

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

Phase 1: Baseline survey of human-carnivore conflict



Final Report

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EXECUTIVE SUMMARY

The Georgia Carnivore Conservation Project (GCCP) was established to conserve the unique and globally important biodiversity of the semi-arid landscape in Georgia. This biodiversity may come under threat and conservation measures may be compromised in areas where human-carnivore conflict is prevalent. For this reason, the GCCP decided to undertake a study in partnership with the Tushetian community, to identify conflict issues surrounding grey wolves, brown bears and ethnic Tushetian livestock herders and owners in areas where they share a landscape, and to suggest possible measures to mitigate the conflict.

The study was focused in the Dedoplistskaro District of East Georgia, particularly around and within the Vashlovani National Park (VNP). In order to gain an overall understanding of human-carnivore conflicts in this area, a comprehensive baseline survey was designed and implemented amongst various interest groups. The first part of this survey involved a semi-structured interview protocol to provide a description of livestock farming in VNP, looking at various husbandry parameters and causes of livestock mortality. The second component of the survey was an analysis of perceptions and attitudes to large carnivores among several target groups, using a self-administered written questionnaire.

In March 2010, semi-structured interviews were conducted with livestock owners and herders from 69 livestock farms within VNP or up to 2km from its boundary. The surveys showed predation to be the biggest contributor to livestock losses, with disease following a distant second. Half the respondents felt their economic losses to predation were large, while 28% considered predation a partial problem. Predators targeted sheep, which were the most commonly farmed species, but also killed or injured cattle, horses and donkeys (the latter a target presumably because it is tied up by the owners). Grey wolves were always noted as the main problem species, with golden jackal and brown bear listed in second place. However, there was quite a significant difference in the number of people that listed wolves a problem (86%), compared to jackals (12%) or bears (3%). Most livestock losses were experienced in winter, particularly in February, which coincides with the lambing season.

Three quarters of 105 documented attacks on livestock were recorded as happening in the afternoon or at dusk, normally when the flocks were in the pasture. Very few attacks occurred at night. Most respondents acknowledged using protective measures such as dogs and corrals to deter predators (every farm had at least one dog), and considered their efforts effective. However, patrolling and the conscious avoidance of potentially risky areas were generally not practiced. While all respondents thought that they did not have permission to shoot predators, the majority brought up lethal control methods as one way to reduce human-carnivore conflict. A large majority (88%) of the respondents indicated that they did not want help to protect their animals.

The second part of the study, a survey of perceptions and attitudes toward wild carnivores, was conducted from March to April 2010. Ten target groups were identified for inclusion in the survey (Tusheti and other livestock owners, herders, cereal farmers, enforcement officers, hunters, rural residents, urban residents, school pupils and school teachers). A total of 784 completed questionnaires were analysed.

Similar results emerged when respondents from the target groups described their feelings towards the various predators. Attitudes 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. Respondents who perceived wolves as dangerous, were afraid of them, were involved in herding livestock, had experienced damage caused by wild carnivores, were older or had a lower level of education tended to hold more negative views.

Unexpectedly, cereal farmers had a fairly positive attitude when it came to bears, and held more negative views towards wolves. Three quarters of respondents thought that the wolf population was increasing in Georgia while 79% also felt there were too many of them. In every group except enforcement officers (national park staff and border guards), the majority of respondents were afraid of wolves, and more so than of bears.

Livestock owners spent the most time in places with wild animals such as wolves, followed by enforcement officers and hired herders. More than three quarters of urban residents, teachers and pupils seldom or never go to places with wild animals. Unsurprisingly, therefore, 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.

Although there was obvious animosity and distrust towards wolves, all target groups tended to acknowledge that they belong in the wild in Georgia, but then only in restricted parts of the country. The majority of people in all target groups (ranging from 61% of livestock owners to 96% of teachers) felt that it is important to have protected areas such as VNP in Georgia. However, 77% of livestock owners and 67% of cereal farmers also felt that hunting should be allowed within these areas, and herders and owners also felt grazing should be allowed. 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.

Generally, the respondents were keen for more information to be disseminated on wolves and bears, and wanted to see more research taking place on these animals in their area. More knowledgeable people were found to be less afraid of large predators, which is an encouraging sign for education programmes aimed at fostering greater understanding of these animals in Georgia.

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1. INTRODUCTION

The Tushetian people of East Georgia are traditional 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 the sheep and cattle of Tushetians. The VNP consist largely of natural pastures which are used from around October to May. In the spring flocks typically move north to the Caucasian (Tusheti) summer pastures. In both these areas there are interactions with large carnivores and as a result conflict often develops.

The Georgia 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. 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.

Study of public opinion and knowledge or “human dimensions research” has become an important element of carnivore conservation management (e.g. Sillero-Zubiri and Laurenson 2001, Bath 2009, Musiani *et al.* 2009). It is now widely acknowledged that wildlife conservation and management is not so much about managing animal populations as about managing 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 human-carnivore conflicts in eastern Georgia we designed and analyzed a comprehensive baseline survey. A second component, or phase II, of this contract concerns the development of a toolbox of mitigation methods for reducing such human-carnivore conflict. These recommendations will be presented in a companion report.

2. AIMS & OBJECTIVES

2.1. Objectives

The first key objective of the study was to gain an overall understanding of human-carnivore conflict (HCC) and the attitudes of the local population toward large carnivores in the Dedoplistskaro District of East Georgia, with a particular focus on Vashlovani National Park (VNP) and surroundings. This was achieved through the design, implementation and analysis of a survey of relevant interest groups. The second key objective was to use the results of the survey to develop a toolbox of mitigation methods for reducing HCC in the area.

While the remit of the GCCP project was to mitigate HCC in East Georgia, a good understanding of the human-dimension of the conflict will provide a better foundation from which to deliver future conservation policy. Public acceptance of carnivores is likely to be influenced not only by the level of livestock losses but also by a host of other factors, including fear, perception and tolerance of risk, demographic characteristics including rural versus urban residence as well as membership of an interest group (e.g. farmers, foresters, hunters, environmentalists). Large carnivore conservation therefore tends to be more socio-political in nature than biological, requiring a good understanding of public attitudes toward predators and existing or planned conservation/management options (Bath 2009).

The main target group for the survey were the Tushetian livestock owners and herders using VNP seasonally. However, in line with GCCP activity 4.1. "Survey of local attitudes and perceptions", we extended our work to include other interest groups. By doing this we sought to get a broader understanding of the perceptions of, and attitudes toward, large carnivores in East Georgia. Pertinent interest groups included: other farmers, hunters, local residents, school pupils and teachers as well as VNP staff and border guards.

2.2. Key questions

The Terms of Reference for the design and implementation of a base-line survey and the development of a strategy for mitigating HCC posed the following questions:-

- What is the extent and intensity of the conflict?
- What is the actual impact of the conflict and is it bearable?
- What livestock management/animal husbandry techniques are currently used?
- How accessible is veterinary care and how effective is it?
- What do the herders and livestock owners feel about living alongside large carnivores?

We also sought answers to the following additional questions:-

- What is the level of public acceptance of large carnivores in East Georgia?
- What is the current level of knowledge of large carnivores?
- How do the attitudes of livestock owners and herders towards large carnivores, their management and protected areas compare to those of other interest groups and the local population at large?
- Which factors most influence attitudes and perceptions?

3. MATERIALS & METHODS

The survey design included two components. The first was a characterisation of livestock farming in VNP, looking at several husbandry parameters such as livestock type, herd/flock size, guarding techniques and livestock losses to predation, disease and other causes of mortality. Data for this component were gathered using a semi-structured interview protocol. The second component was a survey of perceptions and attitudes to large carnivores among several target groups, using a self-administered written questionnaire.

3.1. Semi-structured interview

3.1.1. Interview design

The interview protocol was based loosely on a research instrument used in Slovakia (Rigg 2004), with substantial revision and addition tailored to the specific objectives of the present study in Georgia. Potential questions were piloted during informal interviews with livestock owners and herders at eight farms in and around VNP on 4th–7th December 2009. We used an interpreter for this purpose. A formal interview protocol was then drafted in English by the consultants and modified on the basis of comments received from the project partners. The protocol was finalised during a subsequent visit on 1st–3rd March 2010 (Appendix I) and translated into Georgian. The accuracy of the translation and the research assistant's understanding of the questions were checked by having him translate the Georgian version back into English and comparing this with the original questions.

3.2.2. Sample frame and sample sizes

Livestock farms within VNP or up to 2km from its boundary were visited in January 2010 and their locations recorded using a GPS (Fig. 1). They were then plotted on a map using GIS software. The study area was arbitrarily divided into Western, Central and Black Mountain Zones. After eliminating farms that were not in use, a total of 72 were identified for inclusion in the survey (Appendix II). In March 2010 the research assistant visited each farm in order to conduct semi-structured interviews with livestock owners and herders (see Glossary for definitions). Nine of the 72 farms were excluded because they were found to be derelict or not in use, but seven others were added that had not been previously mapped. From the total of 70 farms from which data were collected, one (#20) was excluded because there were no livestock, only beehives. Therefore a total of 69 farms were included in the analysis (Table 1). Although prompted to, some respondents did not answer all the questions, so the sample size for individual items is indicated in the results.

3.2.3. Sampling procedures

A research assistant was recruited on the basis of his experience working with local communities in Georgia. On 4th–7th February he was given training by one of the consultants in how to administer the survey. Emphasis was placed on best practice to reduce observer bias (e.g. Rubin and Rubin 1995, Leech 2002). In particular, the research assistant was instructed not to share his own experiences and views. During March the research assistant conducted semi-structured interviews with livestock owners and herders during unannounced visits to active livestock farms in and around VNP. The phrasing of questions was kept short, straightforward and clear. Jargon and leading questions were avoided.

Neutral probes and prompts were used to get as much information as possible. Replies were filled in on individual questionnaire sheets and additional notes taken.

Table 1. Farms included in the survey ($n=69$) listed by zone and area

Location		Number of farms surveyed		
Sampling zone	Name of area	Within VNP	2km buffer	Total
Western	Small Shiraki	0	4	25
	Eshmakis Khevi	1	0	
	Vashlovani	0	2	
	Pantishara	0	7	
	Samukhe	0	11	
Central	Bugha Moedani	6	0	20
	Imedas Mta	2	0	
	Lekistskali	1	0	
	Natlistskali	3	2	
	Chighoeti	4	2	
Black Mountain	Shavi Mta	4	3	24
	Takhistskali	6	0	
	Alpadara	6	1	
	Sabatlo	2	2	
Total	–	35	34	69

3.1.4. Study area

The study was conducted in Vashlovani National Park and a buffer set arbitrarily at 2km from its boundary (Fig. 1). VNP forms part of the Vashlovani Protected Areas (VPA), which are located in the Dedoplistskaro District of East Georgia, between the Iori and Alazani Rivers (Fig. 2). In addition to VNP, the VPA also include Eagle Gorge, Takhti-Tepa Mud Volcanoes, Juma Bay and Alazani Floodplains Natural Monuments. The core of VNP consists of Vashlovani Strict Nature Reserve, which was established in 1935 to preserve its unique light forests. The Reserve was expanded to 101 km² in April 2003, when Vashlovani National Park (251 km²) was established along with the VPA (Kikodze 2007).

The highest point in VNP is at 708m a.s.l. and the lowest point in the areas is at 90m a.s.l., where the River Iori enters the Mingachauri Reservoir. Vashlovani has a dry climate and is typified by wild pistachio trees (*Pistacea mutica*), arid light forests and bluestem-feather grass steppes. Other forest types present include mixed deciduous (Georgian oak (*Quercus iberica*) and ash (*Fraxinus excelsior*) with some maple (*Acer campestre* L. & *A. ibericum*) and elm (*Ulmus carpinifolia*)) and flood-plain forests (poplar (*Populus canescens* & *P. nigra*) and oak (*Quercus pedunculiflora*)). The Strict Nature Reserve contains badlands-like areas of dry ravines and steep cliffs, known as “*Alesilebi*”, with semi-desert steppe vegetation as well as arid and deciduous forests.

The territories of VNP and the neighbouring Eldari Lowland, Patara Shiraki and Iori Steppe are used by Tushetians as winter grazing lands. They graze their sheep, goats and cattle in

the natural pastures of the VNP from autumn to spring, after which most flocks are moved to summer pastures, typically in the Greater Caucasus (Fig. 2).

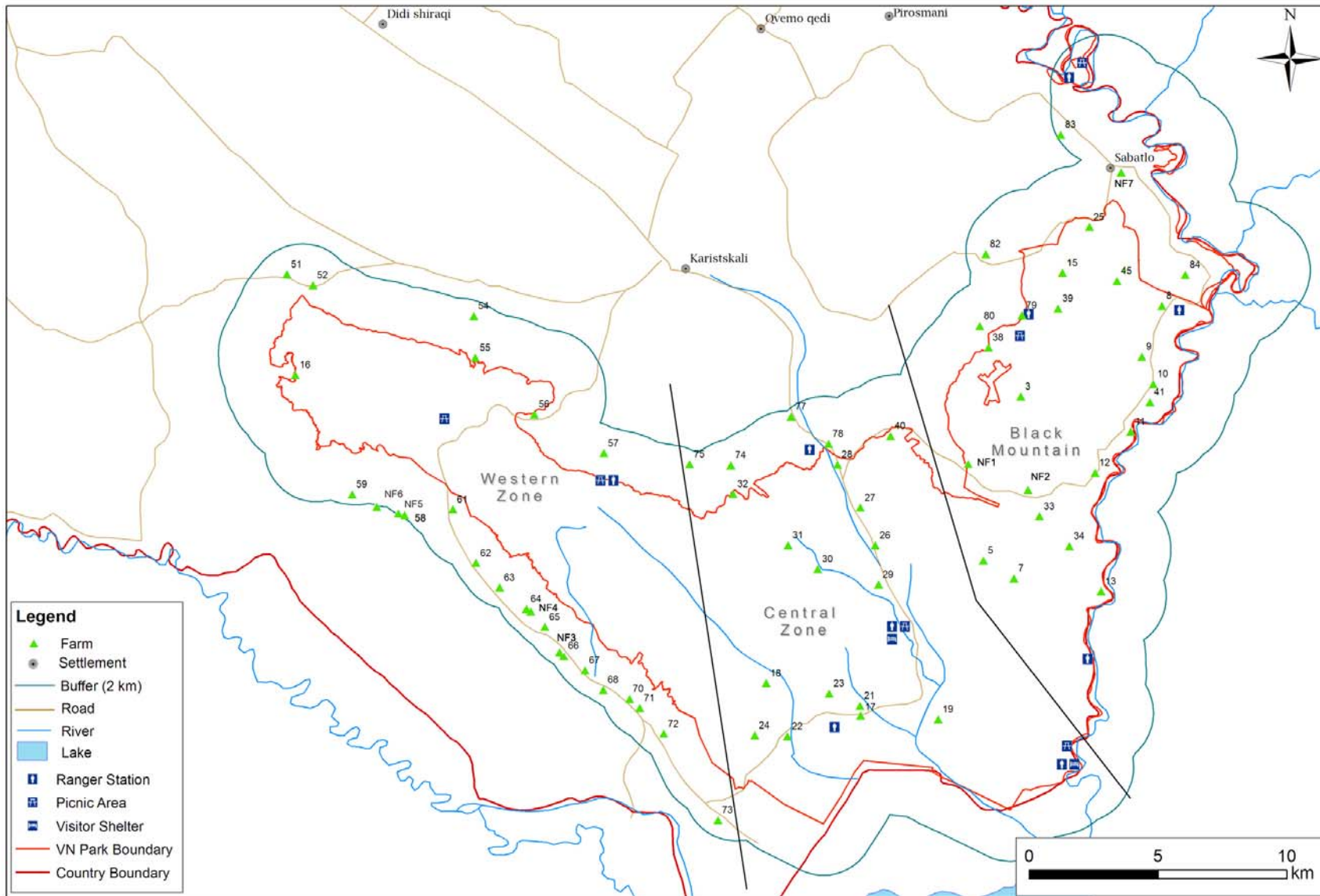


Fig. 1. Vashlovani National Park indicating 2km buffer area, survey zones and locations of farms included in the study

3.2. Written questionnaire survey

3.2.1. Questionnaire design

A quantitative social sciences method, usually referred to as “survey research”, was used as the main method to collect data for this part of the study. The implemented questionnaire was based on a research instrument developed by A. Bath, Memorial University, Newfoundland, Canada, and used in Alberta (Wechselberger 2002), Austria (Wechselberger and Leizinger 2005) and Slovakia (Wechselberger et al. 2005), substantially revised and adapted to Georgian conditions and the specific objectives of the present study.

