2002 report

Protection of Livestock and Conservation of Large Carnivores in Slovakia

The use of livestock guarding dogs to protect sheep and goats from large carnivores in Slovakia

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Finally, and although I am sure they would rather be thanked with a bit of extra food than by being mentioned in this report, I wish to acknowledge the wonderful dogs in this study and to express regret for the abuse which I was unfortunately unable to prevent some of them suffering.

Robin Rigg, in Pribylina, Slovakia, 31st January 2003

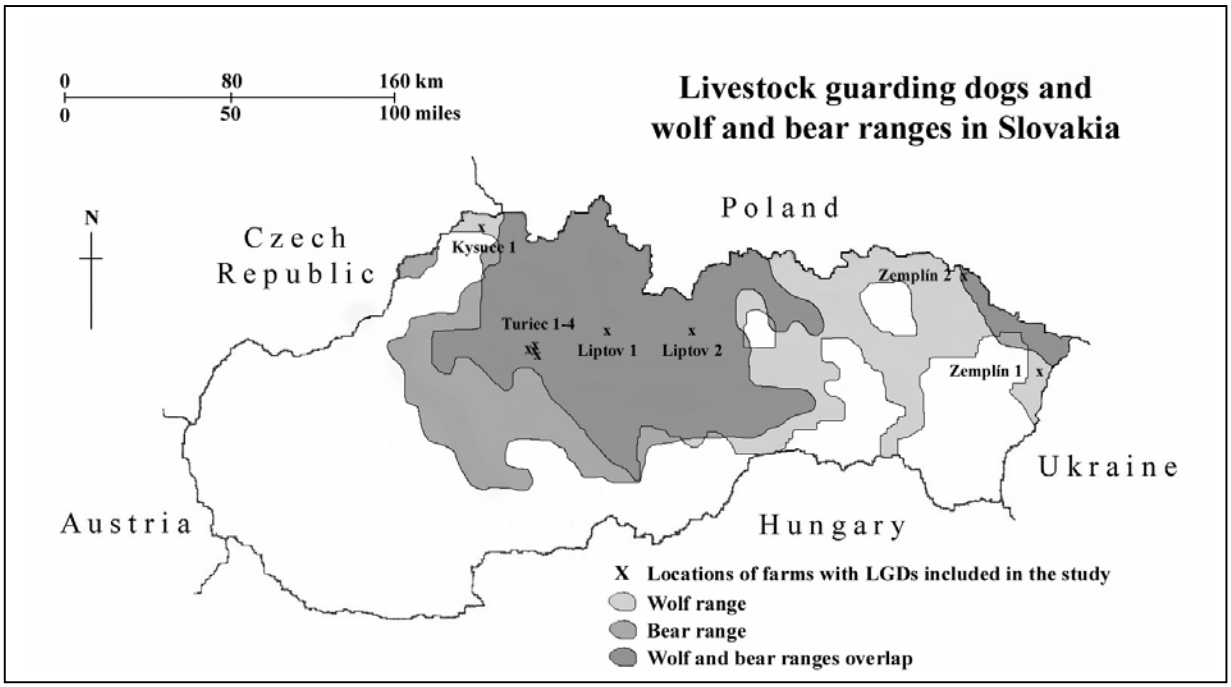
Contents

Title page photograph: Slovenský čuvač (Blanca and Axo) guarding sheep in Zemplín, Slovakia, May 2002 (R. Rigg).

Preface

Livestock guarding dogs (LGDs) have been raised for millennia to protect domesticated animals from wild predators, stray/feral dogs and thieves. A recent review (Rigg 2001b) found that use has declined in many regions for several reasons. Some breeds are rare, others have been bred for show, crossbred or misused in ways that have weakened their working ability. Nevertheless in parts of Italy and Romania the LGD tradition survives largely intact. Elsewhere, e.g. Slovakia and Poland, systematic efforts are being made to increase the use of LGDs to support large carnivore conservation. LGDs have been tested in countries where they are not traditional, e.g. Norway, Namibia and the USA. LGDs are especially appropriate when rare, endangered and legally protected carnivores are causing damage to livestock. Many LGD projects therefore operate in conjunction with carnivore conservation initiatives that, when funding and assistance can be provided, help offset farmers' start-up costs. One such initiative is the Protection of Livestock and Conservation of Large Carnivores project, running in Slovakia since 2000. Traditional use of LGDs in Slovakia was gradually abandoned in the first half of the 20th century, at a time when large carnivores were almost extirpated. Losses of sheep, goats and cattle to wolf (*Canis lupus*) and European brown bear (*Ursus arctos*) subsequently increased as their populations naturally recovered. Hostility due to livestock depredation, especially to wolves, is greater than recorded losses, which remain relatively low in Slovakia (<0.3 % of all sheep p.a. costing <30,000 Euros for wolf and bear combined) and affect a minority of farms, so effective prevention measures such as the use of LGDs might help reduce conflict and increase acceptance of large carnivores.

Fig. 1. Map of wolf and bear ranges and livestock guarding dog locations.



[Wolf and bear ranges adapted from Hell et al (2001) and Hell and Slamečka (1999) respectively.]

1. Introduction

1.1. Protection of Livestock and Conservation of Large Carnivores project

Preparation for an initiative to renovate the traditional use of livestock guarding dogs (LGDs) began in 1998 (building on pilot work in the mid 1990s) and in spring 2000 the Protection of Livestock and Conservation of Large Carnivores project was launched. In its first year a total of 8 LGD pups were trained in the Pohronie region of central Slovakia. The project expanded in both size and range in 2001 with funding for an additional 22 Slovenský čuvač and Caucasian shepherd pedigree or "pure-bred" pups in northern, central and eastern Slovakia. This report deals in detail with 14 dogs placed at sheep farms in the Kysuce, Turiec, Liptov and Zemplín regions (see Fig. 1).

1.2. Project goals

The Protection of Livestock and Conservation of Large Carnivores (PLCLC) in Slovakia project aims to fund, field test and implement non-lethal methods of protecting livestock from wolves and bears in Slovakia. The initial goals of this project were set as:-

- To evaluate the suitability of livestock guarding dogs (LGDs) to prevent attacks by wolves and bears so as to ease the anti-wolf/predator feeling that currently exists. This will also reduce the need for defence kills and address the animal welfare concerns of the current system of using permanently chained, untrained dogs.
- Through educational presentations, primarily to nature conservancy and forestry staff, farmers and shepherds, dog breeders and students, to explain the "new" methods being tested to ease human-wildlife conflict and begin to foster a more compassionate understanding of large carnivores and their roles within the Western Carpathian ecosystem.

1.3. Study area

The majority of Slovakia's uplands are part of the Western Carpathian mountains. Relief across the country varies from wetlands at 94 m a.s.l. to high mountains with Gerlach, at 2654 m a.s.l. the highest peak of the entire Carpathian range, lying in Slovakia's High Tatras. Large carnivores and traditional livestock herding occur mostly in the uplands of northwest, central, north and east Slovakia in Kysuce, Turiec, Orava, Liptov, Nízke Tatry, Podpoľana, Pohronie, Spiš, Gemer, Šariš and Zemplín regions (Fig. 1). Livestock grazing areas studied in this report lie principally within or near the following larger protected areas: Tatranský (High Tatras) National Park (NP), Nízke Tatry (Low Tatras) NP, Malá Fatra NP, Muránska Planina NP, Poloniny NP, Veľká Fatra NP (formerly a Protected Landscape Area or PLA), Horná Orava PLA, Poľana PLA and Kysuce PLA. The most common tree species in Slovakia are beech *Fagus sylvatica*, spruce *Picea abies*, oak *Quercus spp*., pine *Pinus sylvestris*, hornbeam *Carpinus betulus* and fir *Abies alba*. The main wild ungulate species are red deer *Cervus elaphus*, roe deer *Capreolus capreolus* and wild boar *Sus scrofa* and the three species of large carnivore present are the wolf *Canis lupus*, European brown bear *Ursus arctos* and lynx *Lynx lynx* (Vološčuk 1999).

1.4. Time-line and progress

1998 The Protection of Livestock and Conservation of Large Carnivores (PLCLC) project was formulated jointly by Slavomír Find'o and Robin Rigg in consultation with Alison Hood of The Born Free Foundation.

1999 After a visit by A. Hood to the proposed project area in Slovakia in May, an agreement was made to proceed with fieldwork.

2000 The project was launched in spring. A total of 8 LGD pups were placed during the year. In August A. Hood along with Debra Forthman of Zoo Atlanta, U.S.A., visited Slovakia to discuss the possibility of conducting field trials of conditioned taste aversion. At the end of the year, the project was divided into two sub-projects: S. Find'o continued with work already begun in Horehronie; R. Rigg began new work, mainly in Liptov and Turiec. It was agreed that the PLCLC project will run until at least 2004.

2001 After a June visit by A. Hood and Claudio Sillero (of Oxford University's Wildlife Conservation Research Unit and scientific advisor to The Born Free Foundation) the conditioned taste aversion trials were cancelled on C. Sillero's recommendation and work continued to focus on LGDs. A total of 22 new dogs were placed at various farms.

2002 A small number of new dogs were added to the project, with the main emphases being on observation and assessment of working LGDs, study of wolf and bear food habits and monitoring losses of livestock to large carnivores.

1.5. Masters programme

Within the PLCLC project, I am conducting a Masters degree through the University of Aberdeen's Zoology Department, with Martyn Gorman supervising, on "The use of livestock guarding dogs to protect sheep and goats from large carnivores in Slovakia". The fieldwork for this study officially began in January 2001 and continued until December 2002; writing up should be complete by December 2003. The study aims to:-

- Analyse the current situation regarding large carnivore depredation on livestock.
- Conduct a study of the food habits of bears and wolves in the Western Carpathians.
- Observe the development of 14 pups from two livestock guarding dog breeds and assess their ability, as yearlings, to protect a flock of sheep from predators.
- From the results of points 1-3, draw conclusions regarding the feasibility and likely effectiveness of using dogs from sources currently available in Slovakia to protect sheep and goats against wolves and bears.

1.6. Other project activities in 2002

In addition to the above, I also monitored and investigated media reports on large carnivores and interviewed shepherds and hunters (see 2.4 and 3.3), researched the historical use and demise of LGDs in Slovakia (4.2), began to prepare a practical education video on raising effective LGDs (4.4), continued publicity and public relations activities within Slovakia and elsewhere (5) and arranged the placement of further LGDs as farmers began to come forward to request them.

2. Large carnivores and the conflict over livestock losses

2.1. Extent of large carnivore depredation on livestock in Slovakia

It is difficult to obtain precise statistics on livestock husbandry in Slovakia in relation to losses due to predation. J. Dubravská (pers. comm. 2002) at the Ministry of Agriculture estimated c.300 seasonal sheep-folds (*salaše*) in Slovakia, the majority of which are likely to be in areas with large carnivores. MP SR (2000b) estimated 300-450. According to my observations in 1998-2002, there are usually between 150 and 700 head of sheep at a *salaš*. Taking 400 as average, there are therefore 300 x 400 = c.120,000 sheep grazed at *salaše* during the April-November herding season. According to official data (MP SR 2000a, Žatkovič 2001: 2) the total national sheep herd numbered between 341,400 and 382,900 during the 1999 and 2000 herding seasons.

Wolves (or lynx in a few cases) reportedly killed 353 head of livestock in 1999, causing 447,500 Sk (c.10,000 Euros) in damage (Hell et al 2001: 93). Bears were recorded as causing the death of 659 sheep in 1986 (Hell and Bevilaqua 1988 reviewed in Kaczensky 1996) and 395 sheep and 7 goats in 1997 (Hell et al 1997, Hell and Slamečka 1999: 90). Compensation paid for damage by bears in the period 1998 to 2001 is shown in Tab. 1. Up until the end of 2002 damage by wolves (and lynx) was not compensated and so records of losses are much more fragmentary and inaccurate; claims of such losses are often not investigated by damage inspection commissions unless there is to be an application for shooting of the carnivore(s) implicated. Taking 500 sheep killed by bears and another 500 by wolves as very approximate (over-estimated) averages per year, this means that c.0.14 % of all sheep or 0.42 % of those estimated to be grazed at *salaše* are killed by bears and roughly the same by wolves per annum. Assuming the total bear population in Slovakia numbers 600-800 (Hell and Slamečka 1999: 81) and the total wolf population numbers 150-350 (Rigg and Finďo 2000, J. Lukáč and E. Baláž both pers. comm. 2002), each bear kills on average c.0.6-0.8 sheep (at a cost of c.1500 Sk or c.35 Euros in compensation) and each wolf c.1.4-3.3 sheep (at a cost of c.65-160 Euros) p.a.

