

Georgian Carnivore Conservation Project Component: Mitigating human-carnivore conflict in East Georgia

Phase 2: Developing an HCC mitigation toolbox



A strategy for managing human-carnivore conflict in East Georgia

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October 2010



This project is supported by the European Union



EXECUTIVE SUMMARY

The Georgian Carnivore Conservation Project (GCCP) was established to conserve the unique and globally important biodiversity of the semi-arid landscape in Georgia. Here, the richness of the carnivore guild and the ecosystem processes they sustain may come under threat and conservation measures compromised in areas where human-carnivore conflict (HCC) is prevalent. For this reason, the GCCP decided to undertake a study, in partnership with the Tushetian community, to identify conflicts between large carnivores and ethnic Tushetian livestock owners in areas where they share the landscape.

During Phase 1 of the project, a comprehensive baseline survey was conducted to gain an overall understanding of HCC in East Georgia (Rigg and Sillero 2010). Phase 2, which is presented in this report, encompasses a toolbox of mitigation methods for reducing HCC. The remit was to develop a strategy for the project area in and around Vashlovani National Park (VNP), considering approaches proven successful in comparable situations and designed so as to be transferable to a wider geographic area, while making suggestions for developing a national policy for dealing with HCC in Georgia as a whole.

Traditional pastoralism persists in VNP as seasonal grazing of winter pastures by local and transhumant peoples (Anthem 2009). HCC stems largely from predation of sheep by wolves. Results of the baseline survey showed that the groups most affected were those that had the strongest negative feelings towards carnivores, livestock owners and herders, for many of whom losses to predation were reported to be an economic burden. This creates a conflict between people's livelihoods and the protection of VNP and its wildlife.

The strategy proposed to mitigate the conflict begins with first partitioning the conflict into three elements: the reducible, the irreducible but bearable and the neither reducible nor bearable. A range of direct and indirect interventions is then described which address those portions of the conflict that either could potentially be reduced or which, at the present time, cannot be reduced but may nevertheless be tolerated by those affected.

Indirect actions seek to make more of the conflict bearable. The apparent reluctance of livestock owners and herders to accept support to deal with HCC, and the prevalence of negative attitudes towards carnivores and conservation in general, calls for a communication strategy of outreach and education to change people's attitudes and incorporate them in decision-making processes. Support to improve the health of herds can help reduce HCC by reducing livestock vulnerability and total mortality. A system of ongoing monitoring would allow a better understanding of factors predisposing farms to predation so that mitigation can be targeted most effectively as well as facilitating prompt responses to attacks. This calls for the establishment of an HCC 'Rapid Response Team'.

Several well-tested tools exist for non-lethal damage prevention, some traditional and some contemporary, that can be applied in VNP. Especially when used in combination, these methods can significantly reduce losses to predation. Preventive measures should be applied most intensively during the lambing season, when livestock is in pastures, and incorporate more effective use of guarding dogs, human vigilance, *fladry* or other portable barriers.

If non-lethal methods do not reduce losses to a bearable level, other approaches may also be needed. Two options appear relevant for VNP: a) to remove problematic wolves and/or to develop an insurance scheme to compensate aggrieved livestock owners, with payments made contingent on improved animal husbandry.

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1. INTRODUCTION

The Tushetian people of East Georgia are nomadic sheep herders. Vashlovani National Park (VNP) and the bordering territories of the Eldari Lowland, Patara Shiraki and Iori Steppe are traditional winter grazing lands for their sheep and cattle (Fig. 1). VNP consists largely of natural pastures which are used from around October to May. In the spring, flocks typically move north or west to summer pastures (Fig. 2). In both these areas people and herds interact with large carnivores and as a result conflict often develops.

The Georgian Carnivore Conservation Project (GCCP) was established to conserve the unique and globally important biodiversity of the semi-arid landscape in Georgia. An important issue identified by the GCCP in this landscape is human-carnivore conflict (HCC). Conflict between large carnivores, especially grey wolves (*Canis lupus*) and brown bears (*Ursus arctos*), and ethnic Tushetian livestock owners and herders, who depend on the same landscape for their livelihoods, is reported to be prevalent. In partnership with the pastoralist Tushetian community, the GCCP intends to identify and implement measures to mitigate these conflicts and enhance the impact of conservation efforts in the area.

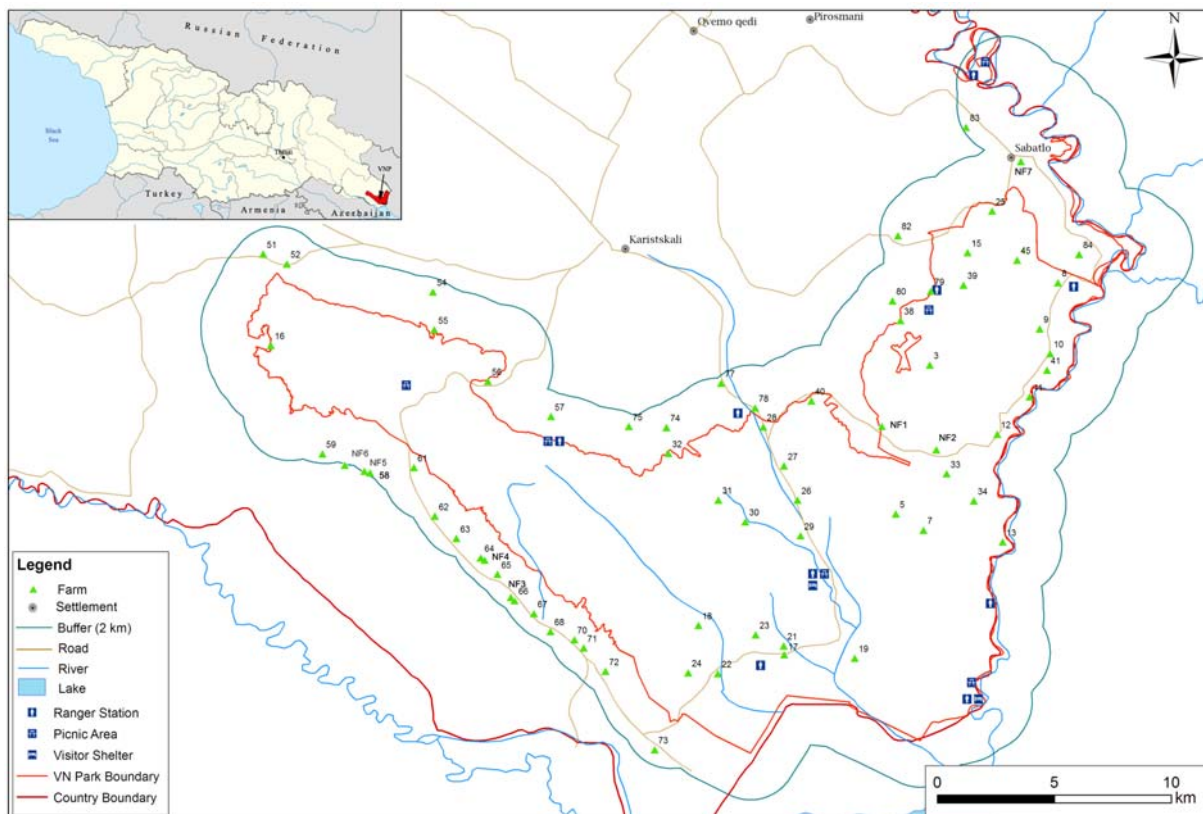


Fig. 1. Vashlovani National Park, indicating the locations of farms included in a baseline survey, the results of which formed the basis of this report (see Chapter 2)

Study of the ‘human dimensions’ of conflict, including public opinion and knowledge, has become an important element of carnivore conservation management (e.g. Bath 2009). It is now widely acknowledged that wildlife conservation is not only about managing animal populations but also requires management of the people that interact with them. Wolves

and bears are only able to coexist with humans if people are willing to share landscapes, tolerate livestock losses or crop damage and accept potential and actual risks to human safety and property. Thus, for successful large carnivore conservation, be it in a protected area or in a wider landscape, there must be a wildlife acceptance capacity (Sillero-Zubiri *et al.* 2006).

In order to gain an overall understanding of HCC in East Georgia, we designed and analysed a comprehensive baseline survey (Phase 1 Final Report, Rigg and Sillero 2010). The second component, or Phase 2, of this project concerns the development of a toolbox of mitigation methods for reducing such human-carnivore conflict. These recommendations will be presented here.

Our remit was to use the findings of the baseline survey to develop a strategy for managing HCC in the project area. This included a mitigation toolbox containing locally relevant tools and husbandry techniques with which livestock owners and herders can actively protect their flocks as well as recommendations for a national policy of HCC mitigation. The GCCP and livestock specialist were to provide input to ensure all methods are locally relevant. It was also specified that all methods should be based on work carried out elsewhere and be proven to be effective. In addition, the toolbox was to be designed in such a way as to be transferable to a wider geographic area and to work as a framework for the development of a national policy in dealing with HCC issues in Georgia as a whole.



Fig. 2. Locations of summer pastures used by livestock owners who spend the winter in the VNP area

2. SUMMARY OF BASELINE SURVEY FINDINGS

A study was undertaken by the GCCP, in partnership with the Tushetian community, to identify the issues surrounding human-carnivore conflict in East Georgia (Rigg and Sillero 2010) with a view to suggesting possible mitigation measures for this conflict in order to improve conservation management efforts in the area.

The study was conducted in March–April 2010. It focused on the Dedoplistskaro District, particularly around and within Vashlovani National Park, and involved a comprehensive baseline survey in two parts. The first part, which used a semi-structured interview protocol, was a description or classification of livestock farming in the VNP area, recording various husbandry parameters such as livestock type, herd/flock size, guarding techniques and losses to predation, disease and other mortality. The second component used a self-administered written questionnaire to gauge the perceptions and attitudes of several target groups towards large carnivores.

In the first part of the survey, livestock owners and herders at 69 farms within VNP or up to 2km from its boundary were interviewed. Ten target groups were identified for inclusion in the second part of the study, the quantitative survey: Tusheti and other livestock owners; herders; cereal farmers; enforcement officers; hunters; rural residents; urban residents; school pupils; and school teachers. The vast majority of the 765 respondents who took part in the written questionnaire lived in the Kakheti Region of East Georgia.

Results on livestock farming in the VNP area:

- Sheep were the most common livestock in the study area, providing wool and lambs, while cows were less common and were used for their milk and cheese. Sixty percent of farms had more than one livestock owner and on average each hired three herders during the winter period (October to April). Most respondents said they moved their livestock elsewhere for the summer, typically to Tusheti but some of them to Tianeti, Back Pshavi, Pankisi, Javakheti or Gombori (Fig. 2).
- Predation emerged as the biggest cause of economic loss, followed by disease. Fifty-two percent of respondents felt their economic losses to predation were large, while 28% considered predation a partial problem. According to 88% of respondents, most predation occurred in winter pastures, with a peak in February corresponding with the lambing season. Eighty-eight percent of killed animals and 67% of those injured by predators were sheep (or in a few cases goats). Eighty-seven percent of 46 farms with sheep had allegedly lost an average of 11 sheep each to predators since arriving in Vashlovani for the winter. Cattle and horses were more likely to be left injured after attacks than were sheep. Donkeys seemed to be selected by wolves, which might be explained by the fact that donkeys were tied up by their owners.
- Predation was considered a big problem at 52% of the livestock farms surveyed. One third (32%) of livestock owners rated the loss to their income from predation as significant. Grey wolves were mentioned by 87% of respondents when asked to rank predators responsible for livestock losses, and were always the most problematic species. Golden jackals and brown bears followed in second place most of the time.
- Seventy-six percent of livestock attacks were reported as happening in the afternoon or at dusk, normally when the flocks were in the pasture. Few attacks occurred at night. Most respondents acknowledged the use of protective measures to deter predators (every farm had at least one dog and all but one farm had a night-time

corral) and considered their efforts effective. Ninety-three percent of owners also had barns for young animals. However, patrolling and the conscious avoidance of potentially risky areas were generally not practiced. Respondents also admitted that perhaps their dogs were not trained properly or were not suitable for guarding against wolves.

- While all respondents stated that they did not have permission to shoot predators (an incorrect statement as wolves can be shot, but not bears), the majority brought up lethal control methods as one way to reduce conflict episodes. Very few listed non-lethal methods. Eighty-eight percent indicated they did not want help protecting their animals.

Results on perceptions and attitudes towards large carnivores and management:

- Feelings were consistently more negative towards wolves than towards bears across all target groups, with livestock owners and hired herders holding the most negative views, particularly towards wolves. Unexpectedly, cereal farmers (many of whom also owned livestock) had a fairly positive attitude when it came to bears but held more negative views of wolves. Seventy-four percent of respondents, especially livestock owners, thought that the wolf population was increasing in Georgia, while 79% of all respondents thought that there were too many of them. In every group, bar the enforcement officers (national park rangers and border guards), the majority of respondents were afraid of wolves, more so than of bears.
- More than three quarters of urban residents, teachers and pupils seldom or never went to places with wild animals. Livestock owners tended to spend the most time in places with wild animals such as wolves, followed by enforcement officers and hired herders. For all the other target groups the respective figure was less than 20%. Unsurprisingly, livestock owners were the group most directly affected by the presence of wolves. Bears had been seen less, shot less and caused less damage within every target group.
- All target groups tended to acknowledge that wolves belong in the wild in Georgia, but only in restricted parts of the country. The majority agreed that it is important to have protected areas such as VNP in Georgia (from 61% of livestock owners to 96% of teachers). Whereas most target groups agreed with a year-round ban on hunting any wild animals within protected areas, 77% of livestock owners and 67% of cereal farmers thought otherwise. Owners and herders also thought that grazing should be allowed in protected areas. The vast majority (89–99%) of respondents in all groups agreed that people should be allowed to kill wolves if their livestock is attacked. Over 90% agreed that compensation should be paid to owners who have lost livestock to predators, while 61% of owners and 86% of herders supported the idea of money being paid only to those that had employed some sort of protection method.
- Generally, the respondents were keen for more information on wolves and bears and wanted to see more research taking place. They differed in their choice of media in which to receive new information. For example, television, newspapers and magazines seemed to be the best media to reach livestock owners, while excursions would be appreciated more by urban residents, pupils, cereal farmers, hunters and teachers.