To identify potential problems, the questionnaire was pre-tested in Dedoplistskaro town and Kasristskali village on 12th–15th February 2010 with 13 respondents: four school pupils, seven residents and two rangers. This resulted in a few changes to clarify the wording of some questions and answers. The design was finalised on 1st–3rd March 2010 and translated into Georgian. The accuracy of the translation was checked by translating from the Georgian version back into English and comparing this with the original questions.

The finalised questionnaire (see Appendix III) was printed as a booklet consisting of six sheets of paper (Din A4). At the top of the first page was a brief text explaining who was conducting the survey and why, plus stressing its anonymity. The research instrument itself consisted of 70 items: individual survey questions or statements for which we wanted to document the respondents’ opinions. These items were organised into six sections, with a brief guide to answering the questions at the beginning of each section. The six sections focused on the following aspects:-

1. attitude, value and belief of people about bears and wolves (19 questions)
2. knowledge about bears and wolves and their management (11 questions)
3. attitude toward bear and wolf management (17 questions)
4. sources of information and how important this issue is to people (3 questions)
5. previous personal experience with large carnivores in Georgia (13 questions)
6. socio-demographic aspects (7 questions)

All attitudinal questions were measured on a 5-point Likert scale ranging from “very negative” to “very positive”, “very bad” to “very good”, “strongly disagree” to “strongly agree” or “very dangerous” to “always harmless”. An “I do not know” option was not included, except for questions #12–18. In addition to these multiple choice questions, the attitudinal sections also contained one open question (#19) requesting a short essay-type response. All knowledge items were of closed structure, offering multiple choice responses, but all of these items also offered an “I do not know” option.

The majority of questions about sources of information, previous experience and socio-demographic aspects were also multiple choice questions, although there were two open-ended items (#46–47) in the section on management and three (#59–61) in the experience section.

3.2.2. Sample frame and sample sizes

Ten target groups were identified for inclusion in the survey (see Glossary for definitions). A total of 784 completed questionnaires were analysed (42 others were discarded: 22 because the respondent was less than 12 years old and 20 because they could not be assigned to a target group). Most respondents (99.2%) lived in the Kakheti Region of East Georgia (see 3.2.4.). Sample sizes for the target groups ranged from 12 to 336 (Table 2). Some respondents did not answer all the questions so in the results the sample size for individual items is indicated.

Table 2. Sample sizes of the 10 target groups and their proportion of total sample size

Target groups	Target	Actual sample	
	<i>n</i>	<i>n</i>	%
1. Tusheti livestock owners &	70	76	9.7
2. other (local) livestock owners			
3. Hired herders	70	47	6.0
4. Cereal farmers	20	12	1.5
5. Enforcement officers	30	37	4.7
6. Hunters	50	46	5.9
7. Rural residents	300	122	15.6
8. Urban residents	300	19	2.4
9. School pupils	400	336	42.9
10. School teachers	60	89	11.4
Total	1,300	784	100.0

3.2.3. Sampling procedures

The quantitative survey was conducted from March to April 2010. Secondary school pupils (“distributors”) of the N 1 school in Dedoplistskaro helped to administer the questionnaire to pupils and teachers. Responses to the written questionnaire were obtained from livestock owners and herders by the research assistant when visiting farms to conduct semi-structured interviews. Different procedures were used for each target group; these are described below.

Livestock owners and herders

Livestock owners and hired herders were asked to fill in the questionnaire during farm visits in spring 2010 to assess damage, prevention measures and reported losses to large carnivores. In some cases they required assistance to understand questions and/or fill in their answers. Five questionnaires were only partially completed and hence were discarded. The response rate (useable questionnaires only) was 89% for these target groups.

Cereal farmers

As the occasional victims of crop-raiding bears, cereal farmers are also involved in human-carnivore conflict. They were identified among sampled rural residents on the basis of their

answer to question #66. As the proportion of cereal farmers among those residents who declined to complete the questionnaire could not be determined, the response rate for this target group is unknown.

Enforcement officers

Rangers and border guards were included opportunistically as the research assistant travelled around VNP and also during visits to the VPA headquarters in Dedoplistskaro. Of the total sample of 37, 22 were border guards and 15 were rangers. The response rate was 100% for border guards and 68% for rangers.

Hunters

Hunters were contacted opportunistically, using snowball sampling and by asking school pupils whose parents were hunters to take their copy of the questionnaire home for their parents to complete. Any residents indicating in their answers to questions #52 or #66 that they hunted, as well as one border guard and five teachers who did so, were moved to the hunters target group. The views of nine livestock owners, six herders, three cereal farmers and 69 school pupils who also hunted were analysed within the target groups mentioned rather than that of hunters. As the proportion of hunters among those residents who declined to complete the questionnaire could not be determined, the response rate for this target group is unknown.

Rural and urban residents

Local residents were sampled by personally distributing and collecting questionnaires. For urban areas (Dedoplistskaro), distributors used the third house/flat rule to select which residences to visit and asked the member of the household whose birthday was soonest to complete the questionnaire. If no one was at home or they refused to fill in the questionnaire, the next neighbouring house/flat was approached in the same way. In rural areas (villages near VNP), every residence was visited to ensure sufficient sample size. The questionnaire was left for people to fill in and was collected later. Respondents were asked to leave the questionnaire in front of the door if they had to leave before the distributor returned. In some cases, mainly involving elderly residents, distributors had to help respondents to fill in their answers. The response rate for rural residents was 62 % and for urban residents 32 %.

Respondents who indicated in their answers to questions #52 and #66 that they hunted were moved from the residents to the hunters target group. Likewise any residents who indicated that they were cereal farmers or livestock owners or herders were moved to the respective target groups.

School pupils and teachers

Three out of five schools in Dedoplistskaro as well as the village schools in Kasristkali, Zemo Kedi, Kvemo Kedi, Arkhiloskalo, Pirosmani and Sabatlo were visited. At each school, the questionnaire was administered during class time to pupils aged 12–18 in up to seven classes as well as teachers, and collected at the end of the class. The return rate of useable questionnaires was 75%. Of 336 school pupils surveyed, 141 indicated that they lived in a village and 184 lived in Dedoplistskaro. The respective figures for teachers were 65 and 22.

3.2.4. Study area

The survey was conducted in Dedoplistskaro District (area 2,530 km², population in 2007 estimated at 30,600), which is an administrative division of the Kakheti Region of East Georgia (area 11,379 km², population 403,600) (Fig. 2). The District lies on an elevated plateau between the Alazani and Iori Rivers at the southeastern limit of Georgia. Elevation ranges from 90 to 1,001m a.s.l. Agriculture is the main economic activity. The central and northern parts of Dedoplistskaro District are mostly cultivated agricultural lands with vineyards, corn fields and gardens as well as areas used for livestock grazing. There is one town (also called Dedoplistskaro, population c.7,700 in 2002) and 15 villages. At the eastern edge, bordering Azerbaijan, lies Vashlovani National Park.



Fig. 2. The location of Kakheti Region within Georgia, showing Dedoplistskaro District (darker shading) and the town of Dedoplistskaro as well as Vashlovani (VNP) and Tusheti National Parks

3.3. Data analysis

Statistical analyses were carried out using the SAS System (SAS 2009) and PASW Statistics 18 (SPSS 2009). Null hypotheses (H_0) were rejected at $\alpha=0.05$.

To identify factors associated with higher levels of predation, reported losses (expressed as absolute numbers and percentage of farm stock) were tested against 14 potential predictor variables: farm location by survey zone; protected area status (farm located inside or outside VNP); distance to tree cover; distance to nearest ravine; extent of shrub cover in pastures; if farm was owner-occupied or leased; number of years using the farm; number of herders; number of livestock; number of dogs; type of dog; owners' ratings of dogs; rating of loss of income due to predation; rating of problems with disease. Similar tests were carried out for losses to sheep, losses to cattle and losses to both combined (farms not holding the respective livestock species were omitted).

To identify patterns in the factors associated with different attitudes towards bears and wolves, answers to items #2–4 were used as responses and tested against 13 potential predictor variables: age; gender; level of education; rural versus urban residence; fear (response to item #10 or 11); perception of danger (item #12 or 18); frequency of going to areas with wild animals; involvement in herding livestock; involvement in hunting; if TV had helped form the respondent’s impressions; experience of damage; if the respondent had seen a bear or wolf; and knowledge level (see below). A data reduction technique, Principal Component Analysis (PCA), was used to summarise patterns among these predictors (Tabachnick and Fidell 2007). This technique exploits correlations among continuous predictors to produce new axes (components) that are linear functions of the input variables. The amount of variance explained by each factor indexes the success of the method: ideally a very few, preferably two, factors summarise the majority of the input variance. The scores on the derived factors are interpreted by inspecting the pattern of factor loadings, the correlations between the original variables and the factors.

To compare knowledge levels, a knowledge score was calculated for each respondent by summing the number of correct answers given to 10 items (Table 3).

Table 3. Items used to calculate a knowledge score for respondents of the questionnaire survey

#	Item	Correct response	Score
20	<i>“Presently in Vashlovani NP there are bears.”</i>	1 to 50	1
22	<i>“What do you think is the main food of bears in Vashlovani NP?”</i>	Fruits, berries, grass	1
22	<i>“What do you think is the main food of wolves in Vashlovani NP?”</i>	Wild boar Livestock	1 1
23	<i>“What is the typical number of wolves in a pack in Vashlovani NP?”</i>	up to 10	1
24	<i>“What is the typical weight of an adult male bear?”</i>	101 to 250 kg	1
27	<i>“In Georgia, nowadays are owners paid money for livestock killed by bears?”</i>	No	1
28	<i>“In Georgia, nowadays are owners paid money for livestock killed by wolves?”</i>	No	1
29	<i>“In Georgia, is it normally legal to hunt bears?”</i>	No	1
30	<i>“In Georgia, is it normally legal to hunt wolves?”</i>	Yes	1
Total	–	–	10

4. RESULTS & DISCUSSION

4.1. Semi-structured interview

4.1.1. Socio-demographic characteristics of livestock owners

The average age of respondents was 40 (range 14–71 years, $n=68$). Only 4% were less than 20 years old, 35% were aged 20–39, 53% were 40–59 and 7% were 60 and older. All livestock owners were male. Most respondents said they came from Tusheti (64%), with a minority from Pankisi (13%), Sagarejo (12%), Telavi (7%), Tianeti (3%) and Dedoplistskaro (1%).

4.1.2. Farm facilities, livestock and husbandry

Sheep were the most abundant livestock species in the study area: 46 farms kept a total of 39,020 sheep, plus c.1,000 goats (Table 4). A total of 2,937 head of cattle were kept at 39 farms (see Appendix II). Three farms (#7, #17 and #41) kept only horses, 24–70 head each, and most others had a few horses (maximum 68). Around half the farms had donkeys, up to eight each. Every farm had a house, all but one had a night-time corral, 93% had a large barn and 88% had smaller barns for young animals. Twenty-two (32%) also had an additional corral for livestock. On average, the same farm had been used by the current occupiers for nine years (range 1–30). Sub-leased farms tended to have been used for five years or less.

Table 4. Numbers of livestock at a total of 69 farms within Vashlovani National Park and up to 2km from its boundary

Livestock	<i>n</i> farms	Per farm		Total
		Mean	Range	
Sheep	46	848	30–1,600	39,020
Goats	46	23 ^a	3–100 ^a	1,042 ^a
Cattle	39	77	13–280	2,937
Horses	59	14	1–70	834
Donkeys	31	3	1–8	81
Pigs	2	6	2–9	11
Total	69	637	24–1,677	43,925

^a Most livestock owners and herders did not count goats separately and so did not know their exact number; the figures given in the table are estimates.

With the exception of three farms pastures were found around the farm buildings. They ranged in size from 80 to 1,000 hectares, with a mean of 327 ha ($n=52$). In most cases (44 of 69 farms) the farm facilities were in private ownership but the pastures were leased. Only two livestock owners said they owned both the farm buildings and the pastures while 23 farms were leased.

Most farms (60%) had 2–4 livestock owners, with a maximum of 11 and a mean of three. Each farm also had an average of three (maximum 12) herders hired for the winter period. Some livestock owners were at the farm during the lambing and wool shearing period, otherwise herders took care of their animals. Wool (38,450 kg in total) and lambs are the

main products from sheep in winter pastures, while milk (20,000 litres excluding that consumed by farm personnel), cheese (5,050 kg) and meat (16,000 kg) are produced from cows.

Most respondents said they moved their livestock elsewhere for the summer, typically to Tusheti (48%) but some of them to Tianeti (14%), Back Pshavi (10%), Pankisi (9%), Javakheti (6%) or Gombori (4%). Livestock owners at five farms said they stayed in the winter pastures year-round (in two cases one or more owners stayed but others left). One livestock owner used Dmanisi village and one Kasristskali village as summer pastures. Arrival in the winter pastures occurred from October to December (rarely January), with a peak in November (60%). Flocks began the migration to summer pastures in April (63%) or May (34%).

4.1.3. Habitat variables

When visiting farms to conduct interviews, the research assistant also recorded distance to ravines and tree cover, and degree of bushy cover in pastures, to estimate the susceptibility of farms to predator attacks. Three-quarters of farm buildings (77%) were estimated by eye to be within 500m of a ravine, whereas tree cover tended to be further away, with 52% of farms not having woodland within 1km. The majority of pastures (72%) were estimated to be 0–10% overgrown with bushes and none was more than 50% overgrown. Most pastures did not have water for livestock and herders or owners were obliged to take their animals a considerable distance to water every third or fourth day or to use rainwater pools. Eight percent of attacks ($n=105$; see below) were reported to have occurred when stock was either drinking (6) or on the way to a water source (2).

4.1.4. Losses to predators and other causes

According to the answers given by livestock owners, predation and disease are the two biggest causes of economic loss (Table 5). Predation was ranked ahead of disease more often (48% of 69 respondents) than the reverse (33%). Overall, predators were said to be a big problem for 52% of the surveyed farms and a partial problem for another 28%.

Table 5. Livestock owners' rankings of causes of financial loss

Cause of loss	Sum of owners' scores ranking sources of loss from most (1) to least (3) problematic			Not mentioned or not a problem (n)
	1	2	3	
Disease	23	9	0	37
Injury	1	0	0	68
Predation	33	18	0	18
Theft	0	0	0	69

Excluding three respondents that kept their flocks in the vicinity of VNP year-round, 88% of respondents considered predation to be most acute in winter pastures, as compared to summer pastures or along the migration route. A clear pattern was found in the intensity of predation, with 87% of respondents ($n=69$) mentioning February as the most problematic month. We used reported arrival and departure dates to calculate the number of active farms by month (excluding that in which the livestock arrived) and found that the peak in

predation corresponded to the period when the most livestock farms were active (Fig. 3). February also falls within the lambing season and tends to have the harshest winter weather. Some respondents commented that during their breeding season, wolves move in large packs and they believed them to be dangerous to humans at this time. Some respondents also thought that wolves are more aggressive in severe winters. The reporting period for this study was a relatively mild winter and wolves were said to have been less aggressive as a result, although this contradicts most statements on the level of losses this year compared to previous years (see below).

