

ily, resulting in a statistical increase in presence signs.

One major advantage of this two-tier financial scheme is that, unless the entire village colludes and decides to cheat, it is very difficult to abuse the scheme. Indeed, the villagers treat Fund 2 as their collective pool of money generated from *their* common resource – the snow leopard. A false claim by one single individual would mean that he benefits from Fund 2 at the expense of the whole community.

PSL is making an attempt to be self sustaining and does not intent to rely on donor money to run the scheme. This approach however leaves the scheme exposed to potential financial crises. The income from eco-tourism is subject to many uncontrolled factors: Perceived or real security issues in Pakistan could seriously decrease the flow of tourists to the area thus leaving the scheme in risk of going bankrupt. PSL faced this problem after September 11, 2001. All bookings for the year 2002 were cancelled and no income was raised for Fund 2. Fortunately, there is still enough money in Fund 2 from previous years. Therefore, two insurance claims in 2002 could be compensated.

A potential drawback of PSL could be the reliance on an economic incentive approach to conservation. Throughout the world a common feature of community based conservation programs is reliance on economic incentives to induce a pro-conservation behaviour among the people. PSL is also going down the same path. While economic incentive is a quite powerful motive for conservation, however, it is not clear how its propagation is effecting other non-economic incentives for conservation. It may be that other institutional motives based on aesthetic, religious, and cultural aspects are being crowded out because of the heavy emphasis on economic motives alone.

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## Compensation for Large Carnivore Depredation of Domestic Sheep 1994-2001

by

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### The development of large predator populations and sheep farming.

Like other European countries, Norway expended considerable resources attempting to eradicate carnivores during the 19<sup>th</sup> and early 20<sup>th</sup> centuries. The system of local bounties was consolidated in 1846 in the "Law on the extermination of predators" which introduced state bounties for a wide range of predatory mammals and birds, including wolves, bears, lynx, wolverines and golden eagles. By the early 20<sup>th</sup> century, populations were approaching all time lows, and there was discussion among contemporary zoologists about whether the species were faced with national extinction.

In the absence of large predators, the pattern of sheep farming changed, and flocks grew in size and were no longer guarded by shepherds. This pattern of husbandry continued to develop into its present form. Lambing generally occurs in spring (April-May) and indoors under close supervision. As soon as snow has melted and lambs are large enough, the sheep are released onto fields surrounding the farms. However, because <5% of Norway's area is cultivated land, it is not possible to sustain the number of grazing animals on fields. Instead, sheep farmers are dependent on exploiting the grazing resources provided in the forests (mainly boreal forest) and mountains (alpine tundra above the tree line). In June, the ewes with their attendant lambs are generally released into these wildland habitats, where they disperse into family groups and establish their traditional home ranges. These grazing areas are scattered throughout Norway to such an extent that it is virtually impossible for a large predator's home range to not overlap with at least one grazing area. The sheep are generally unherded, unguarded and unsupervised, although the owner is required to patrol the area at least once a week. In the absence of large carnivores this pattern of husbandry was successful, and losses of sheep to accidents and disease were minimal. From 1996 to 1999, an average of 2.1 million sheep were released each summer into the wildlands for grazing.

However, from the 1970's official attitudes towards the virtually absent large predators began changing and a sequence of legal changes to their status came into effect, ranging from protection, to limits on hunting seasons and restrictions on the use of certain methods. The response was a slow recovery of all species. During the late 1980's there was a noticeable increase in sheep losses in the wildland pastures which led to the initiation of a series of studies to examine mortality causes of sheep using radio-collars. These studies indicated that most of this increased mortality was due to depredation from large predators. By the late 1990's there was some attempt to adjust husbandry practices to reduce depredation, although these changes have not been adequate and have hardly had any impact on overall losses.

### The system of documenting and compensating losses

The sheep owner is responsible for finding sheep killed or injured by large predators. These finds then need to be confirmed by a local representative of the national wildlife management agency's (the Directorate for Nature Management - DN) field division (the State Nature Inspectorate - SNO). A range of criteria from the field-autopsy of the carcasses to signs found associated with the kill-site are used to assign each kill to a particular predator species. However, given the extensive nature of Norwegian sheep husbandry, it is not expected that all predator killed sheep are found and have their cause of death confirmed in order for compensation to be paid. In addition, once several sheep in a grazing area have been confirmed as being killed by a given predator, the personnel may not be able to control all reported carcasses. In fact most losses above the "normal loss" (a long term average of non-predation mortality

from each region in the period before large predator recovery) are eligible for compensation provided one or more criteria are fulfilled. These include:

- 1 some documented losses within a grazing area due to large predators,
- 2 permanent presence of large predators within the region,
- 3 age and seasonal specific patterns of losses,
- 4 a history of chronic depredation losses in the grazing area.