3. DEVELOPING HCC MITIGATION MEASURES

A level of tolerance is always required for humans and carnivores to coexist. Realistically, in human-dominated landscapes, this will only be, at best, an uneasy tolerance (Sillero-Zubiri and Laurenson 2001). Conservation policy must therefore encompass a mixture of strategies, including protectionism, conservation education, public relations, community involvement and revenue sharing (Sillero-Zubiri and Switzer 2004, Sillero-Zubiri *et al.* 2004, 2006).

When selecting measures to mitigate the direct conflict arising from economic losses due to livestock predation, two factors need to be assessed:

a) **What is bearable?** (see Box 1) – For example, how many head of livestock can an owner afford to lose while still maintaining his current livelihood?

b) **What resources are available and what are the constraints?**

A variety of approaches are available to tackle HCC involving wolves and livestock (e.g. Bangs *et al.* 2005), either by reducing depredation (e.g. Cluff and Murray 1995) or increasing tolerance of losses (e.g. Naughton-Treves *et al.* 2003). Actions can be broadly classified as ‘direct’ (non-lethal and lethal preventive measures, insurance or compensation) or ‘indirect’ (education and outreach, improving livestock health, monitoring programmes).

Indirect actions

Community involvement

Where conservation is impeded by conflict between local communities and protected species, communication between wildlife managers and local communities is essential (Sillero-Zubiri and Laurenson 2001, WWF/SARPO 2005). Community-based conservation initiatives may involve outreach and education, including local communities in management decisions, improving economic benefits to the community through non-consumptive use such as ecotourism (Walpole and Thouless 2005) or consumptive use such as sport hunting (Leader-Williams and Hutton 2005) and the participation of local people in research and conservation activities. An important first step in relation to HCC is listening to grievances in order to recognise and acknowledge the problem (Sillero-Zubiri and Laurenson 2001).

Conservation education

Some form of community education is included in many conservation and wildlife research projects (Sillero-Zubiri and Laurenson 2001) with the aims of raising awareness of the issues as well as generating more positive attitudes toward the wildlife species and conservation measures involved. The success of such efforts has not always been documented or measured (see Gore *et al.* 2008). Theoretically, education can alleviate both the reducible and irreducible elements of HCC (see Box 1) by, respectively, informing people about the damage prevention measures they could use and changing their perceptions through, for example, provision of accurate information about carnivores and conflicts (Macdonald and Sillero-Zubiri 2004).

Reduction of total livestock mortality

The economic burden of livestock losses can be alleviated by improving animal health, for example through a vaccination programme (Sillero-Zubiri and Laurenson 2001), so that stock is less vulnerable to predation and more resistant to disease.

Monitoring

Examples exist of how collecting reliable information to inform the decision-making process has led to a reduction in killing of wildlife implicated in conflict (WWF/SARPO 2005). Systematic monitoring can identify problem areas and hence facilitate the efficient targeting of mitigation efforts (Muhly *et al.* 2010). Monitoring is also required to evaluate the effectiveness of other measures implemented to mitigate HCC (WWF/SARPO 2005).

Direct actions

Non-lethal damage prevention measures

There are many proven tools, some traditional and some contemporary, that have proven to be successful in deterring predation by canids (Linnell *et al.* 1996, Bangs and Shivik 2001, Fritts *et al.* 2003, Fox and Papouchis 2005, Breitenmoser *et al.* 2005, Good *et al.* 2008, Stone *et al.* 2008). The proper implementation of these methods, especially in combination, can significantly reduce, and in some cases eliminate, predation. In addition, some evidence indicates that protecting livestock from wolves reduces the killing of wolves (e.g. Musiani *et al.* 2003, Blanco and Cortés 2009). Available measures include the use of:

- Guard animals;
- Fencing and other barriers to exclude predators and contain livestock;
- Modified livestock husbandry patterns (avoid grazing in high risk areas, times of day and seasons; confine livestock at night or during bad weather; dispose of carcasses appropriately; replace vulnerable stock; adjust calving/lambing seasons and location);
- Human vigilance to protect herds and detect attacks early;
- Repellents, aversion and harassing to modify predator behaviour;
- Translocation of persistent depredators by damage control professionals.

Limited lethal control of predators

Several models have been used with various degrees of success in reducing HCC (Treves and Naughton-Treves 2005):

- Removal of problem animals by damage control professionals;
- Empowering livestock owners and herders with the right to defend their livestock;
- Allowing a trophy hunting quota.

Off-setting the economic cost of predation

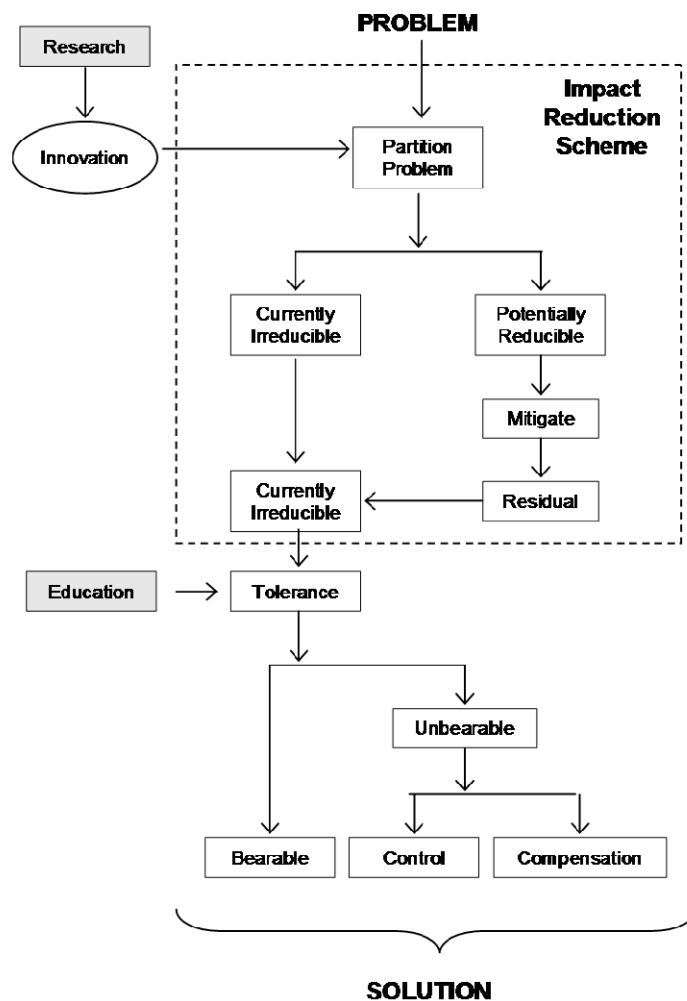
Direct compensation schemes, in which government offsets a portion of the cost of a conflict incident through a cash or 'in kind' payment following an exhaustive assessment process to measure the extent of the damage, unless tied to the implementation of preventive measures, are generally giving way to insurance schemes (see LCIE 2003, Nyhus *et al.* 2003, 2005).

Box 1. Which losses can be reduced and which are bearable?

Macdonald and Sillero-Zubiri (2004) developed the notion of partitioning a human-wildlife conflict into reducible and irreducible elements, and of shifting the balance between these as currently intractable elements are rendered reducible by innovations. Indeed, many species-based conservation programmes can be approached by a rather small number of paradigms. An essential element of the solution is to mitigate the reducible problems, thereby minimising the current level of conflict.

A key question is: Which conflict is **bearable** (more or less willingly) by those affected and which is unbearable? The extent to which people are willing to bear a conservation cost (such as predation) will depend on their tolerance. Tolerance in turn can be heavily affected by the **education** element of the solution, as tolerance is affected by values, not merely financial, that may be attributed to a species or a process of which it is a part.

With regards to the **unbearable** component of current conflict, two options are relevant: either to control (generally to kill) the problematic creature, or to compensate the aggrieved party. There can be some overlap between the ‘mitigation’ and ‘control’ approaches, but these can loosely be partitioned as **non-lethal** and **lethal interventions**, respectively. The reality is that every intervention interacts with every other, creating a web of links. For example, access to compensation might be made contingent on improved animal husbandry – a form of mitigation.



4. KEY OUTPUT I: A plan for the mitigation of HCC in Vashlovani

4.1. From survey to action

In line with the remit of this project, in this chapter we are interested in determining how the information on farming practices and public attitudes obtained during Phase 1 reflects on possible mitigations of human-carnivore conflicts in East Georgia, particularly Vashlovani National Park (VNP) in Dedoplistskaro District. In the next chapter we will then consider how these mitigation measures could be incorporated into policy to achieve long-term impact.

During a baseline survey in VNP (Rigg and Sillero 2010), evaluation of attitudes indicated that the group most affected by wild predators was also the group with the strongest negative feelings towards carnivores: livestock owners and herders. In VNP, traditional pastoralism persists in the form of seasonal grazing of winter pastures by local and transhumant peoples. Here, human-carnivore conflicts stem largely from predation of sheep by wolves, although other carnivore species including jackals and bears are also implicated. Livestock predation is an economic burden for a large proportion of livestock owners and the source of negative attitudes towards wolves and other wildlife, which creates a conflict between people's livelihoods and the protection of VNP.

When partitioning the conflict into reducible and irreducible elements (see Chapter 3), account should be taken of the livestock owners' own ratings in addition to how reported losses compare to other areas (see Box 2). A large majority (81%) of livestock owners in VNP who reported losses due to predation of up to 1% of their stock rated the financial loss as insignificant, whereas owners reporting losses above 1% usually considered this a big loss to their income. Elsewhere in Europe, losses to large carnivores have usually amounted to <1% of livestock available (Kaczensky 1999). One percent may therefore be a useful guide to what is currently bearable for the majority of livestock owners in VNP.

Mitigation efforts should initially focus on farms identified by the baseline survey as having high HCC (see Appendix I). However, as the survey was conducted in only one winter season, it is not known if the same localities tend to be affected each year, as found for example in the French Jura (Stahl *et al.* 2001), Tuscany (Gazzola *et al.* 2008) and Slovakia (Rigg *et al.* in press), and if the level of conflict observed in 2010 was typical for the area. Further monitoring is needed to clarify these points.

Box 2. Defining the unbearable

*In poor rural communities, losses can have a substantial economic impact (Mertens and Promberger 2001, Jackson *et al.* 2010), whereas in more prosperous parts of the world, carnivore-livestock conflict is more a social and psychological problem (Fourli 1999, Bangs *et al.* 2005). For example, in a region of India where the Snow Leopard Trust (<http://www.snowleopard.org>) has helped establish a livestock insurance program, a herder's annual income averages US\$400–600 while a yak is worth an average of US\$213 and a horse US\$170. The loss of even one animal therefore represents a major financial hardship for herding families. In contrast, in the Norwegian system, sheep are routinely lost to various causes. Most losses above 'normal' (a long-term average of non-predation mortality from each region in the period before large predator recovery) are eligible for compensation provided one or more criteria are fulfilled (Linnell and Brøseth 2003).*

The findings of the baseline survey also provide some indication as to which interventions may be more effective in Vashlovani, on which we will base the proposed toolbox. Below we link the main findings with the various toolbox components.

1. People involved in farming, and particularly **livestock owners and herders, are the most heavily affected by human-carnivore conflict in VNP**. Predation emerged as the biggest cause of economic loss, followed by disease. Affected farms had allegedly lost an average of at least 11 sheep during the winter, a cost per farm considered economically significant by livestock owners. This group also expressed **the most negative attitude towards wolves**. Therefore, mitigation measures should focus on this target group and specifically on livestock predation issues.
2. Despite considering economic losses to be significant and numbers of wolves to be on the increase in Georgia ('too many carnivores'), **livestock owners do not want help protecting their animals**. However, all stakeholders including livestock owners were interested in receiving more information on wolves and bears, and wanted to see more research taking place. The media preferred by livestock owners were television, newspapers and magazines; urban residents, pupils, cereal farmers, hunters and teachers would appreciate excursions to wild areas. It is apparent that an effective strategy to mitigate conflicts in VNP should include:
 - *establishing a 'Rapid Response Team' and systems for monitoring HCC;*

→ **Toolbox Component 1**

- *conducting a programme of education, communication and extension work.*

→ **Toolbox Component 2**

3. Another way to make livestock losses bearable in VNP is to:
 - *improve animal health so that the economic impact of predation is diminished*

→ **Toolbox Component 3**

4. Livestock depredation in VNP is largely limited to wolf attacks on sheep during the winter (the summer pastures are elsewhere, e.g. in Tusheti), with attacks peaking in the afternoon and at dusk when the flocks are in the pasture and the majority of losses occurring during the lambing season (February).
5. Clearly, the timing of attacks, susceptible areas and livestock types should be the target of mitigation measures. Information gathered on the effectiveness of methods already in use was mixed. To deter predators most livestock owners use guarding dogs, night-time corrals and barns for young animals. They consider these to be effective but many also admit that their dogs may not be suitable or properly trained for the purpose. Surveillance measures such as patrolling and avoidance of potentially risky areas are not practiced. There is clear potential in VNP for:
 - *improving the effectiveness of livestock guarding dogs;*

→ **Toolbox Component 4**

[It is felt that the use of donkeys or other guard animals (Andelt 1999a, Landry 2000) is not a viable option for VNP as dogs are an established part of the Tushetian sheep breeding tradition and donkeys appeared to be selectively depredated by wolves (although this was probably due to them being tethered). A summary of good practice with guard donkeys is included in Appendix II.]

