Georgian Carnivore Conservation Project component:

Mitigating human-carnivore conflict in East Georgia

Third Survey of Human-Carnivore Conflict in Vashlovani

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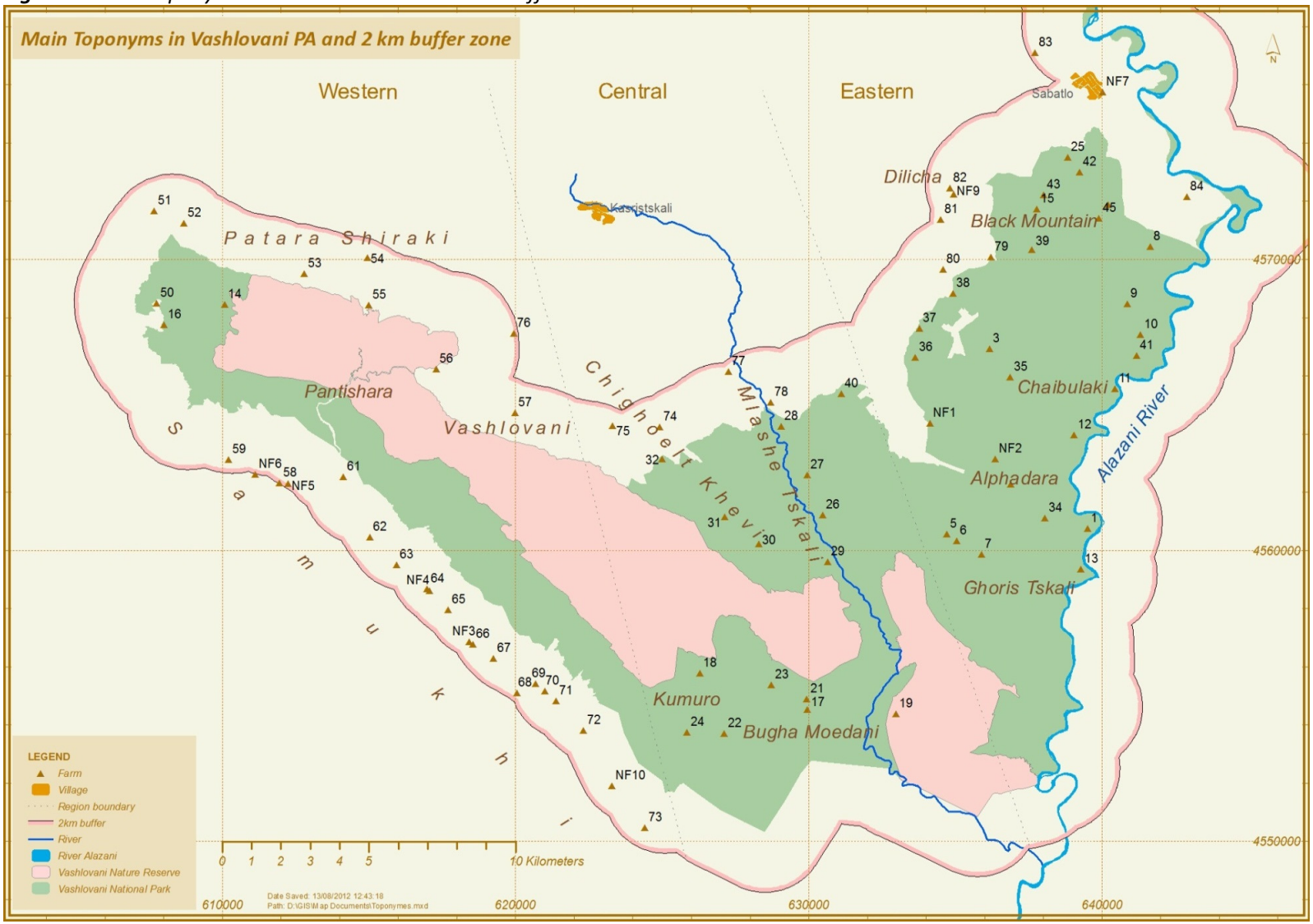
Introduction

The Tushetian people of East Georgia are traditional transhumant sheep farmers. 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 the 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 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 has identified and is implementing 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 only about managing animal populations but also 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).

Figure 1: *Main toponyms in Vashlovani PA and 2 km buffer zone*



Methods

The methodology used for GCCP's third HCC survey was based on previous surveys (see Baseline Survey of Human-Carnivore Conflict; Final Report, GCCP June 2010 and Second Survey of Human-Carnivore Conflict in Vashlovani; Final Report, GCCP, June 2011) with the following changes:

- Due to the full-time presence of the HCCRT in the field we are able to collect attack event data as it happens (livestock owners are encouraged to contact the HCCRT when their livestock are attacked so that the team can investigate). In theory, this decreases the projects dependence on the end-of-season collection of attack data (which, due to the length of time between the attack and the data collection, is inherently inaccurate) and allows the survey to focus on the general patterns of HCC.
- Interview and event datasheets are more detailed. Farm facilities, preventive measures (to interview) and habitat details (to predation event) were added to new datasheets (Appendix 1).
- The total time taken for the survey was longer than previous as other activities were being implemented concurrently with other activities. It was carried out from 29th March to 20th April with 11 survey days spent between this dates.

GCCP commissioned the development of an access database for storing HCC data in spring 2012 (Fig. 2). The database allows for faster data entry, safer storage and better analysis through the use of queries. The Response officer was trained in its use and maintenance.

The database is now fully functional and all survey data has been entered into it. The analysis detailed within this report was carried out using the database in conjunction with ArcGIS.

Table 1: Data collected during surveys

Year	Interview	Attack event
2010	70	105
2011	56	72
2012	60	49
	186	**226**

Summarizing all implemented survey results, we can see that there are a total of 84 potential farms in the study area. However, not all will be active in any given year or, indeed within any given winter season (for example, some farms are used temporarily for lambing). During the current survey (2012) all active farms in the area were visited. The final number of surveyed

farms was 60, compared to the 2010 (n69) and 2011 (n56) surveys. A total of 76 farms have been surveyed since the 2010 and, of these 59% were surveyed in all three surveys, 29% have been surveyed twice and 13% only once (Fig. 3).