Tab. 1. Compensation paid for damage caused by brown bear (*Ursus arctos*) in Slovakia.*

	1998	1999	2000	2001	Average
beehives	*532,854 Sk* 12,400 Euros	*176,597 Sk* 4100 Euros	*128,505 Sk* 3000 Euros	*228,310 Sk* 5300 Euros	*266,567 Sk* 6200 Euros
sheep and goats	*210,816 Sk* 4900 Euros	*360,991 Sk* 8400 Euros	*351,903 Sk* 8200 Euros	*498,750 Sk* 11,600 Euros	*355,615 Sk* 8300 Euros
cattle	*176,269 Sk* 4100 Euros	*114,190 Sk* 2700 Euros	*51,496 Sk* 1200 Euros	*29,190 Sk* 700 Euros	*92,786 Sk* 2200 Euros
other	*1170 Sk* 25 Euros	*0 Sk* 0 Euros	*0 Sk* 0 Euros	*7000 Sk* 150 Euros	*2043 Sk* 50 Euros
Total	*921,109 Sk* 21,400 Euros	*663,558 Sk* 15,400 Euros	*531,904 Sk* 12,400 Euros	*763,250 Sk* 17,800 Euros	*719,955 Sk* 16,800 Euros

[Figures in Euros are rounded to the nearest 100 except where the sum is <200 Euros; data from Kassa (1999, 2001, 2002); there are minor inconsistencies between sources.]*

2.2. Livestock losses in perspective

The rough calculations above suggest that losses of livestock suffered to large carnivores in the Slovak Carpathians are fairly minor nationally and are well down at the lower end of the scale when compared with other areas in Europe (Kaczensky 1996: 73, Fourli 1999). Each bear in Norway, to take an extreme example, kills an average of around 100 sheep per year (Linnell 2000), besides which there is additional predation by wolves, lynx and wolverine *Gulo gulo*. According to Ciucci and Boitani (2000), approximately 2 million Euros is paid in compensation per year for livestock losses to predators in Italy which, they say, seems to be the highest in Europe (but is still less than 20 % of the compensation paid to Italian farmers for damage to agricultural crops by wild boar). Wolf diet in Portugal is almost exclusively based on domestic animals due to the low numbers of wild prey (F. Fonseca in Tubbs 1997; Fonseca 2000); c.2900 Euros per wolf were paid for damage in 1997 (Vingada et al 1999). Seven million pesetas (43,750 Euros) in compensation are paid per year for damage to livestock in the Cantabrian mountains of Spain, 50 % of which is estimated to be caused by bears (Blanco 2000).

Kaczensky's (1996) study of 12 European countries with large carnivores concluded that:-

- Sheep are by far the most vulnerable livestock and are preyed on preferentially.
- Livestock are most vulnerable at night and on forest range.
- The level of predation on livestock is generally highest for wolf and lowest for lynx.
- Almost everywhere losses are <1 % of total available stock.
- There is no obvious link between predator population size and losses or between sheep available and lost.
- High densities of natural prey do not necessarily prevent high livestock losses.
- Local differences in livestock guarding techniques seem to be the most important factor explaining differences in predation levels.

2.3. Livestock and large carnivore co-existence

In the Romanian Carpathians there are thought to be 5-6000 bears and 2-3000 wolves. In the same area there are also around 5 million sheep and 5 million people (Ionescu 1993a, Ionescu 1993b, CLCP 2000). Nevertheless, Mertens and Promberger (2000) found that an average of only 0.62 % and 2.08 % of all sheep in 2000 and 1998-99 respectively were predated at monitored flocks and concluded that the continued use of traditional methods, including livestock guarding dogs, was successfully protecting flocks of sheep even in an area with the highest numbers of large carnivores in Europe west of Russia. Promberger (1999) believed that levels of predation depended on how well livestock was guarded: attentive shepherds with good livestock guarding dogs lost few animals.

In Italy, also, problems of predation by wolves, domestic dogs and brown bears have been much less in areas where the traditional husbandry system of small flocks with shepherds and livestock guarding dogs was still used compared to areas where it had been abandoned (Zunino and Herrero 1972, Zimen 1981, Boitani 1982, Boitani and Ciucci 1993, Ciucci and Boitani 1998).

2.4. Shepherds' narratives, hunters' rhetoric, media reports and public opinion

A typical bear attack on livestock in Slovakia involves the loss of 0-3 sheep (data from damage assessment commission reports). Most shepherds I have spoken to express little or no resentment towards bears, which they usually describe as carrying off one or two sheep to eat somewhere in seclusion. Wolves, perceived as killing more than necessary, are resented more. Occasional cases of substantial surplus killing tend to receive massive media attention and therefore appear more common and significant than they really are, in turn being reflected in shepherds' narratives.

A case in point occurred at around 01:30 on the night of 7th-8th May 2002 when at least 33 animals (17 adult sheep and 16 lambs) were reputedly killed by wolves at Závadka nad Hronom on the south side of the Nízke Tatry. I visited the site on 10th May. Although the main flock had spent a trouble-free night in an open area with several dogs chained around and shepherds sleeping nearby, pregnant ewes and ewes with newly-born lambs as well as goats with young kids had been corralled between lines of bushes, providing perfect cover for approaching predators. Shepherds and local hunters expressed typical arguments about wolves being over-populated in the area and having already "liquidated wild game" had turned to livestock, but the farm manager said he could tolerate their presence if damage to livestock was compensated as is that by bears (act. no. 543/2002 will make this the case from 1st January 2003) and conceded that the reduction in wild ungulates in recent years is due at least in part to high levels of poaching. The attack was widely reported in the media (e.g. on national TV news on 9th May and in *Slovenka* magazine for 10th-16th June under the title, "Four-legged bandits: drama in the sheep fold"), again with typical arguments such as "they have lost their shyness". Shepherds claimed that in the dark, with fireworks being thrown and people and animals running about, they had been able to count 6-7 different wolves, from which they concluded that there must have been 10-12 in total, including "young which were being taught how to hunt", although it was not specified whether they meant yearlings which had already survived a harsh winter or pups-of-the-year, then just a few weeks old. By the time this story reached a sheep farm at the western end of the Nízke Tatry it involved 14 wolves killing 70 sheep. This case emphasises the importance for large carnivore conservation of raising public awareness through publicity and education in order to counter a general climate of hostility fostered by misinformation which otherwise allows farmers and shepherds to leave livestock insufficiently protected and hunters to demand the right to shoot more animals.

There have been at least three other well-publicised cases of surplus killing by wolves in the last four years. On 26th June 1999 sixteen sheep and 7 goats were killed when their flock, abandoned by its shepherds, was allowed to scatter into the forest in Nízke Tatry (S. Ondruš pers. comm. 2000). At the end of July 2000, 11 sheep were killed and 11 injured (later died) outside a fold in Veľká Fatra, having broken out in panic during a stormy night-time attack (Kubínyi 2000). The flock had been attended by a single shepherd with a herding dog. In 2001 the same farm grazed its sheep at the same location and with the same lack of protection: wolves killed or seriously injured c.40 sheep in a single attack, again in July and again during a night-time thunderstorm (Rigg 2001a). Hunters and subsequently also media reports, shepherds and farmers typically explained the attacks as due to wolves being "over-populated". Not many people pointed out that

leaving large numbers of sheep next to (or even in) a forest containing wolves as well as bears without doing anything to protect them was asking for trouble. In fact, after a break in 2002 the chairman of the farming co-operative involved in the 2000 and 2001 incidents was even considering returning sheep to the same location in 2003, motivated by the desire to bring in more money from state subsidies linked to the number of hectares grazed.

2.5. Conclusions

- The conflict over large carnivore depredation on livestock in Slovakia is driven largely by emotions, erroneous beliefs and ulterior motives rather than by facts and knowledge.
- Large carnivore depredation on livestock is economically insignificant overall (wolves, bears and lynx combined probably cause <40,000 Euros in damage to sheep, goats and cattle nationally p.a.), though may, in rare cases, cause substantial losses to particular farms.
- Cases of substantial (>10 sheep/goats killed in one event) surplus killing by wolves are rare (approximately one per year). In all four cases examined, shepherd error was to blame.
- Although recorded damage by bears to cattle and beehives fell steadily from 1998 to 2001, that to sheep more than doubled in the same period.
- Compensation schemes can be important in mitigating conflicts over losses, but in Slovakia compensation is sometimes paid out for damage caused by bears even when preventive measures were absent or of a type which is widely used but ineffective (e.g. the ubiquitous practice of chaining dogs around flocks at night).
- State-paid farm subsidies are aggravating the problem in some cases by encouraging farmers to graze their stock in high-risk areas.
- The useful findings of Kaczensky's 1996 report on the nature and extent of livestock depredation by large carnivores in Europe have yet to filter through to Slovakia, although the pattern of her conclusions describes the Slovak situation very well and could be used to identify high-risk areas and design preventive measures.
- The level of knowledge is very low and scientific research on large carnivores almost totally lacking in Slovakia. Most "information" which is made public originates from the anecdotes of hunters who frequently call themselves "the real conservationists" and "friends of nature".
- This general lack of knowledge allows irresponsible farmers and shepherds to leave their livestock insufficiently protected and fosters support for (or at least tolerance of) the unnecessary killing of large carnivores by hunters.
- Media reporting has a major influence on the fate of large carnivores. Newspaper, radio, magazine and television articles greatly favour sensational accounts of the negative aspects of large carnivores, give the impression that such problems are more numerous and greater in extent than they really are, quote hunters as experts on large carnivores, often fail to describe appropriate preventive measures which could (or should) have been taken and rarely make much attempt to put particular incidents into context or perspective.

3. Large carnivore food habits

3.1. Scat analysis

A total of 253 bear, 36 wolf and 8 lynx scats were collected and stored by freezing in 2001-02, primarily from Nízke Tatry, Západné Tatry and Veľká Fatra. The main effort was directed to finding bear scats; wolf and lynx scats were only collected incidentally, the reasons being that there has recently been a large-scale study of wolf food habits in Slovakia (Kolenka 1997, Rigg and Finďo 2000, Strnádová 2000, Strnádová 2002) and lynx are very rarely reported to have preyed on livestock in Slovakia. The wolf study analysed 353 scats from the period 1992-2000 found in 15 mountain ranges across central and eastern Slovakia. Percentages of occurrence for domestic animals in the samples were: 0.8 % sheep, 0.3 % cattle and 0.3 % domestic dog. Wild ungulates (red deer, wild boar and roe deer) were found to constitute over 90 % of wolf diet in the Slovak Carpathians.

Although a detailed analysis of the bear scats collected during the current study has not yet been completed, the general trend of bear diet in the Nízke and Západné Tatry during the period when livestock are grazing on pastures can be described. The most important component of bear diet in May-July was found to be green vegetation – herbs and grasses. Even scats found in areas where bears had been feeding, or attempting to feed, on human food waste (e.g. in Demänovská dolina) nonetheless contained vegetation more often than refuse, suggesting that this human-originating food source was a supplement rather than a mainstay for bears using it – a conclusion also supported by the observation that, although such resources were constantly available, bears used them irregularly through the course of the year. From late spring through the summer to autumn insects were also consumed, as evidenced in scat contents as well as by rocks turned over, ant (*Formicidae*) and wasp (*Vespidae*) nests dug up, tree stumps/trunks broken open as well as beehives destroyed. Bears focussed on various fruits as they became available, including bilberries (*Vaccinium myrtillus*) and raspberries (*Rubus idaeus*), then cowberries (*Vaccinium vitis-idaea*), apples (*Malus* spp.) and later rowan (*Sorbus aucuparia*) and rose-hips (*Rosa canina*). The number of scats found to contain animal hair was low and that with remains of livestock minimal. The use of human-originating sources of food diversified and appeared to intensify from summer to autumn, when reports of livestock losses and damage to beehives were supplemented by cases of bears visiting orchards near villages and feeding in maize (*Zea mays*) fields. Bears also made extensive use of hunters' ungulate feeding sites (see below).