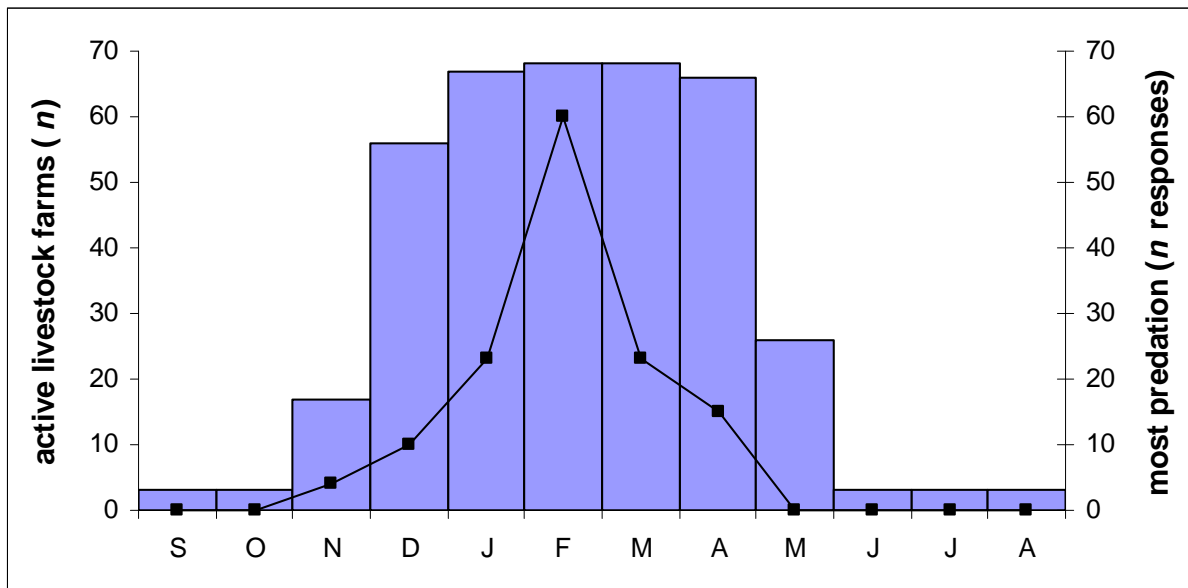


Fig. 3. Number of active livestock farms in the study area by month (columns) and responses of 65 owners to the question, “In which month(s) do you tend to lose most stock to predators?” (line)

Three quarters of farms had allegedly suffered from predation since arriving in the winter pastures, while a minority (16%) reported losses to predators during the migration. The latter was said to have occurred mostly in the surroundings of Dedoplistskaro (at Taribana, Dedoplistskaro Lake and Gamarjveba village) or, in one case, in Ialghuja Mountains near Rustavi in Kvemo Kartli Region. For the period spent in winter pastures in or within 2km of VNP up to March 2010 a total of 577 domestic animals were reported to have been killed by predators and another 67 injured (Table 6). This represents 1.3% and 0.2% respectively of the total of 43,925 head of all livestock reported in the study area.

Most losses were of sheep: 88.4% of killed animals and 67.2% of those injured were sheep (in a few cases goats). Eighty-seven percent of 46 farms with sheep had allegedly lost an average of 11 sheep each to predators. The proportion of cattle farms afflicted was smaller at 36%, excluding two farms where there were injuries but no fatalities (Fig. 4). However, the percentage of cattle killed or injured per farm (2.2%) seemed to be higher than that of sheep (1.4%). Cattle and horses were more likely to be left injured after attacks than were sheep, presumably because they were more difficult to kill. Donkeys seemed to be selected by wolves, with 10% of all donkeys reported killed compared to <2% for other livestock species. This might be explained if donkeys were tethered when left unsupervised.

Table 6. Damage to livestock by predators at 69 farms in and around VNP in winter 2009/10 as reported by livestock owners during semi-structured interviews conducted in March 2010

Livestock attacked		Farms affected		Damage per farm			Total damage	
		<i>n</i>	%	mean	max	%	<i>n</i>	%
Sheep (and goats)	Killed	40	87.0	11.1	70	1.3	510	79.2
	Injured	11	23.9	1.0	12	0.1	45 ^a	7.0
Cattle	Killed	14	35.9	1.3	8	1.7	49 ^b	7.6
	Injured	9	23.1	0.4	3	0.5	16 ^c	2.5
Horses	Killed	5	8.5	0.2	5	1.2	10 ^d	1.6
	Injured	3	5.1	0.1	3	0.6	5	0.8
Donkeys	Killed	5	16.1	0.3	3	9.9	8	1.2
	Injured	1	3.2	0.0	1	1.2	1	0.2
Total	Killed	52	75.4	8.4	71	1.3	577	89.6
	Injured	22	31.9	1.0	13	0.2	67 ^e	10.4
	No damage	16	23.2	–	–	–	–	–

^a 28 survived. ^b including 11 calves. ^c 8 survived. ^d including 3 foals. ^e 36 survived.

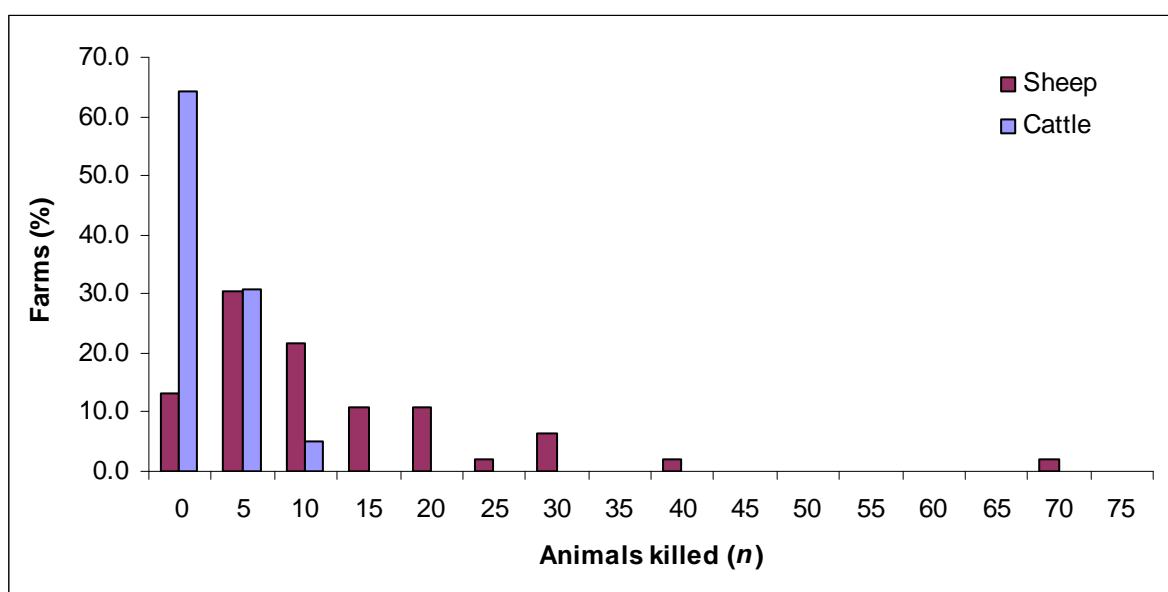


Fig. 4. Total losses to predators during the 2009/10 winter season reported at 46 farms with sheep and 39 farms with cattle

The impact of predation was not distributed evenly across the study area. Five clusters of farms suffering from high and medium impact were identified: in the northwest part of Black Mountain; between Black Mountain and Takhis Tskali; northwest of Central Bungalows and around the Central Entrance; and in two areas of the Iori Steppe, southwest of VNP. In contrast, three clusters of farms with little or no damage in 2009/10 were observed: in the southern part of VNP; along its northwestern boundary; and between the two high impact areas of the Iori Steppe (Fig. 5).

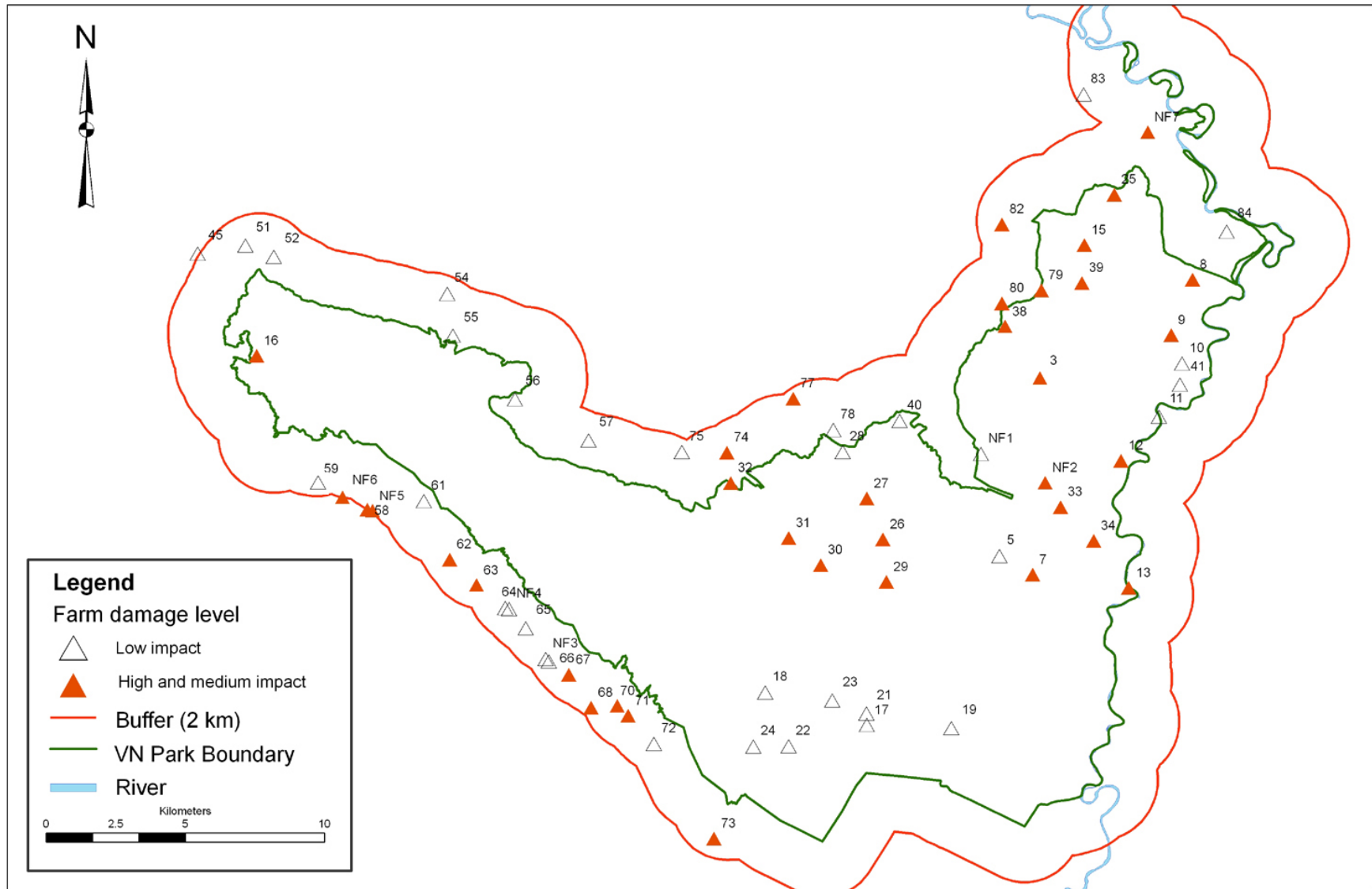


Fig. 5. Locations of farms with no or negligible damage versus those with above average damage during the 2009/10 winter grazing season

On a 5-point scale from “very big” to “insignificant”, livestock owners most often rated the loss to their income due to predation as “big” (32%, $n=68$), “insignificant” (19%) or “medium” (15%). Respondents from Pankisi Gorge, in particular, thought that predation caused a big loss to their income because they received payment for keeping cattle on behalf of other owners but had to reimburse the money if the cattle were lost.

More respondents ($n=69$) said their losses in 2009/10 had been higher than usual (36%) than said they were lower (26%) or about average (12%). When asked to consider the last five years, slightly more respondents thought that problems with predators had been getting more common (46%) than thought they had become less common (37%). Eleven respondents (16%) thought there had been no change.

Grey wolves were clearly regarded as the main problem animal. When asked to rank predators, wolves were mentioned by 86% of respondents ($n=69$) and always as the most problematic species (Table 7). Golden jackals (*Canis aureus*) were listed eight times, always ranked second. Brown bears were ranked second (1) or third (1) and lynx (*Lynx lynx*) as the second (1) most problematic species. Other predators of lesser concern were mentioned by seven respondents: snake (3), fox (*Vulpes vulpes*) (2) and black vulture (*Aegypius monachus*) (2).

Table 7. Ranking of predator species by livestock owners in terms of their impact on livestock

Predator species	Sum of owners' scores ranking predator species from most (1) to least (3) problematic			Not mentioned or not a problem (n)
	1	2	3	
Bear	0	1	1	67
Fox	0	1	1	67
Jackal	0	8	0	61
Lynx	0	1	0	68
Snake	0	1	2	66
Vulture	0	1	1	67
Wolf	59	0	0	10

4.1.5. Details of attacks

Respondents provided details of 105 attacks in which a total of 201 head of livestock were allegedly killed and a further 24 injured, 15 of which did not survive (Table 8, Fig. 7). Although most farms had two or more livestock species, each attack caused damage to only one of them. Sheep were the victims in two-thirds of attacks and cattle in a quarter of them. At least 36 (21%) of the killed sheep were lambs. Of 21 cattle reported killed, ten were young animals. A mean of 1.9 animals were killed per attack, with a maximum of 50 sheep killed in a single event (at farm #68 in December).

Wolves were held responsible for all attacks described except one that was by the livestock owner's own dogs (which he subsequently killed) and 19 in which the respondent said they had not seen the predator or did not know what species it had been. In 74% of cases

allegedly involving wolves ($n=82$), 1–3 animals were said to have carried out the attack, although there was one report of a pack of 12 (at farm #62) and two reports of a pack of 20 (farms #77 and #80). Four attacks by wolves were repelled by dogs and people without loss of livestock. It is possible there were more such cases than those mentioned by interviewees.

Table 8. Predator attacks on livestock ($n=105$) in winter 2009/10, as reported by livestock owners and herders at 48 farms in and around VNP during semi-structured interviews in March 2010

Livestock attacked		Attacks		Damage per attack			Total damage	
		<i>n</i>	%	mean	max	mode	<i>n</i>	%
Sheep	Killed	66	62.9	2.6	50	1	174	77.3
	Injured			0.2	4	0	13 ^a	5.8
Goats	Killed	2	1.9	1.0	1	1	2	0.9
	Injured			–	–	0	0	0.0
Cattle	Killed	26	24.8	0.8	2	1	21	9.3
	Injured			0.3	1	1	8 ^b	3.6
Horses	Killed	3	2.9	0.3	1	0	1	0.4
	Injured			0.7	1	1	2 ^c	0.9
Donkeys	Killed	4	3.8	0.8	1	1	3	1.3
	Injured			0.3	1	0	1 ^d	0.4
Total	Killed	89	84.8	1.9	50	1	201	89.3
	Injured	19	18.1	0.2	4	0	24 ^e	10.7
	No damage	4	3.8	–	–	–	–	–

^a 3 survived. ^b 4 survived. ^c 1 survived. ^d 1 survived. ^e 9 survived.