- using fladry, fencing and other barriers to exclude predators;

→ Toolbox Component 5

[Permanent fencing of pastures, although an excellent option for use in small pastures, is impractical for VNP because of the high cost of fencing large areas, the visual impact it would have in protected areas and the potential impediment of other wildlife species (blocking migration corridors or water routes for wildlife).]

- improving husbandry and human vigilance.

→ Toolbox Component 6

[In some regions of the world, ranching neighbours often plan and set up 'calving camps' to help one another by sharing labour and resources during this critical time (Fox and Papouchis 2005). However, this requires a level of coordination and cooperation that would be challenging to achieve in VNP.]

6. Livestock owners would consider lethal control methods in response to direct attacks, and most are against a year round ban on hunting or controlled grazing within VNP. On the other hand, they as well as the general public view compensation positively, particularly for those that employ some sort of protection method. Options considered appropriate for VNP are:

- setting up an insurance scheme;

→ Toolbox Component 7

[Although widespread public support was found for paying compensation to owners who have lost livestock, compensation schemes implemented elsewhere have not necessarily resulted in more tolerance of predators (Naughton-Treves et al. 2003) or a greater willingness to coexist with them (Gusset et al. 2009). Some schemes have failed to achieve the stated objective of alleviating loss (e.g. Madhusudan 2003). Although compensation schemes are widespread and can be relatively inexpensive, they are open to corruption, can involve expensive bureaucracy, tend to encourage a state of constant conflict (Cozza et al. 1996) and can lead to a decrease in efforts to prevent damage and conflicts with wildlife (Bulte and Rondeau 2005). Furthermore, they often do not identify and improve situations where only a few farms suffer the vast majority of losses. Incentive mechanisms that are directly tied to conservation outcomes (e.g. payments to locals based on the size of the wildlife population) should be considered instead of compensation programmes (Bulte and Rondeau 2005).]

- dealing with problem animals.

→ Toolbox Component 8

4.2. The toolbox

A review of the practices currently used by livestock owners and herders to deter predation in the VNP area revealed gaps and opportunities for improvement (see section 4.1). The following toolbox, designed specifically to mitigate HCC in VNP, focuses on mitigation actions that have been successful elsewhere, have a high chance of being successful here, too, and are realistic given our knowledge of people's conflicts with wildlife and attitudes.

The first set of tools can be considered '**indirect**' actions to mitigate the problem of livestock predation and of negative attitudes towards carnivores and conservation, primarily by shifting the balance towards the bearable element of the conflict (see Chapter 3) through extension work, conservation education and improvement of livestock health. The second set includes more '**direct**' actions, either to avoid or to compensate for livestock losses (i.e. the unbearable element of the conflict). These interventions involve: persuading owners and herders to adapt their husbandry systems; providing external support to sustain a system of vigilance; setting up an insurance scheme and; as a last resort, controlling problem animals.

For each toolbox component we present: objectives; background rationale, with examples of successful interventions and references; the actors involved; implementation guidelines; and budgetary considerations. The human and other resources likely to be needed to implement each toolbox component are also outlined.

Indirect actions

The apparent reluctance of livestock owners and herders to accept support to deal with HCC, and the prevalence of negative attitudes towards carnivores and wildlife conservation in general, calls for a strategy of information and education to change people's attitudes. Education and outreach work with livestock owners will also help to incorporate them in the decision-making process.

Opportunity: This toolbox component ties in well with the GCCP initiative to help with the development of VNP and deliver a local outreach/communication strategy.

In particular, support towards improving the health of herds – i.e. reducing livestock vulnerability and overall mortality – can help to reduce the level of conflict. By improving animal husbandry and veterinary care, the impact of additional mortality (to predators) can be alleviated, reducing the economic burden of livestock predation.

Opportunities: This toolbox component could be tied in with other GCCP activities: providing husbandry training through Elkana and working with the APA to install a veterinarian in a new ranger station at the gazelle enclosure.

Establishing and maintaining a **system of ongoing monitoring** would allow for the detection of clustering among kills and farms highly affected by predation, so that mitigation work can be targeted most effectively. It will also allow evaluation of the measures implemented.

Direct actions

Several well-tested tools exist for non-lethal damage prevention, some traditional and some contemporary, that can be applied to deter predation in VNP (e.g. Fox and Papouchis 2005, Good *et al.* 2008, Stone *et al.* 2008). Especially when used in combination, these methods can significantly reduce, and in some cases even eliminate, predation, potentially reducing the perceived need to kill wolves.

Measures to diminish predation in VNP should be most intensive during the lambing season and when the animals are in the pastures (afternoon and dusk), and be combined with more effective guarding dogs, human vigilance, *fladry* or other portable barriers. More vigilance and continuous monitoring will allow early detection of kills and swift intervention.

It is quite possible that non-lethal predation control would not reduce losses to a bearable level, and in such cases other approaches may be needed. Two options appear relevant and appropriate for VNP: a) to remove problematic wolves; and/or b) to develop an insurance scheme to compensate aggrieved livestock owners, with payments made contingent on improved animal husbandry.

Carnivore management tends to be an ongoing series of evolving compromises rather than final solutions (Linnell *et al.* 2005, Huber *et al.* 2008). When implementing the toolbox, an **adaptive management approach** should be taken, working with willing livestock owners and herders to test the various interventions, learning together from the outcomes and being ready to implement changes as situations and results dictate (WWF/SARPO 2005). For example, it should be borne in mind that, if excluded from some flocks by damage prevention measures, **wolves may switch to other, less well protected flocks.**

→ Toolbox COMPONENT 1:

Establishing an HCC Team and monitoring systems

Objectives

To provide the framework and resources necessary to systematically address HCC issues in VNP and the surrounding area.

Background

An important first step towards mitigating HCC is recognising the problem (Sillero-Zubiri and Laurenson 2001). This involves both acknowledging the concerns of those affected and collecting sufficient information to design interventions based on informed decision-making (WWF/SARPO 2005). Dedicated HCC Teams, such as the Bear Emergency Teams set up in Austria, Croatia and Romania, can respond quickly and more effectively to events and demonstrate to the public that action is being taken.

In addition to playing a key role in implementing mitigation measures, the team would also coordinate the monitoring and evaluation of HCC. Systematic and ongoing monitoring, such as GIS-based (e.g. Muhly *et al.* 2010) and 'Event Book' approaches (WWF/SARPO 2005), can identify chronically affected farms and clustering of HCC as well as elucidating factors apparently predisposing particular farms or localities to predation. This allows mitigation efforts to be planned and targeted effectively while also providing recommendations for livestock herders to avoid high-risk areas. Additionally, monitoring will be required to evaluate the effectiveness of other Toolbox Components.

Actors involved

- GCCP and VPA staff
- APA

- Friends of Vashlovani Association (newly formed, set up by the IUCN)
- Shepherds association (newly formed)

Implementation guidelines

- One or two conservation officer(s) working alongside VNP staff but functioning independently, with own transport (motorbikes are cheap to purchase and maintain). The HCC Team may be composed of VNP rangers, but also incorporating a VNP Outreach Officer. An alternative is that two people with complementary skills work together as part of a team, with one having more animal skills and the other better on communication, not just with livestock owners and herders but also with children.
- The Team will be based at one of the VNP ranger stations (or at the new gazelle enclosure field centre?) and work according to a work plan that will enable regular visits to farms on a rotational basis, but also reacting rapidly to visit sites of reported attacks. The new shepherds association may be useful in coordinating such work and the newly-formed Friends of Vashlovani Association may provide additional resources, human or managerial, for the HCC Team.
- Systems to monitoring and analyse HCC should be set up incorporating GIS and an 'Event Book' approach (see implantation guidelines for Toolbox Components 7 and 8).
- Job descriptions can be prepared for immediate recruiting, with a start date following interview in October/November 2010. Try to recruit locally. Candidates for the team would be existing VPA rangers and the visitor/education specialist, alternatively personnel recruited specifically for this role.
- Candidates should possess the following attributes: Georgian, preferably Tusheti; familiar with the area and known by locals; good knowledge of animal husbandry; able to communicate in English; computer skills (Excel essential); technical degree (Diploma, BSc. or equivalent on animal science/biology).
- The Education Officer would be nominally part of the HCC Team but with different skills and functioning independently with own transport (motorbike?), based in Dedoplistskaro (part-time in VNP) and working to a plan that will enable regular visits to farms on a rotational basis as well as working with all local schools.
- Try to recruit locally, although not essential. The candidate would possess the following attributes: Georgian; good knowledge of environmental issues, particularly with regard to rangeland management/farming; ability to communicate in Georgian, Tushetian and English; good writing skills; good people/communication skills; computer skills; teaching degree (e.g. elementary school teacher, or degree on environmental education). Graphic art, graphic design and storytelling skills would be additional assets that would suit the job.

Budgetary considerations

- HCC Team leaflet (e.g. A4, U-folded). Briefly outline the Tusheti shepherding tradition, livestock-predator conflict and introduce the HCC Team remit and *modus operandi*. Fairly straightforward, develop in-house. Content and printing within two weeks. £150 in UK for 1,000 copies (same or cheaper in Tbilisi?).

- Staff: £800 for annual running costs, £1,000 equipment, £6,000 annual salary? Funding and sustainability could be addressed by using existing VNP ranger service.
- Equipment purchase and maintenance: to include a vehicle (e.g. £2,500 for 175cc. motorbike); mobile phone/radio; a netbook/hand-held or Ipad for gathering data; hand-held GPS; digital camera; basic necropsy/collecting kit.

→ **Toolbox COMPONENT 2:**

Education, communication and extension work

Objectives

To work with livestock owners and herders to disseminate information, raise awareness, influence attitudes and open up communication channels so that livestock owners are incorporated into decision-making processes.

Educate the broader community through an outreach campaign, reaching beyond the livestock farming community and into the local population, to help reduce poaching and thus assist the recovery of prey populations in VPA.

Background

Education and outreach are consistently regarded as central to any attempt to deal with human-carnivore conflicts (Sillero-Zubiri and Laurenson 2001). In Europe, several initiatives and guidelines have been developed to support teachers and educators with environmental lessons, with a variety of methods and activities for diverse educational situations involving children, adults and various interest groups.

Extending education and outreach beyond the livestock owners and into the local population is relevant for conservation purposes and would help reduce poaching (Wood 2010) and hence the recovery of wild prey populations in VNP. An important issue for educators to address is the **fear of wolves** found in all sections of society and playing a major role in shaping attitudes towards this species and its management (Rigg and Sillero 2010; see also Linnell *et al.* 2002).

Actors involved

- HCC Team / Outreach and Education Officer(s)
- Livestock owners and herders
- Local communities
- Collaborations with VNP and the Friends of Vashlovani Association to implement outreach/education work.

Implementation guidelines

- Gentle start, with focus on preparing materials and informal visits to farms and schools during first few months and beginning in earnest in the spring.
- HCC manual: technical manual on coexistence with wolves and bears developed from relevant sections of this toolbox and other sources (e.g. Eriksson *et al.* 2002).

Written in Georgian using clear, simple language and illustrating various mitigation options for people living and working in the VNP area.

- Educational materials could be produced in-house, e.g. an information booklet on wolves and bears targeted to schools.
- Outreach Officer advises livestock owners on better husbandry and animal health.
- Use regional and local media to highlight value of predators and conservation in general (television, newspapers and magazines).
- A local bulletin to publish lessons and updates on the effectiveness of the various techniques applied in the area to deter predation.
- Plan excursions to the VNP for people from urban areas, pupils, cereal farmers, hunters and teachers.

Budgetary considerations

- Costs of developing the HCC manual (including translation) will depend if done in-house or not. In the UK, approximately £600 for 200–300 copies of A5 booklet, 20–24 pages (same or cheaper in Tbilisi?).
- Educational materials prepared in-house to save costs or short-term consultant brought in to get it done quicker.

→ Toolbox COMPONENT 3:

Improving livestock health

Objective

To diminish the impact of additional mortality and to alleviate the economic burden; a strategy to reduce losses unrelated to carnivore predation based on improvements in both animal husbandry and veterinary care.

Background

Predation is one of several challenges faced by Tusheti livestock owners using VNP (Anthem 2009, Ziekidze 2010). Providing assistance with veterinary issues has potential to reduce overall losses (see Box 3): healthy stock is less vulnerable to predation and some losses to disease may have been wrongly attributed to predation. In any case, assistance to improve the health of domestic stock is often a good incentive for livestock owners and likely to be a good hook to get them involved (a ‘hearts & minds’ approach) as well as being good for public relations. For example, rabies control in the context of Ethiopian wolf (*Canis simensis*) conservation promotes positive attitudes among locals (Sillero-Zubiri and Laurenson 2001).