These findings are broadly similar to those of Baláž (2002) who mostly worked in areas of the Západné Tatry with minimal human disturbance, though in his results the human-originating component was smaller (oats, maize, sugar beet, apples and plums together constituted 6.3 %, mostly in autumn and mainly due to hunters' feeding sites) reflecting the greater distance of his study area from arable land, livestock and orchards. In his sample of 291 scats from 1999-2001, the two most significant items were herbs (40 % representation) and bilberries (39.6 %). Jamnický (1988), who also worked in the Tatras, felt that the proportions of grasses and herbs (63.2 % occurrence) as well as ants (13.2 %) which he found in a rather small sample of 68 fresh

scats collected in the period 1950-85 were higher than they should be for a member of the Order Carnivora. His figures for sheep and red deer were both 2.9 % (each found in 2 of 68 scats).

Particularly from September a large proportion of the bear scats collected in the present study contained maize, oats or apples which had often been consumed at feeding sites for ungulates. Opinions differ as to the influence on bears of hunters' feeding sites (see e.g. Rigg and Baleková 2003), but there is no doubt that in Slovakia they are used extensively and presumably attract and sometimes concentrate bears in areas where they would not otherwise be. On 25th October 2002, for example, I counted a total of 115 fresh bear scats at and around a single ungulate feeding site with an enormous pile of oats and potatoes (the latter apparently not much liked by the bears) brought by tractor and trailer into Kôprová dolina National Nature Reserve, Tatranský National Park, an area nominally afforded the highest degree of nature protection in the country. The site was still being visited by bears until at least 9th November. Contrary to the claims of hunting advocates and the recommendation of the Large Carnivore Initiative for Europe and Council of Europe's "Action plan for the conservation of the brown bear (*Ursus arctos*) in Europe" (p.31-32), these sites are frequently not "located far from settlements and in areas closed to general human use". For example, in October of both 2001 and 2002 I observed similar concentrations of bear scats at and around feeding sites with oats, maize, potatoes and apples in Janská dolina, Nízke Tatry National Park. These localities were less than 100 m from marked tourist paths and lay between three of the National Parks finest National Nature Reserves. I found very little if any evidence of bear activity away from these feeding sites for a distance of several kilometres whilst food was available there. On 26th June 2002 a bear or bears was/were found to have fed on maize left within 1.5 km of Krpačovo, one of the largest and busiest concentrations of hotels and recreational cottages in Nízke Tatry. Ľ. Remeník also showed me ungulate feeding sites regularly used by bears in Veľká Fatra National Park, although these were located further from tourist paths. In one case such a feeding site, in combination with a field of maize situated very close to the forest edge, had drawn bears into the immediate vicinity of a sheep farm (*salaš*) for several weeks. Although no sheep were lost (perhaps at least partly due to the presence of LGD Asan), the shepherds were somewhat uneasy, having seen a sow with cubs passing within a few hundred metres of their flock and found bear tracks much closer than that.

It is well known that a major problem of interpreting results from scat analyses is that the proportions of the various components of excrement are unlikely to be the same as those of the food items consumed. In order to compensate for this error, I asked Kamil Soos of Stropkov Zoo to follow the procedure of Hewitt and Robbins (1996) for generating correction factors (CFs) the use of which, these authors concluded, "is likely to [more properly reflect] the importance of animal matter as a contributor to the nutritional status of many bear populations."

The wolf scats collected all appeared to contain remains of wild ungulates (*Cervidae* or wild boar). Lynx scats found in August contained bones and fur of rodents plus fruit. Sub-samples from 79 of the bear and 13 of the wolf scats were given to staff at the Veterinary University in Košice to examine for parasites. The results will be published in due course.

3.2. Direct observations of large carnivores

Due to limitations of time and the need to concentrate primarily on assisting in and observing the raising of livestock guarding dogs, collecting data on livestock plus searching for scats, little effort was made to observe large carnivores directly. Nevertheless I saw 6 different bears, 1 wolf and possibly 1 lynx in my study area in 2002 (details below). In 2001 I saw 2 wolves in TANAP.

29th April 2002 at 04:45-04:55, light rain, 980 m a.s.l. Two bears came to rubbish bins in Demänovská dolina, Nízke Tatry NP (NAPANT), making low contact calls. One tried to open a bin (designed to be bear-proof), unsuccessfully, by shoving with forepaws. Prints measured on the bins suggested the bear leaving them was fairly small, c.60-80 kg. In the early morning of 8th May a 67 kg female bear was legally shot at a nearby tourist facility. Permission for shooting was issued on the basis that she had been dangerous to people, allegedly having gained entry to a chalet and torn a man's trousers with her claws.

13th May at c.17:00, sunny and warm in Tatranský NP (TANAP), bad weather approaching from the west. Saw what I believe to have been a lynx lying in the sun on rocks above the tree line at 1800 m a.s.l.. I turned away briefly and when I looked back the animal had left silently (no sound of hooves on rocks). Within 1 km were scattered feathers of a male capercaillie (*Tetrao urogallus*) and a bed in grass among dwarf pine (*Pinus mugo*) with a lynx scat next to it.

31st May at 18:00-19:15, cool but clear. Two bears in TANAP. Estimated by a colleague (E. Baláž) familiar with the area and its bears to be a male of c.250 kg and a female of c.130 kg, the considerably smaller female nevertheless having much more body fat. Mostly grazed on grass in a gully above the tree line at c.1600 m a.s.l. The male made several courtship advances from which the female retreated, apparently afraid. Still present and unaware of us when we left.

1st June at 10:30-13:00. Same two bears as above, same place. Grazing. Female now obviously more relaxed with the male. Witnessed a brief mating. Present and unaware of us when we left.

18th June at 07:30. Sunny morning, already starting to heat up above the tree line in NAPANT. A wolf ran down a gully within 150 metres of where I was sitting with two BTCV volunteers at 1700 m a.s.l. It slowed down where the slope levelled off, trotted across the meadow below us and – still unaware of our presence – sniffed here and there as it went, before disappearing among dwarf pine. On 24th June at 08:30 a BTCV volunteer and leader saw the same or a different wolf 4.5 km to the northwest, apparently tracking a roe deer that had passed them c.20 minutes earlier.

18th June at 23:00-23:20. A bear fed on scraps of food around a latrine also used for disposing of rubbish outside a mountain tourist lodge at 1700 m a.s.l. above the tree-line in NAPANT where I was staying with 9 BTCV volunteers and their leader.

19th June at 21.20-22.10. I arrived back at the same lodge as the previous day to find a crowd gathered outside – the bear had been again half an hour previously. At c.21.40 it reappeared from dwarf pine below the lodge and proceeded to make a number of approaches to the latrine/rubbish area. Staff from the lodge hurled fireworks towards it, from which it ran, but quickly returned, after a shorter and shorter interval each time. Several Czech tourists approached the bear, taking

photographs and calling for bread to throw to it. The bear cautiously approached until c.20 metres from the tourists at which point some of them panicked and ran to the lodge, resulting in the bear loping a few metres further forward which in turn caused heightened alarm among the people. Those of us still outside retreated slowly until the bear was chased off with more fireworks.

23rd July at 20.15-20.25. I observed a bear feeding on raspberries in a clear-cut at c.700 m a.s.l. in Malá Fatra NP. Two fresh bear scats in the immediate vicinity were full of raspberry seeds.

3.3. Human-habituated and human food-conditioned bears

Problems with nuisance bears are sufficiently common in Slovakia to lead to an international conference (Rigg and Baleková 2003). Although injury to humans is rare, as with surplus killing of sheep by wolves, it attracts disproportionate media coverage. According to Hell (2003), such cases most often involve habituated bears. Hell and Slamečka (1999: 98-101) described and included photographs of a case when bears were hand-fed and even allowed into a house. During my studies of bear food habits in 2001-02 I have found that in a number of areas with chronic nuisance bear problems (e.g. Demänovská dolina and Tále-Trangoška in the Nízke Tatry), bears have been encouraged to approach by tourists or hotel staff offering them food as a titillating attraction or were fed by well-intentioned people (in one case a hotel chef, in another a holiday cottage owner) thinking they were helping hungry bears. The behaviour of the bear is commonly considered cute and amusing, "just like a dog", until someone gets raked by a set of claws or teeth. The bear may then be legally shot as a menace or, alternately, requests to shoot such animals have sometimes been turned down by the Environment Ministry with little action being taken besides laying the blame on poor waste management and the luring of bears, which has caused considerable resentment among frightened locals towards nature conservancy staff.

In 2002 I recorded six cases of people attacked by bears in Slovakia (there may have been others less serious and/or not publicised). See 3.2 29th April for the first case; in all five other cases, those injured (8 in all) were involved in an illegal act at the time: camping outside designated campsites in a national park (3x2), picking mushrooms in a protected area without permission (1) and poaching (1). The 3 cases of injured campers probably involved the same bear trying to get to food in tents: all occurred in the Tále-Trangoška recreation area, a human habituated and food-conditioned bear was seen numerous times (e.g. 3.2 18/19th June) and there were no more attacks or sightings after a 93 kg female was legally shot at Tále on 17th August. Human-originating food was available at several sites in the area and a bear had been fed by tourists, hotel staff and others. In contrast, reports strongly suggested that the mushroom-picker was unfortunate to approach a hidden bear which launched a defensive attack from c.10 m. In the sixth case (related to me by a reliable source) a poacher, having made a successful kill, went to fetch help with butchering or transport but on returning to the scene was attacked by a bear which had found the carcass.

Herrero (1970) concluded from a study of attacks by *Ursus arctos* on humans in N. American national parks that, although serious incidents were rare, "...there is a high injury rate attributed to grizzlies that have directly associated food with the presence of man. It is clearly possible, although not proven, that feeding at garbage dumps could induce certain grizzlies to overcome

their normal aversion to the odour of man and to seek similar food in developed areas." In his chapter on "The dangers of garbage and habituation", Herrero (1985) outlined the distinction between habituation to a repeated stimulus, such as human presence, and the formation in the mind of a human food-conditioned bear of an association between people and food (p.51-73). "Edible garbage and casually stored human foods," he wrote, "brought grizzly bears close to people, and the inevitable sometimes occurred... or a grizzly, smelling food in a tent, might rip into it and, when confronted with a person, attack." (p.53). "In the worst cases [habituation and human food-conditioning] have been associated with grizzly bear-inflicted deaths." (p.54). In one fatal case, "When the men suddenly confronted the bear [feeding from their camp site] at close range, she responded as if she were defending a food supply, much the same as if she had been defending a carcass." (p.55). Although European brown bears are less aggressive than *Ursus arctos* in N. America and east of the Urals (Herrero 1985: 248, Swenson et al 2000), the parallels between Herrero's findings and the current situation in Slovakia are clear. No one has been killed by a bear in Slovakia for more than 100 years (Hell and Find'o 1999), but Linnell et al (2002: 33-34) reported 36 (12 outside Romania) people killed by brown bears in Europe in the 20th century.

A new bear-human conflict resolution project is to be launched in spring 2003 by The Slovak Wildlife Society, Freedom for Animals and the WOLF Forest Protection Movement. It will concentrate on improving the level of knowledge about bears through information, education and media campaigns, as well as dealing with specific problem areas e.g. waste management and livestock/beehive protection. It is hoped that by trying to resolve conflicts between people and bears and promoting a fact-based approach it will be possible to balance the current tendency of the media and certain interest groups to alarm and even deceive the public by sensationalising isolated, rare events, at the expense of finding solutions acceptable to the majority of people affected and conducive to the long-term existence of a healthy bear population in Slovakia.