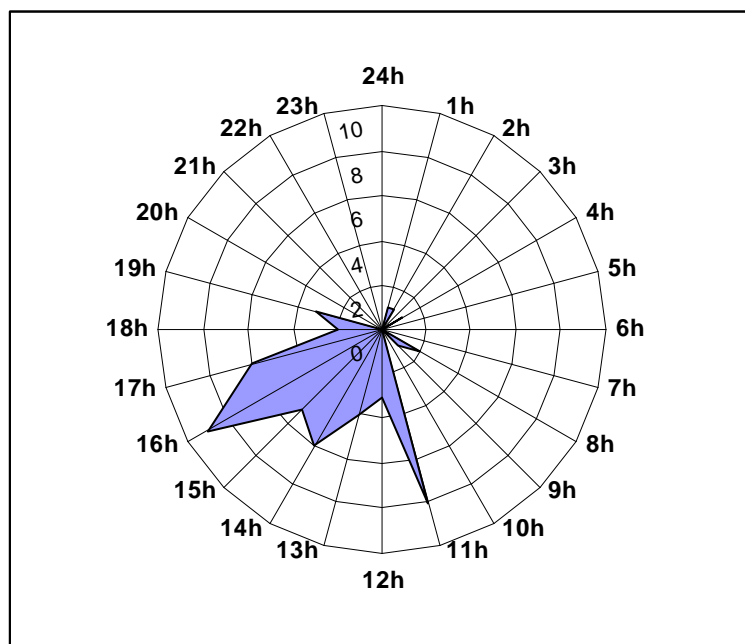


Fig. 6. Time of day at which predators attacked livestock in and around VNP during winter 2009/10 according to reports by owners and herders ($n=52$ attacks)

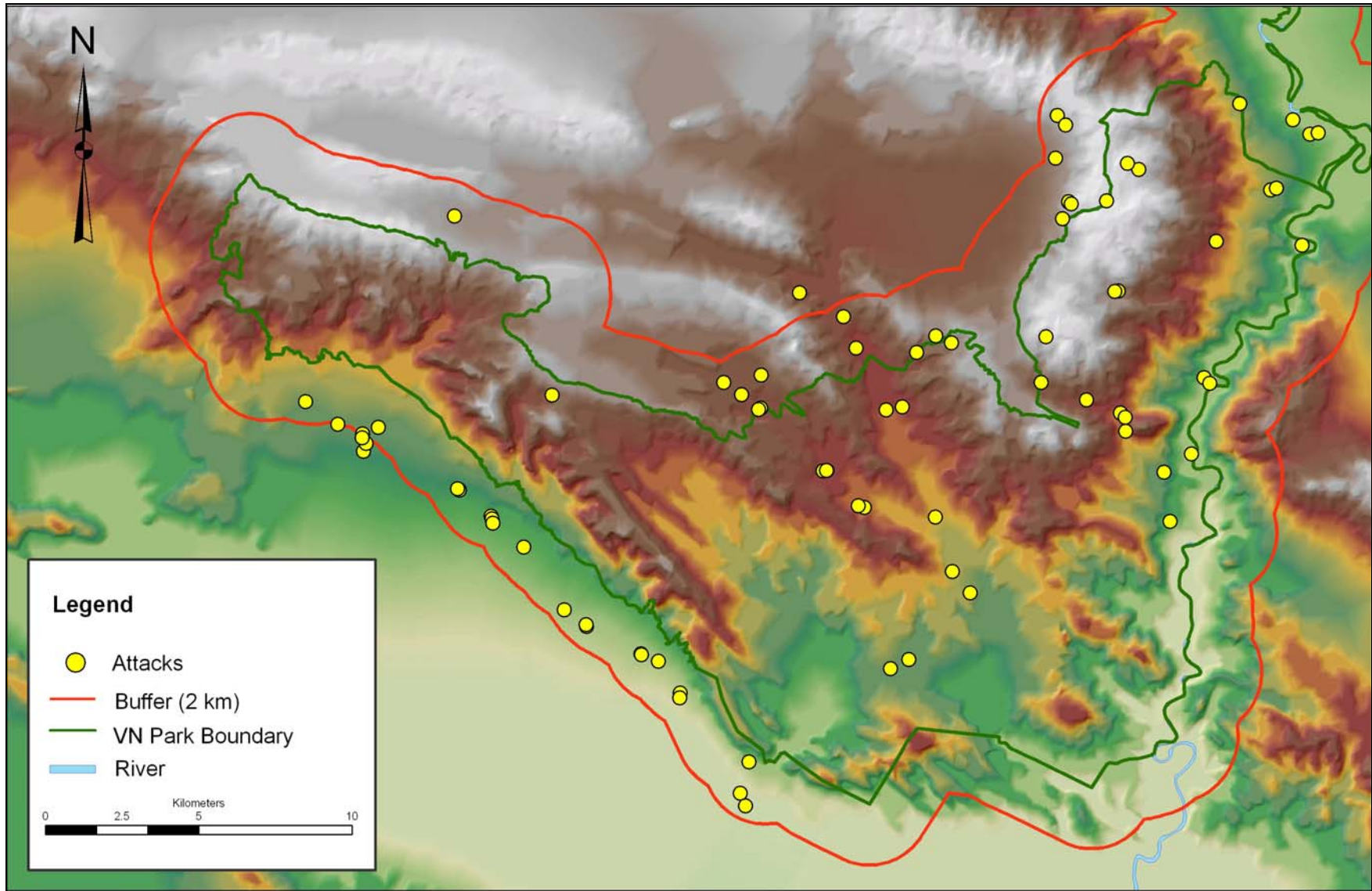


Fig. 7. Sites in and around VNP where attacks on livestock were reported to have occurred in winter 2009/10 showing altitude zones

Half the attacks were said to have occurred in March, the month in which the survey was conducted. However, this result is probably biased because respondents were first asked to recount the most recent incidents. In addition, as livestock owners and herders did not make written records of the events at the time they occurred, it is to be expected that they would tend to have better recall of more recent cases. Attacks were said to occur most often in the afternoon (57%, $n=104$) or at dusk (19%) and typically when flocks were in the pasture (69%, $n=104$). When a specific time was mentioned ($n=52$), it was most often between 14.00 and 17.00, with another peak at 11.00 (Fig. 6). Only 15% of attacks were reported to have happened at night. The weather at the time of the attack was most often described as clear (55%, $n=102$) or cloudy (28%), with rain in 11% of cases and snow in 4%.

4.1.6. Preventive measures

According to the results of the survey, the use of preventive measures is widespread and all but one respondent ($n=67$) considered them to be effective. A large majority of respondents (88%) thought their losses would be worse if they did not use such measures. Dogs and corrals were ubiquitous. Use of scarecrows was common (49% of farms), as was sleeping near the flock at night (41%). However, patrolling was mentioned by only 3% of respondents and none of them indicated that they took special care to avoid risky places or remove carcasses in order to reduce predation. Remains of livestock killed by predators, if not fully consumed by predators (25%, $n=52$) or black vultures (15%), were fed to the shepherds' dogs (60%). Injured livestock, if it could not be treated, was killed and fed to the dogs (88%, $n=32$) and/or eaten by the shepherds (33%).

Every farm had at least one dog, with an average of eight and maximum of 27. In total data were collected on 525 shepherd dogs in the study area: 376 adults and 149 young. Respondents most often reported their dogs to be of mixed descent (66%, $n=67$), with a minority claiming to have Caucasian (10%) or Georgian (25%) shepherd dogs or a combination of pure and mixed breed (4%). In most cases dogs had originated from on-farm reproductions (82%), but sometimes they had been exchanged (9%) or given as gifts (9%). In one case a Georgian shepherd dog (Kazbegura) had been given to the farm by the Georgian Cynological Association Bombora.

No special regime for training dogs was reported in most cases. Most respondents ($n=68$) said dogs learned what to do by themselves (40%), from being brought up with the flock (31%) or from older dogs (25%). Only two respondents mentioned specific actions to train dogs, in both cases to promote attentiveness: encouraging dogs to accompany the flock and feeding them near livestock.

A large majority of respondents ($n=67$) thought they had good (61%) or partially good (22%) shepherd dogs. The reasons most often given for dogs being good were that they were attentive to livestock (51%), aggressive to predators (12%) and not afraid of wolves (7%). A total of 21 respondents who said their dogs were partially good or that they could not rate them most often explained that they were not attentive enough (38%), were attentive but afraid of predators (19%) or were insufficiently protective (33%). At five farms, respondents stated that their dogs (some or all of which were mongrels that had bred on the farm) were not good, citing lack of attentiveness (2), the dogs' fear of wolves (1) or poor breeding (1) or a failure to train them as pups (1).

Dogs were said to have been present during 62% of the 105 attacks detailed above. Their reaction was usually described as barking (90%, $n=69$) and chasing the predators (91%). In two cases (at farms #9 and #84) dogs allegedly killed a marauding wolf. Remains of a wolf were present at one of these farms, where one of the dogs had a severe face wound. There were three cases in which dogs were said to be afraid of wolves, one in which they fled from wolves and two in which dogs did not notice daytime attacks.

Herders or owners were said to have been present during 76% of attacks ($n=105$) and usually reacted by shouting (95% of cases) and chasing after the predators (91%). Only one respondent said that nothing could be done and one said that he had run away together with his dogs on seeing a pack of 20 wolves.

All respondents ($n=67$), regardless of whether or not they were within the protected area, stated that they did not have permission to shoot predators. When asked how the conflict between people and predators could be reduced, most mentioned lethal control: 25% thought that wolves should be killed, 18% that they should have permission to kill wolves themselves and 16% that they should be allowed to keep a gun at the farm, to either shoot wolves or scare them away. Eleven respondents did not know what could be done, four saw no problem and one thought conflicts could not be reduced. A minority of respondents mentioned non-lethal measures: good dogs (9%), careful herders (7%), electric fencing (1%) or compensation (1%). A large majority of respondents (88%) indicated that they did not want help to protect their animals. Most of those that did (5/8) made comments relating to lethal control of wolves.

4.1.7. Veterinary care

On a 5-point scale from “very unsatisfied” to “very satisfied”, livestock owners most often rated their general satisfaction with the veterinary services available to them as “satisfied” (70%, $n=67$), with around a quarter feeling “unsatisfied” (27%). Sheep dip, vaccinations and medicines were reported to be available to all. The financial burden of treatments was generally rated as “medium” (45%, $n=69$) or “high” (33%) and only rarely “very high” (4%). Rabies and anthrax vaccinations were available free of charge. If a location was mentioned where veterinary care was sought, this was in Kasristskali (5), Alvani (3) or Dedoplistskaro (2). Most respondents (73%, $n=66$) bought drugs and injected their livestock themselves. Almost half (45%, $n=67$) said they had not had problems with drugs. More had managed to buy drugs (11) than had had difficulties doing so (4), although 11 respondents commented on the poor quality of some drugs. Vaccination for Bradzot, in particular, seemed to be expensive and difficult to obtain.

4.1.8. Factors affecting levels of HCC

Perception of losses

Livestock owners’ ratings of their loss of income due to predation during winter, on a 5-point scale from insignificant to very big, correlated with the percentage of livestock they reported killed ($r=0.56137$, $p<0.0001$), even after adjusting for variation in numbers of livestock among farms (GLM, $F=87.00$, $p<0.0001$). Of 32 livestock owners reporting predation levels of <1% of their livestock, 81% rated the loss as insignificant and a further 13% considered it

small. In contrast, all but one of those owners indicating that predation caused a big ($n=21$) or very big ($n=2$) loss reported more than 1% of their animals killed (maximum 18%). As might be expected, livestock owners who ranked disease as a more important cause of financial loss reported fewer losses to predation than owners who ranked the latter as the greater problem (GLM, $F=11.50$, $p=0.0021$).

Farm ownership and personnel

Accounting for variation in livestock numbers, no significant difference was found between losses at leased versus owner-occupied farms (GLM, $F=1.18$, $p=0.282$). How many years the current occupiers had used the farm ($F=0.40$, $p=0.530$) and how many herders were working there ($F=0.71$, $p=0.402$) also had no discernable influence on predation levels.

Farm location and livestock

Overall, neither median number of livestock killed per farm (median test, chi-square=0.580, $df=2$, $p<0.748$) nor percentage of sheep (chi-square=2.897, $df=2$, $p<0.235$) or cattle (chi-square=1.333, $df=1$, $p<0.248$) lost differed significantly among the survey zones. However, adjusting for livestock numbers, more cattle (but not sheep) were killed in Black Mountain (GLM, $F=3.86$, $p<0.026$). Likewise, overall predation level did not differ between farms inside and outside the national park (GLM, $F=0.49$, $p<0.486$), but cattle (though not sheep) were more likely to be killed within VNP (GLM, $F=4.57$, $p<0.036$) (Fig. 8).

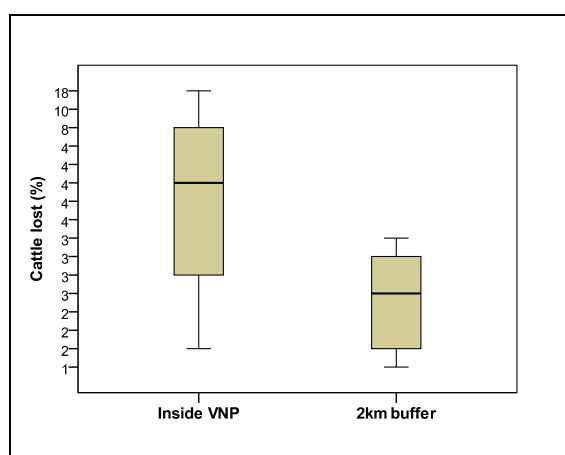


Fig. 8. The percentage of cattle reported killed by predators at farms inside and outside VNP

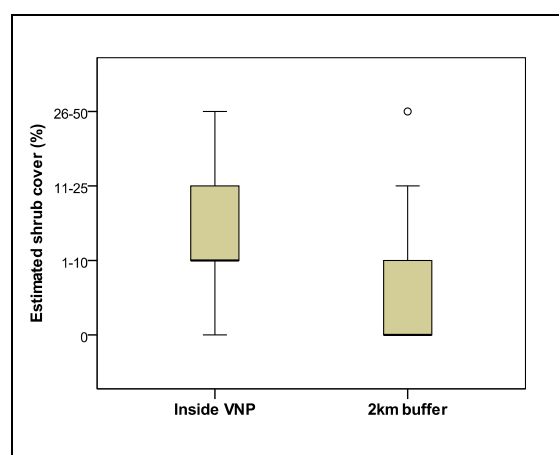


Fig. 9. Visual estimates of shrub cover in pastures inside and outside VNP

The proportion of farms suffering from high levels of HCC did not vary between sheep and cattle farms (Table 9). However, at 13 farms holding both and where high losses occurred, the damage was to sheep in 10 cases but to cattle in only 3 cases.

Table 9. Predation levels at sheep, cattle and mixed farms in and around VNP

Damage level	Sheep farms	Cattle farms	Sheep and cattle	Total farms (n)
High	11	9	13	33
Low/none	12	10	8	30
Total farms (n)	23	19	19	63

Habitat and landscape features

Pastures in Black Mountain were more overgrown than those in other zones (Kruskal-Wallis test, chi-square=29.411, df=2, $p<0.001$) and there was more shrub cover inside VNP than outside (Mann-Whitney U test, $U=233.500$, $p<0.001$) (Fig. 9). Of the three habitat variables surveyed, percentage of shrub cover in pastures most strongly correlated with proportion of livestock lost ($r=0.4122$, $p=0.0006$), followed by distance between farm buildings and nearest trees ($r=-0.3763$, $p=0.0020$). Distance to nearest ravine had no apparent effect on predation rates ($r=-0.1112$, $p=0.3777$). After accounting for variation in livestock numbers among farms, neither distance to trees (GLM, $F=1.64$, $p=0.206$) nor shrub cover in pastures (GLM, $F=2.32$, $p=0.133$) affected losses to sheep and cattle combined, but significantly more cattle (though not sheep) were killed in more overgrown pastures (GLM, $F=7.70$, $p=0.007$).

When comparing farms at which livestock owners indicated that predation caused a big or very big loss to their income ($n=24$) with those where the loss was said to be small or insignificant ($n=35$), zone and extent of shrub cover were the only variables found to differ significantly (Table 10). Whereas 50% of farms in Black Mountain were rated as high loss, this was the case for only 20% of those in Western Zone and 35% in Central Zone. Similarly, 50% of high loss farms had pastures that were >10% overgrown with shrubs, compared to only 14% of low loss farms.

Table 10. Comparison of high loss and low loss farms, classified according to livestock owners' responses to interview item #43

	zone	status	years	ownlease	herdernos	sheepnos	cattlenos
Mann-Whitney U	262.000	325.500	400.500	382.000	260.000	401.000	89.000
Wilcoxon W	892.000	625.500	995.500	977.000	431.000	701.000	225.000
Z	-2.589	-1.684	-.119	-.171	-.581	-.300	-1.474
Asymp. Sig. (2-tailed)	.010	.092	.905	.864	.561	.764	.141

	dognos	dogtype	dogquality	treedist	overgrown	ravinedist
Mann-Whitney U	345.000	384.000	309.500	314.000	269.000	415.000
Wilcoxon W	906.000	684.000	805.500	614.000	899.000	715.000
Z	-.830	-.241	-.368	-1.806	-2.455	-.081
Asymp. Sig. (2-tailed)	.407	.810	.713	.071	.014	.935

Preventive measures

Higher dog:sheep ratios appeared to limit losses (Fig. 10), although the relationship was nonlinear ($r=-0.2168$, $p=0.157$, $n=44$). The number of adult dogs at sheep farms correlated with numbers of sheep ($r=0.493$, $p=0.001$, $n=44$) (Fig. 11). During farm visits it was observed that large flocks were sometimes split up for management purposes. It is possible that not all livestock was always accompanied by dogs. Indeed, although every farm had a least one dog, owners reported them absent during a third of attacks. Insufficient daytime attentiveness to livestock of some LGDs may partly explain the temporal pattern of predation: two thirds of attacks happened during daylight hours when flocks were in pastures (not necessarily always accompanied by dogs), while only 15% of attacks were said to have occurred under cover of darkness, when livestock was gathered in corrals close to farm buildings (presumably where dogs were most likely to spend the night).

Owners who described their dogs as pure-bred were more likely to be satisfied with their performance (Mann-Whitney U test, $U=247.500$, $p=0.001$): whereas all but one owner of Georgian ($n=19$) or Caucasian ($n=3$) dogs rated them as good, 38% of owners of mixed breed dogs ($n=39$) stated that their dogs were only partly good and 10% that they were not good. However, a significant relationship was not detected between the percentage of all livestock lost and either how owners rated their dogs (Kruskal-Wallis test, $\chi^2=1.613$, $df=2$, $p<0.446$) or if they described them as pure versus mixed breed (Mann-Whitney U test, $U=388.000$, $p=0.294$). There was some evidence, though not statistically significant, that mixed breed dogs did better with cattle and “pure-bred” dogs were more effective with sheep (see Figs. 12 and 13).