Figure 2: *Access database navigation form*

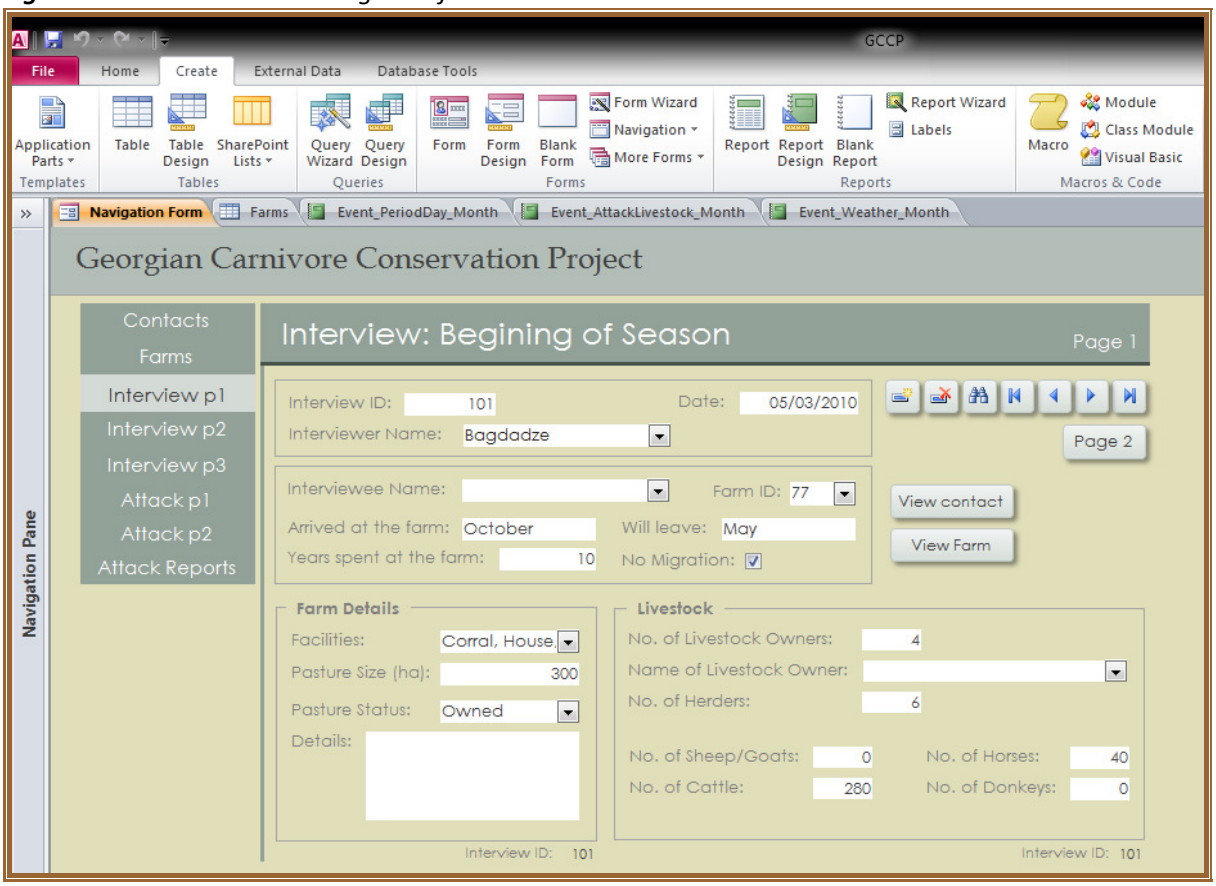
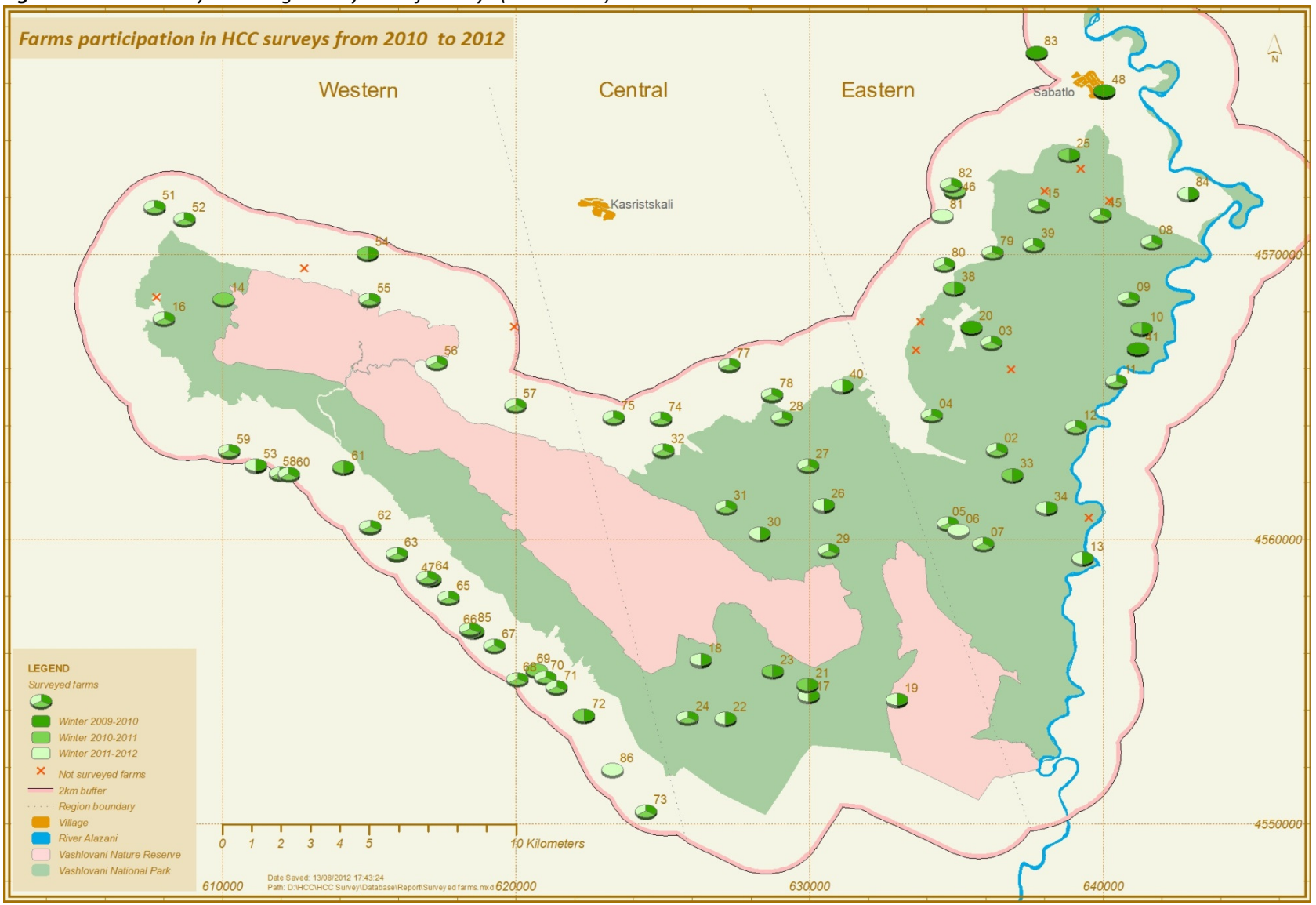


Table 2: Surveyed farms by regions in 2012

General Region	VNP	2km buffer	Sum
Western	2	23	25
Central	13	4	17
Eastern	14	4	18
	29	**31**	**60**

***Figure 3**: Farms surveyed during three years of surveys (2010-2012)*



Results & Discussion

Socio-demographic characteristics of livestock owners

The average age of respondents was 43 (range 18-81, n=60). Only 1 respondent was less than 20 years old, 45% were aged 20-39, 33% were 40-59 and 20% were 60 and older. All livestock owners were male. All respondents were from one of three districts of Kakheti region. The home regions of respondents are given in Table 3.

Table 3: Respondent's (n=60) number and percentage by living places

Akhmeta				Sagaredjo		Telavi	
Tusheti - (70 % of Akhmetians)		Pankisi - (30% of Akhmetians)					
n	%	N	%	n	%	n	%
34	57	14	23	7	12	5	8

Livestock, farm facilities and husbandry

The overall number of livestock reported was 39,131 head with an average number of 879 head per farm. Lambs are excluded here to better represent the number of sheep in the area throughout the winter period (previous surveys included lambs). With this in mind, we can see some differences amongst livestock and between surveys. In 2010 and 2011 there were 77 & 78 head of cattle per farm, respectively, whilst in 2012 the number had decreased by 19% (Table 4). However, the number of horses remained more stable, with numbers of 14 (2010), 15 (2011) and 16 (2012) heads per farm reported. Only five farms were without horses. 31 farms (51%) had 1-10 horses, 20% - 11-20, 16% had 21-40 head and only 2 farms (3%) had more (59 and 140) (Fig. 4). It is interesting to note that a farm with 140 horses (farm #13) made a business of keeping horses from other farms during the winter.

Table 4: Numbers of livestock from 60 farms within the study area

Livestock	n farms	Per farm		Total
		Mean	Range	
Sheep/Goat	41	879	70 – 3,000	36,030
Cattle	35	63	12 - 200	2,197
Horse	55	16	1 - 140	855
Donkeys	15	3	1 - 8	49
Total	**60**	**652**	**23 - 3036**	**39,131**