Actors involved

- HCC Team / Animal Health Extension Officer
- Livestock owners and herders
- Local office of the Ministry of Agriculture (or relevant animal health agency)

Box 3. A livestock vaccination programme

*The Snow Leopard Trust's (<http://www.snowleopard.org>) livestock vaccination programme, in partnership with villages in northern Pakistan, helps people in snow leopard range keep their herds of sheep and goats healthy in exchange for the herders' commitment to protect the snow leopard. The programme **helps herders obtain basic livestock vaccines**, which were previously unavailable and unaffordable in this remote rural area. In exchange the participating communities **agree not to kill snow leopards or their prey species**.*

*These two actions may at first seem unrelated but, in fact, the programme grew out of an awareness that **common, preventable animal diseases are a much greater threat to herds** than are predators like the snow leopard. A major concern that had to be addressed as the vaccination programme was developed was that, as fewer livestock were lost to disease, herd sizes in participating villages would grow. This would create even more grazing competition for the snow leopard's primary, wild prey base. To avoid this, participants also agreed to limit the size of their herds. The SLT helps the herders sell any livestock beyond this herd limit at local markets.*

Implementation guidelines

- The Animal Health Extension Officer visits the farms most heavily affected by predation (see Appendix I) to suggest and discuss a timetable for vaccination and/or other disease prevention interventions that livestock owners could implement and incorporate into their husbandry practice routine.
- Prepare, or adapt existing, brochure on husbandry and disease prevention (in Georgian with clear simple language) and distribute among livestock owners with any additional relevant information, and repeat visits.
- **Work with livestock owners to create a livestock vaccination programme** that will help keep flocks healthy. As part of the programme the owners and herders commit to protecting the wolves and wildlife in VNP.
- As it is anticipated that fewer livestock will be lost to disease, flock sizes may grow; so it should be contemplated that participants agree to limit flock size. As part of this process owners may be helped to sell any livestock beyond flock limit at local markets, if necessary, or excess animals could be transferred to other farms as replacement stock in lieu of financial compensation (see Toolbox Component 7). Another alternative, although it may not be practical to implement, is that VNP would issue permits for a given number of livestock to graze inside the park.
- Other animal health extension work could include subsidising the distribution of veterinary medicines and visits by a veterinarian to affected farms (e.g. once a year).

Budgetary considerations

- Total cost will be dependent on level of intervention required, but could be reduced by focusing on the most exposed farms and linking up with other organisations with a focus on rural development. For example, the activity could be initiated by the GCCP and then handed over to the Friends of Vashlovani or shepherds association.
- Human resources: depending on funding, the Animal Health Extension Officer role may be delivered by other members of the HCC Team, or contracted out for fix-term

spells during autumn or spring. If plans to post a veterinarian at the new field centre at the gazelle enclosure come to fruition, this could be a good person for the task.

- The largest cost other than a salary for the Animal Health Extension Officer would be de-wormers, antibiotics and other medicines.
- Developing and printing a brochure on disease prevention.

→ Toolbox COMPONENT 4:

Livestock guarding dogs

Objectives

The main aim is to improve the effectiveness of LGDs at reducing losses to predators. Additional outcomes of improving the attentiveness of dogs to livestock could be a reduction in their tendency to wander and present a hazard to unfamiliar people (a potentially important issue in relation to the policy of promoting increased visitation to VNP). Also, a role may be played in preserving traditional breeds and practices.

Background

The use of livestock guarding dogs has proven to be one of the best methods to limit losses of livestock to a variety of predators in many different situations worldwide (e.g. Linhart *et al.* 1979, Coppinger *et al.* 1988, Andelt 1992, Andelt and Hopper 2000, Rigg 2001, 2004, Rigg *et al.* 2003, LCIE 2005a,b, Marker *et al.* 2005, Gehring *et al.* 2010). To make effective guardians, dogs must possess three key traits: they should be trustworthy (become part of the flock without causing a disturbance, exhibiting submissive behaviour towards livestock and not harming them); attentive (stay with the flock as much as possible, both day and night, following when it moves and resting among or near the livestock); and protective (bark at new or strange activities and situations, taking up a position between the flock and any potential threats).

Livestock guarding dogs are an integral part of the Tushetian herding tradition in Georgia. All livestock farms surveyed during the baseline survey had at least one LGD, with an average of eight dogs per farm. However, because flocks were sometimes split up, it is possible that not all livestock was accompanied by LGDs at all times. Dogs were frequently encountered away from flocks. **Insufficient daytime attentiveness** may explain why most attacks were reported to occur during daylight hours, when flocks were in pastures, rather than at night.

Some dog breeders and researchers in Georgia think that the quality of LGDs at working farms is insufficient due to crossbreeding and the export of the best dogs to the Soviet Union. During the baseline survey, **livestock owners with pure-bred dogs were more satisfied** with their performance than those who said they had mixed breed dogs, although during informal pilot interviews prior to the survey several livestock owners and herders had rated mixed dogs as superior because they were faster. No significant relationship was detected between the percentage of all livestock lost and either how owners rated their dogs or if they described them as pure versus mixed breed. However, some evidence was found that mixed breed dogs might be better with cattle while 'pure-bred' dogs could be more effective with sheep.

Actors involved

- Livestock owners and herders
- HCC Team / Outreach Officer
- Dog breeders and researchers

Implementation guidelines

- In order to determine whether insufficient daytime attentiveness of LGDs is a key factor leading to losses, more prolonged and intensive observations of dogs and flocks would be necessary than were possible during the baseline survey. Data could be gathered either by direct observations (e.g. from a vehicle or on horseback) using a focal observation protocol (e.g. Rigg 2004) or by fitting a sample of dogs and livestock with GPS-GIS collars to record their relative positions.
- Improving the attentiveness of grown dogs can be problematic and requires a patient and consistent approach. Some techniques which may be helpful are described in Appendix III. Some of this could be compiled into an information brochure for livestock owners and herders on best practice in working with LGDs.
- Success is more likely to be achieved if starting with young pups. The project could consider purchasing e.g. 20 pups (pure-bred for placement with sheep, ideally from working parents) to distribute across farms and then work with livestock owners and herders to raise them according to recommended guidelines (see Appendix III), with regular monitoring and outcome evaluation.

Budgetary considerations

- Costs of producing an information brochure for livestock owners and herders.
- Observation of LGDs may be done by members of the HCC Team or contracted out to a canid specialist.
- Information on sources of LGDs (addresses and contacts of Georgian breeders and associations, availability of pups and prices) to be compiled in-house by project personnel in Tbilisi.

→ Toolbox COMPONENT 5:

Fladry, fencing and other barriers

Objectives

The main aim is to temporarily exclude predators from specific areas where livestock is prone to attack. A secondary aim would be to address the sourcing of materials for barrier construction within the context of protected areas.

Background

Confinement is one of the simplest, most effective ways to reduce predation by wild canids. Keeping sheep in corrals significantly reduces losses and the practice of **lambing in sheds**

protects young livestock when they are most vulnerable to predation. The method is not very convenient for large, open-range operations, but in general fences are particularly successful at night and represent a cost-effective mitigation tool for protecting livestock from predators at local scales.

In VNP, livestock is already confined at night and small lambs are kept in fairly secure structures. The small proportion of losses at night suggests that the typical combination of night-time corrals, dogs and human presence is largely effective in deterring predators. However, further fencing may be economically beneficial because predation is concentrated in specific areas and times of the day (most attacks occur in the pastures at dusk). Although permanent fencing would be impractical and have undesirable impacts on wildlife movements (e.g. blocking migration corridors or access to water sources), in cases similar to VNP **portable or temporary fencing** techniques, including electric fences (LCIE 2002), have been used with good results. A potential added benefit of fencing is to keep the flock together, which in turn enables more effective guarding (see Toolbox Component 6).

A simple and inexpensive method that seems to suit the conditions of VNP is the use of '**fladry**': a series of red or orange cloth flags hung along a thin rope. For unknown reasons, wolves avoid crossing these lines. The technique was developed to hunt wolves in Eastern Europe and Russia, but it has also been successfully adapted to protect livestock from wolves in Canada (Musiani *et al.* 2003), Poland (Nowak and Myslajek 2006) and Slovakia (R. Rigg unpub. data). *Fladry* fences are much less expensive to produce and install than wire or permanent fencing. *Fladry* is also easily moved and can be quickly installed over large areas, even by one person.

Although after a time wolves may overcome their wariness of *fladry*, in Canada they avoided it for up to 60 days, which could be long enough to keep them away from calves and lambs (Musiani *et al.* 2003). The added 'bite' of **turbo-fladry** – *fladry* on top of electrified line – uses electric shock to enhance the negative experience of wolves that come into contact with the fence-line. Wolves that attempt to cross, bite or touch *turbo-fladry* experience an electric shock which reduces the likelihood of them losing their fear, thus extending the period of time that it functions as an effective barrier. *Turbo-fladry* is more expensive than regular *fladry* but can be three or more times as effective and is also highly portable and relatively easy to produce although, like *fladry*, it requires regular maintenance to remain effective.

Actors involved

- Livestock owners and herders
- HCC Team / Outreach Officer (technical support)

Implementation guidelines

- Initially the Outreach Officer visits farms, offering technical support and helping to assess the best strategy for each farm.
- The Outreach Officer checks the condition of night corrals and evaluates whether there is room and need for improvement.
- Technical information on barriers is provided in a brochure with simple descriptions of the options.

- Livestock owners will be responsible for building, implementing and maintaining the barrier technique of their choice. Portable fencing can be constructed from several different types of materials including multiple **electric fencing** strands (e.g. Mertens *et al.* 2002), wire mesh and portable panels.
- Obtaining materials such as wood for fence construction was raised as an issue by some livestock owners during pilot interviews, which could be an opportunity for VPA staff to build trust by working together with owners to source materials appropriately, given the protected status of VNP.
- Lambs should be confined to corrals next to the lambing shed for up to two weeks after birth. In addition to protecting lambs from predation, this can lead to higher survival rates because sick or orphaned lambs can be identified and cared for.
- To reduce stress on livestock they should be introduced to new barriers gradually.
- Fencing should be moved regularly to keep vegetation from being trampled or overgrazed.
- **Fladry** lines should be made from thin but strong string with pieces of coloured material (traditionally red) sewn on at 30–50cm intervals. The pieces should be 40–60cm long and 10cm wide. When using *fladry* to protect livestock, the lines should be strung around the pasture (rather than around the corral or pen), ideally attached to posts hammered into the ground so that the bottom edges of the material are 15–20 cm above the ground and can move in the wind.
- **'Turbo-fladry'** is simply *fladry* hung on an electrified fence-line powered by solar-charged batteries.
- **Regular maintenance is essential**, including the replacement of aged, torn or faded material, as a broken, tangled, pinned down or otherwise compromised *fladry* barrier is likely to fail. *Fladry* tends to sag if soaked by heavy rain, flags will wrap around the line when blowing in the wind and livestock may chew or pull on them.
- The Outreach Officer remains involved as a monitor, evaluating the effectiveness depending on the materials used etc. and working with livestock owners and herders to ensure that barriers are adequately maintained.

Budgetary considerations

- Training an Outreach Officer in damage mitigation equipment and techniques.
- Time of the Outreach Officer or other personnel to assess farms and evaluate the effectiveness of measures implemented.
- Costs of producing an information brochure for livestock owners and herders.
- *Fladry* is inexpensive but time consuming to prepare. School children or other volunteers can assist with producing flags and attaching them to lines.
- *Turbo-fladry* involves the additional costs of electrification.

→ Toolbox COMPONENT 6:

Husbandry and human vigilance

Objectives

The primary goal of increased human vigilance is to reduce livestock-predator interactions and livestock losses. Secondary goals include quickly finding sick, injured or dead livestock; preserving the evidence of a livestock loss to help investigators determine the cause of death or injury; monitoring livestock movement and range conditions; and learning more about livestock-predator interactions.

Background

Livestock husbandry can have a clear effect on levels of depredation (Ogada *et al.* 2003, Blanco and Cortés 2009, Muhly *et al.* 2010). In Africa, the risk of daytime predator attack in community rangelands was lowest for small herds grazing in open habitat, accompanied by dogs as well as human herders (Woodroffe *et al.* 2008). Leaving livestock unattended during the day, on the other hand, facilitates predation by wild canids (Gusset *et al.* 2009).

Traditional animal husbandry practices with documented success at limiting losses to predators include livestock guarding dogs, confinement of livestock at night and during the lambing season and herders attending flocks throughout the day and night. Historically, shepherds who remain with the sheep flock during the day can help reduce predation and the presence of predators (e.g. Nass *et al.* 1984 for coyotes *Canis latrans*) near livestock. These methods are used in VNP, although there seems to be room for improvement.

Confinement is one simple and effective way to reduce predation, already implemented in VNP with **night corrals** (see Toolbox Component 5). Studies show that sheep kept in corrals suffer fewer losses than those that are not. Portable fencing can work well for protecting livestock in open-range operations. The practice of **calving and lambing in sheds** has the benefit of protecting young livestock when they are most vulnerable from both predation and inclement weather. Typically, ewes and lambs (or goats and kids) are confined to corrals next to the lambing shed for as long as two weeks after birth. In addition to protecting lambs or kids from predation, shed lambing can lead to higher survival rates because ranchers can care for sick and orphaned animals.

Livestock husbandry practices in VNP also rely on **daytime shepherding**, but it is apparent that more vigilance is required to minimise predation of sheep by wolves during the winter lambing season, particularly in the afternoon and at dusk when flocks are in the pasture. In general, livestock losses to wolves often occur when the shepherd is unaware that there is a wolf pack nearby. **Knowing what wolf activity is occurring** in the area, for example by increasing human presence and/or vigilance, is essential to better protect the herds. Telemetry results obtained by the GCCP will also provide pertinent data.

