

tures overnight. In the meanwhile, we will also test possible habituation of wolves to such barriers, because we do not want to recommend implementation of a technique that will only work temporarily. Specifically, wolf researchers should avoid public opinion over-reactions to unexpected livestock losses due to wild wolves habituating to such barriers!

We believe that the *fladry* technique has great potential for wolf management. The use of *fladry* for wolf capture is currently being implemented. Further research is needed as soon as possible in order to evaluate the use of *fladry* to protect livestock in areas where conflicts between wolves and shepherds are arising.

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## Electric Fences and Fladries in Romania

The *Carpathian Large Carnivore Project* is an international joint initiative of the Munich Wildlife Society and the Romanian State Forest Administration. Goal of the project is to establish a community-based conservation of large carnivores and their habitat in a model region in the southern Carpathians through an integrated management approach. Mitigation of conflicts between large carnivores and livestock breeders is an important part of our management and conservation concept.

In the Romanian Carpathians, flocks are traditionally *guarded* with shepherds and guarding dogs. This method is very effective and only about 2% of all sheep are taken annually by wolves and bears. Still, many livestock owners consider large carnivores a pest. Social and economic conditions are changing in Romania, and it is likely that this intensive guarding system will not be economically feasible anymore, once salaries are rising.

To *counteract* this, our project initiated a programme to improve the livestock guarding system

and to find alternatives to the intensive guarding. Electric fences and fladry seem to be two possible solutions. During fall and winter 1999, we equipped two shepherd camps with 12 V powered electric fences in order to test the difficulties in running the camps under the specific Romanian conditions (e.g. no access to electric current or little technical understanding of shepherds). Starting from May 2000, we will equip 10 shepherd camps during the summer grazing season with electric fences, to test their effectiveness against wolves and bears. Based on the experiences of Musiani, we further plan to equip 5 camps with fladry equipment. We will monitor all equipped shepherd camps and 15 control camps without additional protection and compare the results with data from shepherd camps monitored in 1998 and 1999.

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## Norwegian Brown Bears: Holders of an Unwanted World Record

When flying over Norway, it appears that the forests and mountains are endless. Compared to a similar flight over other areas of western Europe the signs of human occupation are minimal. Surely if there is anywhere for brown bears to have a chance to survive and thrive in Europe it must be here? Unfortunately the answer is not necessarily yes. The forests of Norway represent superb brown bear habitat. There are plenty of moose, ants and blueberries and other things that bears like to eat. It is no problem to find good denning sites under anthills or spruce trees. Even though the forestry industry is intensive, this appears to have no negative effects on brown bears, as the population in neighbouring Sweden is thriving where forestry is even more intensive. So, what's the problem?

The problem is that bears do not confine themselves to eating moose, blueberries and ants. Every summer, over 2 million domestic sheep are released into the forests and mountains of Norway. These graze freely without any supervision in the form of shepherds or dogs for up to 3 months. During these three months there is nothing to prevent bears (and other large carnivores like lynx, wolverine and wolves) from helping themselves ad libitum. Unfortunately for farmers, managers, and conservationists ali-

ke the bears do not hesitate. Losses are generally well documented by trained personnel, and have steadily increased during the last 10 years. In 1998 compensation was paid for 4265 bear-killed domestic sheep. When the estimated population size is between 25 and 50 (we share a population with Sweden, so the number of bears actually in Norway varies a lot, this means that each bear is on average killing about 100 sheep each summer. This is a world record in terms in the number of livestock killed per individual bear, and is in fact 20 times higher than the nearest competition. It is also a world record that Norway could do without. As a result there is an enormous conflict between sheep farmers and the government which is greatly hindering the process of reestablishing viable bear populations inside Norway.

In order to try and reduce predation, a number of measures have been, and continue to be evaluated.



Drawing: Dominique Roth

Bringing the sheep in from the forest early in August avoids the season with the highest losses, but means that farmers lose up to 30% of their grazing season. Currently an experimental project to test livestock guarding dogs and shepherds is currently in its third year. Guarding dogs were imported from Italy and Poland and so far have proved to be very effective. However, before they could be used to guard a flock, shepherds with herding dogs needed to be included in the husbandry system to prevent the sheep from spreading out. This is a new component in Norwegian sheep husbandry and greatly adds to the cost of the system. However, in two years they have not had a single case of bear predation on the experimental

flocks. Although such efforts can demonstrate that it is possible to farm sheep in bear areas, the extra costs may mean that it is not practical on a large scale. In addition farmers are often slow to accept new methods.

The lessons so far from Norway are the following; (1) There is a difference between good bear habitat being available and bears being allowed to use it. (2) Depredation rates can be enormous if sheep are grazed without supervision in forest habitats. (3) It appears that shepherd / guarding dogs systems prevent most predation, but economics may prevent their widespread application. (4) Long term solutions will probably involve some changes in husbandry and increased zoning of both sheep and bears.

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## Large Carnivore Damage in Spain

Three species of large carnivore exist in Spain: the brown bear, the wolf and the Iberian lynx. There are some 80 bears in the Cantabrian Mountains, in the northwest of Spain, slightly decreasing. In addition, there is a remnant population of 5 or 6 bears in the western Pyrenees and maybe 6 other bears in a recently reintroduced population in the Central Pyrenees; most of these bears are on the French side. In the Cantabrian Mountains, bear damage is scarce and it is not a conservation problem. The amount compensated by regional governments in the Cantabrian Mountains is 7 million pesetas (43,750 \$) per year, but only 50% of this is estimated to be actually caused by bears. Bears are perceived as a minor problem by Cantabrian local people for several reasons: sheep are very scarce in bear range, so damage is moderate and surplus killing is rare; wolves are common in the Cantabrian Mountains, and compared to them, bears appear not so bad. In recent years, as bears attract tourists, they are perceived more and more positively by local people. In the Pyrenees, sheep are common, and the very few remaining bears cause much more damage in relation to their numbers than those in the Cantabrian Mountains.

There is an increasing population of 2,000 wolves covering about 100,000 km<sup>2</sup>, living mainly in the northwest of Spain. We can roughly estimate the da-