3.4. Conclusions

- Livestock forms an insignificant portion (c.1 %) of the diet of wolves in Slovakia. The figure is unlikely to be greatly dissimilar in the case of bears and is probably much less for lynx.
- The vast majority (>90 %) of wolf diet in the Slovak Carpathians is composed of wild ungulates (red deer > wild boar > roe deer).
- In the Nízke and Západné Tatry bear diet varies considerably according to season and location. The most important types of food overall are herbs, grasses and wild fruits (especially bilberries), which together may account for 90 % or more of the diet, though in some areas bears make considerable use of human-originating food sources.
- Potentially dangerous situations regularly arise in a number of areas with bears due to poor food storage and/or waste management and deliberate luring of bears as tourist attractions.
- Hunters' ungulate feeding sites have a major influence on bear food habits in the three national parks studied by attracting bears to areas used by tourists and livestock, concentrating several bears into small areas and leading to individuals becoming human food-conditioned.

4. Livestock guarding dogs

4.1. A brief introduction to livestock guarding dogs (LGDs)

Livestock guarding dogs (LGDs), rather than helping herdsmen move their stock as do herding dogs such as the Hungarian Puli, Scottish Border Collie and German Shepherd, protect the animals from external threats. They are usually large (often 70 cm at the withers and >45 kg) and appear independent, stubborn and intelligent. They have calm dispositions and do not show the typical predator-type behaviour (stare, stalk and chase) of herding dogs which move livestock. Most LGD breeds have a large head and pendant, rather than pricked, ears. Many are white.

Coppinger and Coppinger (1978) separated LGD behaviour into three basic components, the development of which – dependent on a combination of genetics and method of raising – is considered critical to produce a good LGD. A successful LGD is attentive (stays with the animals it is to guard), trustworthy (does not harm them) and protective in the face of danger. Not all breeds of dogs make good LGDs; inappropriate breeds are likely not to show enough of the required behaviour patterns and/or will show too much undesirable behaviour, such as chasing sheep. Traditional LGD breeds include the Polish Owczarek Podhalański, Caucasian shepherd dog, Bulgaria's Karakatchan, the Kuvasz and Komondor from Hungary, the Great Pyrenees, the Italian Maremmano-Abruzzese, the Carpathian/Romanian and Mioritic sheepdogs of Romania and the Slovenský čuvač in Slovakia (see, for example, Fogle 2000: 300-361).

The basic principle of raising LGDs was summed up by Coppinger (1992 quoted in Marker 2000): In order to achieve a good adult LGD showing the three required behavioural traits, "The dog should be kept with, brought up with, socialised with and bonded with the stock it is going to protect." Lorenz (1985) stated: "If the dog isn't with the sheep it isn't where it's supposed to be." The critical period for domestic dogs to form social attachments is between 2-4 and 12 weeks of age (Scott and Fuller 1965). During this period they can form strong social attachments to other species; it is this phenomenon which is exploited in raising LGDs. Social attachment becomes difficult after 16 weeks and so it is essential to begin the training of LGDs as pups. However, pups should not be separated from their mother too early as they may later show fear of dogs. The USDA (1998) listed the "Key points in successfully rearing a guarding dog" as follows:-

- Select a suitable breed and reputable breeder.
- Rear pups singly from 8 weeks of age with sheep, minimising human contact (probably the most critical ingredient for success).
- Monitor the dog and correct undesirable behaviours.
- Encourage the dog to remain with or near the livestock.
- Ensure the dog's health and safety.
- Manage the livestock in accordance with the dog's age and experience (e.g. use smaller pastures while the dog is young and inexperienced).
- Be patient and allow plenty of time to train your dog. Remember that a guarding dog may take 2 years or more to mature.

4.2. The story of LGDs in Slovakia

Livestock guarding dogs probably came to Slovakia from Romania and the Balkans via the Ukraine Carpathians along with other aspects of the transhumance system of intensive livestock grazing in mountainous areas during the gradual Wallachian colonisation from the 13th and 14th to the 18th and 19th centuries. The Tatranský čuvač, Lipták or *valaské psi*, of which until relatively recently every *salaš* (temporary sheep dairy farm/fold) had up to 10 for protecting livestock from predators and thieves, became the native breed of LGD. However, by the mid-1920s numbers had declined to such an extent – particularly during World War I – that systematic efforts were initiated to rescue the čuvač as a breed. With International Canine Federation (FCI) recognition in 1965/69 and the establishment of a club for the Slovenský čuvač (as dog breeders re-named the Tatranský čuvač), breeding focussed on the production of show dogs, pets and property guardians (Kurz 1958, Laurinčík et al 1958, Podolák 1967, Najman and Novotný 1973, Urbancová 1975, Barlik et al 1977, Podolák 1982, Polách 1988, CR 1990, Sims and Dawydiak 1990, Barlik 1992, Čaplovič 1997, Slavkovský 1997, Finďo 1997, Zuskinová 1999, Fogle 2000, Jamnický 2000, Hála 2001, SčJr 2003). Most *salaše* still have dogs (čuvač-type or other, usually the Caucasian sheepdog, Central Asian sheepdog, Polish Owczarek Podhalański and crosses thereof) for protecting livestock, but they are almost always chained to stakes or trees around the fold and milking pen, though at some camps they are released at night. Chaining dogs alters their behaviour (I have found many at *salaše* to be abnormally aggressive or, when approached closer, rather timid, sometimes ecstatically playful or excessively solicitous of attention) and limits their ability to protect livestock to the length of the chain (Coppinger and Coppinger 1994) or barking to alert shepherds. Many of Slovakia's chained dogs also suffer excessively as they are deprived of social interaction and some are left on open pastures without access to shade and water.

Bloch (1995) believed the LGD tradition was lost in Slovakia during communism (1948-89) due to "the demise of the wolf and various political events". It would seem advisable to have a better understanding of the timing and course of this change as some factors involved might still be extant and therefore of importance to current efforts to revive the use of LGDs for purposes of livestock protection and carnivore conservation. In 2002 I researched this topic through semi-structured interviews with shepherds, academic researchers, dog breeders and others as well as by consulting publications and examining archive photographs. I found that most people – including senior staff at the Ministry of Agriculture, agricultural researchers at ethnographic museums and even many shepherds themselves – did not understand the difference between a herding dog and a livestock guarding dog, so some care had to be taken to clarify to which the discussion referred.

Although a fairy tale, the story of *Starý Bodrík a vlk* or *Old Bodrík and the wolf* as collected by Pavol Dobšinský (1828-1885) clearly describes a livestock guarding dog effectively protecting a flock of sheep in Slovakia. The story begins, "At a remote sheep farm lived a dog named Bodrík. For a long time the shepherd was happy with him because he allowed no wolf to come near the sheepfold, neither during the day nor during the night." (Bednar 2001: 9). In his illustrations accompanying the tale, Martin Benka (1888-1971) drew a čuvač, unchained and therefore able "to circle the sheepfold" and go out from the farm to challenge a wolf, bear and fox (*Vulpes*

vulpes), as in the story. Jan Hála's illustrations from the 1940s (e.g. in Hála 2001: 68, 78) and his description (p.94-97) of the čuvač guarding flocks by day and *salaš* by night also eloquently portray the continued traditional use of LGDs in Liptov. In 1953, however, Kováč (p.263) wrote that guarding (but not herding) dogs could be chained and some early 1960s photographs (e.g. in Podolák 1982) show LGDs chained up in the Nízke Tatry. At this time, hunting had decimated the wolf population (reviewed in Voskár 1993 and Hell et al 2001) and bears were half as numerous and more restricted in range than presently (reviewed in Janík 1997, Hell and Slamečka 1999), so it may be that there was no longer a pressing need to protect flocks effectively. Perhaps the total number of dogs was reduced to cut costs, or smaller ones favoured for the same reason (T. Krafčiková pers. comm. 2003). Remaining dogs may have been chained for convenience. Podolák (1967: 109) reported that tame LGDs were taken out to pasture but "dangerous" ones were chained near the *koliba* (shepherds' hut) during the day and released at night.

However, systematic efforts to save the čuvač from extinction began in 1925, when the first of a small number of dogs was taken from the region south of the Tatra mountains to Moravia (now in the Czech Republic; kennel club-style selective breeding of the čuvač did not become firmly established in Slovakia until after World War II). Dr. A. Hrůza of Brno Veterinary University started a breed register in 1929 and a breed club was founded in 1933 (Barlik et al 1977, CR 1990, Sims and Dawydiak 1990: 34-35, Barlik 1992, Fogle 2000: 317, SčJr 2003). According to J. Goliašová, visitors from Moravia at the same time perceived that a number of other traditional Slovak agricultural breeds were in danger of being lost, so it may be that the LGD tradition began to be abandoned and forgotten as part of a general decline in agriculture preceding the Communist period. Indeed, the national sheep herd fell from 2,731,000 in 1870 to 1,301,000 in 1900 (Slavkovský 1997), although the decline was greater in southern areas of Slovakia than in mountainous regions and during the same period numbers of cattle nearly doubled.

This does not preclude the no-carnivores-means-no-need-for-LGDs hypothesis, as hunters had virtually extirpated bears from Slovakia by the 1920-30s (reviewed in Janík 1997 as well as Hell and Slamečka 1999: 74) and in the same period numbers of wolves were also very low, again due to intense persecution by hunters (reviewed in Voskár 1993 and Hell et al 2001: 110-111). Licensed bear hunting was resumed in 1962 in response to continued population expansion and increasing damage to livestock and beehives (Janík 1997), which makes it unlikely that livestock protection would have been reduced at this time. This, combined with the facts that "rescue" breeding of the čuvač had begun earlier and that LGDs were routinely chained in the 1950-60s would strongly suggest that Slovakia's LGD tradition began to be abandoned prior to the Communist period, in fact before the Second World War, possibly due to the virtual extirpation of large carnivores and/or a decline in traditional agricultural methods.

Podolák (1967: 109-110, 1982: 150-151) described the need in the past to protect flocks at night from thieves (usually shepherds from other farms wanting to improve their diet or replace lost sheep) as well as carnivores, and how large guarding dogs (čuvač) were chained for this purpose near the farm dairy buildings during the day and moved nearer the flock at night. Zuskinová (1999), describing traditional sheep-folding in Liptov, noted that the čuvač was used as a

guarding dog near the *koliba* or *košiar* (sheepfold), and only seldom went with the flock to pasture (indicating that the LGD tradition was already rare in the third quarter of the 20th century). Perhaps theft from the *koliba* was perceived as a greater risk than predation on sheep (I. Zuskinová pers. comm. 2003). Although, when roused by their canine alarms, shepherds would certainly have had more time to stop a thief than they would a predator, surely a free-roaming LGD would have presented a greater deterrent to thief and carnivore alike? In addition, sheep thieves are not unique to Slovakia, but I have yet to hear of another country where all the LGDs are chained. It seems unlikely, therefore, that LGDs were tethered solely for the purpose of making them more aggressive towards would-be sheep thieves (Finďo 1997: 3, 1999: 5) unless, once "trained" to be more vicious, the dogs were to be released. One of the reasons present-day shepherds give for not releasing their dogs is that they would be too aggressive to people, so it would be ironic indeed if the practice of chaining LGDs developed to make the dogs more aggressive and was then perceived to have been so successful that shepherds became afraid to release them, thus leaving a country full of dogs on chains. Many other dogs besides LGDs are chained in Slovakia, most visibly property guard dogs and pets in yards. This is not to make them more aggressive; it is rather a cheaper and easier alternative to erecting a dog-proof fence. Perhaps the same may be said in the case of Slovakia's LGDs: they are chained up to keep them where they are wanted, but to the detriment of their working effectiveness.

Remnants of the LGD tradition endured at some farms and in the practices of some shepherds. In 1999 I saw a čuvač-type dog accompanying a grazing flock from Liptovská Kokava, though this is the only such case I have seen in Slovakia of an unchained, sheep-socialised LGD attending a flock during the daytime which was not part of, or inspired by, the PLCLC project. A number of shepherds I interviewed in 2001-02 recalled having worked at farms which had sheep-socialised LGDs, but this always seemed to be in reference to the past. Explanations given for chaining dogs generally included circular arguments (if they were released the dogs would disturb the sheep or be aggressive to people; see also Tabs. 2 and 3), but some shepherds gave other reasons, such as the danger of free-ranging dogs being hit by cars. One of the shepherds at Liptov 2 told me he had lost a good dog in this way and a čuvač in the PLCLC project was badly injured in a collision with a car in 2000 (Finďo 2000: 15). J. Goliašová (pers. comm. 2002) thought that the general advance of civilisation, including surfaced roads and increased motorised transport in the vicinity of *salaše*, had been instrumental in the decline of the traditional LGD system.