Figure 4: *Livestock distribution at farms in the study area*

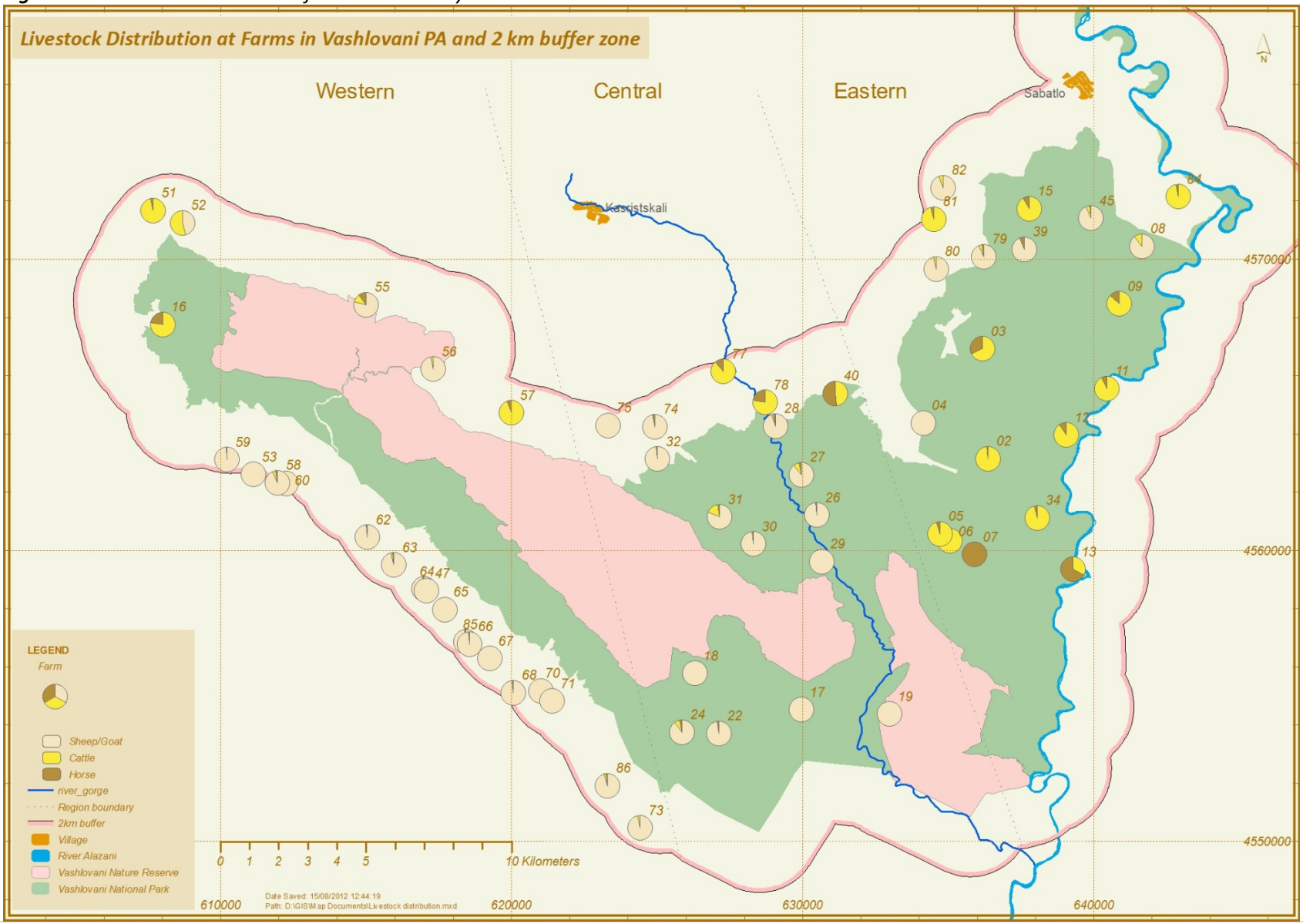


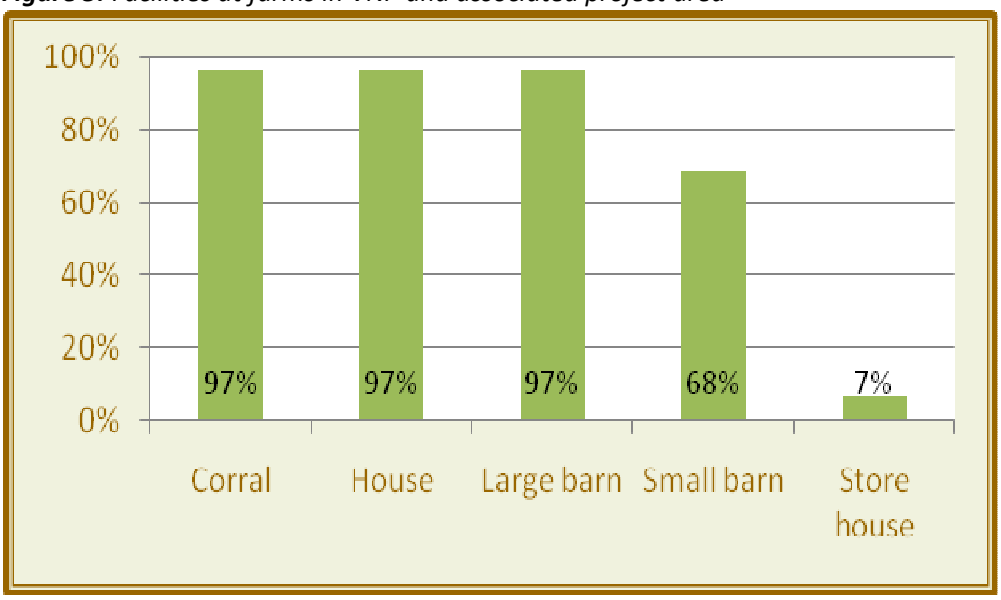
Table5: Distribution of Sheep and cattle at surveyed farms in 2012

Sheep (overall) - 41 farms (69%)		
Only sheep – 24 farms (40.5%)	Sheep/Cattle – 17 farms (29%)	Only cattle – 18 farms* (30.5%)
	Cattle (overall) - 35 farms (59%)	

*From these cattle farms, four are permanent

Average pastures size was 302ha (n=45) with only three farms having pastures smaller than 100ha. 11% of pastures were owned by livestock owners (n=54), 63% were leased and 16% rented. The types of facilities at farms (Fig. 5) varied little though there is some difference apparent in their quality and materials. Most farms have a corral, house and large barn. Small barns are mainly for lambs and they are used only at sheep farms; hence their numbers are relatively low. Corrals usually are made from wire, reed, thorn or from concrete slabs. Most sheep farms had three corrals or one divided into three sections with each used for different sheep cohorts (lambs, mothers, juveniles, males etc.). It's very usual for sheep farms to have small sleeping cabins around corrals for guarding sheep at night (Figure 7).

Figure 5: *Facilities at farms in VNP and associated project area*



The average number of persons in each farm was five (compared to six in 2010 and three in 2011) comprised of three shepherds/herders (max=12) and two livestock owners (max=5). These numbers remain the same when comparing sheep with cattle farms. The average number of sheep per person was 148 head (Range 73-200) while the average number of cattle per person was 22 (Range 10-40). Usually each person has his function at farm; some are herding the flock, others stay at the farm, cooking or looking after sick and weak animals.

Livestock began arriving at the winter pastures during the end of September and continued through to January. Generally the arrival tends to occur over a longer period than the return to summer pastures (Figure 6) because the livestock owners aim to preserve winter pastures as long as possible by delaying their arrival. To do this, they will look for temporary pastures *en route* along the Alazani valley. If they find a suitable place they will stay there until just before the onset of lambing season; if not, they will continue moving slowly, staggering the arrival of flocks in Vashlovani. In spring, when lambing season is finished all farmers will wait for news of the snow melting on the Abano pass. As the pass opens most will leave Vashlovani, giving a sharp drop in active farm numbers in May. Peak of number of active farms occurred in January, February and March (coinciding with the lambing season).

By the end of April, 2012 most flocks have left Vashlovani with only five remaining; three of these stayed for the summer (two of them are permanent farms, one stayed for this summer). Arrival and departure dates often change between years, depending on prevailing weather conditions and the condition of the grasslands.

Figure 6: *Arriving farms at winter pastures and leaving to summer pastures in 2012*

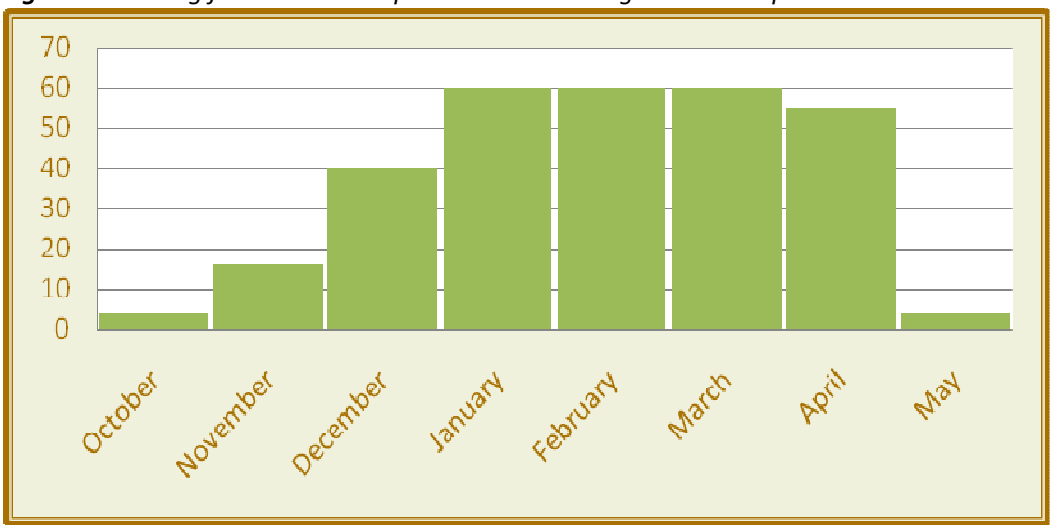


Figure 7: *Typical corral with sleeping cabin for night guarding*

Losses to predators and other causes

Disease was unusually significant in 2012 (Table 6) with 64% of respondents identifying it as the main cause of sheep-loss, compared to 41% and 56% in 2010 and 2011 respectively. Respondents were asked to provide their thoughts on general causes of loss and most equated it to bad weather and grass conditions. Looking in the broader context we can see that the situation was affected by an outbreak of foot and mouth disease (FMD) in 2011 whilst in 2012, an unusually cold winter resulted in poor milk production by ewes and a subsequent loss of lambs. Other, less common causes were also identified (n=14), including snakes and terrain (farm #17 has several "pseudo-karsts in its territory into which sheep fall and are lost, Figure 8).