Compensation is designed to cover the slaughter value of the sheep, although some additional compensation for lost production value of ewes, and extra work may also be eligible for compensation. Compensation is paid for losses due to brown bear, Eurasian lynx, wolverine, wolf and golden eagle. It is the county environmental management authority that is responsible for processing claims by individual sheep farmers, and the claims are based on the field documentation by SNO and the information provided by the farmer.

The losses of sheep due to depredation in Norway are far higher than for any other European country when the small size of the large carnivore populations is taken into account. Although only 5-10% of the sheep compensated were actually documented as being killed by carnivores (Table 1), there have been many studies of sheep mortality patterns in Norway using radio-collared sheep that have confirmed the extent of depredation. At present, wolverines and lynx are the worst depredators, largely because they occur in the largest numbers (Table 1). The losses have also been rising during recent years, from 1,301 in 1994 to its peak of 33,109 in 1999. It is interesting to note that sheep do not form a major part of the summer diet of any of the carnivores, so that it appears that much of the livestock killing is "surplus

**Table 1:** Number of documented losses, losses which were compensated and total amount paid in Norway in 2001. In 2001 a total of NOK 43 Millions (US\$ 6.2 Millions) was compensated.

	Documented losses	Losses which were compensated
Bear	434	3,054
Wolf	69	788
Lynx	379	7330
Wolverine	658	13,535
Eagle	109	897
Unspecified large predator	9	4,287
Total	1,658	29,891

killing” motivated just by the fact that wherever the carnivores hunt their natural prey (which are abundant throughout Norway) they cannot fail to encounter sheep. The extreme high losses appear to be a consequence of the extensive nature of the husbandry and the wide dispersal of the sheep.

Compensation has succeeded in preventing most sheep farmers from losing too much money as a result of carnivore depredation, although bear depredation on ewes is hard to compensate as it is often the largest ewes and potentially most useful for breeding that are killed. However, many sheep farmers have simply quit because of the apparent lack of future in the industry or the psychological effect of losing the lives of so many animals. Furthermore, paying compensation has clearly not stimulated farmers to adopt carnivore compatible husbandry measures, as losses have steadily risen in line with increasing carnivore populations. In fact, there is a good deal of resistance to adopting new husbandry methods, even when financial assistance is provided. A husbandry system that allows around 30,000 sheep to be killed by carnivores each summer can clearly not continue without change, especially when considered from the point of view of animal welfare, even if it is fully compensated. There is therefore a clear need to find a way of moving the emphasis from paying compensation after depredation, to stimulating forms of husbandry that prevent depredation from occurring in the first place. The main problem here is that changes are likely to cost huge amounts of money as radical changes to the husbandry are required. These extra cost will be in addition to the large amounts that are already used to subsidise the industry.

The only useful bi-product of this system is the fact that data useful for monitoring carnivore populations are available. Although it is hard to use these data to say anything about details of carnivore population size, it is possible to use the documented kills to map changes in species specific distribution, and to use losses as a very rough indicator of population trend.

## Saving the Central Asian Leopard in Turkmenistan

by

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With their powerful muscles and long, sharp teeth, big cats often seem terrible and even invincible. This strength is deceptive, however, as these animals depend on populations of other animals – often large ungulates – for food. When anthropogenic pressures such as herding drive down populations of wild ungulates, predators must prey on other animals, and domesticated animals become easy targets. Naturally, conflict arises between the interests of protecting the predators and preserving the local economy, especially in poverty-stricken rural regions where herding is the only means of sustenance. A successful conservation strategy must find a way to mitigate this conflict and interest the local population in conserving the predators.

As recently as the last century, one of such predators, the Central Asian leopard (*Panthera pardus tilianusciscaucasica*), was spread found throughout all of the mountains of Turkmenistan, southern Uzbekistan, and southwestern Tajikistan, as well as parts of the Caucasus. Although the former range of the leopard in these regions stretched for several million hectares, today such habitats are confined to less than 600,000 to 800,000 hectares. Almost all of the leopard’s habitat degraded quickly when they were subjected to overgrazing of domestic herds, timbering, fires, hunting, the introduction of agriculture, and in some cases even tourism.

Until the 1940s-1950s when a sharp decline began, the leopard group in the Western Kopetdagh Mountains existed at a relatively stable level. At the present time, however, the population is declining even as its basic sources of prey – urials (*Ovis vignei*), wild goats (*Capra aegagrus*), and wild boars (*Sus scofa*) – are also declining. At this rate, the leopard population will become fragmented and ultimately go extinct, as happened with the Caspian tiger (*Panthera tigris virgata*), which once lived in the tugai forests of Turkmenistan. The tugai were filled with the tiger’s favored prey, Bukhara deer (*Cervus elaphus bactrianus*) and wild boars, but when the tugai ecosystems collapsed under anthropogenic stresses, both the deer and boar declined.

The leopard demonstrates a more flexible behavior in response to human activities. Within a relatively brief period of time (from the 1930s to the 1970s) it