Increasing human presence allows better monitoring of livestock and wolf activity and may be one of the best ways to deter wolves. Practices vary from place to place, but the principle is that wolves tend to stay away from areas with regular or frequent human presence, and when herders or riders respond quickly to undesirable wolf behaviour, such as approaching or chasing livestock, the wolves are likely to feel threatened and thus avoid contact with shepherds. For example, **range rider programmes** (e.g. Stone 2009) have reported low-to-

zero losses in comparison to the higher losses recorded before riders were deployed. This practice also works as an alert system to quickly find sick, injured or dead livestock; it helps preserve the evidence for investigators to determine the cause of death or injury; and to monitor livestock movements. For particular periods requiring intensive vigilance, such as during lambing, **community based shepherding**, in which neighbours take turns caring for and tending livestock, is a good option (Fox and Papouchis 2005).

Various **herding and stewardship methods** may play a role in discouraging wolf attacks on livestock. For example, the bunching up encouraged by the methods of the Bud Williams Stockmanship School (<http://stockmanship.com>) and other programmes could make cattle less vulnerable to wolves. Herding is an instinctive defensive behaviour of ungulates threatened by pack-hunting predators such as wolves, as it is much more difficult and risky for wolves to isolate an animal from a herd than to pursue individual animals dispersed across the landscape. Herding and stewardship methods can play a role in discouraging wolf attacks on livestock, for example by avoiding flocks splitting.

Proper disposal of livestock carcasses can contribute to keeping predators away from herds/flocks. Leaving the carcasses of dead livestock on the pastures can encourage scavenging (Lehner 1976); carcasses increase the amount of food available to carnivores and may help to artificially raise their density. Moreover, carnivores that feed on carcasses will learn that livestock is a source of food and that potential prey is in the area (Fritts 1982, Mech *et al.* 2000). Coyotes, for example, are known to congregate in areas where livestock carrion is available in winter. In the case of VNP we advise *a priori* evaluation of the detrimental effects that reducing carrion availability might have on scavengers, including the four species of vultures found in the area.

Access to water, or wells in this case, can also affect how predators as well as livestock are distributed across the landscape, with implications for herding techniques.

Proactive measures cannot always be implemented quickly or effectively enough to prevent livestock losses. In such cases, and usually as a last resort, **moving livestock to an alternative grazing site** can be the best solution for livestock owners and wildlife managers alike. This may only have to be done temporarily, for instance, to avoid conflicts with wolves that have young pups to feed or to **avoid having vulnerable young livestock near wolves**. In some cases, conservation organisations have paid livestock producers for additional costs of relocating to safer pastures. They may work together to adjust the timing and location of grazing to minimise conflicts with wildlife and allow livestock grazing activities to continue.

Actors involved

- Livestock owners and herders
- HCC Team / Outreach and Education Officer(s)
- VPA administration staff

Implementation guidelines

- The HCC Team use the HCC manual (see Toolbox Components 1 and 2) to spread awareness of improved techniques to detect and deter predators.
- **Increase flock vigilance during daytime**, particularly in the afternoon and at dusk, when the flocks are in the pasture, and during the lambing season (February).

- Herders can boost their effectiveness by working with **livestock guarding dogs** that can alert them to the presence of wolves and other predators and assist in deterring or repelling attacks (see Toolbox Component 4).
- A simple way of improving current husbandry is **not to divide flocks at the time they are most vulnerable**. Do not leave small groups of sheep without dogs, always use night corrals, use other deterrents in the pastures (see Toolbox Component 5).
- **Community based shepherding**, e.g. neighbours taking turns caring for and tending livestock, can help achieve high levels of vigilance during critical periods.
- Wolves are expected to stay away from areas with regular or frequent human presence. Herders (and possibly range riders employed for the purpose?) can **patrol pastures at dusk**, when wolves tend to be most active, checking for signs of unusual agitation in the livestock, howling and other signs that wolves are present such as tracks, scat and hair snagged in fences.
- HCC Team provides training for shepherds and range riders on **basic patrolling techniques** and on **quick response to undesirable wolf behaviour** such as approaching or chasing livestock. With support from VNP Outreach Officer.
- An additional benefit of increased human vigilance is the **early detection of kills**. This is particularly relevant for the HCC Rapid Response Team and insurance schemes (see Toolbox Components 1 and 7).
- Minimise wolf presence in pastures by **removing and properly disposing of carcasses**. Burying them is insufficient: they would be found and dug up.
- The identification and **mapping of depredation hotspots** may in time lead to recommendations for herders to avoid certain areas, will guide the work plan of farm visits by the HCC Rapid Response Team and target education activities.
- **Manage the location of new wells** and **pipe water away** from hotspots of conflict. GIS data could be used to identify the best locations for new wells. Problems accessing water and unfulfilled promises by other agencies to provide wells were mentioned by several livestock owners, so there is an opportunity for the GCCP and VPA staff to build trust by working together with owners to address this issue.

Budgetary considerations

- Employing range riders and/or increasing the number of herders will provide additional protection against predators, but it increases production costs for the livestock operation. This approach may work if government agencies, conservation organisations and other ranchers are able to help pool resources to establish range rider or herder programmes.
- Costs can be reduced by training less-experienced riders and herders and by limiting human surveillance to certain times, while simultaneously prompting building and maintenance of night corrals.
- A further incentive for livestock owners would be to make any compensation or insurance scheme dependent on the implementation of such mitigation measures (e.g. well-guarded herds).

→ Toolbox COMPONENT 7:

Setting up a livestock insurance scheme

Objectives

To compensate for losses and to increase tolerance of carnivores by livestock owners in VNP.

Background

All target groups surveyed in East Georgia (Rigg and Sillero 2010) supported the payment of compensation to owners whose livestock has been killed, particularly livestock owners, teachers, herders and rural residents. The idea of compensation starts with the assumption that opposition stemming from livestock depredation is an economic issue and that paying for losses to predators will alleviate the problem of living with carnivores (Montag 2003). Compensation schemes have now been tested in various parts of the world and it appears that there are limits to these assumptions (see Box 4).

In most compensation schemes the government offsets a portion of the cost of a conflict incident through a cash or 'in kind' payment made directly to the aggrieved party. The extent of damage in each incident is measured through an exhaustive assessment process. Such schemes have been largely viewed as failures: they are easily corrupted, can involve expensive bureaucracy and tend to lead to a state of constant conflict if they do not encourage owners to take action to protect their livestock (Cozza *et al.* 1996, Sillero-Zubiri and Switzer 2004, Bulte and Rondeau 2005). Compensation schemes can also be expensive and unsustainable in the long run.

Box 4. Compensation failings

*While some results indicate that compensation schemes help to mollify the livestock producing community and to reduce the animosity towards the agencies that manage carnivores (Fritts *et al.* 1992, Fourli 1999), others show that livestock depredation encompasses much more than just economic losses (Montag 2003). In the USA, for example, livestock producers who had been compensated for their losses to wolves were no more tolerant than their counterparts who alleged a loss but received no compensation (Naughton-Treves *et al.* 2003). In some cases compensation can lead to a decrease in efforts to prevent damage, thus exacerbating conflicts with wildlife (e.g. Bulte and Rondeau 2005, Gazzola *et al.* 2008, Gusset *et al.* 2009). Total compensation paid in Norway is vastly higher than that in Sweden, even though the latter has higher numbers of carnivores, particularly of bears (Swenson and Andrén 2005). Furthermore, compensation has clearly not stimulated Norwegian farmers to adopt carnivore compatible husbandry measures, as losses have steadily risen in line with increasing carnivore populations (Linnell and Brøseth 2003).*

*In Slovakia, shepherds have the most negative attitudes to carnivores despite the availability of compensation for damage by bears since 1962 (Rigg *et al.* in press). Payments are nominally conditional on an inspection commission absolving the owner or guardian of blame and since 2003 (when compensation for wolf damage was added) the preconditions specifically mention use of prevention (enclosures, electric fences, guardians, shepherd dogs). In practice, however, ineffective methods (chained dogs, electric fencing to contain livestock rather than exclude predators) are accepted as sufficient for compensation to be paid (Rigg 2004).*

The problem of compensation schemes not encouraging the improvement of management systems could perhaps be alleviated by modifying compensation criteria, although this is yet to work in Slovakia (Rigg 2004, Rigg *et al.* press; see Box 4). Other crucial elements of a successful compensation scheme include: quick and accurate verification of damage; prompt and fair payment; sufficient and sustainable funds; and measures of success (Nyhus *et al.* 2003). As compensation schemes are costly to administer and are open to corruption, a system could be considered whereby, rather than owners being paid for each kill, they receive a lump sum to tolerate predators (e.g. Swenson and Andrén 2005). This approach would positively benefit those that have good husbandry practices because they would still receive the same payment even if damage levels decreased (provided that predator numbers did not) which would hopefully promote others to follow suit.

While it is widely recognised that compensation schemes have largely failed, local insurance schemes, or a combination of insurance and compensation, offer a more promising approach (see Boxes 5 and 6). Compared with 'ex post' compensation, **insurance encourages livestock owners to apply prevention methods**. Co-financing insurance systems with public funds (e.g. Psaroudas 2007) can be a valuable tool for increasing rural people's tolerance towards wildlife. Two possibilities are state-operated insurance systems and subsidising farmers for paying premiums to private companies. In both cases, the obligatory nature of insurance for damage caused by protected species is of crucial importance.

Box 5. Insurance schemes

These involve the payment of insurance premiums, by individuals or a community, for insurance against damage to crops, loss of livestock or personal injury or death. Insurance schemes have worked well in an agricultural context when, on commercial farms, farmers have insured against such things as hail damage to crops. The method has not yet been fully tested in a pastoralist context for sufficient information to be available on its success.

Commercial livestock growers may insure valuable stock against predation using established commercial insurance brokers. Premiums could then be reflected by parameters such as management strategies and risk of predation due to proximity to the wildlife area. As a result, rather than 'managing the predator', in order to meet regulations set by insurers such a system would encourage ranchers to adopt an active herd management strategy (e.g. Rasmussen 1999). Co-financing insurance systems with public funds can be a valuable tool for increasing people's tolerance towards carnivores. State-operated insurance systems or the subsidising of farmers for paying their premium to private companies are both acceptable.

Some of the difficulties inherent in compensation schemes may be circumvented by **community-based insurance schemes**, where the community has a vested interest in the transparency of the system and legitimacy of claims, and where producers sustaining least losses may derive some benefit analogous to a 'no-claims' bonus. In areas facing serious economic damage from livestock losses, **incentive programmes** may be necessary to motivate communities to protect carnivores. For example, in the Baltistan region of northern Pakistan farmers pay premium contributions per head of livestock to a fund administered by the community. A second fund, operated jointly by the community and Project Snow Leopard staff, receives income from carnivore-centred ecotourism activities. Following depredation, a claimant receives compensation from the first fund, but if the claimant's accumulated

premium is not high enough to cover the full value of the loss incurred, money is taken from the second fund to cover the remaining costs. This combination provides livestock owners with both a disincentive to kill predators and a positive incentive to conserve them (Hussain 2003).

The Snow Leopard Trust (<http://www.snowleopard.org>) has also worked with local communities to set up and finance a village-run insurance programme for valuable livestock including yaks, horses, cattle, yak-cattle hybrids and donkeys. As part of the programme, herders agree not to kill snow leopards (*Unica unica*) or their prey species and to leave some room for the snow leopard's wild prey to graze. Another example of a successful community based livestock insurance scheme (Khan and Waseem 2007) provides a tangible incentive to local communities to support conservation and find ways to live in harmony with leopards (*Panthera pardus*) in Pakistan. In the USA, Defenders of Wildlife has created an innovative programme called the **Proactive Carnivore Conservation Fund** which shares the cost of non-lethal damage prevention measures with ranchers (Stone 2009).

Actors involved

- HCC 'Raid Response Team' (RRT) / Outreach Officer
- Livestock owners and herders
- Local government
- Insurance brokers
- Non-government organisations / advocacy groups

Implementation guidelines – setting up

- Initial assessment: a short 'willingness to pay' survey among farmers to determine whether insurance will work in East Georgia. Some guarantee is needed that a 'critical mass' of farmers would consider scheme (say 40–60% positive response?) once they have a full understanding of the conditions. Year 1: Survey and feasibility study. Year 2: Roll out pilot.
- **Community involvement:** Motivate and assist the local community to develop a livestock insurance programme to compensate people for losses of livestock to wolves in VNP. In exchange for receiving assistance with a livestock insurance programme, flock owners in VNP explicitly agree not to kill wolves or their prey species.
- The livestock insurance programme should not only seek to reduce the level of conflict via reducing retaliatory killings, but it should also use **incentives** to attempt to reduce conflicts by making wolf predation less likely in the first place. This can be done by providing incentives for good herding practices that keep sheep away from wolves:
 - a) **Bonuses can be paid out of the insurance fund** to owners who have no livestock lost during a coverage year, or to the owner(s) with fewest losses;
 - b) If a flock owner or group of herders **agree not to graze their livestock on a portion of the PA** – thus reducing grazing pressure and, possibly, leaving more forage for the wolves' wild prey – the flock owner receives a fee that is based on the fair market rent for grazing land in the area.