Figure 8: *Pseudo-karst hole in Kumuro area*

Table 6: *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			No Problem
	1	**2**	**3**	
Disease	**34**	18	0	1
Predator	19	**34**	0	0
Theft	0	0	5	48
Other	0	0	14	39

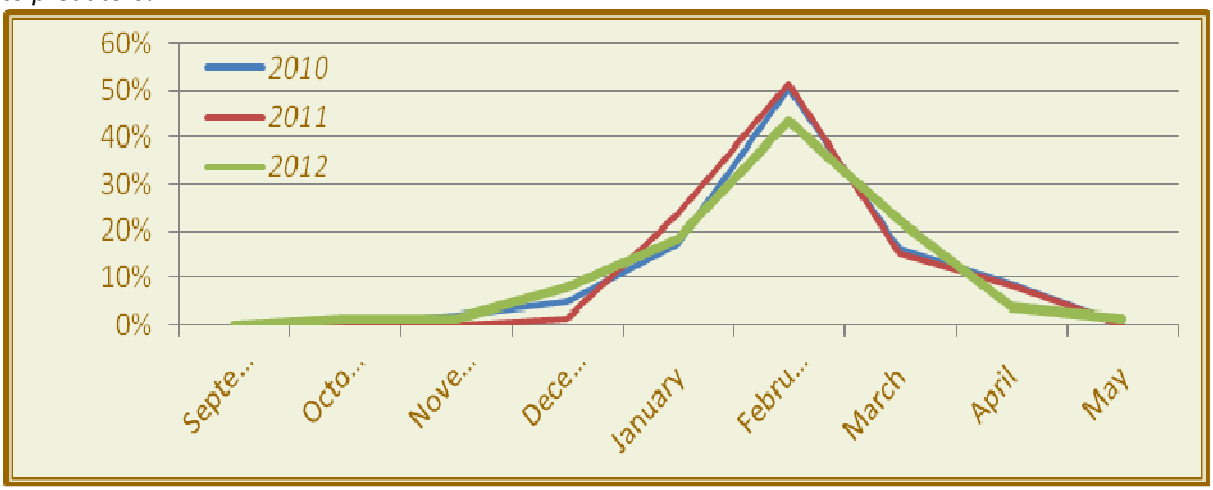
When livestock owners and shepherds were asked whether predators were a big problem, 75% said yes; the highest level across all surveys (Table 7) and one would expect this to be reflected in the levels of damage actually reported each year. However, this is not the case with 2012 actually seeing a decrease in the percentages of livestock lost to predators (1.9% in 2011 against 1.5% in 2012). It may be that respondents are tending to blame predators for increased losses when in reality, losses are caused by more mundane reasons such as bad weather and grass conditions.

Table 7: Livestock owners' responses on question: 'Are predators a big problem for you?' in each survey

Answer	2009-2010	2010-2011	2011-2012	Overall
No	21.43%	21.82%	13.46%	19.21%
Partly	27.14%	18.18%	11.54%	19.77%
Yes	51.43%	60.00%	75.00%	61.02%

As in previous surveys, February appears to have seen a peak in wolf attacks (Figure 9). In 2011 (text box) a high number of attacks in February was linked, by respondents, to the onset of wolf breeding season (though there was often some confusion of when the breeding season actually starts).

Figure 9: *Livestock owners' responses on question: 'In which month(s) do you tend to lose most livestock to predators?'*

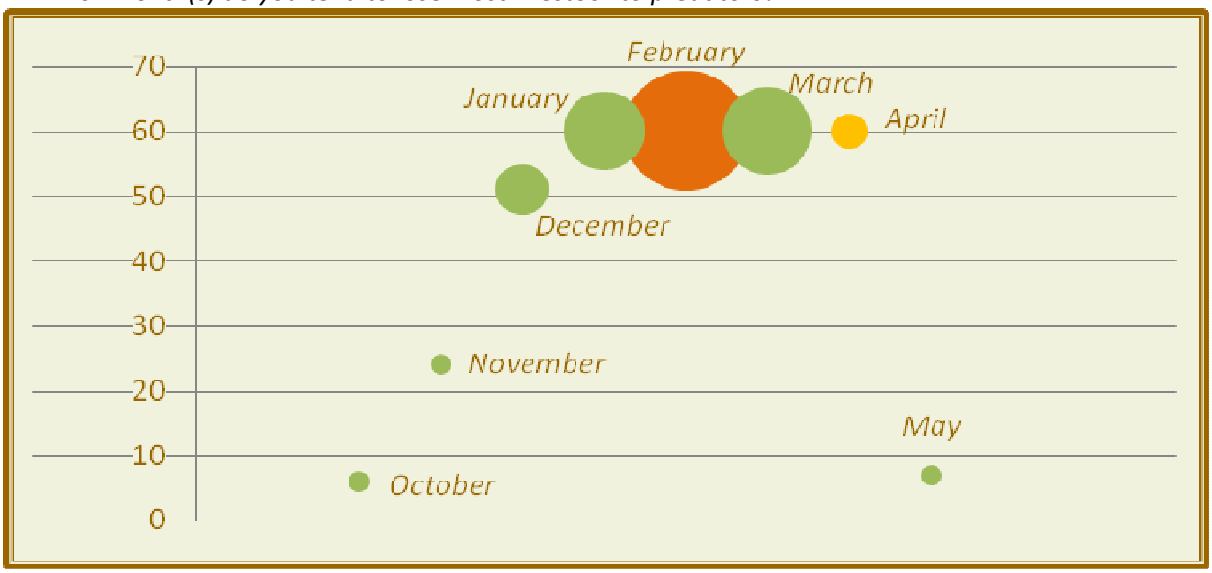


"As in the first survey, most respondents considered February as the peak period for wolfattacks and this was, in most cases, linked to the wolf breeding season. The alternative explanation, that the increase in attacks may be linked to the onset of lambing, does not seem to register. When comparing the number of active farms with the perceived frequency of wolf attacks (Figure 2) there does not appear to be a direct relation between the two. However, the apparent time-lag between maximum farm occupation and the sharp increase in wolf attacks may simply reflect a natural time lag between sheep arriving in the area and resident wolves capitalizing on the seasonal food supply. It should also be noted that the data recorded for wolf attacks is not wholly reliable as it is collected after the fact and relies on the memory of individual respondents. Once the HCCRT is established and wolf attack data can be collected as it happens, such patterns should become clearer."

2nd survey report

One hypothesis for a peak in February was that this is when the most farms are active (i.e. when the highest numbers of sheep are present). However, if we compare the number of active farms by month we can see that this does not necessarily bear out as the number of active farms is fairly stable from January through to April whilst perceived levels of attack very widely over the same period (Figure 10).

Figure 10: *Correlation of number of active farms in 2012 and Livestock owners' responses on question: 'In which month(s) do you tend to lose most livestock to predators?'*



The most likely explanation for this February peak remains, then, the onset of lambing season and the underlying cause is likely to be more complex than wolves simply taking lambs. The ewes that give birth to the lambs are also in a state of physical stress as fat reserves become low and body condition worsens. In this way, sheep as well as lambs are more likely to fall victim to wolves.

"The number of cattle identified as killed in the first survey was only 49 (7.6%), less than in 2011, which was 102 (11.4%) killed. This may be the first indication that as sheep leave the area, resident wolves are switching to cattle which remain on-site year round. This hypothesis is supported by closer examination of the first survey results. Of the 14 attacks on cattle, five (35%) occurred in towards the end of the season, April and May. This possible pattern warrants further investigation."

2nd survey report

Overall damage caused by predators in the winter of 2011-12 was 1.5% (table 8), the same as in winter 2009-10 and less than 2010-11 (1.9%). Whilst this may be a result of an actual fluctuation in wolf attacks between years, it may also be due simply to variations in the time the survey was carried out. The later in the season it is implemented, the more time for attacks to occur. The 2nd survey was implemented one and half month later than the baseline survey.