The danger of hunters shooting dogs was mentioned by some shepherds as well as dog breeders and owners. One of the LGDs in the PLCLC project was shot dead by a hunter (Finďo 2001) and, despite being fully informed of the project's purpose, hunters near Asan's flock threatened to shoot him if he continued to wander because they were concerned that he might hunt "their" game. According to hunting law (act no. 23/1962 and amendment no. 99/1993), hunters have the right to shoot a dog more than 200 m from a dwelling and not under its owner's control; some of them show little discretion or restraint in exercising this right, preferring instead to shoot first and ask questions later. For example, the 1/2003 issue of *Hubertlov* ("The expert magazine for hunters and friends of nature") has an article on page 15 describing how a hunter saw what he

thought to be a stray dog, shot it, then found it to have been a raccoon dog (*Nyctereutes procyonoides*). Rare occurrences of the golden jackal (*Canis aureus*) in south/southwestern and southeastern Slovakia have been recorded by similarly fatal means (at least five males shot since 1989; Danko 2002, Hell and Garaj 2002: 93); it is now a protected species. The law states that sheepdogs can be shot if more than 200 m from a flock. Significantly, this law was passed at a time when the correct use of LGDs had already been largely abandoned in Slovakia.

It may be that the exclusion of grazing from many mountain ridge meadows after the declaration of national parks (e.g. TANAP established in 1948/9, grazing eliminated by 1955; Vološčuk 1999), which inevitably meant the location of flocks and their dogs nearer to settlements, was also a factor. T. Krafčiková (pers. comm. 2003) believed that more LGDs were kept on at farms further from villages. *Salaše* now receive far more summertime visitors than in the past, such as tourists and townspeople curious, thirsty or seeking to buy sheep cheese, and surrounding lands often become the hunting grounds for numerous mushroom pickers. Only one out of 284 respondents to a questionnaire (Bloch 1995) reported having been bitten by a Polish Owczarek Podhalański while passing a LGD-guarded flock near the Slovak-Polish border. My own experience of encountering LGDs in Romania and Bulgaria in 2001 was that they kept an eye on or challenged passing strangers but did not attack. However, there have been some problems of LGD-visitor encounters during the course of the PLCLC project, sometimes made worse by visitors' hysterical reactions on seeing an approaching LGD (Asan in this study, see also Finďo 2001: 12-13), the heightened aggressiveness of a male LGD (Asan) while a herding dog bitch was in heat or biting and chasing of visitors on bicycle/motorbike (Barón). See also 4.5. Interestingly, illustrator and writer Jan Hála, who lived among rural people in the region below the Tatras from 1923 till his death in 1959, noted that *"Boli to psi ani medvedina, celá dedina sa ich bála"*, "The dogs were like bears, the whole village was afraid of them" (Hála 2001: 97).

Shepherding is a hard job and milking one of the most arduous tasks. Men employed at *salaše* work 15+ hour days, including hand-milking 70-100 sheep 2 or 3 times per day, while living in a cramped trailer far from home. Wages are not great and many shepherds are only employed for the spring-autumn grazing season. Unsurprisingly farmers often struggle to find people willing to take on such work. According to J. Podolák (pers. comm. 2002) this was already so in the 1960s. Many farms I have visited were forced to employ as shepherds some rather dubious characters. In the worst cases of alcoholism, heavy drinking on the job, sometimes failing to turn up for work or being in no fit state to perform their duties, it is difficult to imagine such people would remain in any other job for very long, especially in a country where c.18 % are unemployed (far higher in rural areas). I have seen several shepherds beat sheep with sticks and kick them unmercifully and suspect the same sometimes happens to their dogs; a shepherd in Horehronie needed 17 stitches after he rather unwisely hit a Caucasian sheepdog when drunk (S. Finďo pers. comm. 2001, Finďo 2001: 13) while some LGDs placed at farms in Liptov and Turiec are shy of or aggressive towards men carrying sticks. I have frequently been surprised by how little some shepherds know about dogs. Today's shepherds also seem to be much less concerned about loss of sheep than their predecessors, who often slept by the flock to guard it (I. Zuskinová pers. comm. 2003). It

may be, therefore, that a further factor in the decline of the LGD tradition has been the gradual loss of traditional skills and knowledge coupled with an increased desire to solve short term problems (e.g. a wandering dog) in the quickest and easiest way (i.e. by putting it on a chain).

The PLCLC project has shown that at least some lines of pedigree Slovenský čuvač in Slovakia still retain the three traits considered necessary for working LGDs (see 4.1 and 4.3). In Puppy Aptitude Tests adapted for LGDs by Sims and Dawydiak (1990), most čuvač-type pups I tested scored in the 3-7 range, which would be compatible with Sims and Dawydiak's finding that, "the quieter, less active and more reserved pups are best suited to the task of protecting livestock" (p.87). A small number of unregistered farm dogs have also been included in trials. All pups from a litter of Slovenský čuvač x Polish Owczarek Podhalański crossbreeds seemed to show higher levels of nuisance behaviour towards sheep and were perhaps more aggressive towards people (Finďo 2000, 2001), although the method of raising these pups was far from ideal and may also have been a significant factor in these problems. Two čuvač-type littermates from a farm in Liptov showed mostly good behaviour towards sheep, especially the female (Eva – see 4.3).

The fact that most farms and *salaše* still have a few livestock guarding dogs – albeit chained – would appear to rule out price as a major problem in renewing the LGD tradition. Pedigree Slovenský čuvač in Slovakia currently cost around 6000 Sk (c.140 Euros) for a male and 4000 Sk (c.95 Euros) for a female. The PLCLC project also tested Caucasian sheepdogs, which can cost three times as much. Although we supplied training pens and the majority of feed in the first year to some farms, the most successful dogs (Blanca and Axo) were raised by a shepherd who managed pens and feed himself; he was given only pups and advice. Pedigree Central Asian sheepdogs can be bought for 8000 to 13,000 Sk, Sarplaninac for 7000 to 10,000 and Komondor for 8000 to 10,000 Sk. Perhaps the main advantage of buying pups with pedigree papers is to avoid being cheated by disreputable breeders (4.5). Disadvantages include the emphasis placed on physical appearance by breed clubs wanting show-winning pets which may be detrimental to the retention of good working traits, the dangers of inbreeding and inflated prices.

There are some differences of opinion between shepherds and the Slovenský čuvač Club in Slovakia over how "their" dog should look, with breeders wanting čuvač to have dark noses and eyes while shepherds prefer pink noses and light-coloured eyes (J. Goliašová pers. comm. 2002). Only around 60 pedigree pups were recognised in Slovakia in 2002 compared to c.100 annually in the preceding few years. J. Goliašová estimates a total of about 2000 registered pedigree čuvač in Slovakia at present. The Club is considering bringing in fresh blood from Finland or the Ukraine; ironically, it does not consider dogs from *salaše* to be suitable for its purposes.

To conclude, it seems that while large carnivores once again pose a threat to livestock in Slovakia, albeit a minor one, and dogs are available affordably which can be successfully raised as livestock guarding dogs, there are several obstacles to the implementation of effective preventive measures, from apathetic shepherds and trigger-happy hunters to hysterical tourists, factors made worse by unfavourable legislation, a poor economy and political change (see 4.5).

4.3. Degree of success in raising pups with sheep

In consultation with Drs. Martyn Gorman and Claudio Sillero, following the guidelines of Martin and Bateson (1993) and considering previous LGD studies (e.g. Coppinger et al 1983) in order to allow comparison of results, I drew up a focal observation protocol involving 4 hours of continuous observation every two months for each of the 14 pups in the study, during the morning sheep grazing/feeding period (depending whether pups were in barns or on pastures), supplemented by occasional night-time observations (using a Zenit/Bushnell 26-4366 scope). There was rather large variation between observers in 2001 so I conducted all 2002 observations myself, except some 24+ hour watches done by BTCV volunteers using a simplified protocol.

I made the first full set of these observations from 24th January to 1st March, when the pups were between 7 and 11 months old. Brita showed weak socialisation to sheep (this had already been apparent in September, when she was 4 months old), spending the whole of the observation period either chasing them or engaged in unrelated activities. The male at this farm (Bak) joined in the chasing when she initiated it, but if left alone with sheep showed excellent (calm, submissive) behaviour patterns. The farmer had followed instructions better with Bak, putting him with sheep at an earlier age and leaving him with them more consistently than Brita. The other pups all showed good behaviour patterns (active and passive submission towards sheep, protective) to a greater or lesser extent at this stage, with the frequency of disruptive motor patterns – especially chasing and grab-biting – also varying quite considerably between pups. The best dogs seemed to be two pedigree Slovenský čuvač (Axo and Blanca) and two non-pedigree Caucasian shepherd dogs (Maco and Dona) which were left together with ewes throughout the January to February lambing period.

Difficulties started to multiply as flocks were shuffled in preparation for the grazing season and the outcome of these problems depended to a great extent on the attitude and response of individual shepherds and farmers. For example, sheep added to Asan's flock at Turiec 1 in spring were initially afraid of him, so the shepherds temporarily separated him from the flock with a fence, then patiently leash-trained him until the new sheep got used to his presence. At Turiec 3, however, shepherds responded to similar problems by trying to keep Flávia and Maco away from the flock and probably beat them. At Liptov 1 the old head shepherd (*bača*) simply refused to allow either Bak or Brita to go out with the flock, so both were left chained up in the farmyard.

The autumn of 2002 was very wet with early snowfalls in the Západné Tatry above c.1600 m a.s.l. from 14th September and below 800 m a.s.l., in livestock grazing areas of Liptov, from 7th October. Observations of LGDs working with flocks were thus curtailed, but the general trend of progress and patterns of behaviour were already well established, except for changes caused by relocations. The progress and status of the 14 LGDs in this study as yearlings and towards the end of the 2002 grazing season are summarised in Tabs. 2 and 3. Axo and, particularly, Blanca were still clearly the best-performing LGDs at the end of the year. In raising these two dogs, the *bača* (unusually) followed USDA 1998 recommendations almost to the letter. He was given Axo at 10 weeks old and Blanca at 7 weeks old – both were put with sheep immediately.

Tab. 2. Summary of status and progress of all 14 LGDs as yearlings (date of 1st birthday in brackets – all in 2002).

Name	**Status and progress as yearlings**
Asan (4/5)	*Bača* reported new sheep added to flock in April afraid of him. He tended to wander when first on pasture; improved after leash training by shepherd, though still wandered a little at night. Very good with sheep, more protective at night. Obviously suffered from heat but no longer chased herding dog as in April. *Bača* pleased with Asan, but questions what his response would be to a predator.
Axo (31/5)	Working very well: though phlegmatic is attentive, mostly trustworthy and protective, esp. at night.
Bak (3/4)	Chained up for several months at Liptov 1. Transfer being negotiated.
Barón (3/4)	Had a tendency to wander as Liptov 2 shepherds never fully accepted LGD project and took little interest in the dogs despite losses to wolf and bear, so he was relocated to Turiec 2 on 27/5.
Bianca (25/5)	Having been chained all winter to prevent wandering, was still tethered on pasture when seen on 28/5. Chased sheep vigorously when released. Farm manager agreed to transfer her to a different flock and have the shepherds use a long lead to train her to stay with the flock.
Blanca (25/5)	Working extremely well and so far the best dog in the study. Very attentive – when observed on 29/5 only left the flock briefly to seek shade or water – as well as protective and mostly trustworthy. *Bača* is very pleased: he can leave his flock unattended with Blanca and Axo to guard it.
Brita (25/5)	Chained as Bak. Numerous promises by farmer to release them not kept; re-location being arranged.
Dona (20/7)	Fell ill after brother Maco transferred to another farm in mid-April. Veterinarian unable to make a specific diagnosis. Still sickly on 9/5. Later showed some improvement but farmer chained her up, claiming she had begun to harry sheep (when observed in a barn together with Maco on 28/2-1/3 both showed excellent trustworthy, attentive and protective – Dona less so – behaviour. By 10/6 farmer arranged for an alternative home away from sheep, effectively removing Dona from the study.
Eva (c.10/6)	Moved as per Barón. Not only did the shepherds leave these dogs to wander where they would, but they also failed to isolate Eva, as promised, when she was in heat, with the result that she mated with Barón and/or a chained Slovenský čuvač when still in the farmyard. She gave birth to 9 pups in the night of 10/6-11/6, of which 6 were alive when the litter was found in the morning.
Finestra (5/7)	Separated from sister Flávia for first time on 21/4 when moved to different flock. When seen on 7/5 she prevented herding dog working (perhaps protecting sheep), and tended to follow shepherd and herding dog rather than flock. Behaviour towards sheep very good, but shepherds afraid that new sheep, not yet used to her, might panic and suffocate so chained her when in barn with sheep at night.
Flávia (5/7)	When observed on 24/4 was in heat for first time and so chained within a pen inside a barn with sheep. On temporary release for observation showed mostly good behaviour, but some chasing, esp. of a kid with bandaged leg. Eye-stalk-chase behaviour seen on 25/2 not apparent in April.
Goro (c.10/6)	Chained up as Bianca to prevent wandering throughout the winter in farmyard and at the beginning of the season on the pasture. No effort made to either separate them from each other or keep them in contact with sheep by any means other than chaining. Farm manager promised to release Goro and have the shepherds train him to stay with the flock using a long leash.
Maco (20/7)	Moved from Turiec 2 to Turiec 3 on agreement between farmers. On 23/4 seemed to have adapted well, showed good protective behaviour. Subsequently accompanied Flávia and flock out to pasture.
Pazúr (20/7)	Shepherds reluctant to allow him to join flock and appeared hostile towards him, mocking him due to his small size (like his littermates Dona and Maco, he is not pure-bred). Outcome still uncertain.