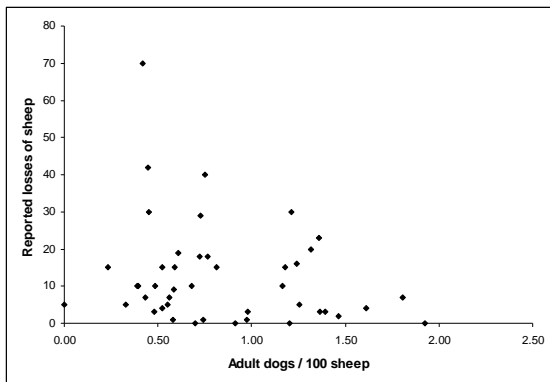


Fig. 10. Number of adult dogs per 100 sheep and reported losses to predation at farms in and around VNP

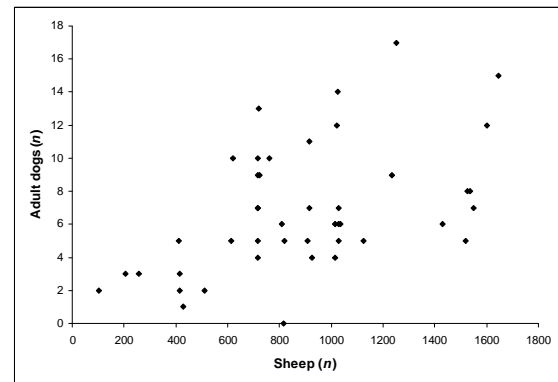


Fig. 11. Numbers of sheep and dogs at farms in and around VNP during the winter grazing season 2009/10

Farms with more livestock (sheep, cattle or both) tended to be further from tree cover ($r=0.4452$, $p=0.0001$), had more herders ($r=0.3800$, $p=0.0015$) and less overgrown pastures ($r=-0.5717$, $p<0.0001$), all of which would be expected to make them less vulnerable to predators. Livestock owners at larger farms reported losing higher numbers of animals ($r=0.5185$, $p<0.0001$), but not a higher percentage ($r=-0.2371$, $p=0.0572$). The higher numbers of dogs at larger farms (Fig. 11) may also have helped prevent wolves successfully targeting larger flocks.

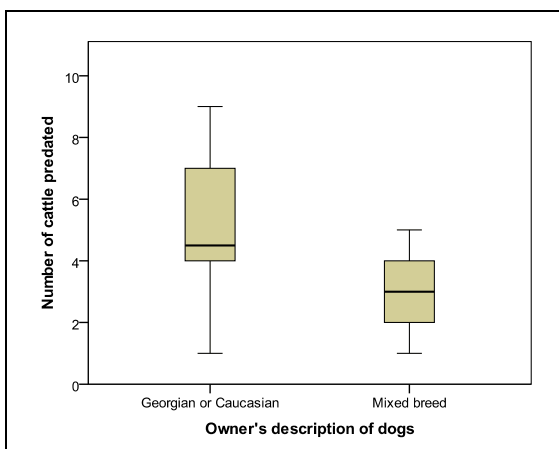


Fig. 12. Comparison of reported cattle losses at farms with “pure-bred” versus mixed dogs

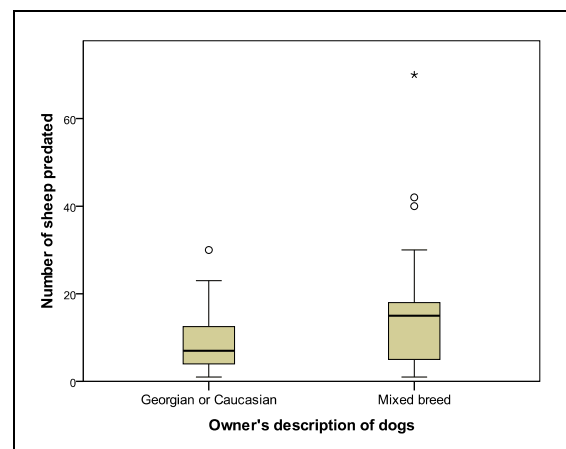


Fig. 13. Comparison of reported sheep losses at farms with “pure-bred” versus mixed dogs

4.2. Written questionnaire survey

4.2.1. Socio-demographic characteristics of respondents

All but 6 of the 765 respondents who answered question #70 indicated that they lived in the Kakheti Region of East Georgia (see Fig. 2): 80.6% of them in Dedoplistskaro District, 16.8% in Akhmeta (which includes Tusheti), 0.8% in Telavi and 0.4% in Kvareli. Basic socio-demographic characteristics of respondents by target group are shown in Table 11.

Table 11. Mean age in years, sex ratio, highest level of completed education (primary, secondary or higher) and place of residence (rural or urban) of respondents ($n=784$) by target group

Target groups	Mean age (y)	Sex ratio (M:F)	Education			Residence	
			% P	% S	% H	% R	% U
Livestock owners ($n=76$)	40.9	1 : 0.01	0	76.7	23.3	97.3	2.7
Hired herders ($n=47$)	35.7	1 : 0.02	2.4	83.3	14.3	95.6	4.4
Cereal farmers ($n=12$)	32.0	1 : 0.09	0	63.6	36.4	83.3	16.7
Enforcement officers ($n=37$)	34.4	1 : 0.00	0	43.3	56.7	70.0	30.0
Hunters ($n=46$)	34.1	1 : 0.13	2.6	65.8	31.6	64.3	35.7
Rural residents ($n=122$)	38.9	1 : 0.92	6.0	70.9	23.1	100	0
Urban residents ($n=19$)	41.3	1 : 3.75	0	57.9	42.1	0	100
School pupils ($n=336$)	15.2	1 : 0.95	100	0	0	43.4	56.6
School teachers ($n=89$)	44.8	1 : 4.25	1.2	12.8	86.0	74.7	25.3

4.2.2. Basic findings by item and target group

Attitude to large carnivores

Public attitudes were consistently more negative towards wolves than towards bears across all target groups (Fig. 14). Livestock owners and hired herders held the most negative views, particularly towards wolves, followed by rural residents. Nevertheless all target groups, including livestock owners (Fig. 15), tended to acknowledge that wolves belong in the wild in Georgia.

The target groups varied on how they felt about the fact that bears and wolves live in Georgia. Enforcement officers (84% positive responses), teachers (73%), pupils (72%), hunters (69%) and urban residents (68%) all tended to think it was good that Georgia has brown bears. Livestock owners (43% positive versus 36% negative responses), herders (40% vs. 31%) and rural residents (31% vs. 27%) were more divided on this item. Concerning the wolf, the pattern was similar but shifted toward the negative. Enforcement officers (36% vs. 31%), hunters (31% vs. 31%), urban residents (37% vs. 37%), pupils (30% vs. 36%) and teachers (30% vs. 42%) were all divided on whether it is good or bad that Georgia has wolves. Livestock owners (82% negative responses), herders (74%) and rural residents (69%) showed clear tendencies to consider it to be a bad thing. Wolves also elicited fewer neutral and more strongly negative reactions than bears, particularly among the target groups most likely to be affected by them (Fig. 16).

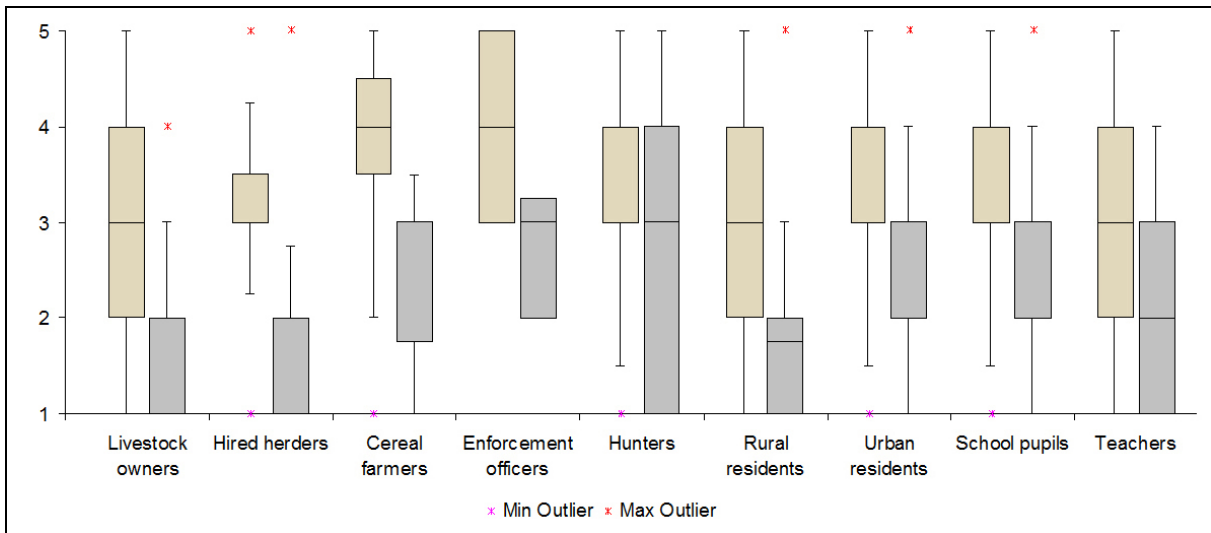


Fig. 14. Responses by target group to the question “Which answer best describes your feelings towards these animals?” measured on a 5-point scale from very negative (1) to very positive (5). Answers related to bears are shown in brown, wolves in grey

It was hypothesised that bears, as occasional crop raiders, would be viewed negatively by cereal farmers, but this was not found to be the case: 73% of farmers had positive feelings towards bears and 55% thought it good that they live in Georgia, with the remaining 45% remaining neutral (Fig. 16). Unexpectedly, cereal farmers held more negative views of the wolf than of the bear, with 58% of them considering it bad that Georgia has wolves. However, around a third of the cereal farmers also kept livestock; half of them mentioned that wolves had attacked their or their family’s cattle or sheep. Negative experiences with carnivores had a strong influence on attitudes (see below).

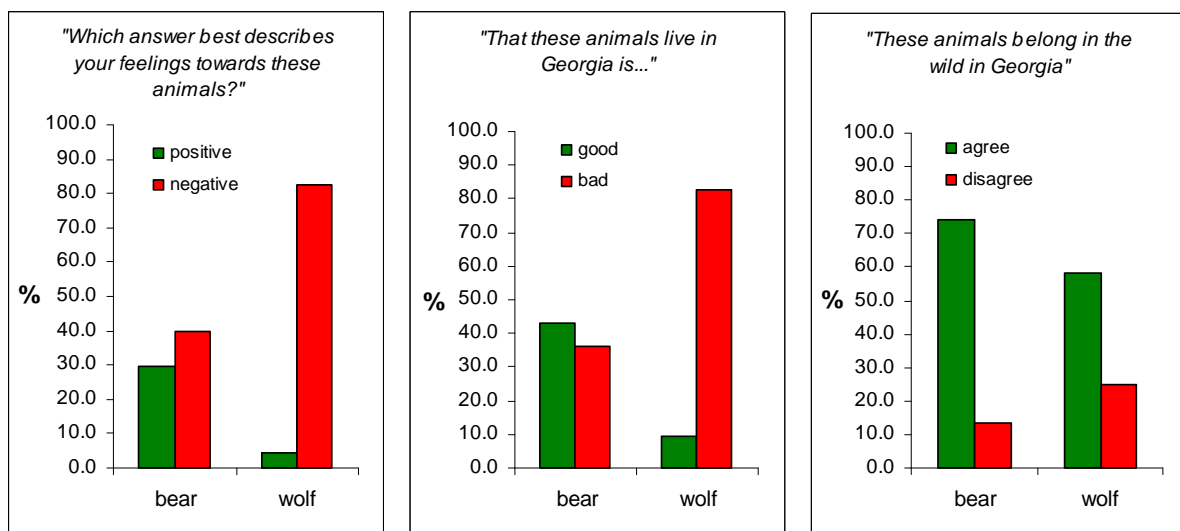


Fig. 15. Responses of livestock owners ($n=76$) in and around VNP to three items investigating attitudes towards bears and wolves

Respondents in every target group tended to think that wolves kill a lot of sheep: 50–60% of livestock owners, herders and rural residents strongly agreed and a further 31–39% agreed with this assertion. The same three groups also showed a tendency to think that bears kill a lot of sheep, but less than 20% of each strongly agreed, while cereal farmers were divided or

neutral on this item and all other groups disagreed. In all groups, there were more respondents who agreed that wolves greatly reduce numbers of deer, the greatest advocates of this view again being livestock owners (75% agreed), rural residents (71%) and herders (68%) together with cereal farmers (67%) and pupils (67%). Contrary to expectations, hunters least often thought that wolves greatly reduce deer numbers, with only 16% strongly agreeing, 27% agreeing and 34% remaining neutral.

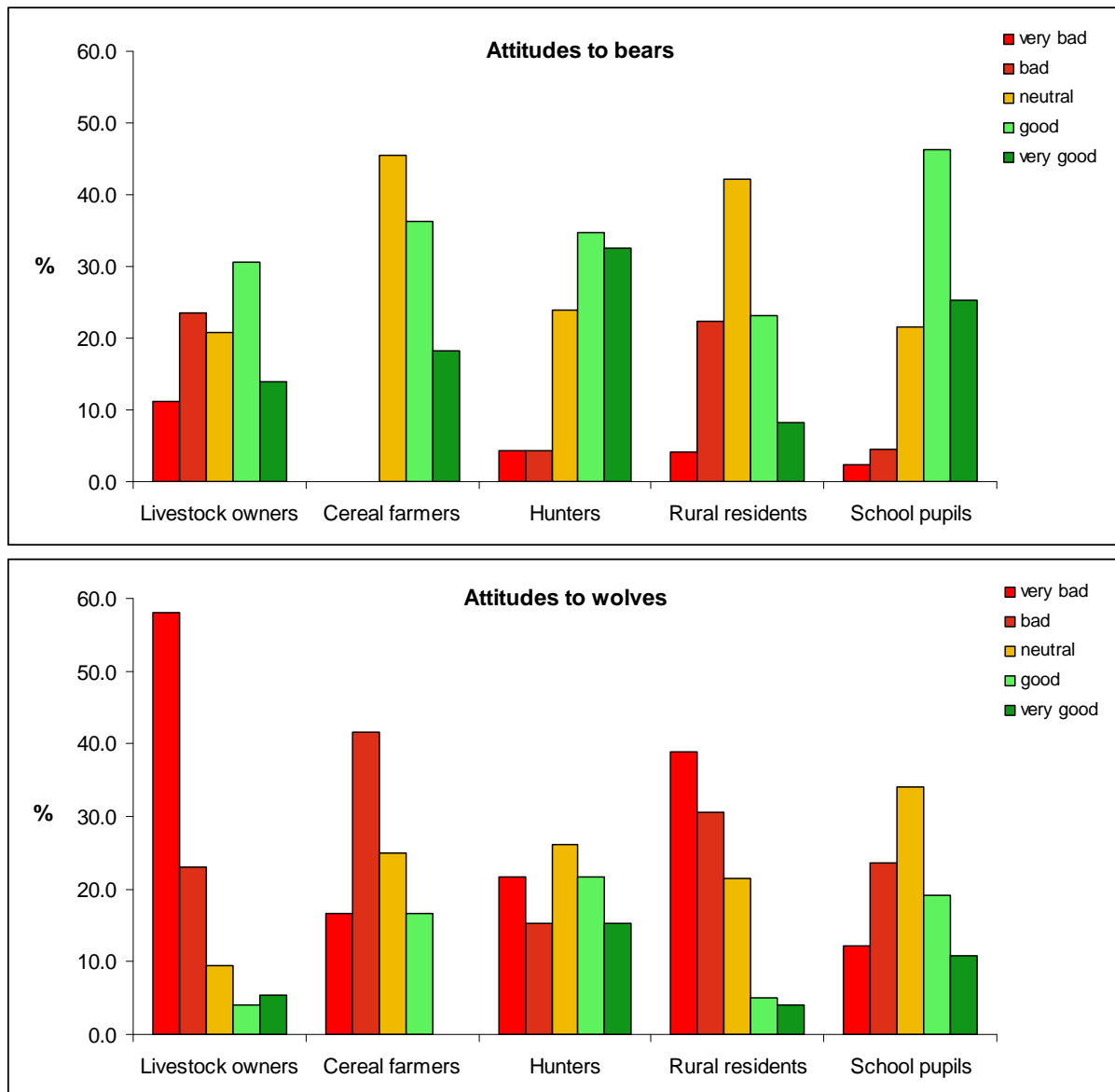


Fig. 16. Attitudes of respondents to the presence of bears and wolves: responses by target group to the item, “That [bears/wolves] live in Georgia is [bad/good]”

Every target group showed a tendency to be more afraid of wolves than of bears and in every group except enforcement officers the majority of respondents were afraid of wolves. Only 6% of rural residents would not be afraid to go to places with wolves. The most fearful group was urban residents (58% strongly agreed that they would be afraid to go to places with wolves and 42% where there are bears) and the least fearful were enforcement officers (6% and 3% respectively). Cereal farmers (55%) and enforcement officers (53%) were the only groups in which most respondents would not be afraid to go to places with bears.