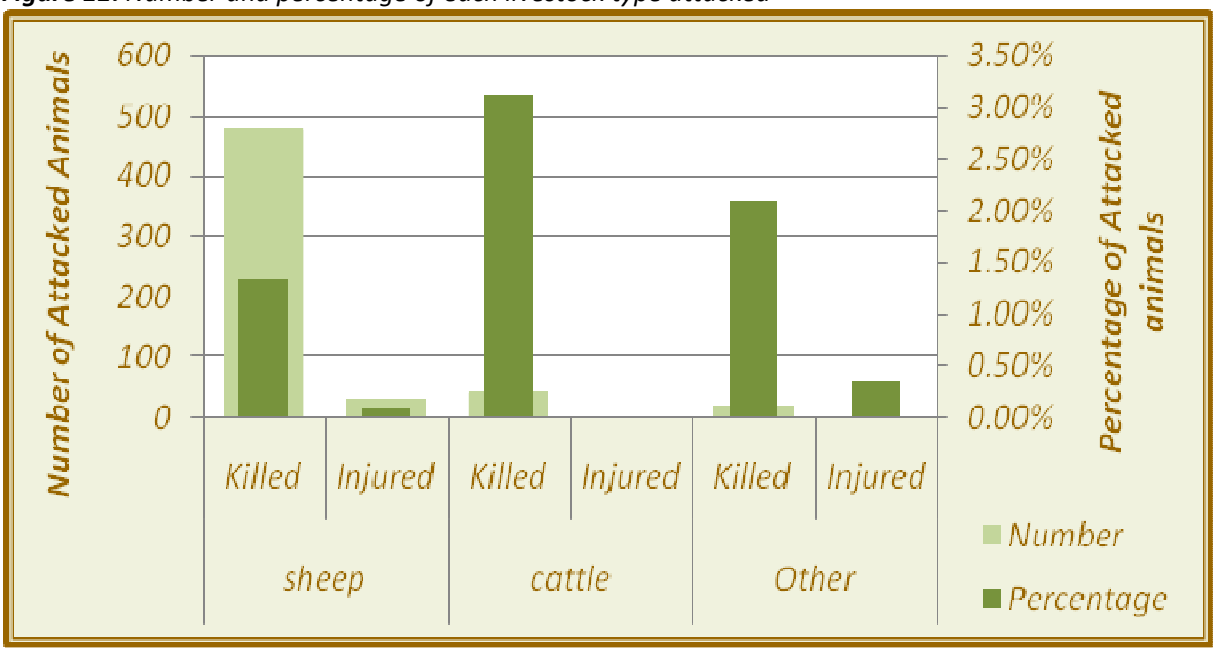
The timing of the survey may also be affecting the numbers of each livestock type being attacked. During the 2011 survey, farmers reported unusually high numbers of cattle being attacked (11.7% in 2011 compared to 7.6% and 7% in 2010 and 2012 respectively). The 2011 survey was carried out later than both the baseline and the current survey, as sheep farms prepared to move their livestock back to the highlands. It is possible that, during this time, wolves are switching their focus to cattle (a hypothesis being explored elsewhere) resulting in a sudden surge of cattle attacks.

Table 8: Damaged livestock during 2011-12 winter season

Livestock attacked		Farms affected		Damage per farm			Total damage	
		n	%	mean	Max	%	n	%
Sheep	Killed	34	56.7	14.1	55	**1.33%**	480	83%
	Injured	16	26.7	2	8	0.09%	32	6%
Cattle	Killed	14	23.3	3.1	7	1.96%	43	7%
	Injured	0	0.0	0	0	0.00%	0	0%
Other	Killed	12	20.0	1.6	5	2.10%	19	3%
	Injured	2	3.3	1.5	2	0.33%	3	1%
Total	Killed	41	68.3	13.2	-	1.4%	542	94%
	Injured	18	30.0	1.9	-	0.1%	35	6%
	No damage	15	25.0	-	-	-	-	-

Figure 11 shows the relation between the number of each livestock species attacked and the percentage of the total number killed for each species and shows us that, even though relatively few cows are killed each year, they represent a bigger proportion of a farmers stock. Subsequently, farmers raising cattle or horses will lose a larger portion of their income for each animal lost to predation. This might affect their attitude towards large carnivores.

Figure 11: *Number and percentage of each livestock type attacked*



Almost half of respondents thought that predation on livestock was "less than usual", a marked change from previous surveys where the tendency was for respondents to report elevated levels of depredation (Table 9). If we assume that, when answering this question, respondents will compare current levels of loss to that of the previous year, it is likely that their response reflects actual, rather than perceived, levels of damage. Indeed, by including levels of damage from each survey year, table nine does appear to show that livestock owners' responses describe the reality well. Furthermore, if we also project back, we would conclude that losses during the 2008-09 winter (prior to our baseline survey) were even less. And that the 2010-11 levels actually represent a, possibly anomalous, peak in attack levels.

Table 9: Dynamics of predation according to livestock owners

Livestock damage	2009-2010	2010-2011	2011-2012	Average
Less than usual	35.29%	24.07%	47.27%	35.63%
About average	15.69%	25.93%	23.64%	21.88%
More than usual	49.02%	50.00%	29.09%	42.50%
Damage level	1.5%	1.9%	1.5%	

On the other hand, comparing this data to livestock owners' responses to the question "In general, are predators a big problem for you?" (Table 10) we can see that the number of respondents that answered "yes" reached a peak in 2012 (75%).

Table 10: Responses to the questions "Is [the number of livestock lost this year] less, the same or more than usual?" and are predators a big problem for you?" across all surveys

Row Labels	Winter 2009-2010	Winter 2010-2011	Winter 2011-2012
No	7.84%	22.22%	11.76%
About average	0.00%	9.26%	1.96%
Less than usual	7.84%	11.11%	9.80%
More than usual	0.00%	1.85%	0.00%
Partly	25.49%	18.52%	11.76%
About average	3.92%	7.41%	3.92%
Less than usual	13.73%	7.41%	5.88%
More than usual	7.84%	3.70%	1.96%
Yes	66.67%	59.26%	76.47%
About average	11.76%	9.26%	19.61%
Less than usual	13.73%	5.56%	27.45%
More than usual	41.18%	44.44%	29.41%

48% of respondents (n=21) perceive the loss of livestock to predators as having a "big" impact on their income. Using queries in the Access database and formulas in Excel for comparing responses about livestock loss and the number of attacked animals we can say that the approximate borderline between a loss that is perceived as "big" and one that is seen as "medium" is around 10 sheep.

Figure 12: *Livestock owners' responses to the question: "For your income this loss is…"*