Box 6. European examples of compensation and insurance

Italy (Cozza et al. 1996, Gazzola et al. 2008). **Local government compensates** 100% of the value of livestock killed by wolves, bears and even feral dogs. This amounted to a modest 0.4–2.8% of total livestock subsidies in the region. It is vital that the criteria for compensation are clearly laid out to avoid abuses in the claim system. In Italy, farmers sometimes keep old or infirm sheep for headage payments, but these are more likely to be killed by predators. Compensation in the Arezzo province of Tuscany focused in the mountainous area inhabited by wolf packs hence there were huge differences between areas with and without wolves. In 1998–2001, compensation costs in the province averaged €86,863. In the same period, no farmer requested prevention funding from the Tuscan region. During the study period wolf population was stable: wolf packs were distributed on 47% of the whole province (1,504 km²), with a density estimated at 2.9±0.7 wolves per 100km².

Norway (Linnell and Brøseth 2003). **Compensation** designed to cover the slaughter value of the sheep, although some additional compensation for lost production value of ewes and extra work may also be eligible for compensation. Only 5–10% of the sheep compensated were actually documented as being killed by carnivores. Most losses above 'normal' (a long-term average of non-predation mortality from each region in the period before large predator recovery) are eligible for compensation provided one or more criteria are fulfilled. These include: 1) some documented losses within a grazing area due to large predators; 2) permanent presence of large predators within the region; 3) age and seasonal specific patterns of losses; 4) a history of chronic depredation losses in the grazing area.

Greece (Psaroudas 2007). **A combination of compensation systems with prevention methods** has an accumulative effect, increasing rural people's tolerance towards wildlife. A semi-public body whose financial sources come mainly from the obligatory insurance premium livestock farmers pay; receives funding from the Greek state only in extreme cases of financial deficits. As prerequisites for compensation, proper guarding of livestock is required.

Spain (Blanco 2003). **Three different systems of damage compensation.** The first, used mainly in Asturias, is the full and direct compensation of all damage. Farmers must report losses to an official ranger, who checks the remains in situ, but there is no requirement to protect stock from predators. **Direct compensation** is paid within a few months. In many cases it is difficult to decide whether animals were actually killed by wolves or only scavenged; most dubious cases are resolved to the farmers' advantage, though compensation is not paid for missing animals. The system is very time consuming for rangers, who devote around 1,000 days a year to assessing wolf damage. This is, however, the method that farmers prefer.

In Castile and León autonomous region (with 60% of Spain's wolves), **farmers must take out a private insurance policy.** The regional government compensates the insurance shortfall payments and the insurance company pays the rest. If farmers have not insured their livestock, they are not eligible to receive the shortfall amount. Regional governments occasionally offer livestock farmers other kinds of help. South of the River Duero and in Castilla – La Mancha, where there are just a few wolves, a technical team verifies claims and helps farmers with paperwork. Damage prevention methods (LGDs, electric and conventional fences) are subsidised or provided free of charge. In these regions, farmers whose livestock has been attacked must inform the insurance company representatives, who pay for most of the damage, as well as the official (administration) rangers so that they set the payment process in motion.

The third system is that used in Galicia, north-west Spain, which hosts around 700 wolves over about 26,000km². Until 2003 no damage was compensated. Since 2004, direct compensation is paid in a hunting reserve that accounts for a tiny part of the wolf range; in the rest of the region **outside the PA livestock owners must assume the losses themselves.**

- Integrate local institutions in the management and operation of the scheme from the beginning. VPA administration, or its local government partners, lead discussions about how insurance claims should be evaluated and paid, and help set compensation levels for different kinds of livestock.
- The local institution collects the monthly insurance premiums from participants, investigates claims when an animal is killed and gives out payments from the insurance fund.

Implementation guidelines – operation

- One possibility is to adopt a model used successfully for snow leopard conservation, in which livestock owners pay a seasonal premium per head of livestock into a fund (Fund 1). This is managed and administered by VNP, the local authority or another appropriate body, which also keeps a record of individual premiums paid in.
- A second fund (Fund 2) receives contributions from (international) wolf advocacy groups and/or generates income from ecotourism activities (which would tie in with other GCCP initiatives).
- The insurance scheme is meant to be largely self sustaining and locally managed. An Insurance Committee (IC), to include the HCC RRT (Toolbox Component 1) is set up for this purpose. Other members of the IC are local, nominated by livestock owners.
- The IC is the signatory on payments made from Fund 1. For Fund 2, the IC and a fund manager are co-signatories. Premiums are paid seasonally.
- Members of the insurance scheme are entitled to interest earned on the total amount, which is paid to them annually in proportion to their individual accumulated premiums. Entitlement to money from Fund 2 is restricted to those members of the community who have paid premiums into Fund 1.
- Claimants must formally file applications with the IC. The HCC Rapid Response Team will react immediately to reports of livestock kills and visit the incident site for a forensic examination following an initial response protocol (e.g. Silver 2007).
- A guide could be designed in Georgian by the HCC Team to help with the identification of carnivores responsible for depredation, explaining how to identify behaviours, spoor and scats of carnivores in VNP (e.g. Dickman and Msigwa 2007).
- Upon receiving a report of an attack on livestock, the HCC RRT opens an incident file, determines if a site visit is warranted and files an initial report. At the conclusion of the site visit, the RRT will generate a standardised incident report to be submitted to the IC which will try to determine the following:-
 - a) Did the reported event (or events) definitely involve a wild predator?
 - b) Was the reported problem a single incident or part of a series of incidents that may involve an habitual offender? (see Toolbox Component 8)
 - c) What appear to be the proximate and secondary causes of the incident(s)?
 - d) What carnivore species is involved? Does the evidence suggest any other specific data about the animal, such as the size, sex and presence of injuries or anomalies to the body?
 - e) What are recommendations for immediate and/or long term courses of action?

- If the IC decides that a claimant should be compensated, the following steps are taken: 1) The claimant receives his individual accumulated premium amount from Fund 1 as compensation; 2) If the claimant's accumulated premium amount in Fund 1 is not high enough to cover the full value of the loss incurred, money is taken from Fund 2 to cover the remaining costs.

Budgetary considerations

- Consultant to get system up and running (£2–3,000?). Seed funds to establish scheme. Will need to be front-headed, with reduced donor input tailing off for subsequent years. £5–8,000 per year? – set this up at 50% of cost of replacing 100 sheep (20% of current reported losses) + 10 calves?
- For example the SLT has gradually been decreasing its financial support of the livestock insurance programme as the insurance fund has built surplus funds year by year (the programme was expected to have become self-sustaining by 2010).

→ Toolbox COMPONENT 8:

Dealing with problem animals

Objectives

To reduce livestock-predator interactions and losses of livestock, addressing owners' grievances, while minimising potential impacts on carnivore populations.

Background

Not all individuals in carnivore populations are equally involved in conflicts (e.g. Jedrzejewski *et al.* 2003). A very small number of "problem individuals", sometimes just a single bear, can be responsible for half of all damage in some situations (Kaczensky 1999). Two-thirds of wolf packs in Wisconsin ranged near livestock without causing problems (Wydeven *et al.* 2004). In Poland, 7% of wolf packs caused 57% of the total damage (Jedrzejewski *et al.* 2003).

The removal of individual livestock-killing predators or wolf packs can therefore be an effective way to reduce or stop predation (Jorgensen 1983) if done very selectively and as soon as possible after an incident. Lethal control may play an important role in avoiding the spread of livestock depredation through some carnivore populations (Woodroffe and Frank 2005). However, it can be very difficult to achieve (Linnell *et al.* 1999) and the effects may be short-lived (<1 year) due to re-colonisation of the vacated territory by con-specifics (Sagør *et al.* 1997, Landa *et al.* 1999, Treves and Naughton-Treves 2005).

Due to several factors which frequently lead to failure, as well as the expense and difficulty of the procedure, the capture, translocation and re-release of persistent livestock killers, although it can succeed in some instances (Bradley *et al.* 2005, Loveridge *et al.* 2010), is not generally considered to be an effective strategy for addressing HCC involving relatively abundant species (Linnell *et al.* 1997, Sillero-Zubiri *et al.* 2004). An exception might be if an endangered species is involved (WWF/SARPO 2005), for example if a leopard or striped hyena (*Hyaena hyaena*) were to be implicated in livestock killing (NACRES 2004).

A major drawback of having damage control professionals remove problem animals is that livestock owners and herders may come to rely on such interventions, as appears to be the case in Slovakia (Rigg *et al.* in press), and abandon or fail to adopt other potentially more effective and longer-lasting forms of mitigation.

Another possibility is to allow livestock owners and herders to harass wolves seen near their flocks and/or to provide them with rubber bullets and training in their use or to issue permits allowing them to shoot at wolves seen attacking livestock (e.g. Bangs *et al.* 2005). In order to reduce the likelihood of such a system being misused or leading to population-level effects on wolves, its implementation would call for an effective monitoring programme and an obligation on livestock owners to report any incidents of shooting at wolves to the HCC.

Actors involved

- (Local) government
- HCC 'Rapid Response Team'
- VPA administration
- Hunters?

Implementation guidelines

- The HCC Rapid Response Team (Toolbox Component 1) will react immediately to reports of livestock kills and visit the incident site for a forensic examination following an initial response protocol (e.g. Silver 2007).
- The Outreach Officer advises livestock owners on measures to prevent further damage (Toolbox Components 2, 5 and 6).
- If problems continue after all reasonable efforts (as defined in protocols) are made to reduce or eliminate the contributing human factors to a conflict situation, steps may have to be taken to identify and remove the particular problem animal(s).
- In this situation, all efforts must be made to minimise the chances of capturing a non-offending animal. Initial removal attempts should be made at the site of a reported depredation event. If this is not possible, care should be taken to identify the problem animal. This may be accomplished through examination of kills, camera trapping and possibly tracking from the site of depredation events. Removal of problem animals should be carried out by qualified staff or with the oversight of officials.
- Before attempting to live-capture an animal, the options for its disposition should be clear. This will determine which removal technique might be employed. Options include translocation and re-release, euthanasia or placement in an appropriate (e.g. EAZA accredited) captive facility. Sale to private individuals, commercial interests or to private or non-accredited zoos or other captive facilities is not recommended.

Budgetary considerations

- Set up and running costs of the HCC Rapid Response Team (Toolbox Component 1).
- Specialist animal handling/immobilising equipment.

5. KEY OUTPUT II: Recommendations for policy level interventions

5.1. Developing a national policy

Policy level interventions to reduce the impact of HCC on shepherding communities, while also relevant to spheres besides wildlife management such as agriculture, rural development and ethnic minorities, would ideally be drafted as integral parts of comprehensive species management plans (e.g. Boitani 2000, Swenson *et al.* 2000). These plans should tackle HCC as part of a broader holistic approach, incorporating careful assessment of any actions likely to affect population size (Huber *et al.* 2008).

In order for such measures to be implemented, they must be accepted by the majority of people affected by or otherwise concerned with carnivores. Experience from around the world has consistently shown that this is only likely to happen when all the major players are included in the process of preparing plans from their inception. Surveys of public opinion (ACT International 2005, ACTA Consultants 2007, Rigg and Sillero 2010) provide an indication of what is likely to be acceptable to different publics. Another human dimensions approach, which has been successfully employed in Europe and North America (Bath 2009), is the facilitated workshop approach of bringing together representatives of key interest groups, who often have a history of conflicting agendas, in order to build trust and achieve consensus on management objectives and methods. This needs government backing not only to provide assurance that outcomes will be adopted but also so that any attempts by particular lobbies to circumvent the working group are directed back into the process.

It was clear during workshops held in Tbilisi in May 2010 on 'Human-bear conflict in the Caucasus' and 'Large carnivores in the Caucasus' (IBA 2010) that there is a paucity of scientific data on some species of large carnivores and on HCC in the region. As good information is needed to make good decisions (WWF/SARPO 2005), this gap needs to be filled and is already being partially addressed through the Georgian Carnivore Conservation Project and previous work on brown bears in some parts of the country (NACRES 2006a,b), which should be extended in scope and also encompass wolves.

In addition, it is increasingly recognised that as most large carnivore populations in Europe span international borders (Boitani and Ciucci 2009), they should be managed at the population level, rather than separately within each country (Linnell *et al.* 2007). This calls for close cooperation between policy makers, researchers and agencies in neighbouring states; in Georgia's case Armenia, Azerbaijan, Turkey and the Russian Federation. Once a constructive working group has been established, representatives from other states can be invited to participate as the workshop approach progresses.

5.2. Transferring the toolbox to a broader geographic area

Application of the toolbox in the project area together with adequate monitoring will provide the opportunity to evaluate which components prove to be most successful at mitigating HCC in VNP. These elements could then be applied in other areas, with adjustments and improvements made on the basis of lessons learned in the pilot area. This could be done either by the GCCP itself, if resources allow, or by other projects or agencies.

The GCCP could encourage this through the dissemination of its results in professional and popular media as well as in the various project outputs and by promoting the work in VNP as a model of best practice (WWF/SARPO 2005), for example organising study tours for those interested in replicating such interventions elsewhere.

During the GCCP Phase 1 baseline survey, livestock owners made reference to problems with bears as well as wolves in the Tusheti summer grazing areas of the Greater Caucasus Mountains, so this could be a good place to expand to initially. As Tusheti is also a national park (Tusheti management plan 2006), and has already been included in some GCCP activities, there could be opportunities to implement the toolbox in collaboration with the park authorities in a similar manner to VNP. Some elements of the toolbox might also prove to be applicable in other protected areas of Georgia experiencing HCC, for example in Borjomi-Kharagauli National Park (ACT International 2005).

