measures & Interventions

- Current & traditional practices for avoiding or reducing losses
- Alternative depredation prevention and alleviation measures
- Pluses and minuses of each measure (*What works best and is most acceptable socially, environmentally and cost-wise*?)
- Seek local input for which indicators (preferably participatory) may best measure the project's effectiveness in (a) reducing losses, and (b) for satisfying local herders (*monitor future losses and predator/prey numbers*)
- Potential matching or reciprocal arrangements and responsibilities from each stakeholder (*herder, government, NGO and donor*)
- Community-specific socio-economic profiles developed using standard participatory PRA tools (*village resource maps, seasonal calendar etc*)

A discussion of alternative remedial measures is beyond the scope of this paper, and the reader is referred to Linnell (1996) and Smith et al (2000a,b). It is important to realize that losses can likely never be completely eliminated. Pastoralists have lived alongside wild predators ever since livestock was first domesticated 10,000 years ago. However, it is important that conservationists acknowledge the role local herders may play in sustaining a particular area's snow leopard population. For example, an analysis of scats or droppings from Hemis by Chundawat and Rawat (1994) placed the annual prey consumption of a snow leopard at 5 blue sheep, 9 Tibetan woolly hares, 25 marmots, 5 domestic goats, 1 domestic sheep and 15 birds (such as snowcock and the chukor partridge). Clearly, livestock is an important source of food for this snow leopard population.

Obviously, protected areas management can only be effective and sustainable if the basic concerns, needs and aspirations of local people are addressed, in parallel with those of the wildlife. Thus, park managers must find acceptable and sustainable solutions to satisfy herders who have lost their stock to predators in or near a protected area. Over the long-term we must ensure that the natural prey base is expanded so that predator dependency upon domestic stock is reduced, and conflicts can thereby be avoided or at least minimized.

The primary benefit of a compensation program is that it directly targets those individuals and households that are suffering from depredation, as opposed to the community at large. Therefore, compensation programs could be applied on a more limited scale, primarily targeting the economically

most-disadvantaged households that lack the resources to guard their livestock or predator-proof their night-time corrals. Even so, it will be important to ensure the fund is adequately capitalized, does not unduly drain resources from the Wildlife Department, and has effective measures in place for validating claims, dispensing funds and minimizing the potential for fraudulent claims.

One alternative to direct compensation which has been applied in recent decades is the ICDP or Integrated Conservation Development Project model, in which local communities living alongside large mammals like tiger, elephant or rhino are offered economic incentives to offset crop or livestock damage. Unfortunately, ICDPs all too often lack a clear conservation focus, and may even resemble a "Christmas tree" of miscellaneous interventions --- none of which do much to reduce the key underlying threats to a species or its habitat. As Sanjayan et al. (1997) note ICDPs need to establish clear links to biodiversity conservation in the eyes of local people and ensure that their expectations are carefully managed throughout the project (which should exceed five years in order to maximize sustainability). By implementing measures for reducing livestock depredation loss along with efforts at upgrading local livelihoods, so one better focuses on the root underlying causes, while offering incentives for good animal husbandry practices. When properly applied, economic and social incentives may provide particularly effective conservation tools for replacing the unsustainable cash pay-out most compensation programs require.

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