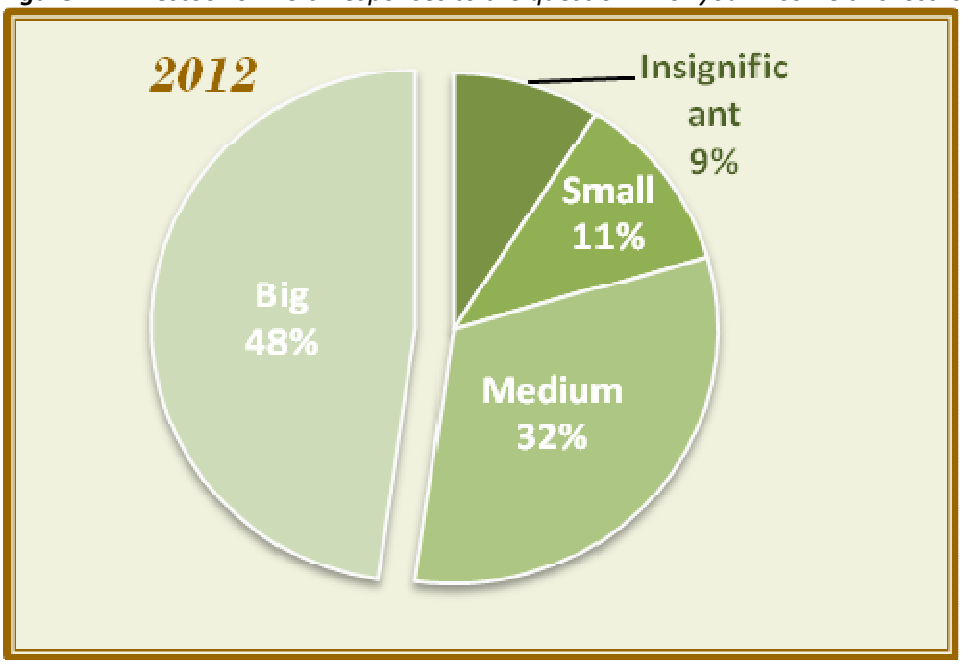


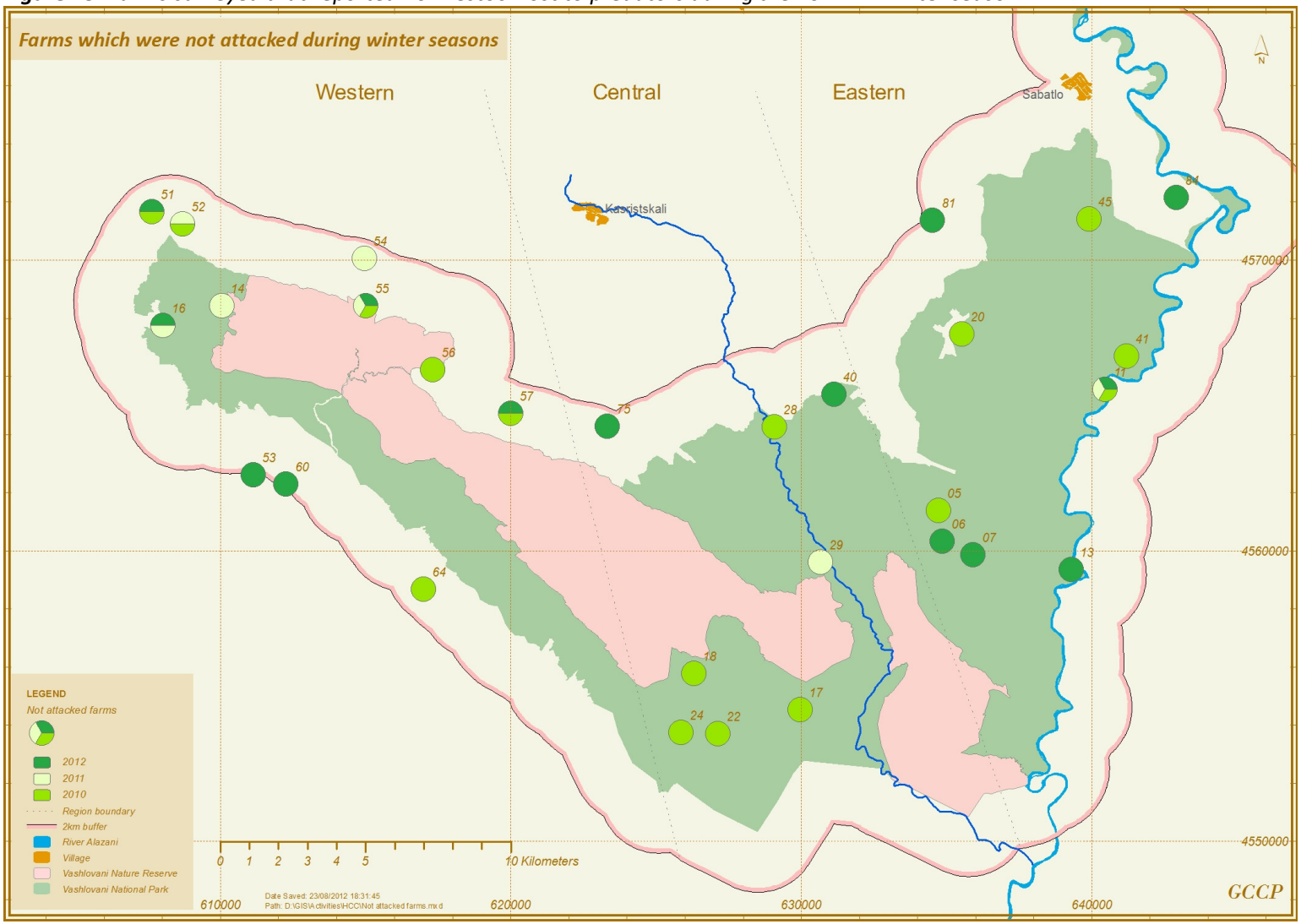
Table 11: Livestock owners' responses on question: "For your income this loss is" across all surveys

Economic loss*	2009-2010	2010-2011	2011-2012**	Average
Insignificant	25.00%	9.80%	9.09%	14.97%
Small	9.62%	5.88%	11.36%	8.84%
Medium	19.23%	19.61%	31.82%	23.13%
Big	46.15%	64.71%	47.73%	53.06%
	100.00%	**100.00%**	**100.00%**	**100.00%**

** During the first and second surveys weused an additional category "very big". This was dropped for the current survey and so results here are pooled where appropriate.*

During the current season, 75% of surveyed farms were attacked by predators (compared to 89% and 76.8% in 2010 and 2011 respectively) with a total of 16 farms suffering no attacks at all. Whilst there seems to be a certain numerical stability here, by looking at the spatial characteristics of the attacks it is not so clear. In 2011, most of the HCC-free farms are located in one region whilst those from the current season are more widely dispersed (Fig. 13).

Figure 13: *Farms surveyed that reported no livestock lost to predators during the 2011-12 winter season*



The wolf was clearly regarded as the main problematic animal in the current survey. 96% of respondents (n=54) identified the wolf as the most problematic predator. Unusually, the two respondents that ranked the wolf in second place considered the lynx to be the most important predator. (Table 12 & Fig. 14) Generally, the bear was ranked as the second most important predator whilst the jackal was considered as the least problematic (some respondents explained that it only takes lambs).

Questions pertaining to the attitudes of livestock owners towards carnivores were removed from the second HCC survey (2011) as the period of time that had passed since the baseline survey (2010) was deemed too short for this to have changed. Subsequently, there is no data for this from the 2011 survey. Comparing data between the current survey and the baseline, however, we see that the main difference is in the responses given for the bear. In 2010 only two respondents ranked it all (with rankings of second and third) whilst 2012 saw the bear ranked by 37 respondents (by 29 as second and 8 as third). The latter results are fairly interesting when one considers that no attacks by bears were reported.

Table 12: Farmer rankings of predators in terms of their impact on livestock

Predator Species	Sum of owners' scores ranking predator species from most (1) to least (4) problematic				No Problem
	1	**2**	**3**	**4**	
Bear	0	**29**	8	1	16
Jackal	0	8	10	4	32
Lynx	2	5	4	2	41
Wolf	**52**	2	0	0	0
Other	0	0	0	0	54

Figure 14: *Farmer rankings of predators in terms of their impact on livestock (1 = most and 4 = least problematic)*

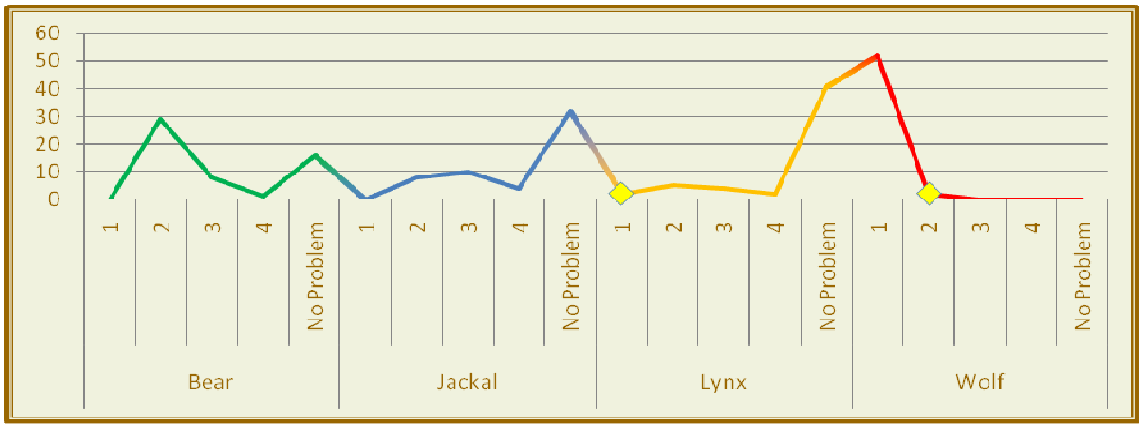
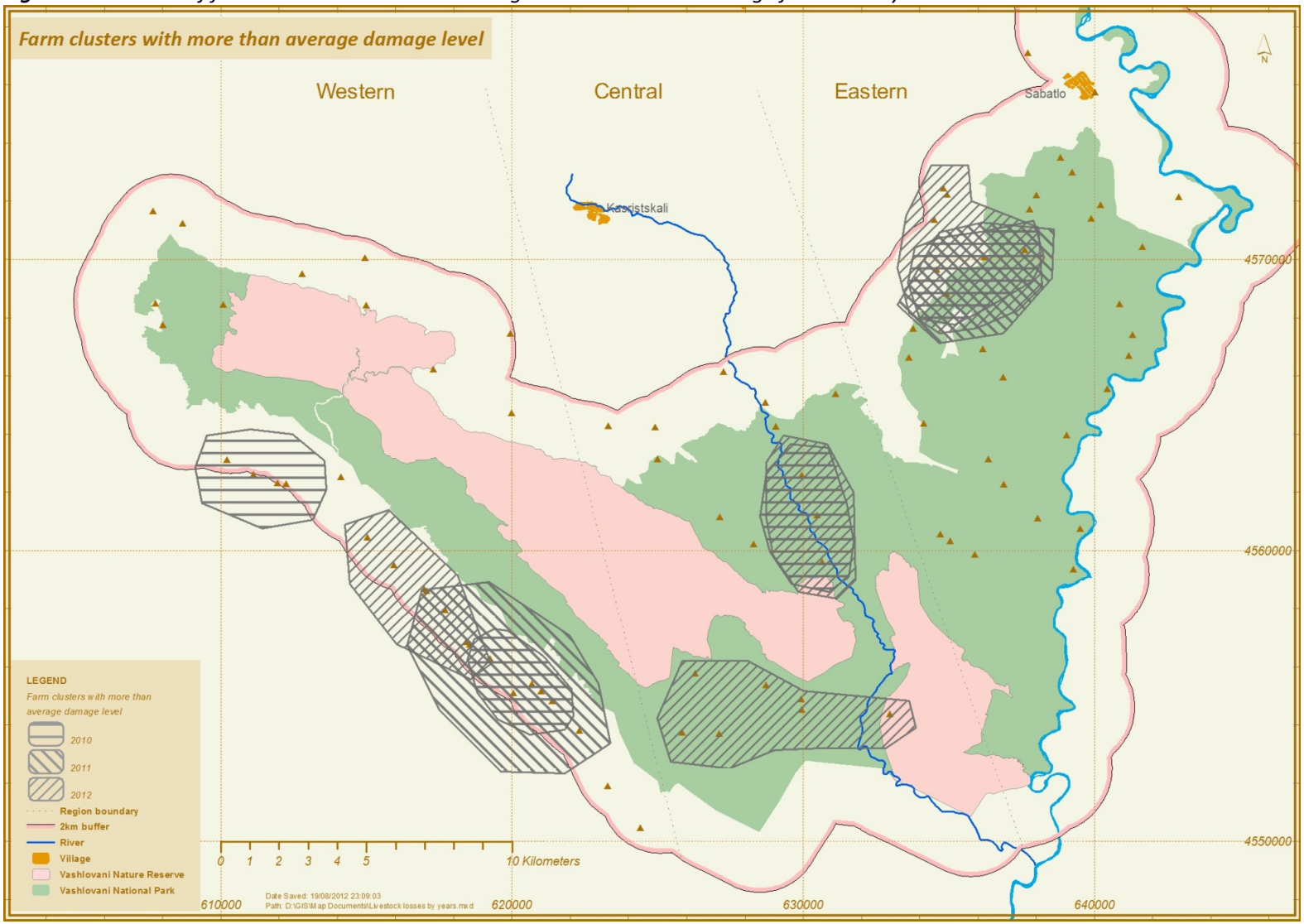