Of course, HCC is not limited to protected areas, or indeed national boundaries, and neither are the mitigation measures proposed. Applying the toolbox in wider landscapes and/or in neighbouring states such as Azerbaijan would, however, be contingent on securing suitable partners and sources of funding although, if they prove to be sufficiently successful, some of the techniques may spread by word of mouth. This 'bottom up', grassroots spread may be complimented by a 'top down' policy approach (see section 5.1) but, again, this would require the mobilisation of substantial resources. One possibility is to target resources in particular areas on the basis of zoning management priorities and goals (see section 5.3.3).

5.3. Other policy-level considerations

5.3.1. Improving the wild prey base

The availability of wild prey is evidently an issue in VNP and other parts of Georgia where illegal killing has been a problem in respect of prey species as well as of predators (NACRES 2004, ACT International 2005, Vashlovani management plan 2005, Tusheti management plan 2006, Wood 2010). Several studies have reported a predominance of domestic animals in the diet of wolves in areas of southern Europe with few wild ungulates, whereas predation on livestock has sometimes decreased following restoration of wild prey due to prey switching (Meriggi and Lovari 1996, Fritts *et al.* 2003, Peterson and Ciucci 2003, Sidorovich *et al.* 2003). African wild dogs in Kenya killed livestock repeatedly in areas where wild prey was heavily depleted and the economic cost of tolerating them was more than 100 times greater than in areas where wild prey remained, even at low densities, and damage to livestock was uncommon (Woodroffe *et al.* 2005).

In VNP, it is possible that predation on livestock is almost inevitable due to the scarcity of wild prey as a result of poaching and over-grazing by livestock. If this is the case – studies of wolf diet and kills are needed to clarify – then prey restoration would be desirable and possibly more effective than non-lethal damage prevention measures (Breitenmoser *et al.* 2005). There may be potential for increasing prey numbers through augmentation or habitat manipulation, possibly tying in with the goitered gazelle (*Gazella subgutturosa*) reintroduction programme. A campaign of outreach and education as well as better enforcement would help to combat poaching (Wood 2010).

Opportunity: In VNP and Tusheti this ties in with other GCCP consultancy work on counter-poaching and local outreach and possibly also the gazelle programme.

Nevertheless it should be borne in mind that although relative densities of livestock and wild prey may be reasonable predictors of the extent of predation, they will not necessarily provide an adequate measure of the intensity of conflict even in apparently similar cultural settings (Bagchi and Mishra 2006). Moreover, in Europe, high densities of natural prey do not necessarily prevent high livestock losses to predation (Mysterud and Warren 1997, Kaczensky 1999) if husbandry practices leave livestock vulnerable (Blanco *et al.* 1992) or there are other causal factors, such as landscape features or predator behavioural ecology (Stahl *et al.* 2001).

On a note of caution, increasing wild prey populations might sometimes result in increased predator populations and hence more depredation (Linnell *et al.* 1996). Some studies have identified high densities of wild ungulates in pastures among factors predisposing farms to predation (Stahl *et al.* 2001, Treves *et al.* 2004), although others (e.g. Muhly *et al.* 2010) have found husbandry practices to be more important than biophysical factors in this regard.

5.3.2. Legal status and lethal control

Overwhelming support (89–99%) was found among all interest groups surveyed in East Georgia for allowing people to kill wolves that attack their livestock (Rigg and Sillero 2010). Only 14% of all respondents in the questionnaire survey, including just 16% of livestock owners, 11% of herders and 11% of hunters, knew that it is, in fact, legal to hunt wolves in Georgia. All livestock owners interviewed in the VNP area, regardless of whether or not they were within the protected area, stated that they did not have permission to shoot predators.

In general, wolf populations are able to withstand human-caused mortality of up to 35% per year (Fuller *et al.* 2003) and there is evidence of wolf reproductive rates increasing in response to heavy hunting pressure (e.g. Sidorovich *et al.* 2003). This provides considerable leeway for permitting lethal control without posing a threat to conservation objectives.

One possibility is to issue permits to livestock owners to shoot at wolves seen attacking livestock (Bangs *et al.* 2005). Another option which might be considered is setting a sustainable quota for trophy hunters, who also have grievances as they perceive wolves as having a major impact on ungulate populations but are no longer paid a bounty for killing them (I. Shavgulidze pers. comm.). Although neither of these approaches is likely to represent the most effective way to prevent attacks on sheep and cattle, they might improve acceptance of carnivores by empowering those most affected (Treves and Naughton-Treves 2005), require far fewer resources than state-run damage control programmes (Sillero-Zubiri *et al.* 2004) and may help foster better relations between livestock owners, hunters and protected area managers. In addition, if managed appropriately, a legal harvest could also generate income for the community and help fund other HCC mitigation measures (Leader-Williams and Hutton 2005).

Over-emphasis of a link between hunting and tackling HCC should, however, be avoided, as it can lead to a situation in which not only livestock owners and hunters but also the general public come to view lethal control as the default position, as in Slovakia, where many people now think that culling carnivores is the only way to reduce HCC (Wechselberger *et al.* 2005, Rigg and Adamec 2007). While manipulating population density through hunter harvest might form part of a multifaceted carnivore management strategy (e.g. Huber *et al.* 2008) and may set the background to render other, more selective interventions feasible (Sillero-Zubiri *et al.* 2004), many studies have concluded that there is no clear, consistent link

between carnivore numbers and levels of damage and/or conflict *per se* (e.g. Kaczensky 1999, Blanco *et al.* 1992, Mysterud and Warren 1997, Swenson and Andrén 2005), probably because more important roles are played by other factors. These include: deficiencies in husbandry such as a lack of human attendance, guard animals or other preventive measures (Kaczensky 1999) and improper disposal of livestock carcasses (Fritts 1982, Mech *et al.* 2000); landscape features (Treves *et al.* 2004, Jędrzejewski *et al.* 2005); proximity of forest cover (Azevedo and Murray 2007) or shrub cover in calving/lambing pastures (Paul 2000); relative availability of natural food sources (Mech *et al.* 1988, Stahl *et al.* 2001, Sidorovich *et al.* 2003, Ryan *et al.* 2007); some aspects of carnivore behavioural ecology such as extreme food selection and surplus killing (Mysterud and Warren 1997); as well as social and political perspectives (Swenson and Andrén 2005).

5.3.3. Zoning

Prioritising carnivores in some areas and human interests in others can help to reduce conflicts by spatial separation of the mutual causes (Linnell *et al.* 2005), with the additional benefit of allowing expensive interventions such as conflict mitigation measures to be targeted in certain areas. Such an approach may garner widespread public support, as all target groups in East Georgia included in the baseline survey (Rigg and Sillero 2010) showed a tendency to think that wolves should only live in restricted parts of the country and that it is important to have protected areas such as VNP. Moreover, all groups except livestock owners and herders were opposed to allowing wolf hunting and livestock grazing in protected areas. Relocating livestock farms has been contemplated (ACTA Consultants 2007).

However, merely protecting carnivores within protected areas and keeping livestock outside them is not likely to be an adequate strategy as PAs are not usually sufficiently large (core areas for viable populations of bears and wolves need to be thousands of square kilometres), well-connected and free of negative human influence to preserve large carnivore populations in isolation (Linnell *et al.* 2005). Zoning is therefore also needed in multi-use landscapes beyond protected areas, which might prove to be more controversial: many people would probably not welcome being included in a 'carnivore zone' ("*Not in my back yard*"). Nevertheless there are precedents. For example, a pilot incentive programme in India aimed to offset losses due to livestock predation and to enhance wild prey density by creating livestock-free areas on common land (Mishra *et al.* 2003).

ACKNOWLEDGEMENTS

This study was commissioned by Fauna & Flora International and NACRES as part of the Georgian Carnivore Conservation Project, funded by the European Union. We thank Gareth Goldthorpe and Liesje Birchenough at FFI and Irakli Shavgulidze and Nino Markozashvili of NACRES for their help and support. We are indebted to Jorgelina Marino for compiling resources from the People & Wildlife website. We are also grateful to all those who assisted us with the design and implementation of the baseline survey, without which this toolbox could not have been produced.

Robin Rigg & Claudio Sillero
October 2010

GLOSSARY

To ensure their clear, consistent use and to avoid potential confusion and misinterpretation, the following glossary of terms was established in English and nearest Georgian equivalent.

- Cereal farmer (ფერმერები, რომელთაც მარცვლეული მოქყავთ):** A person growing crops – but not substantial numbers of livestock (as defined under livestock owner) – around VNP.
- Enforcement officers (კანონის აღმსრულებლები):** National Park rangers, border police, etc, working in and around VNP.
- Farm (მეურნეობა/ფერმა)** Buildings (pens, barn, farmhouse) used by herders/owners to contain their flocks/herds while in or around VNP.
- Flock (ფარა):** A number of sheep/goats kept and grazed together.
- Herd (ჯოგი, ნახირი):** A number of cattle/horses kept and grazed together.
- Herder (მწყემსი, მენახირე):** A worker who tends livestock on a daily basis but is not the owner of a significant proportion (>10%) of the herd/flock.
- Hunter (მონადირე):** A person that legally hunts wild animals in East Georgia, whether commercially or as a hobby.
- Livestock (პირუტყვი):** For the purposes of this survey, livestock is considered to include sheep, goats, cattle, horses, donkeys and pigs.
- Livestock owner (პირუტყვის მეპატრონე):** The owner of at least 100 sheep/goats or at least 15 cattle/horses, who may or may not tend them daily. This group could be subdivided into Tushetian (present in East Georgia during the winter but going to the Caucasus for the summer grazing season), local (present throughout the year) and other.
- Poacher (ბრაკონიერი):** A person that illegally hunts wild animals in East Georgia.
- Rural residents (სოფლის მაცხოვრებლები):** People living in villages near VNP and not belonging to one of the other target groups.
- Sheep dog (ნაგაზი, მეცხვარე ძაღლი):** A large breed of dog used to guard livestock, living close to the flock. Livestock guarding dogs kept in VNP may be listed as Georgian, Caucasian, mixed breed or other.
- Urban residents (ქალაქის მოსახლეობა):** People living in Dedoplistskaro and not belonging to one of the other target groups.

ABBREVIATIONS USED

APA	Agency of Protected Areas	LGD	Livestock guarding dog
GCCP	Georgian Carnivore Conservation Project	NP	National Park
GIS	Geographic information system	PA	Protected area
GPS	Global positioning system	VNP	Vashlovani National Park
HCC	Human-carnivore conflict	VPA	Vashlovani Protected Areas

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Appendix I

Farms with high or medium HCC during the 2009/10 grazing season

Farm #	Livestock kept ^a		Reported loss		In VNP?	Zone ^d	WGS 84 UTM / UPS	
	Sheep	Cattle	% stock ^b	Income ^c			X	Y
68	Y		4.90	Very big		Western	8620202	4557019
34		Y	4.35	Very big	Y	Black Mtn.	8638247	4563005
33		Y	18.00	Big	Y	Black Mtn.	8637055	4564217
79	Y	Y	7.04	Big		Central	8636371	4571998
NF2	Y	Y	6.02	Big	Y	Black Mtn.	8636509	4565097
25		Y	4.44	Big	Y	Central	8638991	4575434
9		Y	4.00	Big	Y	Black Mtn.	8641028	4570389
15		Y	3.75	Big	Y	Black Mtn.	8637906	4573619
71	Y		3.73	Big		Western	8621530	4556728
82		Y	3.48	Big		Central	8634958	4574364
16	Y	Y	3.05	Big	Y	Western	8608204	4569647
77		Y	2.86	Big		Central	8627456	4568111
7			2.86	Big	Y	Black Mtn.	8636054	4561791
74	Y		2.63	Big		Central	8625081	4566169
13		Y	2.60	Big	Y	Black Mtn.	8639508	4561315
73	Y		2.50	Big		Western	8624613	4552320
62	Y		2.35	Big		Western	8615136	4562335
32	Y		1.97	Big	Y	Central	8625215	4565084
80	Y	Y	1.87	Big		Central	8634960	4571535
26	Y	Y	1.80	Big	Y	Central	8630685	4563056
12		Y	1.79	Big	Y	Black Mtn.	8639232	4565883
27	Y	Y	1.06	Big	Y	Central	8630105	4564525
29	Y	Y	1.04	Big	Y	Central	8630805	4561528
30	Y		0.97	Big	Y	Central	8628451	4562135
3		Y	8.00	Medium	Y	Black Mtn.	8636326	4568848
39	Y		3.49	Medium	Y	Black Mtn.	8637821	4572262
NF7	Y	Y	2.33	Medium		Black Mtn.	8640186	4577672
67	Y		2.32	Medium		Western	8619405	4558199
31	Y	Y	2.04	Medium	Y	Central	8627294	4563107
38	Y		1.95	Medium	Y	Black Mtn.	8635065	4570698
NF5	Y		1.48	Medium		Western	8612360	4564086
58	Y	Y	1.42	Medium		Western	8612173	4564128
8	Y	Y	1.01	Medium	Y	Black Mtn.	8641800	4572383
40	Y	Y	0.60	Medium	Y	Central	8631287	4567318
Total	23	22			21	-	-	-

^a Sheep farms also kept goats, most farms had horses and many kept a few donkeys. Farm #7 was primarily a horse farm (Rigg and Sillero 2010).

^b Based on losses since arriving in the VNP area up to the time of the baseline survey (March 2010).

^c Owners' ratings on a 5-point Likert scale: "very big", "big", "medium", "small", "insignificant".

^d The study area was arbitrarily divided into three zones.