Tab. 3. Summary of status and progress of all 14 LGDs towards the end of the 2002 grazing season.

Name	*Breed	Sex	1st location†	Status and progress up to 08/11/02
Asan	CS y	♂	Turiec 1	Still at original farm. Works part-time, attentiveness varies considerably, wanders to village. No sheep lost this year, despite presence of bears.
Axo	Sč y	♂	Zemplín 1	Working very well at his original farm. Four herding dogs, four sheep and a goat lost in 2 attacks, probably by wolves, but shepherd believes would have lost many more sheep without LGDs.
Bak	Sč y	♂	Liptov 1	After a good start, farmer and shepherds at Liptov 1 were unable or unwilling to deal patiently with normal problems of e.g. chasing sheep and chained him up permanently; was therefore relocated to a different farm (Zemplín 2) but there he killed several sheep, so was first tethered and then moved to Zemplín 1 farmer's house and kept away from livestock.
Barón	Sč y	♂	Liptov 2	He was reasonably trustworthy and more attentive and protective at night when observed at Turiec 2 on 11/6-12/6. However, he was later chained up after chasing and biting visitors.
Bianca	Sč y	♀	Kysuce 1	In a small enclosure/kennel in the farmyard. Farm manager claims was released with flock and worked well for a time when Goro was put with a different flock in summer, but I never saw this. Outcome still uncertain.
Blanca	Sč y	♀	Zemplín 1	Working extremely well (see Axo). *Bača* followed instructions for raising Blanca and Axo almost exactly: they were initially separated from each other but in constant contact with sheep, even during lambing, from summer through to spring before joining the same flock on pasture.
Brita	Sč y	♀	Liptov 1	Although she had been chained up for several months, the farmer had allowed her to breed (with Bak); she was moved to Zemplín 2, whelped and later taken out with sheep; did well initially but soon tethered there, too.
Dona	CS n	♀	Turiec 2	Withdrawn from the project and used as a property guard dog.
Eva	Sč n	♀	Liptov 2	Whelped at Turiec 2, subsequently began following flock voluntarily, but farmer reported slight tendency to hunt game.
Finestra	CS y	♀	Turiec 3	Working reasonably well at her original farm but was still more attentive to shepherd than sheep, prevented herding dog moving sheep and failed to stop a bear killing 3 sheep and 1 ram; shepherd therefore ambivalent, though acknowledged that she was still young and insufficient alone.
Flávia	CS y	♀	Turiec 3	Intensive husbandry system including artificial insemination at original farm seemed unsuitable for LGDs, therefore moved to a new farm near Žilina where, at least initially, will guard the farmyard rather than sheep per se.
Goro	Sč n	♂	Kysuce 1	In a small enclosure/kennel in the farmyard. See Bianca.
Maco	CS n	♂	Turiec 2	Seasonally-hired shepherds at Turiec 3 hostile to presence of LGDs and stopped him joining flock. Sometimes wandered into the village, therefore was first chained outside barn then moved to new farm with Flávia.
Pazúr	CS n	♂	Turiec 4	Despite a fair start, stopped going with flock because *bača* was afraid he might cause damage to sheep, although he never did so. After a long period of uncertainty as to the outcome, he was left permanently in a pen next to the sheep's night-time enclosure; *bača* said he would never be allowed to go out with sheep, even though the farm had lost several sheep to predation.

[Sč = Slovenský čuvač; CS = Caucasian shepherd dog; y/n = with/without pedigree papers; † See page 4 Fig. 1.]*

4.4. Ability of yearling Slovenský čuvač and Caucasian sheepdogs to protect sheep

No sheep from Asan's flock were predated in 2002, despite the proximity of bears (see 3.1).

Coming as rather a surprise, in September the first three cases were reported of attacks by large carnivores leading to losses in flocks where our LGDs were working. The first case occurred at Turiec 3 on the night of 12th-13th September. The lone shepherd sleeping in a trailer near his flock out on the pasture was woken by dogs barking at around 02.30-03.00 and on going out with a lamp saw a bear which he estimated to be <100 kg; it killed 3 sheep and a ram, fed and left of its own accord. The next day the flock was moved to pastures nearer the village and no further losses were suffered. The damage inspection commission visited the site of the attack and approved payment of compensation. The shepherd was unimpressed with the performance of the LGD, Finestra, which he said had kept at a distance of c.50 m from the bear and barked only after his own herding dog raised the alarm. During discussions, though, he acknowledged that she was still young (14 months old at the time) and inexperienced and, in any case, one LGD is not enough. Some shepherds, such as this one, have unrealistic expectations of LGDs and are too quick to dismiss them as failures. Large breeds such as the Caucasian sheepdog take longer to mature and so may not begin working at full strength until 2-3 years old (e.g. USDA 1998). Rather ironically, this attack was one of very few by bears in Turiec which was compensated in 2002 (Ľ. Remeník pers. comm. 2002), indicative of the low level of losses to large carnivores in Slovakia.

In the second case, which occurred at Zemplín 1, a former collective farm near the Ukraine border and about 1.5 km from the nearest village, on the night of 15th-16th September, the head shepherd strongly believed that a wolf or wolves, rather than a dog, caused the damage. At around midnight he heard a great commotion in the farmyard where the flock was lying and so opened the window of the farm office block where he and his family were sleeping and shone a light out. He saw what he took to be a wolf snatch one of his herding dogs from right in front of the farm building. Another herding dog had disappeared earlier in the evening but was thought to have wandered off. He described how the flock split into two during the attack and one LGD stayed with each part. I spent the night at this farm on 19th-20th September and 2nd-3rd October, but these nights passed without incident, despite much barking.

The shepherd thought the canid he saw was a wolf because it was very fast, agile, focussed and skilled in the hunt and had powerful forequarters. He has had experience of stray dogs attacking his sheep in previous years. In the morning he found that 3 ewes were missing, no trace of which was found. They may have fallen into the barn's drainage canals during the panic of the attack. Local hunters told him there was a female wolf with pups in the area, so he assumed that it was her teaching her pups to hunt (this is a very common supposition in relation to carnivore attacks on livestock in Slovakia, perhaps arising as people wonder why livestock – rather than wild animals – was attacked). He also said he had found a section of one of the herding dog's legs and what he thought might be a wolf den, but he had to leave before he could show me these. He was clearly much more upset about the loss of two experienced working dogs than of the sheep. Hunters had also told him about 2 or 3 other cases of wolves killing dogs in the same region.

The third case was a replay of the second, at the same farm, during which the remaining two herding dogs disappeared along with a young sheep and a goat on the night of 22nd-23rd September. The losses were not discovered until morning. The attacks on this farm came without prior warning signs: the shepherd even believed there were no large carnivores in the area besides occasional stray dogs, though in July Viliam Bartuš (WOLF Forest Protection Movement) and I found wolf scat within 8 km. Despite the loss of four herding dogs, four sheep and a goat, the shepherd was pleased with Blanca and Axo, sure more sheep would have been lost without them. He lost a large portion of his flock, sold very few lambs and got no milk from his sheep in 2002 due to a bad batch of winter feed, losses which far out-weighed those caused by large carnivores.

At the beginning of October I used a video camera to record the responses of the then four most sheep-attentive LGDs in the study to the approach of a substitute predator. As the LGDs were still young (from 15 to 17 months old) and fairly inexperienced (though all had had some contact with predators, as described above), an unfamiliar German shepherd bitch was used rather than some larger, more aggressive dog. Asan and Finestra were tested on 1st, Axo and Blanca on 3rd October. In each case, a dog handler endeavoured to remain hidden from the LGD(s) behind vegetation while approaching to <100 m of the flock edge; he then released the "predator" and, if necessary, encouraged her to run towards the sheep. After the trial, the "predator" was led away, the flock and LGD allowed to resettle and the procedure repeated from a different direction.

When the "predator" was released by the handler, Asan was resting in shade above the grazing flock and the former was able to reach and begin chasing sheep. Asan noticed the disturbance a few seconds into the attack at a time when the "predator" was c.100 m from where he was lying. He stood up with raised tail and looked towards the commotion, then ran to the scene, but after initially confronting the "predator", which did not yield, he appeared to become uncertain and his immaturity showed as he shied away from lunges by the German shepherd. He then appeared to check that two sheep nearest the "predator" were all right and lay down between them and the threat. He was more sure of himself in the second trial. In both cases sheep fled from the "predator" but scattered only slightly as Asan ran among them, quickly returning to grazing after he had passed. Finestra was much more aggressive to the "predator", which she detected at c.50 m, than Asan had been, though she had the advantage of support from a herding dog.

Axo and Blanca were, as usual, accompanying the same flock – with no shepherd or herding dog present – during trials. While handler and "predator" approached undetected to <20 m from passing sheep, both LGDs were sniffing around at the back of the flock. They discovered the released "predator" c.50 m from them, <10 m from the nearest sheep, and reacted instantly: both raced to the intruder, tails raised, squared off and interposed themselves between sheep and threat. In the second trial, although Axo initially reacted in similar fashion to the first time, Blanca was lying with a different part of the flock and remained oblivious to the whole incident.

In these trials, two Slovenský čuvač were better at seeing off a threat than one Caucasian sheepdog. A "predator" got within striking distance of sheep before discovery by LGDs; the latter, especially Asan, were clearly still immature but would have been more protective at night.

4.5. Problems encountered

A number of problems were listed in the sections on LGDs in Slovakia (4.2) and the raising of the 14 LGDs in this study (4.3 including Tabs. 2 and 3). Loss of livestock at flocks nominally protected by LGDs (4.4) is also problematic as it could be seized on by farmers and hunters alike as evidence that LGDs are ineffective. The general difficulties of working with many Slovak shepherds are alluded to throughout this report and described in those for 2000 (Finďo 2000) and 2001 (Finďo 2001, Rigg 2002). In addition, some specific problems were encountered this year, which are outlined below, in approximate chronological order of occurrence. Many difficulties arose as a result of not following basic USDA (1998) guidelines for raising LGDs (4.1).