Figure 15: *Clusters of farms that have received damage levels above the average for the study area*



Details of attacks

Respondents provided details of 49 attacks in which a total of 74 stock animals were attacked (61 killed and 18 injured). As in previous surveys each event involved only one stock animal type. Sheep were the most attacked animal. A total of five attacks on cattle were reported with six animals killed and one injured. Eight attacks on horses and donkeys were described, with one animal killed in each case. Only three from all reported attacks were without victims.

Table 13: *Predator attacks on livestock (n=49) in winter 2011/12, as reported by livestock owners and herders at 39 farms in and around VNP during semi-structured interviews*

Livestock attacked		Attacks		Damage per Attack		Total damage	
		n	%	mean*	max	n	%
Sheep	Killed	36	73.5%	1.31	6	47	64%
	Injured			0.33	1	12	16%
Cattle	Killed	5	10.2%	1.2	2	6	8%
	Injured			0.2	1	1	1%
Other	Killed	8	16.3%	1	1	8	11%
	Injured			0	1	0	0%
Total	Killed	42	86%	0.9	6	61	82%
	Injured	13	27%	0.3	1	13	18%
	No damage	3	6%	-	-	-	-

** This figures are very approximate because respondents often do not provide failed attacked. They usually describe attacks when they loss stock*

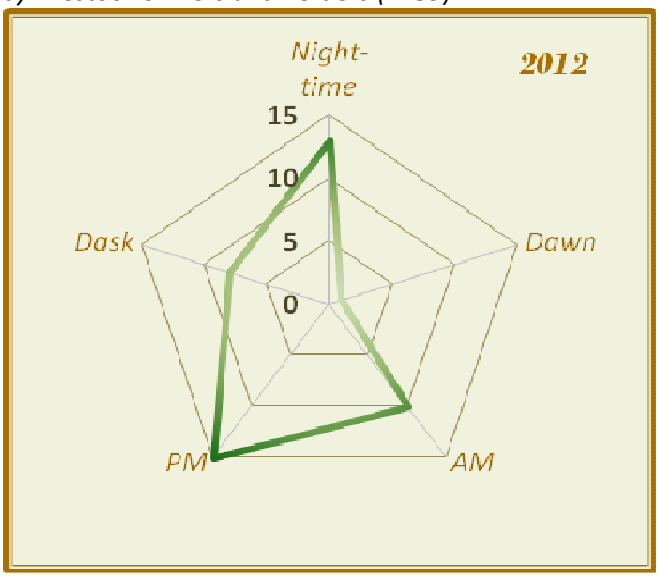
The average size of flocks suffering from wolf attacks was 243 head (min=1, max=800). Small flocks (<100) tend only to occur at or near the farm as they are comprised of animals that are too sick or weak to go to pasture and this is reflected here as 86% of attacks on these flocks occurred near the farm.

Wolves were reported as responsible for attacks on livestock in 90% of all cases (the remaining 10% detail attacks where the culprit was not identified). However, in 27% of these, the predator was not actually seen.

The average number of wolves involved in a single attack was 1-2 (max=6). When looking at the numbers relating specifically to attacks on sheep and goats, wolves were visually identified as the culprits in 84% of cases (n=30). Only 20% of attacks on all other stock types (n=15) could be visually attributed to wolves (n=1,3,3) but this may be more a reflection of the fact that sheep are more likely to be accompanied by shepherds than other animals.

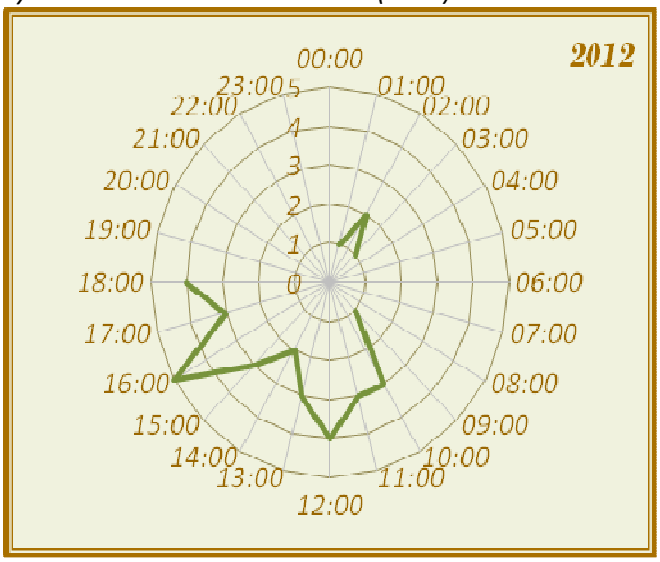
53% of attacks occurred during the day (from 10:00 to 16:00) and 28% at night (Figure 16) with only one attack occurring at dawn, when the shepherds are waking up and preparing to leave the farm.

Figure 16: *Period of day at which predators attacked livestock in and around VNP during winter 2011/12 according to reports by livestock owners and herders (n=39)*



The peak time for attacks was at 16:00 but this is based on a relatively small sample where precise times could be provided (n=15) (Figure 17).

Figure 17: *Time of day at which predators attacks occurred in and around VNP during winter 2011/12 based on reports by livestock owners and herders (n=39)*



Most attacks occurred when the flock was grazing (Figure 18) which makes sense when one considers that this is where they spend more than half of their time(Flocks leave farms on dawn (approximately at 08:00) and stay on pastures till dusk, sometimes till night-time (approximately till 8-9 o'clock), so they spend 12-13 hours at pasture). If we compare it to another half time, which they spend at farm inside corral or barn where the flocks are more protected than at pastures where the typically larger numbers of sheep within grazing flocks as opposed to flocks at the farm may also make this a more attractive prospect for a wolf, whilst the difficulty of monitoring large, dispersed flocks at pasture means opportunities for picking off stray animals may present themselves. This, compared to the smaller area of flatter terrain found around farms again makes the pasture a better place for predation.

As in previous surveys, the weather conditions were clear during most attacks (47%) with only 20% of attacks taking place during cloudy weather and 16% in snow. Generally, in order to be able to identify any relationship between attack events and weather conditions it is necessary to have at least approximate data on the number of clear or rainy days during the season (Table 14).