Appendix II

Good practice with guard donkeys

Donkeys exhibit an inherent dislike for canids and will bray, bare their teeth, chase and attempt to bite and kick them. They can reduce livestock losses to coyotes (Walton and Field 1989) but are probably not as effective as LGDs at reducing losses to wolves and bears and there could be difficulties using both together (Andelt 1999a). The advantages of donkeys over LGDs are that they: require less care; are more adaptable to changes of owner, climate and activity; seem to be less prone to accidental death; have less tendency to stray; are longer lived; can stay in the same pastures as the flock; eat the same food; and do not necessarily need to be raised with sheep from a young age (Tapscott 1997).

Donkeys of any age can be integrated into flocks although young animals are recommended. The process is relatively easy and takes about 1–6 weeks. Donkeys should be tested by challenging them with an unfamiliar dog in a pen or small pasture and those that are passive should not be used for guarding. An individual female donkey (or jenny with foal) with each herd is considered best. Geldings can also be used, but donkey stallions can be aggressive to livestock, especially in autumn. In the Swiss Alps, a single donkey guarding a flock of up to 50 sheep in fenced pastures or 200–250 in unfenced mountain pastures worked best (Landry 2000). Breeding should preferably be synchronised so that the donkey gives birth to its foal a month before livestock begins to calve/lamb.

Points to consider:

- Select donkeys of adequate size and conformation.
- Only use a jenny or a gelded jack. Intact jacks may kill livestock.
- Donkeys should be given about 4–7 weeks to bond with sheep. Stronger bonds may form if donkeys are placed with sheep or goats at an early age (3–6 months).
- Raise donkeys away from dogs. Do not use dogs to gather sheep or goats in pastures with guard donkeys.
- Only use one donkey per pasture, as multiple donkeys might spend more time together than with sheep. Do not use donkeys in or adjacent to pastures with horses or other donkeys.
- The best results can be expected in small (240 ha or less) pastures with no more than 200 sheep or goats. Donkeys cannot be expected to work well if sheep or goats are scattered.
- Jennies in heat may kill lambs or kids and may need to be temporarily removed.
- Do not use donkeys and guard dogs together.
- Donkeys are inexpensive and easy to keep. They can be used with most other carnivore management methods and are less likely to stray than dogs.

Appendix III

Good practice with livestock guarding dogs

Livestock guarding dogs (LGDs) require both instincts and learned behaviour, so achieving good LGDs is a combination of choosing the right pups and raising them in the correct way (Lorenz and Coppinger 1986, Coppinger and Coppinger 2005). Pups which do not have the right genes will not succeed regardless of how they are raised, but also dogs not reared properly cannot be retrained later. To make a good livestock guardian, a dog must be trustworthy, attentive and protective. The aim of the LGD breeder and trainer is to achieve an acceptable level in all three of these characteristics (see also Green *et al.* 1984, Green and Woodruff 1988, 1999, Braithwait 1996, Landry 1999, Rigg 2001, Dawydiak and Sims 2004).

Key traits

Trustworthy

Livestock guarding dogs must become part of the flock without disturbing or harming it. They should be submissive to livestock: approaching with their ears back and squinting or averting their eyes, rolling over to expose their belly. Sniffing around the face or anus of livestock is investigatory behaviour, which is also a good sign that the dog has the right instincts.

Attentive

In order for a dog to be able to defend livestock, it must stay with it as much as possible, both day and night. LGDs should follow the flock when it moves and rest among or near the livestock. A dog is also showing the required behaviour if it retreats towards the flock when a stranger approaches (see Coppinger *et al.* 1983).

Protective

LGDs should bark at new or strange activities and situations. Pups typically rush out barking with tail raised, but if challenged may retreat to the flock with tail between legs. This is called approach-withdrawal behaviour. As dogs mature they should become more confident, advancing further towards potential threats and showing dominance behaviour (see McGrew and Blakesley 1982).

Raising and training

The main elements to raising good livestock guarding dogs are: choosing the right type of dog; socialising it with livestock so that it stays with them; and correcting unwanted behaviour to ensure the dog is trustworthy as well as attentive. Protectiveness will take care of itself as this is an instinctive behaviour that does not need to be taught, but some dogs are more protective than others.

To ensure that a LGD stays with the flock as much as possible, it should become part of the flock from an early age. *“The dog should be kept with, brought up with, socialised with and bonded with the stock it is going to protect.”* Domestic dogs have a so-called ‘critical period’, between about 4 and 14 weeks of age, during which they can form strong social bonds not only with other dogs but also with other species, including livestock. This process is

facilitated by LGDs having only weakly developed predatory instincts, which helps livestock accept the dogs among them.

Traditionally, shepherds have tended to raise their livestock protection dogs in an unstructured way. In Georgia, as well as in Romania (Mertens and Schneider 2005) and among the Navajo of the American southwest (Black and Green 1985), for example, young dogs are expected to learn from older ones, with quite severe punishments metered out for misdemeanours. Persistent offenders and pups that are considered unsuitable are neglected, killed or otherwise removed.

A more formal system has been developed in North America (e.g. Lorenz and Coppinger 1986) and successfully implemented in many countries, the main elements of which are described below. Although the text refers to sheep, the same principles apply to other livestock, including cattle.

- Choose a healthy pup of a recognised LGD breed/type from a reputable source.
- Take the pup from its mother and siblings at **6–8 weeks** of age and immediately put it close to the livestock you want it to protect in a pen that is large enough for the dog to move freely and allows regular contact between pup and livestock but is secure enough to prevent the pup getting out. This could be a fenced off area of the farmyard or barn. It should be out of sight and hearing of the farmhouse. Give the pup some toys to play with and provide high-quality dog food regularly.
- Minimise contact with humans and other dogs. Remember, the pup is going to be a working dog, not a pet. Do not let it play for long periods with people (including children) or other dogs. Apart from short visits, the pup should be kept isolated and in contact with the livestock until **16 weeks** of age.
- Do not allow the pup to escape from the pen, wander around or hang about near people. It is important that you do not reward such behaviour by giving it food or attention when it leaves the livestock. Remember, *“If the dog isn’t with the sheep it isn’t where it’s supposed to be.”*
- Whenever you are doing chores near the pen, let the pup out among the livestock. Supervise early contacts with sheep carefully. Reprimand the pup immediately if it chases sheep, chews their ears or pulls tails and wool.
- Spend time with the pup so it is not afraid of you and will allow you to handle it later. Routine worming, vaccination and veterinary checks are essential for good health and performance. Begin the dog in obedience training (“come”, “no”, “stop”) during its early exposure to sheep. However, always return it to the pen after a short time and praise it when it greets the livestock.
- Some farmers leave their pups together with livestock from an early age. If you do this, consider the dog’s personality when selecting which sheep to put with it. A few weak lambs may be suitable for small or shy dogs but they might be injured by a larger, more energetic dog, which would be better off with male yearlings. Do not leave a pup unattended with livestock for long periods of time until both are clearly adjusted to the situation.

- Ensure that the pup gets to know several individuals, not only one or two, and ideally animals that are going to stay as part of the flock rather than sold. Once one group of sheep accepts the dog, other sheep unaccustomed to guard dogs will tend to accept it more quickly.
- As the pup gets older, introduce it (on a leash) to the rest of the farm including equipment, machinery, vehicles, other livestock (horses, cattle, donkeys, chickens) and dogs. Supervise the dog closely when it is first introduced to new-born lambs. Concentrate on building confidence by praising and rewarding desirable behaviour.
- At **4–5 months** of age start to leave the dog with the flock for longer periods of time. As the dog matures and becomes accustomed to being with sheep, move it to situations which provide progressively more freedoms and opportunities for independent action. Move it from a small pen to a larger pen to a pasture and from a few lambs to the whole flock that it will eventually guard. Monitor it carefully, encouraging good behaviour and reprimanding it for bad behaviour.
- Observe the dog carefully after each move or change in routine. Make sure it adjusts properly and react quickly to correct any mistakes.
- Continue to be consistent in making sure the dog stays with the sheep. Return it to the flock any time it tries to leave and praise it when it stays.
- Even when the pup is older it is a good idea to provide a place where it can rest and eat that the sheep cannot get into.
- LGDs should receive at least basic obedience training. Having control over the dog is not only important for the safety of sheep and humans but it also allows it to be examined and treated when necessary and provides an opportunity for development of an affectionate dog-human bond. Work with the dog on a regular basis in the pasture with the sheep so that in the dog's mind training becomes associated with the pleasure of the owner's company and with sheep.
- By **6–12 months** of age the dog will probably begin to mark its territory, exhibit more serious concern for the sheep, and bark with deliberate intent. However, it is important to continue to supervise young dogs as they are vulnerable when not yet physically and mentally mature. Young dogs can suffer mental traumas while guarding stock that may prevent them from developing the confidence necessary to become successful adult guardians.
- If left alone with livestock in fenced pastures, the dog should be checked daily and provided with sufficient food, water and shelter. It may need to be trained which livestock it is supposed to watch (i.e. not those of a neighbour).
- Regularly examine the dog's ear canals, eyes, mouth and feet. Keep its nails clipped and trim the hair on its feet and under the tail as needed. Look for cuts and scratches that can become infected. You may need to shear or brush the dog's coat during hot weather.
- Be patient and allow plenty of time for your dog to mature. LGDs may show ideal behaviour within the first six months, but it will most likely take longer for them to develop enough confidence to attack predators. LGDs can usually be expected to begin working effectively **between one and three years old**.

Solving common problems

In a long-term study of more than 1,000 dogs of various Old World breeds and crossbreeds used on livestock farms in over 30 different states of the USA, it has been found that 65–75% of dogs turn out to be good or excellent. Nevertheless there are a variety of problems that can occur during the process of raising and training. Some of the commonest concerns are described below, with suggestions on how to alleviate them.

Inattentive

Not all dogs will stay with the flock and be attentive all the time. Most dogs sleep during the day, although they tend to be more attentive at night. During hot and humid weather dogs may leave to seek shade or water. Brushing out the under-fur, shearing long-haired dogs and giving plenty of water can reduce this. Dogs may also go looking for shelter from bad weather or extra food. Make sure that you provide LGDs with their basic needs, including sufficient food, to allow them to do their job. Leaving the flock can also be associated with sexual activity, so neutering may decrease roaming. Neutered dogs also tend to eat less food and remain healthier while remaining effective guardians.

Escaping (as well as chasing) can be impeded by attaching a weight to the dog's collar using a chain. The weight should be a piece of wood, tyre or other material not likely to cause injury, about 30 cm long, 8–35 cm in diameter and up to a quarter of the weight of the dog. The chain should be a metre or more in length.

The most common attentiveness problem is dogs returning to areas of human activity. Seriously inattentive dogs tend to be those treated as pets or allowed to develop social relations with pet dogs. If all corrective measures have failed, even dogs more attentive to people than livestock can be useful in some situations, such as where a shepherd is always present, within an electric fence or where pastures surround the farm.

Untrustworthy

Most pups and young dogs will act playfully towards livestock at some point. This typically includes chasing, biting, mounting and wool-pulling. Occasionally it can result in injury or even, in extreme cases, death. Such behaviour can usually be corrected with patient training: less than 5% of LGDs become habitual sheep killers. However, if stalking-type behaviour is observed, the dog should be replaced.

Whenever a dog is seen harassing stock it should be reprimanded immediately. Sick, old or odd sheep may be attacked by otherwise trustworthy LGDs, so if possible replace them with healthy individuals. Likewise if fearful lambs are inadvertently encouraging the dog to chase them by running away, replace them with yearlings or older (but not aggressive) animals. The unwanted behaviour may be due to boredom: give the pup some toys to play with. Chasing can be reduced by lowering the dog's calorie intake (but not quantity of food), such as with a two-week diet of cooked oats.

If the problem persists, a chicken wire fence can be used to temporarily separate dog and sheep while still keeping them in contact with each other within the barn or farmyard. For older dogs, a 'dangle stick' attached to a chain on the dog's collar and hanging 8–10 cm above the ground should slow it down. Another measure would be to put a basket muzzle on the dog to stop it biting. These are temporary measures, however, and do not teach the dog not to chase. Perhaps the dog is not ready to be left with livestock.

Not protective enough

LGDs do not need to be ferocious at all times in order to deter predators. A dog that appears to be lazing around all day doing very little might in fact be performing its role very well, particularly at night, when predators tend to be more active. Be patient in allowing a young dog sufficient time to develop the confidence to confront large predators. Having the company of other dogs tends to give LGDs more courage. They will also be less anxious in novel surroundings. More than one dog may be needed to protect a larger or widely scattered flock and this will also reduce the impact of a deficient animal. One dog per 100 sheep is often given as a rule of thumb. Some dogs might not be aggressive towards predators but are very vigilant and so can still be useful in barking to alert other LGDs and herders, which also distracts the attention of predators. Most protectiveness problems are associated with poor attentiveness.

Aggressive to humans

Whilst serious injury is thankfully rare, sufficient consideration should be given to the issue of human safety. A certain degree of aggression is to be expected from dogs whose job is to guard and protect. However, LGDs do not need to be overly aggressive towards people in order to successfully defend livestock from predators. When choosing which breed to work with, take its likely temperament into account.

If a dog is going to be working in areas frequented by unfamiliar people, such as farm visitors/customers, tourists or mushroom pickers, it should get used to meeting a variety of people from an early age. As a precautionary measure you should put up warning signs at the boundary and entrance or approach to your property to alert people to the presence of LGDs and escort visitors, particularly children, when near the flock.

LGDs are likely to react more negatively to strangers when the owner is not present. Intact males can become more aggressive as they mature and bitches when they are in heat or lactating. Dogs are often especially protective of their food or a territory boundary such as a fence. Those which remain excessively aggressive after neutering, even without provocation, should be replaced unless they can be contained in a secure area and very carefully managed.