An untrustworthy dog breeder and shepherds' predilection for appearance

The three sibling "pure-bred" Caucasian shepherd dogs Dona, Maco and Pazúr were always smaller and of different build to those with pedigree papers (Asan, Finestra and Flávia) and these differences became more exaggerated as they grew, to the extent that it was soon clear the breeder had been dishonest in his claims of their parentage. This breeder was also untrustworthy in failing to forward the pups' veterinary records as agreed so we could not be sure that he had vaccinated them as he claimed. The behaviour of the siblings towards sheep was nevertheless very good – better than the pedigree dogs – but shepherds valued appearance over performance, especially at Turiec 4 where Pazúr was openly ridiculed and ultimately rejected. The *bača* at this farm was a particularly awkward individual to co-operate with, appearing to invent excuses from the beginning for not working properly with Pazúr, culminating in statements such as, "I am responsible for sheep, not dogs" and, "What if he panics the sheep and they crowd together and suffocate? We would have to shoot *him* as a pest", an attitude which did not change even when a bear started killing sheep in the autumn. I saw no evidence, however, that Pazúr was mistreated in any way, and he was confined in a pen next to the sheepfold rather than chained, so he was left at the farm. Paradoxically, this shepherd was positive about LGDs when interviewed by local newspaper, *Nový Život Turca* (see 5). I suspect that the removal of Dona from work with sheep may have also related to her small size and very un-Caucasian sheepdog-like appearance as, although the private sheep breeder at Turiec 2 claimed she had begun to harass his stock, her behaviour towards sheep had been very good when I observed her at the beginning of the year.

LGD behaviour

Some behavioural problems have already been noted in 4.2, 4.3 and Tabs. 2 and 3. Most fall within the areas outlined by Sims and Dawydiak (1990: 45-80) and should be correctable but "patience is required", often lacking on the part of shepherds. Several LGDs prevented or attempted to prevent herding dogs moving sheep; Asan quickly grew out of this behaviour but Finestra persisted throughout the year. Axo and Blanca, also, did not allow herding dogs to work normally, although the *bača* at Zemplín 1 was not worried by this. Somewhat unexpectedly, two of the three Caucasian sheepdogs with pedigree papers, and hence the most expensive dogs in the study, were clearly more interested in following people than livestock. They did, however, have good protective behaviour. Flávia showed some remnants of hunting behaviour at 7 months old,

as she stalked and chased Finestra, but this seemed to disappear in two months. Asan, Bianca, Goro and Bak chased, caught and killed chickens. They, as also Maco and Flávia (after shepherds prevented them accompanying the flock) tended to wander around the surrounding area and into the nearby village. The use of a drag or wooden beam dangled from the collar was explained (Sims and Dawydiak 1990: 54-59), but shepherds never tried these techniques, even though such devices were used in the past with the čuvač in Slovakia to prevent dogs chasing game (Kurz 1958: 342, Podolák 1967: 109, Jamnický 2000) and I have seen herding dogs in Liptov so equipped. Eva sometimes left her flock to chase after roe deer and Asan may have killed a young wild boar. All 14 LGDs bothered sheep to varying degrees at some stage in their development. Bak, Brita, Barón and Eva were implicated in incidents of sheep killing. Even the best yearlings, Blanca and Axo, still indulged in occasional brief chases of individual sheep which they seemed to dislike or consider odd. Nevertheless, Sims and Dawydiak (1990) advised that LGD behaviour can change substantially as dogs mature and a seemingly unsuccessful adolescent may still prove to be a good guardian: in the USA c.75 % of trained dogs become good guardians (USDA 1998).

Shepherds rejecting LGDs

It is apparent from the literature on livestock guarding dogs (e.g. Sims and Dawydiak 1990) that, especially where the system is not already established, there has to be at least some minimal amount of time expended on working with growing dogs to teach them their duties and discourage obnoxious behaviour. In the hope that it would lead to better co-operation and avoid the problems which we experienced with some shepherds in the first year of the PLCLC project in Horehronie (Finďo 2000), in four cases while selecting farms at which to place LGDs in 2001 I met with and agreed the placement of LGDs with sheep owners or farm managers rather than shepherds. In hindsight, this was a mistake: the head shepherd or *bača* is traditionally responsible for the day to day management of the seasonal livestock fold or *salaš* (where predation is most likely to occur) and so he must be in favour of having LGDs in order to ensure that pups are raised well and allowed to accompany the flock. Where shepherds were simply informed by the farm manager or sheep owner that they would be raising LGDs (as at Liptov 1 and 2, Kysuce 1 and Turiec 3), there was a tendency among shepherds to view the dogs as extra (unpaid) work for them as well as a nuisance and threat to their income in possible lost milk production due to the disturbance of grazing sheep. The first signs of problems with LGD pups were then often taken as proof that the system did not work and therefore justification for not working patiently with the dogs, leading to them being chained up or left behind. For example, the nearly-retired *bača* at Liptov 1 refused to allow LGDs to accompany sheep and so Bak and Brita spent several months first shut inside the barn and then chained up in the farmyard. There was then great unwillingness to reintroduce the dogs to wary sheep, the farmer blaming this on the shepherds and shepherds attributing the problem to the farmer. Repeated discussions with and promises from the farmer did not lead to any change in the situation, so both dogs were relocated to Zemplín 2. At Liptov 2 problems with uncooperative shepherds finally became intolerable when the chairman of the sheep company, who had been in favour of having LGDs, lost his position in an election and his successor was not interested in continuing with the project; Barón and Eva were therefore moved

to Turiec 2. As described in 4.3, Maco and Flávia were also rejected by seasonally-employed shepherds more interested in the short-short concern of maximising milk production and hence wages rather than the long-term benefit of raising LGDs to protect their source of income from predation. In contrast, when agreements were made with the *bača* (Zemplín 1, Turiec 1 and 2), the period of pup-raising was far more successful, with the exception of Pazúr at Turiec 4 as described above. At Turiec 2 and 3 there was considerable variation evident between individual shepherds; those employed throughout the year were in general more patient with and in favour of LGDs than the extra seasonal workers taken on for the grazing and milking season.

Unwanted pregnancies

Liptov 2 shepherds did not notice when Eva started to come into heat. Once I had pointed this out to them, they proved incapable of isolating her despite having two barns and a number of other buildings available. Thus she became pregnant while herself only 10 months old and spent much of the 2002 grazing season with her pups (see Tab. 2). The situation at Liptov 1 was slightly different, in that Brita and Bak were chained up separately. On 22nd July Brita gave birth to five live female pups (three others were still-born), apparently pure-bred čuvač. It seemed that the old farmer had deliberately allowed Brita to breed (with Bak), despite being specifically told that this was not wanted during the grazing season and when she was only a year old, either because he enjoyed having pups around and/or thought he could make some money by selling them. Bitches elsewhere were successfully confined when in heat.

Reactions to the presence of LGDs

The most pertinent groups in this instance are farm visitors (cheese-buyers, walkers, tourists), pickers of mushrooms and forest fruit and hunters. Although the danger posed by LGDs to people is low (4.2, Bloch 1995), the sight of a rapidly approaching 70+ kg wolf-coloured Caucasian shepherd dog can trigger panic and hysteria which may result in a bite (Finďo 2001: 12-13) or the dog thinking the terrified visitor is initiating a game of chase (Asan). Barón was chained after biting visitors – the farmer was worried that cheese-buyers would stay away. Shepherds and farmers are generally in close contact with local hunters (officials of livestock companies are often hunters themselves, e.g. at Kyscue 1, Liptov 2 and Turiec 3) and so hunters were easily informed about the project. Nonetheless, some were hostile and threatened to shoot wandering LGDs (4.2). Recommendations to post signs warning visitors of the presence of free-ranging guard dogs and to put coloured collars on the dogs were not followed by farmers.

Husbandry practice unsuitable for LGDs

In addition to the problems with seasonally-hired shepherds described above, the failure of LGDs at Turiec 3 was also partly due to the intensive system of husbandry practised at this former co-operative farm. Artificial insemination and repeated rearranging of flocks were used to maximise milk and lamb output. Locations of flocks were also changed to gain subsidies for grazing remote pastures without leaving livestock in such high-risk (in terms of predation) areas very long. Maco and Flávia had no chance to become accustomed to any specific flock/location, or sheep to them.

Relocations of LGDs

For reasons already described, during the course of 2002 I made decisions to relocate Barón and Eva, Bak (twice) and Brita, Maco (twice) and Flávia to different farms. Soon after arrival at Turiec 2 Eva whelped and then spent most of her time with her pups around the farm buildings. By September she was voluntarily accompanying and protecting the flock. Barón also spent much time around the farm buildings, perhaps reluctant to leave Eva. He showed good protective behaviour of the flock when it returned to the farm environs at night, but was later chained up after biting visitors. Various possible strategies recommended by Sims and Dawydiak (1990: 53-80) for training him were explained to the farmer/*bača* but he did not try any of them. Soon after his arrival at Zemplín 2, a shepherd started taking Bak out on a long lead with the flock, although he at least once bit through the lead and ran back to be near Brita, who was left in the barn as she was pregnant, and twice bit the shepherd out of fear. He was soon left alone overnight with the flock in a barn as the sheep had seemed unafraid of him and he had shown good behaviour towards them. Unfortunately, this was premature and he killed 5 sheep and 2 goats, together worth c.12,000 Sk (290 Euros). It is not known if this was during excessive play or if he attacked them as they were still new to him (Sims and Dawydiak 1990: 65). He was subsequently tethered in the farmyard but escaped and took to wandering into the nearby village; the shepherds were unable to catch him. I therefore reluctantly took the decision to move him again, this time to Zemplín 1 where, as a precaution, he was no longer put with livestock. After raising her pups and being put with stock, Brita was also implicated in the killing of a sheep at the beginning of October, but shepherds admitted that the sheep had been very sickly and so Brita may well have partially eaten it after it had already died. Maco initially adapted well to his first relocation but he and Flávia were not put with stock after their transfer away from Turiec 3. We have therefore had somewhat mixed experiences of relocating LGDs to new flocks; this is an operation which requires some care and supervision so is problematic for shepherds inexperienced with LGDs.

Influences of economic reform and political change

Around 45 % of all farms in Slovakia are unprofitable and sheep numbers declined by 46 % from 1990 to 1998 (MP SR 2000b). Flock owners at 3 locations where LGDs were placed during the PLCLC project, including one in this study (Zemplín 2), later sold their sheep. There has been much uncertainty and reform ahead of Slovakia's entry to the EU (now set for May 2004); a requirement for pasteurisation threatened to force many farms out of business (MP SR 2000b) but has not been implemented. I was twice violently ill in 2002 immediately after consuming sheep dairy products from Turiec 2 (the only farm at which I have had such trouble). One Liptov *bača* was concerned enough about *salaš* hygiene to pioneer the use of a prototype milking machine in 1965 (Zuskinová 1999: 115-117). Perhaps a greater proportion of those farms which survive the transition to EU membership will equip themselves with milking machines (or focus on meat), driven by more stringent hygiene requirements and the difficulty of finding reliable labour for hand-milking. This in turn might lead to less grazing of flocks in remote areas and more often bringing them into barns at night, both of which – if they happen – are likely to reduce predation. In the meantime, such instability makes it hard to introduce a longer-term strategy such as LGDs.

5. Publicity and publications

Slovakia

I gave a presentation on LGDs and the PLCLC project at the multi-disciplinary, international conference, The Integrated Solution of Problems with Nuisance Bears (*Ursus arctos*), held in eastern Slovakia on 11th-12th April 2002. The presentation was well received and was the only one dealing in detail with the issue of livestock predation. The paper will be published shortly in the forthcoming conference proceedings:

Rigg R. (2003). The use of livestock guarding dogs to protect sheep and goats from bears and wolves. In: The integrated solution to the problem of nuisance bears (*Ursus arctos*). Rigg R. and Baleková K. eds. Conference proceedings, Nova Sedlica, Slovakia 11-12.4.2002: __-__.

Rigg R. Využívanie pastierskych strážnych psov na ochranu oviec a kôz pred medveďmi a vlkmi. In: Zborník referátov z odbornej konferencie „Komplexné riešenie problému synantropných medveďov (*Ursus arctos*)“ Rigg R., Baleková K. Nová Sedlica, 11-12.4.2002: s.__-__. 2003.

In its 21st May edition the regional newspaper for the Turiec area, *Nový Život Turca*, featured a very favourable and almost full-page article with two photographs on the LGD project entitled “Huňatí strážcovia sa vracajú” (“Shaggy guardians are returning”). On 7th June the Central and Eastern European correspondent for *The Economist* magazine visited central Slovakia to discuss wolves and bears and went with myself and a journalist from Slovakia’s Rádio Expres to see Asan, one of our LGDs working in Turiec.