Between 78% (urban residents) and 100% (cereal farmers) of every target group rated wolves as very dangerous or dangerous (Fig. 17). The respective range for bears was 16% (enforcement officers) to 59% (rural residents). After the wolf, the species most frequently considered dangerous were the wild boar (up to 67%) and the two felids: the leopard was regarded as very dangerous or dangerous by 42–63% of cereal farmers, rural residents, livestock owners, enforcement officers, herders and urban residents while 52–90% of the same groups as well as 81% of pupils, 74% of hunters and 73% of teachers thought this of the lynx. The domestic dog elicited more “mostly harmless” responses than any other species listed (52–90%) and was least often considered dangerous (0–16%) by all target groups except enforcement officers, fewer of whom rated the jackal and wild boar as dangerous. Respondents were most often uncertain about the potential danger of leopards.

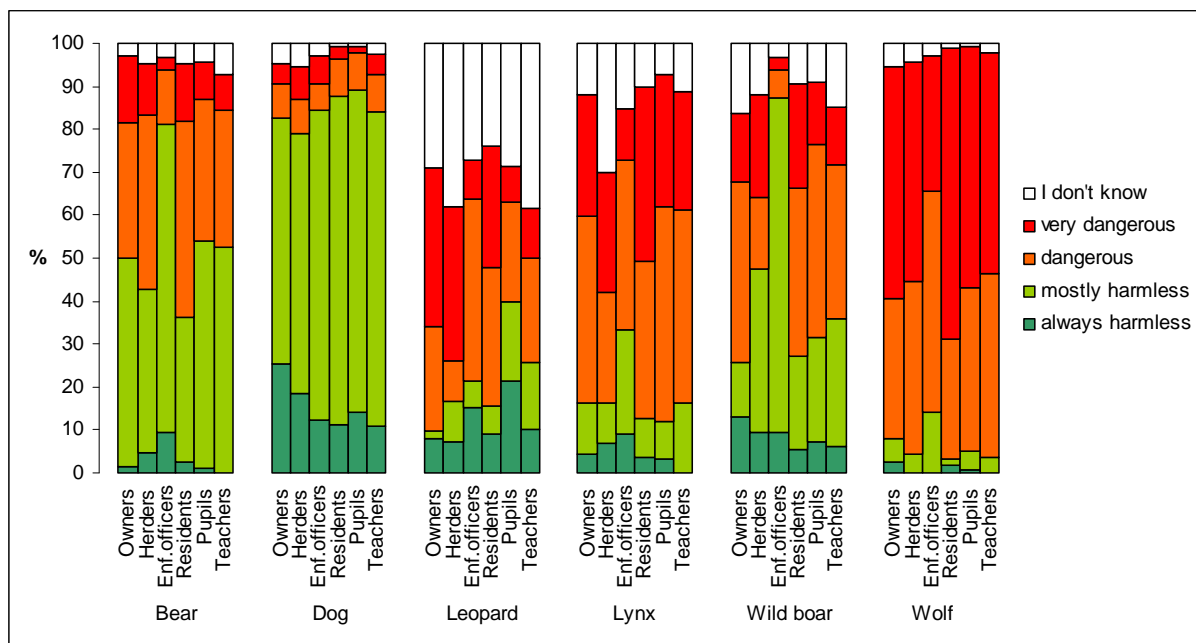


Fig. 17. The danger rating of various animal species by respondents in the Kakheti Region of East Georgia divided into six target groups: livestock owners and their hired herders, enforcement officers (protected area rangers and border guards), rural residents, school pupils and their teachers

Knowledge

Overall, 48% of respondents ($n=784$) answered five or more knowledge questions correctly, although no one got all 10 right and only one person (a school pupil) scored 9/10. Livestock owners were the most knowledgeable about carnivores and their management, with a mean score of 5.3/10 (median 5), followed by enforcement officers (4.9, 5) and hunters (4.9, 5). Urban residents (3.7, 3) and teachers (3.7, 4) answered the fewest questions correctly, followed by rural residents (4.0, 4) and hired livestock herders (4.2, 4) (Fig. 18).

More than three quarters of livestock owners, herders and cereal farmers as well as two thirds of hunters knew that compensation is not paid for damage by bears and wolves. However, many respondents in the other target groups, ranging from 29% of rural residents to 49% of teachers, indicated that they did not know if compensation is paid or not. The question most often answered correctly was if it is normally legal to shoot bears, whereas the least often correctly answered question was if it is legal to shoot wolves in Georgia. Only

14.4% of all respondents ($n=773$), including 16% of owners, 11% of herders and 11% of hunters, knew that it is legal to hunt wolves, with the percentage of correct responses by target group ranging from 9% for enforcement officers to 17% for rural residents. Although 75.5% of all respondents ($n=773$) knew that it is illegal to hunt bears, 16% of hunters ($n=45$), more than any other group except urban residents (26%), thought it legal to do so.

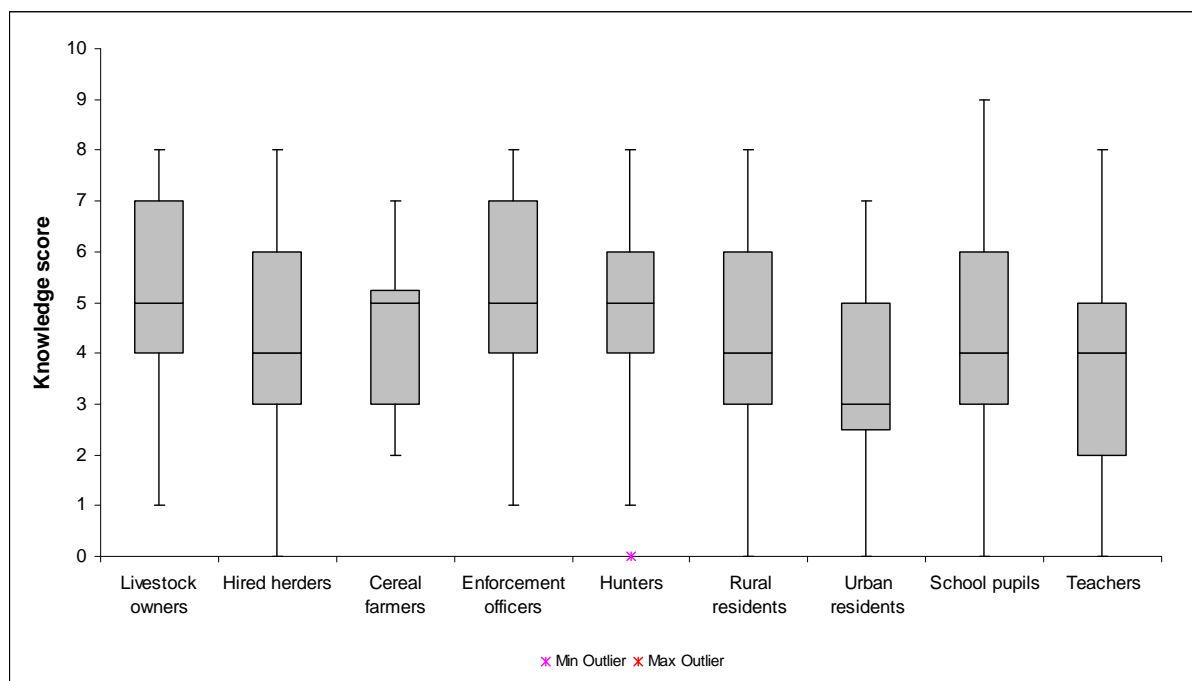


Fig. 18. Knowledge of bears, wolves and their management by target group

Attitude to management

Most respondents (63.8%, $n=781$) thought that the number of wolves is increasing and that there are too many of them in Georgia (78.6%, $n=778$). Livestock owners held the strongest views, with 83% ($n=75$) of them thinking that wolf numbers are increasing and 97% agreeing (66% of them strongly) that there are too many wolves in Georgia. Livestock owners also tended to think that bears are becoming more numerous (54%, $n=74$), whereas hunters were divided on whether numbers are increasing or decreasing (38% vs. 40%, $n=46$), as were school pupils (26% vs. 33%, $n=334$). The largest proportion of all other target groups indicated that they did not know the trend of the bear population. Perhaps surprisingly, only 17% of cereal farmers thought that there are too many bears and none of them agreed strongly with this statement. All other target groups except livestock owners and herders tended to be neutral or disagree.

All target groups showed a tendency to think that wolves should only live in restricted parts of Georgia: overall 72.6% of 767 respondents agreed with this statement. Likewise all target groups supported the payment of compensation to owners whose livestock has been killed: only 10.5% of respondents disagreed with this idea, the highest support being among livestock owners (92%, $n=74$), teachers (89%, $n=89$), herders (87%, $n=47$) and rural residents (83%, $n=121$). Although there was less support overall for the suggestion that money should only be paid to owners who tried to protect their livestock, hired herders (86%, $n=43$) and livestock owners (61%, $n=70$) tended to support this condition.

There was overwhelming support (89–99%) among all target groups for allowing people to kill wolves if their livestock is attacked. However, most herders (62%, $n=45$) and livestock owners (58%, $n=71$) agreed that hunting of wolves should be strictly regulated, as did the other target groups. Whereas most target groups tended to disagree with hunting wolves in national parks, rural residents were divided (39% for vs. 42% against, $n=121$) and most livestock owners (77%, $n=73$) and herders (67%, $n=46$) thought it should be allowed. Livestock owners and cereal farmers were the only target groups that lacked a majority of support for a year-round ban on hunting any wild animals inside protected areas. Conversely, livestock owners (77%, $n=73$) and herders (67%, $n=45$) were the only target groups who thought that livestock grazing should be allowed in protected areas, with urban residents (79%, $n=19$), pupils (68%, $n=334$), hunters (59%, $n=46$) and teachers (55%, $n=89$) all opposed, a third of pupils and urban residents being strongly opposed to this.

A majority of respondents in each target group agreed that it is important to have protected areas such as VNP in Georgia, ranging from 61% for livestock owners to 96% for teachers. More than three quarters of respondents in each target group agreed that people need more information about wolves and that more research should be done on them, the only slight exception to this being urban residents, 42% of whom gave a neutral response on the need for more research.

Sources of information

Substantial differences were found among the target groups (Fig. 19) which should be taken into account when designing outreach and education programmes. Livestock herders, owners and rural residents were the most conservative both in terms of what had formed their impressions of bears and wolves (Table 12) and in the range of media from which they wanted to receive more information (Table 13). Cereal farmers, urban residents and school pupils mentioned the broadest range of sources.

In terms of what respondents said had formed their impressions of carnivores, television was the most influential medium, reaching 67% of cereal farmers, 62% of teachers, 60% of school pupils, 46% of hunters and 43% of rural residents. Livestock owners tended to rely more on their own experience (53%) or information from their peers (41%), as did herders (30% and 40% respectively). Hunters most often received information on bears and wolves from their peers (50%) and were also mentioned by 43% of enforcement officers, 42% of cereal farmers, 37% of urban residents, 30% of pupils and 27% of rural residents as having helped form their impressions. Protected area staff were mentioned by 42% of urban residents but had influenced no more than a quarter of any other target group, except their own peers.

A majority of each target group was interested in learning more about bears or wolves, the only exception being herders, of whom 47% were interested and 30% were not, compared to 58–95% and 0–16% respectively for the other target groups. Different target groups favoured different sources for receiving new information (Table 12). For example, television, newspapers and magazines are likely to be the best media for reaching livestock owners. Excursions would be appreciated by urban residents, pupils, cereal farmers, hunters and teachers. The internet might reach few people other than pupils and enforcement officers

while presentations are suitable mainly for urban residents. Leaflets were not favoured by any target group so should not be relied upon to convey information.

Table 12. Answers of 784 respondents' to item #48, "What has formed your impressions of bears and wolves?", expressed as the percentage of each target group that marked each option

Target group	Newspapers / magazines	Books / leaflets	Fairy tales	Hunters	TV	Radio	School	Family	Farmers / Herders	PA staff	Own experience	Other	Total ^a
Livest. owners	13.2	7.9	1.3	17.1	15.8	2.6	14.5	14.5	40.8	9.2	52.6	0	189.5
Herders	6.4	6.4	6.4	23.4	10.6	0	6.4	10.6	40.4	8.5	29.8	6.4	155.3
Farmers	16.7	25.0	25.0	41.7	66.7	25.0	16.7	33.3	25.0	25.0	33.3	25.0	358.4
Enforc. officers	21.6	29.7	0	43.2	32.4	8.1	13.5	5.4	40.5	40.5	32.4	0	267.3
Hunters	15.2	30.4	15.2	50.0	45.7	4.3	13.0	23.9	21.7	19.6	23.9	10.8	273.7
Rur. residents	20.5	15.6	4.1	27.0	42.6	3.3	5.7	13.1	17.2	4.9	8.2	13.1	175.3
Urb. residents	36.8	57.9	21.1	36.8	36.8	15.8	36.8	31.6	10.5	42.1	5.3	5.3	336.8
School pupils	21.7	30.1	16.4	30.1	60.4	4.2	45.8	42.6	19.0	19.9	14.3	4.2	308.7
Teachers	38.2	39.3	15.7	18.0	61.8	10.1	33.7	27.0	13.5	13.5	15.7	4.5	291.0
Mean ^b	21.1	26.9	11.7	31.9	41.4	8.2	20.7	22.4	25.4	20.4	23.9	7.7	

^a The sum of percentages for each option, used as a relative measure of how conservative each target group is in terms of the range of sources that have formed their impressions of carnivores.

^b The mean percentage of positive responses for each option, weighting all target groups equally, to indicate the relative impact of the various sources of information across target groups as reported by respondents.

Table 13. The forms in which respondents ($n=784$) would like to receive more information about bears or wolves, expressed as the percentage of each target group that marked each option

Target group	Newspapers / magazines	Books	Leaflets	TV / radio	PA staff	Internet	Excursions	Special activities	Presentations	Other	Total ^a
Livestock owners	34.2	14.5	7.9	34.2	19.7	5.3	17.1	15.8	2.6	0	94.7
Hired herders	21.3	4.3	2.1	19.1	14.9	8.5	8.5	10.6	2.1	0	63.7
Cereal farmers	16.7	25.0	0	25.0	50.0	8.3	50.0	25.0	0	0	158.3
Enforcement officers	27.0	27.0	21.6	37.8	13.5	29.7	18.9	32.4	16.2	0	148.5
Hunters	18.9	21.6	13.5	32.4	21.6	16.2	43.2	32.4	16.2	0	162.0
Rural residents	21.3	9.0	6.6	36.9	14.8	15.6	13.1	9.0	3.3	0	92.7
Urban residents	26.3	15.8	15.8	31.6	21.1	21.1	63.2	36.8	31.6	0	205.4
School pupils	13.1	27.4	10.1	22.9	24.1	27.7	56.5	19.6	15.8	1.2	167.8
School teachers	16.9	19.1	7.9	37.1	25.8	18.0	41.6	23.6	5.6	0	151.7
Mean ^b	21.7	18.2	9.5	30.8	22.8	16.7	34.7	22.8	10.4	0.1	

^a The sum of percentages for each option, used as a relative measure of how conservative each target group is in terms of the range of media from which they would like to receive more information on carnivores.

^b The mean percentage of positive responses for each option, weighting all target groups equally, to indicate the potential effectiveness of each medium in reaching a range of target groups.

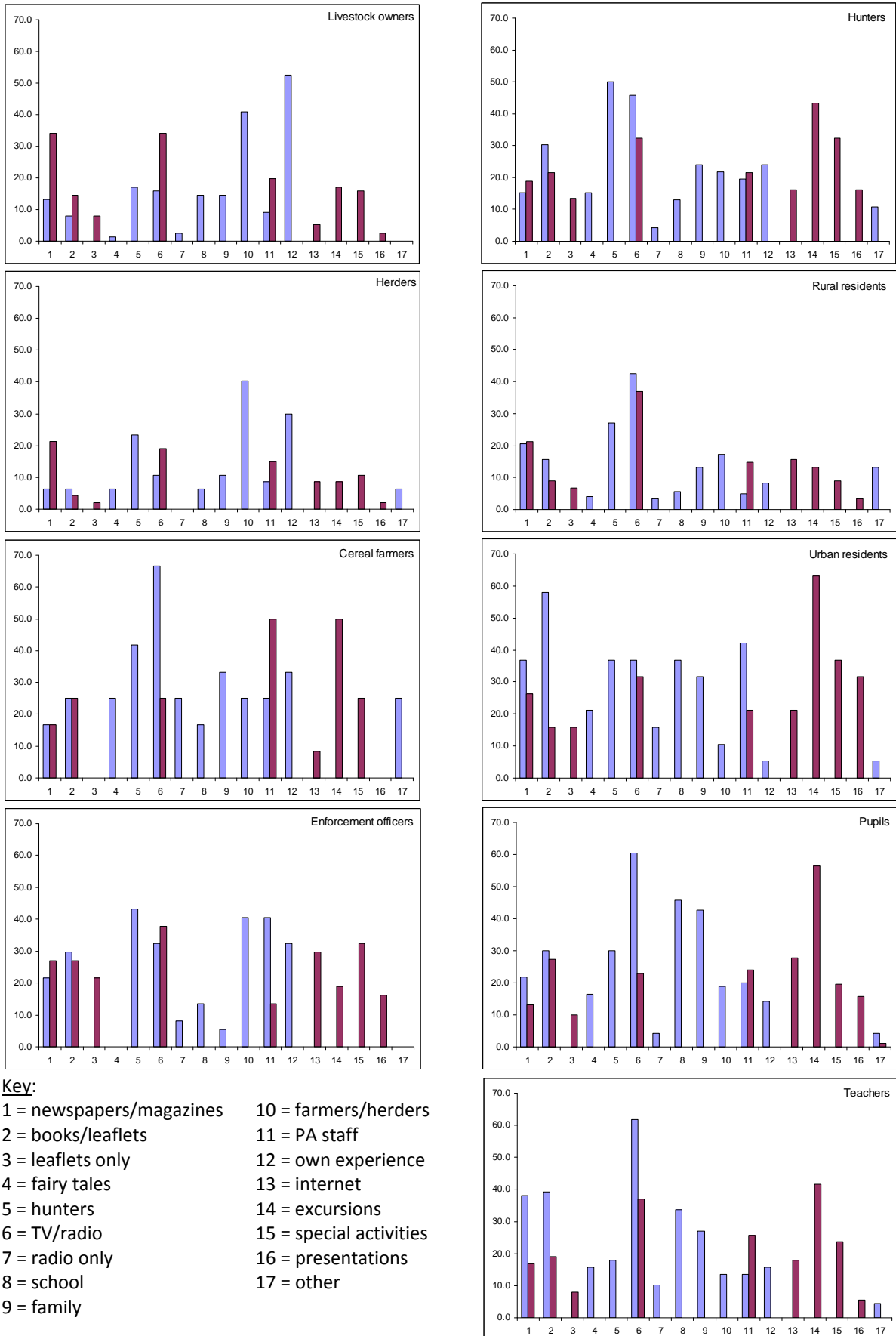


Fig. 19. What respondents said had formed their impressions of bears and wolves (blue) and how they would like to receive more information about them (red)

Experience with large carnivores

Livestock owners tended to spend the most time in places with wild animals such as wolves, with 81% of them indicating that they frequented such places almost daily, followed by enforcement officers (64%) and hired herders (59%). For all the other target groups the respective figure was less than 20%. More than 75% of urban residents, teachers and pupils seldom or never go to places with wild animals. Surprisingly, 42% of hunters, 39% of rural residents, 25% of cereal farmers and 21% of herders responded that they seldom went to places with wild animals, while a further 11%, 35%, 13% and 21% respectively indicated that they never went to such places.

Table 14. The percentage of respondents in each target group undertaking various activities in areas with wild animals such as wolves

Target group	Sheep/cattle herding	Hunting	Watching wildlife	Hiking	Skiing	Berry/mushroom picking	Mountain biking	Fishing	Other
Livestock owners	92.1	11.8	3.9	1.3	0	7.9	0	11.8	0
Hired herders	80.9	12.8	2.1	2.1	0	8.5	0	10.6	0
Cereal farmers	33.3	25.0	41.7	8.3	0	25.0	8.3	16.7	0
Enforcement officers	2.7	0	48.6	8.1	0	8.1	0	18.9	21.6
Hunters	18.9	91.9	21.6	21.6	0	27.0	0	43.2	5.4
Rural residents	35.2	0	18.9	17.2	0	19.7	0.8	9.8	4.9
Urban residents	10.5	0	36.8	52.6	0	31.6	0	21.1	15.8
School pupils	8.6	20.5	25.3	55.7	3.0	17.9	8.6	22.0	4.5
School teachers	18.0	0	27.0	55.1	2.2	20.2	1.1	7.9	10.1

Regarding activities undertaken in wildlife areas, livestock owners and herders tended to do little other than tending their animals, with c.11% of each group mentioning fishing, slightly fewer berry or mushroom picking and slightly more hunting (Table 14). The other target groups all participated in a broader range of activities (Fig. 20), with watching wildlife apparently common among several of them, particularly enforcement officers, cereal farmers and urban residents. Many hunters also fished, as did smaller proportions of the other target groups. A majority of school pupils, teachers and urban residents hiked in areas with wild animals. Active sports (mountain biking, skiing) were the least popular of the activities listed in the questionnaire. Note that although the data presented suggest that no residents, teachers or enforcement officers hunted, this is because all respondents in these target groups who indicated that they hunted were moved to the hunters target group.

Unsurprisingly, livestock owners were the group most directly affected by the presence of wolves: 93% of them indicated that they had seen a wolf, 57% had shot one and 79% had experienced damage caused by wolves (Fig. 21). The respective figures for herders were 77%, 26% and 59%. Nearly two thirds of hunters said they had shot a wolf and 88% had seen one in the wild, compared to 92% of enforcement officers, 83% of cereal farmers and 61% of rural residents who said they had seen a wild wolf. One third of rural residents and two thirds of cereal farmers, pupils and hunters or their families had suffered damage by wolves.

Bears had been seen less, shot less and caused less damage within every target group. Nevertheless, 36% of livestock owners, 24% of hunters and 14% of herders claimed to have shot a bear and 78% of livestock owners as well as 72% of hunters said they had seen one. None of the cereal farmers ($n=12$) and only 8% of rural residents ($n=118$) indicated that their family had suffered damage by bears, although 39–40% of livestock owners and herders had experienced damage. Pooling all respondents for the purpose of comparing experience of the two species, 29.8% of respondents had seen a bear compared to 62.4% who had seen a wolf; 5.8% had shot a bear compared to 14.9% for the wolf and 9.7% of respondents had suffered damage by bears within their family compared to 36.5% who had experienced damage by wolves.

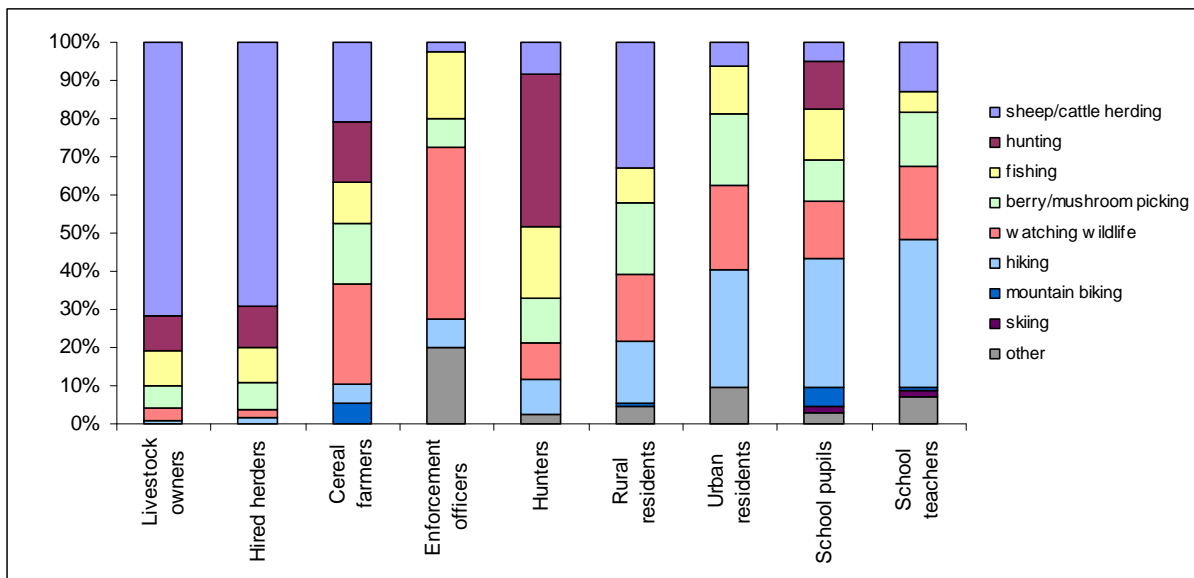


Fig. 20. Activities undertaken by respondents in wildlife areas, expressed as the frequency of occurrence of each activity among all responses from the target group

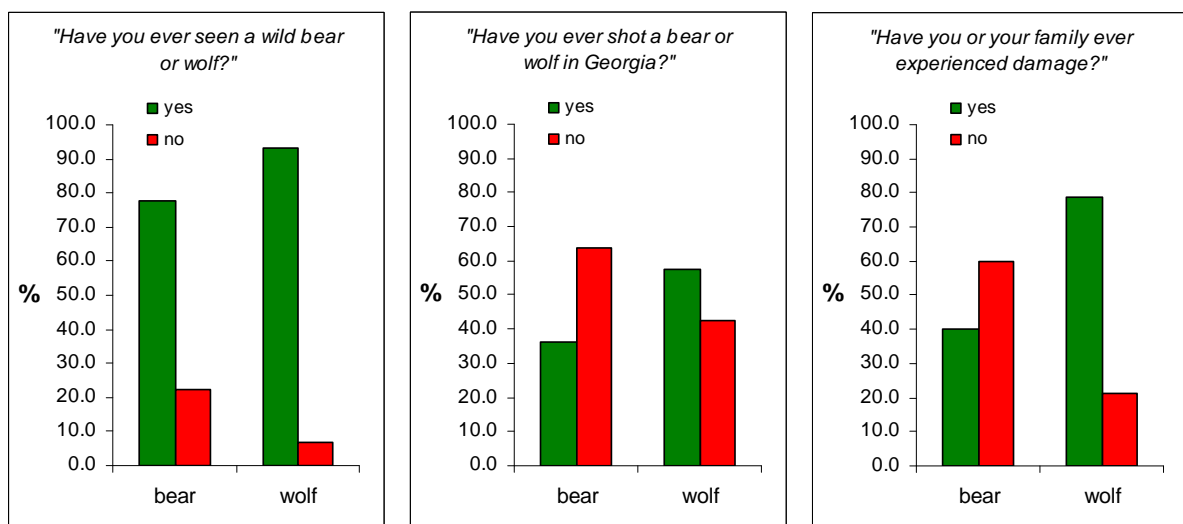


Fig. 21. Responses of livestock owners ($n=76$) in and around VNP to three items investigating their experience of bears and wolves

4.2.3. Factors affecting attitudes toward carnivores and their management

As documented in the previous section, wolves elicited more negative responses than bears across all the target groups investigated. Respondents' gender, their frequency of going to places with wild animals and whether or not they reported having seen a wolf had little or no influence on their feelings toward this animal. However, most of the other factors tested were found to influence feelings towards wolves (response to questionnaire item #2). More positive feelings tended to be found among people who hunted ($r=0.1224$, $p=0.0007$) and who indicated that their impressions had been formed partly by television ($r=0.1242$, $p=0.0006$), although the relationships were weak. Negative correlations were found between feelings towards wolves and perception of the danger they present ($r=-0.2948$, $p<0.0001$), respondents' involvement in herding livestock ($r=-0.2908$, $p<0.0001$), their level of fear of wolves ($r=-0.2432$, $p<0.0001$), experience of damage caused by wild carnivores ($r=-0.2432$, $p<0.0001$), their age ($r=-0.1697$, $p<0.0001$) and level of education ($r=-0.1172$, $p=0.0013$).

Knowledge was negatively correlated with fear of both wolves ($r=-0.158$, $p<0.0001$) and bears ($r=-0.187$, $p<0.0001$), i.e. people who knew more about bears and wolves tended to be less afraid of them. As fear was found to be one of the main predictors of attitudes to wolves and bears, this is an encouraging finding for education programmes aimed at fostering greater understanding of large predators in Georgia.

5. CONCLUSIONS

Human-carnivore conflict in the Dedoplistskaro District of East Georgia, particularly within and around the Vashlovani National Park, centres on the loss of livestock to grey wolves. While other predators such as brown bears and golden jackal are acknowledged as preying on livestock, it is the wolves that account for the highest number of losses and towards which the brunt of livestock owners' hostility is directed.

Comprehensive baseline surveys found that predation on livestock accounted for the largest economic loss to ethnic Tushetian farmers, with sheep being the most commonly targeted livestock, followed by cattle and horses. Disease was listed as a distant second to predation in terms of livestock losses. Despite the use of livestock guarding dogs and protective enclosures, around half the livestock owners and herders still reported high losses to wolves, especially during the lambing season in Vashlovani winter pastures. Most attacks took place during the afternoon or early evening when the animals were out at pasture, with very few attacks occurring at night.

The study also showed that most owners saw lethal control of predators as the only way to deal with the predation problem, with these owners stating that they did not want help protecting their animals.

In the attitudinal survey conducted amongst various target groups, attitudes were once again significantly more negative towards wolves than bears or other carnivores. Bears had been seen less, shot less and generally caused less damage. Respondents thought that the wolf population was increasing and that there were too many of them in Georgia. Most people indicated a fear of wolves, although very few of them spent much time in areas where they knew wolves to be found, apart from those directly involved with farming or wildlife.

Despite this negative perception towards wolves, most people acknowledged that wolves belong in the wild in Georgia, but then only in restricted parts of the country. Livestock owners, cereal farmers and herders generally agreed with this but also stated that hunting should be allowed within these protected areas. The majority of people felt it was acceptable to kill wolves in retaliation for livestock attacks, and that compensation should be paid to those owners that have lost animals to predation. Interestingly, most owners and herders felt that compensation should only be paid to those that had made an effort to protect their livestock in some way. There was a keen interest across the board in having more information available on wolves and bears, and general support for further research on these animals.

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Livestock farms were initially mapped by Amiran Kodiashvili; we are also grateful for his expert guiding and driving during our first visit to VNP in December 2009. Giorgi Gorgadze and Bejan Lortkipanidze provided GIS files. Thank you to VPA administration staff for providing maps, information and use of their facilities. Survey protocols were translated into Georgian by Nino Markozashvili. Aleco Baghdadze, our research assistant for the survey, interviewed livestock owners and herders. The written questionnaire was administered in Dedoplistskaro schools by pupils of the N 1 school (thanks go to Maila Lapiashvili) and to other target groups by Giorgi Bughridze. Data were entered into Excel by Aleco Baghdadze and Lana Askilashvili.

Oxford University's WildCRU provided facilities as well as the help of additional personnel for data analysis: Magdalena Bennett worked on GIS and Paul Johnson lent invaluable assistance with statistics.

We sincerely thank all those who participated in or otherwise assisted with the survey.