My article entitled “Saving wolves by protecting sheep with dogs” was published in the Yule 2001 issue p.8-9 of *Howling*, newsletter of Slovakia’s WOLF Forest Protection Movement, which is one of the country’s most prominent non-governmental conservation organisations. The project was also featured in the Slovak edition of the newsletter, *Zavýjanie*, for Kračún 2002 p.8 in an article entitled, “Ovca celá a vlk sýty?” (“Sheep whole and wolf full?”).

In its 24th-30th September issue on page 2, *Liptov* regional newspaper featured an illustrated article on the project under the headline “Angličania kráčali po stopách medveďa” (“English people walked in the tracks of bears”). This was quite a positive article, focussed on the work of BTCV volunteers and eco-tourists hosted by The Slovak Wildlife Society, and shows that favourable media attention – albeit containing a few mistakes in the reporting of details – can be achieved for large carnivores with a little effort.

In September The Wolf Society of Great Britain donated sufficient funds for the purchase of a digital camcorder with which to film LGDs for publicity and education purposes. Many farmers and shepherds find Finďo’s 1997/99 booklet on LGDs too long (40+ pages) and technical to be a useful practical guide, so the aim is to put together a short film outlining the most important points in raising LGDs, including interviews with shepherds discussing their own experiences with LGDs within the PLCLC project.

Elsewhere

A review of my report, "Livestock guarding dogs: their current use world wide" was included in Carnivore Damage Prevention News No. 5, which can be downloaded from URLs http://www.kora.unibe.ch and http://www.large-carnivores-lcie.org. The report itself is available as IUCN/SSC Canid Specialist Group Occasional Paper No. 1 at URL http://www.canids.org/occasionalpapers and links to it have been made from several websites, including URL http://www.carnivoreconservation.org, where my report on last year's work, "The use of livestock guarding dogs to protect sheep and goats from large carnivores in Slovakia: 2001 report", was also included as a down-loadable pdf file (News archive 19th Feb. 2002).

The 2002 No. 3 issue of *Wolves*, newsletter of The Wolf Society of Great Britain, included an article entitled, "Project update: livestock guarding dogs in Slovakia", along with a full-page advertisement for sponsoring livestock guarding dogs, a scheme which has so far raised over £500 for the project.

A poster presentation by myself and Martyn Gorman on, "The use of livestock guarding dogs to protect sheep from bears and wolves in Slovakia", was included at the International Association for Bear Research and Management (the IBA)'s 14th International Conference on Bear Research and Management held at Steinkjer, Norway from 28th July to 3rd August. The poster was also displayed at the Zoological Society of London's symposium on People and Wildlife: Conflict or Co-existence? (London, 5th-6th December), at the Wildlife Conservation Research Unit/Born Free Foundation's People and Wildlife conference (Oxford University, 11th December) and at the University of Aberdeen Zoology Department's Research Day on 16th December 2002. The abstract of this poster presentation is included below.

THE USE OF LIVESTOCK GUARDING DOGS TO PROTECT SHEEP FROM BEARS AND WOLVES IN SLOVAKIA

Robin Rigg and Martyn Gorman (Zoology Department, University of Aberdeen)

Livestock guarding dogs have been used in Eurasia for millennia to protect domesticated animals from wild predators, stray or feral dogs and human thieves. The tradition was abandoned in Slovakia due to socio-economic changes during Communism and/or low levels of losses after large carnivores were virtually extirpated. By the late 20th century wolf, bear and lynx populations had recovered and predation on livestock increased. The overall level of losses is, however, still low: wolves and lynx reportedly killed 353 head of livestock in 1999, causing c.£6700 worth of damage; compensation paid for sheep, goats and cattle "damaged" by bears totalled c.£6000 in 2000. Nevertheless livestock depredation is frequently given as justification for killing large carnivores. The Protection of Livestock and Conservation of Large Carnivores project, launched in spring 2000, aims to reintroduce the traditional system of raising livestock guarding dogs. Fourteen pups were bought in 2001 and raised with sheep. Behavioural observations are testing whether two selected breeds (Slovenský čuvač and Caucasian shepherd dog) retain the key traits of trustworthiness, attentiveness and protectiveness; scat analyses will estimate the proportion of livestock in the diet of wolves and bears in the Western Carpathians.

6. Summary, conclusions and recommendations

Although most aspects of the transhumance system of grazing livestock in mountainous areas are still evident in Slovakia, including attendance of flocks by shepherds, the traditional use of livestock guarding dogs was gradually abandoned during the first half of the 20th century at a time when wolves and bears had been virtually extirpated. Protection from hunting subsequently allowed large carnivore populations to recover naturally and the ensuing conflict over livestock predation is now prominent in the media and quoted by many hunting advocates as a reason to kill more wolves and bears. Recorded losses are, however, relatively low (<0.3 % of all sheep p.a. costing <30,000 Euros for wolf and bear combined) and livestock forms an insignificant portion of wolf and bear diet (c.1 %), with each bear in Slovakia estimated to kill on average c.0.6-0.8 sheep (at a cost of c.35 Euros) and each wolf c.1.4-3.3 sheep (at a cost of c.65-160 Euros) p.a. More than 90 % of wolf diet consists of wild ungulates and >90 % of bear diet is composed of grasses, herbs and wild fruits. Damage to livestock by bears has been compensated since 1962; that by wolves and other carnivores will be compensated from 2003. In all four recent publicised cases of substantial surplus killing of sheep by wolves, inadequate – or completely absent – means of protection from predators was to blame. The commonest form of livestock protection used at present is to chain a few untrained dogs around the sheepfold; this is not an effective prevention measure, although it is regarded as such when compensation is paid for damage.

Six pedigree Slovenský čuvač, two farm-bred čuvač-type dogs, three pedigree Caucasian shepherd dogs and three supposedly "pure-bred" Caucasian shepherd dogs were raised with sheep at eight different farms. Near-perfect bonding to sheep was achieved with two out of the 14 dogs (Blanca, Axo). Two other dogs worked fairly well throughout the 2002 season (Asan, Finestra), one worked well when not raising pups (Eva) and two more dogs were working well until prevented by shepherds from accompanying sheep (Maco, Flávia). Two dogs were rejected by shepherds, one after a long illness and perhaps both due to their unimpressive statures (Dona, Pazúr). Two dogs showed very good bonding early on but contact with sheep was interrupted; subsequent relocations did not work out well (Barón, Bak). Three dogs had insufficient contact with sheep (Bianca, Goro, Brita). The following conclusions can be drawn:-

- At least some lines of Slovenský čuvač and Caucasian sheepdog retain good working traits.
- The key to success in raising LGDs is to ensure the commitment of the head shepherd or *bača* to follow basic guidelines consistently and patiently.
- LGDs are best raised in a farmyard or barn (ideally over winter) rather than out on pastures.
- Some aspects of husbandry, individual shepherds and outside factors inhibit the process.
- The presence of LGDs alone does not necessarily deter predators.
- Dogs in their second year of life may not yet be confident or quick enough to prevent losses.
- Although there are insufficient data to compare the effectiveness in reducing losses of the two breeds tested, in view of its lower cost, greater heat tolerance and native origin, the Slovenský čuvač would seem to be a better choice for farms in Slovakia, although the Caucasian shepherd dog certainly has the edge in ability to intimidate (sheep, visitors and perhaps also predators).

7. Outline of work for 2003-04

In its first three years (2000-02) the PLCLC project focussed on raising Slovenský čuvač, Caucasian sheepdog and Slovenský čuvač x Polish Owczarek Podhalański crossbreed pups with sheep and observing the degree of success of this process in relation to the attentiveness, trustworthiness and protectiveness of the dogs as they matured. We have thus been able to show that LGDs can be successfully raised in current Slovak conditions and that at least some lines of Slovenský čuvač do, indeed, retain sufficient LGD traits. Not all dogs have succeeded although this has often been due to the attitudes of shepherds.

The proposal from 2003 is to shift the emphasis away from buying and placing dogs and on to publicity of the project and dissemination of our results and experiences as well as basic information on livestock guarding dogs to as wide an audience as possible. This will not only increase the impact of the project itself but will also enable other large carnivore conservation initiatives to make use of its results and conclusions.

The main points from the project to be publicised include:-

- The composition of wolf and bear diets.
- The (low) overall level of large carnivore predation on livestock.
- What are LGDs and how to use them.
- Good and bad practice in raising LGDs.

Methods of raising public awareness will include:-

- Approaching newspapers, magazines, radio and television stations for media coverage.
- Investigating the possibilities for developing educational materials for use in schools.
- Organising a travelling exhibition of photographs from the project, with associated lectures.
- Making, showing and possibly distributing a video on the use of LGDs in Slovakia.

Further pups may still be bought, or better yet bred from dogs already included in the project, and placed with sheep as farmers and shepherds come forward to express interest, the funding for which will be considered on a case-by-case basis. More stringent criteria will be employed for selection of farms and placement of LGDs; it should also be recognised that many farmers and shepherds need more help and support to raise LGDs than was previously anticipated. The formal hand-over of ownership to shepherds/farmers of the 14 dogs involved in this study will include discussion on future breeding, with the possibility of neutering some dogs. Existing dogs will still be regularly monitored as they develop towards their prime working age.

As it has been found that the Slovenský čuvač can still make a good livestock guarding dog, a more detailed investigation of this breed should be undertaken, including an analysis of the level of inbreeding (Fonseca 2000) and other factors pertinent to its renewed use as a working dog.

Finally, it will be necessary to continue monitoring the livestock situation and losses to large carnivores in order to keep the project current and it would also be advisable to continue studies of wolf and bear ecology in regions with livestock, especially in relation to food habits.

The Slovak Wildlife Society

The Slovak Wildlife Society (SWS) is a not-for-profit NGO established in the UK in 1998. Our goal is to help ensure the long-term survival of endangered species in Slovakia through an integrated approach to solutions for sustainable co-existence with people. So far, we have:-

- Developed and part-funded an ambitious project to resolve conflicts between large carnivores, people and livestock, using livestock guarding dogs.
- Participated in and helped fund long-term research on wolf *Canis lupus* food habits, home range and movements (using radio-telemetry).
- Conducted and part-funded research on brown bear *Ursus arctos* food habits.
- Conducted and funded surveys of the endangered Tatra mountain chamois *Rupicapra rupicapra tatrica* as well as marmots *Marmota marmota* in Nízke Tatry National Park.

In order to raise funds and to provide field assistance SWS organises and hosts working holidays with The British Trust for Conservation Volunteers and runs low impact, sustainable "Wolves, bears and eagles" wildlife holidays in Slovakia's Tatra Mountains. Both the working holidays and the wildlife holidays generate money for other projects and also aim to show local people that their wildlife can be a source of profit to them if it is protected, rather than hunted. Since 2000 we have raised more than £12,500 (c.840,000 Sk) for wildlife conservation and research projects. In addition, our four "Wolves, bears and eagles" holidays and eight BTCV holidays in 2000-02 contributed nearly £26,000 (c.1,730,000 Sk) to local economies in large carnivore areas.

Through our international activities SWS also aims to publicise the little-known country of Slovakia, its wildlife and conservation issues more widely:-

- Our eco-holidays have brought around 100 British, Italian and German citizens to Slovakia.
- We have worked with The Born Free Foundation, The British Trust for Conservation Volunteers, The Wolf Society of Great Britain, the University of Aberdeen and the Wildlife Conservation Research Unit at Oxford University as well as a BBC film crew.
- We co-presented a poster on "Wolves in the Western Carpathians: past, present and future" at the *Beyond 2000: Realities of Global Wolf Restoration* symposium in Duluth, Minnesota, USA from 23rd-26th February 2000 (URL: www.slovakwildlife.org.uk/poster.htm).
- We part-funded a poster entitled "The use of livestock guarding dogs to protect sheep from bears and wolves in Slovakia" at the *14th International Conference on Bear Research and Management* held in Norway from 28th July to 2nd August 2002.

At both the bear conference and the wolf symposium we were the only people presenting Slovakia's wildlife. Much of our work is done on a voluntary basis, which allows us to target more money to grass-roots conservation.

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