Robin Rigg & Claudio Sillero
Summer 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 მოჰყავთ):** 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

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

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Appendix I

Semi-structured interview protocol and datasheet

*[Items marked * may be recorded directly by the research assistant]*

- *1. Interview #: _____ *2. Date: _____
- *3. Name of research assistant: _____
- *4. General area: *Circle applicable:* *Western* *Central* *Black Mountain*
- *5. Zone: *Circle applicable:* *in VNP* *2km buffer*
- *6. Farm number: _____ *[according to map]*
- *7. Exact location (GPS coordinates): _____ *[check on list]*

Farm and livestock demographics

8. Name of interviewee: _____ 9. Age: _____
10. Which district of Georgia is he from? _____
11. Contact details: _____
12. Description of farm buildings and facilities:
Circle all applicable: *house* *large barn* *smaller barn(s) for lambs*
 night-time corral (give details) _____ *other (specify _____)*
13. Size of pastures (in hectares): _____ ha
14. Are pastures owned or leased? *owned* *leased*
15. How many livestock owners #: _____ and herders #: _____ are at the farm?
16. For how many years have you used the same farm? _____
17. Where do you go in summer? _____
18. When did you arrive here? _____ 19. When do you expect to leave? _____

Livestock numbers

20. Sheep: #: _____ 21. Goats: #: _____ 22. Cattle: #: _____
23. Horses: #: _____ 24. Donkeys: #: _____ 25. Pigs: #: _____

Products

26. What are the main products produced in Vashlovani and how much do they produce before leaving for summer pastures?
- Sheep: milk* _____ *l* *cheese* _____ *kg* *meat* _____ *kg* *wool* _____ *kg*
- Cattle: milk* _____ *l* *cheese* _____ *kg* *meat* _____ *kg*
27. How do you sell your products? _____
28. What are the difficulties of selling your products? _____

[Now ask the interviewee to provide details of the most recent attack.]

46. Date: _____

47. Time: dawn am pm dusk night-time (approx. time if known _____)

48. Activity of flock immediately before the attack

Circle applicable: grazing in pasture drinking at water source sleeping at farm
resting in pasture walking to/from pasture other (specify _____)

49. Location: [ideally get the interviewee to point to the actual location, then research assistant goes to the spot and takes a GPS reading] _____

50. Weather (circle applicable): clear cloudy mist/fog rain snow
other (specify _____)

51. # and type of livestock killed or injured:

killed injure
d
sheep
cattle
other (specify)

52. Predator species and number if seen: bear ____ jackal ____ lynx ____ wolf ____

53. Dogs present: yes no

54. Dog behaviour toward predator:

Circle applicable: no reaction bark chase bite/contact
run away other (specify _____)

55. Herder/owner present? yes no

56. Herder/owner's behaviour toward predator:

Circle applicable: no reaction shout chase shoot other (specify _____)

[Now ask for the next previous attack and repeat data questions, and then for the attack before that, until all attacks have been registered and/or interviewee loses interest.]

Preventive measures

57. Sheep dogs #: ____ of which adults (>1 yr): ____ juveniles (<1 yr): ____

58. Are they: Caucasian Georgian mixed breeds other (specify _____)?

59. Do you think you have good dogs?

yes no partly explanation: _____

60. Where do you get your dogs from? _____

61. How do you train them? _____

62. What measures do you use to protect your livestock from predators?

Circle all those used and rank in order of importance:

dogs sleeping with flock scare devices (specify _____)
shooting avoiding risky places (specify _____) putting flock in barn
patrolling removing dead livestock other (specify _____)

63. Do you think these measures are effective?

yes no partly doesn't know

64. What would happen if you didn't protect your flock?

nothing would lose more doesn't know other (specify _____)

65. How do you think the conflict between people and predators could be reduced?

66. Would you like help to protect your flock? yes no

If yes, how? _____

Veterinary care

67. Which are the most problematic diseases for your flock/herd? _____

68. Where do you go for veterinary care? _____

69. What treatments/services are available?

Circle all applicable: sheep dip vaccination medicines other (specify _____)

	very unsatisfied	unsatisfied	neutral	satisfied	very satisfied
70. How satisfied are you with the services?	1	2	3	4	5

71. Please explain your answer to question 70.

	very high	high	medium	low	very low
72. How much of a financial burden is treating your animals?	1	2	3	4	5

73. Please explain your answer to question 72.

Remarks

74. Do you have anything else you would like to add about what we have talked about?

Appendix II

Farm numbers and GPS coordinates

Farm #	Livestock kept		In/out	Zone	District	WGS 84 UTM/UPS	
	Sheep	Cattle				X	Y
3		Y	VNP	Black Mtn.	Shavi Mta	8636326	4568848
5		Y	VNP	Black Mtn.	Takhis Tskali	8634872	4562475
7			VNP	Black Mtn.	Takhis Tskali	8636054	4561791
8	Y	Y	VNP	Black Mtn.	Alpadara	8641800	4572383
9		Y	VNP	Black Mtn.	Alpadara	8641028	4570389
10	Y	Y	VNP	Black Mtn.	Alpadara	8641419	4569372
11		Y	VNP	Black Mtn.	Alpadara	8640591	4567477
12		Y	VNP	Black Mtn.	Alpadara	8639232	4565883
13		Y	VNP	Black Mtn.	Takhis Tskali	8639508	4561315
15		Y	VNP	Black Mtn.	Shavi Mta	8637906	4573619
16	Y	Y	VNP	Western	Eshmakis Khevi	8608204	4569647
17			VNP	Central	Bugha Moedani	8630104	4556409
18	Y		VNP	Central	Bugha Moedani	8626459	4557579
19	Y		VNP	Central	Lekistrkali	8633134	4556301
20			VNP	Black Mtn.	Shavi Mta	8635692	4569388
21	Y		VNP	Central	Bugha Moedani	8630088	4556823
22	Y		VNP	Central	Bugha Moedani	8627293	4555642
23	Y		VNP	Central	Bugha Moedani	8628868	4557283
24		Y	VNP	Central	Bugha Moedani	8626038	4555636
25		Y	VNP	Central	Sabatlo	8638991	4575434
26	Y	Y	VNP	Central	Natlistskali	8630685	4563056
27	Y	Y	VNP	Central	Natlistskali	8630105	4564525
28		Y	VNP	Central	Natlistskali	8629237	4566202
29	Y	Y	VNP	Central	Chighoetkhevi	8630805	4561528
30	Y		VNP	Central	Chighoetkhevi	8628451	4562135
31	Y	Y	VNP	Central	Chighoetkhevi	8627294	4563107
32	Y		VNP	Central	Chighoetkhevi	8625215	4565084
33		Y	VNP	Black Mtn.	Takhis Tskali	8637055	4564217
34		Y	VNP	Black Mtn.	Takhis Tskali	8638247	4563005
38	Y		VNP	Black Mtn.	Shavi Mta	8635065	4570698
39	Y		VNP	Black Mtn.	Shavi Mta	8637821	4572262
40	Y	Y	VNP	Central	Imedas Mta	8631287	4567318
41		Y	VNP	Black Mtn.	Shavi Mta	8641344	4568619
45			VNP	Black Mtn.	Sabatlo	8606086	4573324
51		Y	buffer	Western	Small Shiraki	8607804	4573613
52		Y	buffer	Western	Small Shiraki	8608822	4573208
54	Y		buffer	Western	Small Shiraki	8615041	4571884
55	Y	Y	buffer	Western	Small Shiraki	8615250	4570378
56	Y	Y	buffer	Western	Vashlovani	8617479	4568103
57		Y	buffer	Western	Vashlovani	8620120	4566623
58	Y	Y	buffer	Western	Pantishara	8612173	4564128

59	Y		buffer	Western	Vashlovani	8610361	4565043
61	Y	Y	buffer	Western	Vashlovani	8614207	4564439
62	Y		buffer	Western	Vashlovani	8615136	4562335
63	Y		buffer	Western	Vashlovani	8616103	4561418
64	Y		buffer	Western	Samukhe	8617126	4560611
65	Y		buffer	Western	Samukhe	8617861	4559883
66	Y		buffer	Western	Samukhe	8618696	4558692
67	Y		buffer	Western	Samukhe	8619405	4558199
68	Y		buffer	Western	Samukhe	8620202	4557019
70	Y		buffer	Western	Samukhe	8621143	4557089
71	Y		buffer	Western	Samukhe	8621530	4556728
72	Y	Y	buffer	Western	Samukhe	8622468	4555731
73	Y		buffer	Western	Samukhe	8624613	4552320
74	Y		buffer	Central	Chighoetkhevi	8625081	4566169
75	Y		buffer	Central	Chighoetkhevi	8623467	4566204
77		Y	buffer	Central	Chighoetkhevi	8627456	4568111
78		Y	buffer	Central	Chighoetkhevi	8628897	4566995
79	Y	Y	buffer	Central	Shavi Mta	8636371	4571998
80	Y	Y	buffer	Central	Shavi Mta	8634960	4571535
82		Y	buffer	Central	Shavi Mta	8634958	4574364
83		Y	buffer	Central	Sabatlo	8637882	4579035
84	Y	Y	buffer	Central	Alpadara	8643024	4574109
NF1	Y		VNP	Central	Imedas Mta	8634207	4566130
NF2	Y	Y	VNP	Black Mtn.	Takhis Tskali	8636509	4565097
NF3	Y	Y	buffer	Western	Samukhe	8618577	4558771
NF4	Y		buffer	Western	Samukhe	8617269	4560562
NF5	Y		buffer	Western	Pantishara	8612360	4564086
NF6	Y		buffer	Western	Pantishara	8611285	4564567
NF7	Y	Y	buffer	Black Mtn.	Sabatlo	8640186	4577672
Total	46	39	–	–	–	–	–

Appendix III

Written questionnaire to quantify public opinion and knowledge

[#: _____]

Dear respondent,

Thank you for filling in this questionnaire about your feelings towards large carnivores living in Georgia, such as bears, jackals, lynx and wolves.

Your opinions towards these animals are important and we greatly appreciate your time answering these questions thoughtfully. Whether positive, neutral or negative your views are very valuable to us, since we are trying to document the range of people's attitudes toward wild animals.

Your answers should represent your real opinions, not those of others. We encourage you to voice your opinion. Your individual answers will be treated confidentially.

Please answer all the questions yourself. Do not take too long over this: it is not an exam!

With regards,

Georgia Carnivore Conservation Project Team

I. We would like to ask about your attitude towards large carnivores in Georgia such as bears and wolves.

Please circle the number that best describes your opinion.

Which answer best describes your feelings towards these animals?	very negative	negative	neutral	positive	very positive
1. Bears	1	2	3	4	5
2. Wolves	1	2	3	4	5
	very bad	bad	neither bad nor good	good	very good
3. That in Georgia there are bears is:	1	2	3	4	5
4. That in Georgia there are wolves is:	1	2	3	4	5
	strongly disagree	disagree	neutral	agree	strongly agree
5. Bears belong in the wild in Georgia	1	2	3	4	5
6. Wolves belong in the wild in Georgia	1	2	3	4	5
7. Wolves greatly reduce numbers of deer	1	2	3	4	5
8. A lot of sheep are killed by bears	1	2	3	4	5
9. A lot of sheep are killed by wolves	1	2	3	4	5
10. I'd be afraid to go to places with bears	1	2	3	4	5
11. I'd be afraid to go to places with wolves	1	2	3	4	5

Which of the following animals do you think are dangerous to humans?

	very dangerous	dangerous	mostly harmless	always harmless	I don't know
12. Bear	1	2	3	4	5
13. Dog	1	2	3	4	5
14. Jackal	1	2	3	4	5
15. Leopard	1	2	3	4	5
16. Lynx	1	2	3	4	5
17. Wild boar	1	2	3	4	5
18. Wolf	1	2	3	4	5

19. If you answered very dangerous or dangerous, in which situations are they dangerous?

II. The next questions ask about your knowledge about bears and wolves.

Please circle the response that best describes your opinion or fill in the blanks.

If you don't know the answer circle "I don't know" rather than asking someone else.

Presently in Vashlovani National Park there are:

20. bears	0	1 to 50	51 to 100	more than 100	I don't know
21. wolves	0	1 to 50	51 to 100	more than 100	I don't know

22. What do you think is the main food of **bears** and **wolves** in Vashlovani NP?

	Bears	Wolves
Fruits, berries, grass		
Mice and hares		
Honey		
Agricultural crops		
Wild boar		
Sheep or cattle		
Other (please specify)		
I don't know		

23. What is the typical number of **wolves** in a pack in Vashlovani NP?

up to 10 11 to 20 more than 20 I don't know

24. What is the typical weight of an adult male **bear**?

up to 100kg 101 to 250kg 251 to 500kg More than 500kg I don't know

About how many people were killed in Georgia in the last 10 years by:

25. bears	0	1 to 10	11 to 100	more than 100	I don't know
26. wolves	0	1 to 10	11 to 100	more than 100	I don't know

In Georgia, nowadays are owners paid money for livestock killed by **bears** and **wolves**?

- | | | | |
|-------------------|-----|----|--------------|
| 27. Bears | yes | no | I don't know |
| 28. Wolves | yes | no | I don't know |

In Georgia, is it normally legal to hunt **bears** and **wolves**?

- | | | | |
|-------------------|-----|----|--------------|
| 29. Bears | yes | no | I don't know |
| 30. Wolves | yes | no | I don't know |

III. What is your opinion about bear and wolf management in Georgia?

Please circle the response that best describes your opinion.

Do you think the numbers of these animals is changing or staying the same?

- | | | | | |
|-------------------|------------|------------|------------------|--------------|
| 31. Bears | Increasing | decreasing | staying the same | I don't know |
| 32. Wolves | Increasing | decreasing | staying the same | I don't know |

	strongly disagree	disagree	neutral	agree	strongly agree
33. In Georgia there are too many bears	1	2	3	4	5
34. In Georgia there are too many wolves	1	2	3	4	5
35. Wolves should only live in restricted parts of Georgia	1	2	3	4	5
36. Money should be paid to owners whose livestock is killed by wolves	1	2	3	4	5
37. Money should only be paid to owners who tried to protect their livestock	1	2	3	4	5
38. Hunting of wolves should be strictly regulated	1	2	3	4	5
39. Hunting wolves in National Parks should be allowed	1	2	3	4	5
40. People should be allowed to kill wolves if they attack their livestock	1	2	3	4	5
41. People need more information about wolves	1	2	3	4	5
42. More research should be done on wolves	1	2	3	4	5
43. It is important to have protected areas such as Vashlovani in Georgia	1	2	3	4	5
44. All wild animals should be protected from hunting year-round inside protected areas	1	2	3	4	5
45. Grazing of sheep and cattle should be allowed inside protected areas	1	2	3	4	5

46. In your opinion, what is the most important issue concerning **wolves** in Georgia?

47. What do you think is the main role of protected areas such as Vashlovani?

IV. Please tell us where your knowledge of bears and wolves has come from.

Please circle all answers that apply.

48. What has formed your impression of **bears** and **wolves**? (Circle all that apply)

newspapers / magazines school books/leaf lets family fairy tales / legends farmers / herders hunters protected area staff radio own experience television other (specify)

49. Are you interested in learning more about **bears** or **wolves**?

yes no partly

50. If yes, in what form would you like to obtain information?

television/radio internet excursions special activities protected area staff
newspapers / magazines books leaflets presentations other (specify)

V. We would like to learn about your experience with bears and wolves in Georgia.

Please tick or circle the answer that best describes your opinion.

51. How often do you go to places with wild animals such as wolves?

Almost daily at least once a week once a month seldom never

52. What do you usually do there?

sheep/cattle herding hunting wildlife watching hiking Skiing
berry/mushroom picking mountain biking fishing other (specify)

53. Have you ever seen a wild **bear**? **yes** **No**

54. Have you ever seen a wild **wolf**? **yes** **No**

55. Have you ever shot a **bear** in Georgia? **yes** **No**

56. Have you ever shot a **wolf** in Georgia? **yes** **No**

57. Have you or your family ever experienced damage caused by **bears**? **yes** **No**

58. Have you or your family ever experienced damage caused by **wolves**? **yes** **No**

59. If you or your family has experienced damage, please give details.

60. How would you react if you saw a **bear**?

61. How would you react if you saw a **wolf**?

If in childhood you were told stories about these animals, how were they described?

62. Bears	mostly positive	mostly negative	various	I wasn't told	I don't remember
63. Wolves	mostly positive	mostly negative	various	I wasn't told	I don't remember

VI. This final section will help us to learn more about the respondents of this survey. Your answers will be confidential.

Please circle or fill in the correct information.

64. How old are you? _____

65. Are you female or male?

66. Your occupation is:

livestock owner	herder	protected area staff	forester	police / border guard	hunter
tourism industry	teacher	student	school pupil	housewife	retired
currently unemployed	driver	fruit grower / wine maker	cereal farmer	other (specify):	

67. If you are a livestock owner, what kind of animals do you have and how many?
*sheep*___ *goats*___ *horses*___ *cows*___ *pigs*___ *other* ___ (*specify* ___)

68. What education have you completed?
primary *secondary* *higher*

69. Do you live in a village or a town?
village *small town* *big town* *other (specify* ___)

70. Which district do you live in? _____

**Thank you for your cooperation.
Please feel free to write any comments in the space below.**