Figure 18: *Livestock activities during attacks*

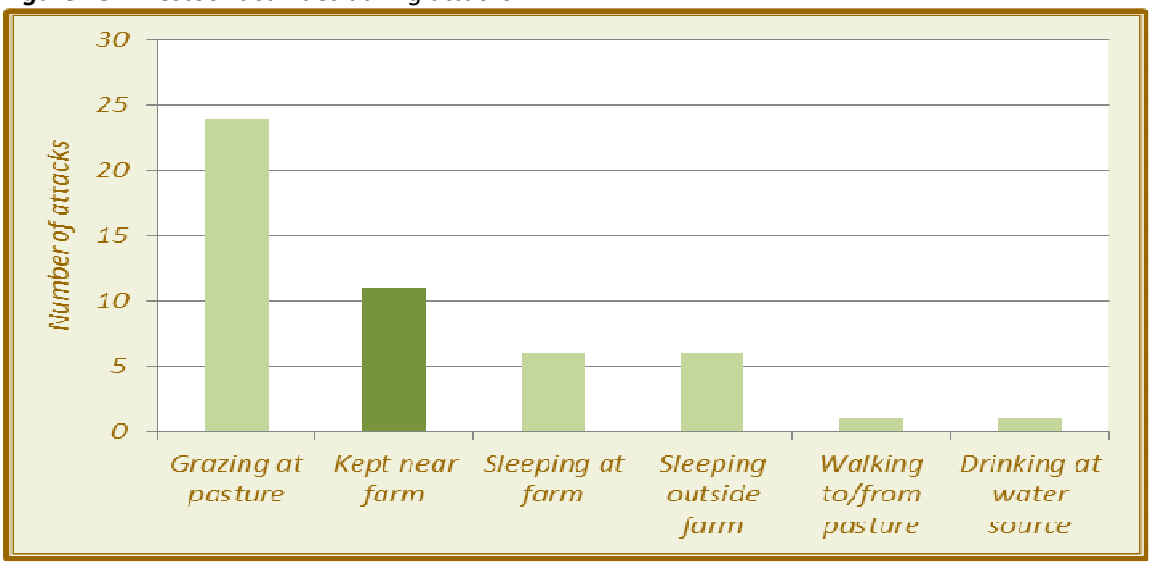


Table 14*: General weather conditions for each year surveyed*

Weather	2009-2010	2010-2011	2011-2012	Average
Clear	54.90%	65.22%	51.11%	57.41%
Cloudy	28.43%	11.59%	22.22%	21.76%
Rain	10.78%	18.84%	0.00%	11.11%
Snow	3.92%	1.45%	17.78%	6.02%
Mist/Fog	1.96%	2.90%	2.22%	2.31%
Wind	0.00%	0.00%	6.67%	1.39%
	100.00%	**100.00%**	**100.00%**	**100.00%**

In 2010 there were more events when dogs and shepherds were present than in subsequent years. However, this may be more a product of how the interview was delivered and responses recorded. Sometimes, shepherds report that they were at attack place even if, for example they were inside the farmhouse, 200-300 m away. In 2012 such cases were recorded as not present. In this way, some of the records in the database show shepherds/dogs as not present whilst a precise figure for the number of wolves involved is given. This is important for analysis. If, for example, we want to investigate when and why wolves attack sheep, we would need an exact picture of the event. If we record a shepherd as present during an attack when, in fact, he was inside the farm and invisible to the wolf, we will falsely assume that the wolf actively ignored the shepherd, attacking the livestock anyway. Referring to tables 15 a & b, we can see that, from the 2011 and 2012 surveys, both shepherds and dogs were absent when wolves attacked stock animals other than sheep.

The average number of dogs present at any attack was 3-4 (excluding attacks without dogs) and the most common response by the dogs to a wolf attack was to bark and chase. Dogs actually fought the wolves during three (16%) events and one of these ended with the dogs killing the wolf. It is interesting to note that of these cases, two involved dogs from one farm (#74); also one of the participants in the GCCP LGD puppy trial.

Table 15a: *Presence/absence of dogs during attacks*

		2010	2011	2012	Overall
Events with dogs present		59	36	18	113
Events with dogs absent		46	36	31	113
Dogs present during attack (sheep)	Yes	37	28	16	81
	No	31	13	19	63
Dogs present during attack (cattle, horse, donkey)	Yes	18	4	1	23
	No	15	22	12	49

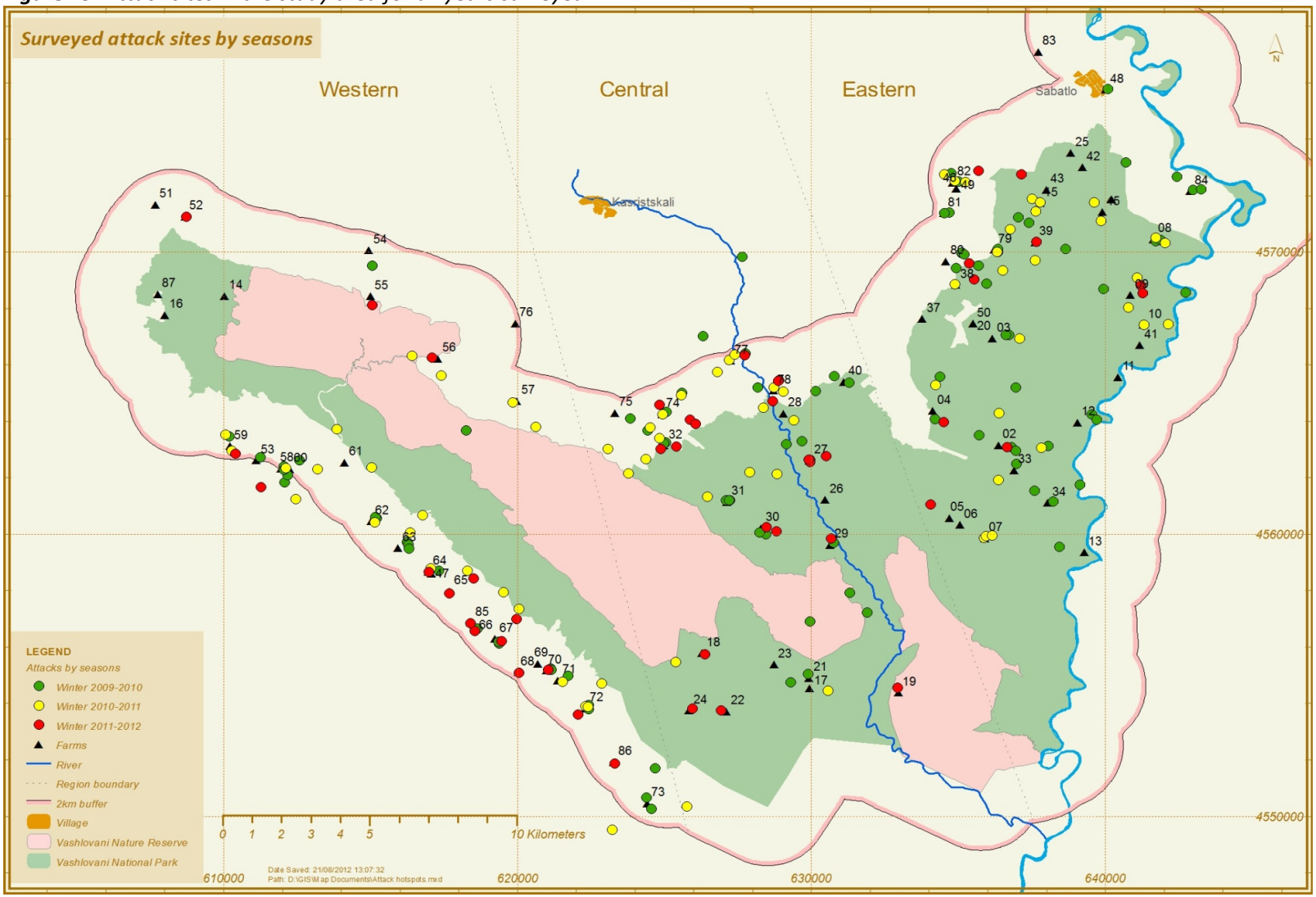
The number of shepherds present at an attack event was, in most cases, only one with only one occasion reported where two shepherds reported seeing the wolf attack (on this occasion, there were also six dogs present and the wolves were unsuccessful). The most common response by a resident shepherd was to shout at the predator. Two reported that they actually chased the wolves away whilst one admitted that he did nothing.

Table 15b: *Presence/absence of shepherds' during attacks*

		2010	2011	2012	Overall
Events with shepherd present		79	37	22	138
Events with shepherd absent		26	35	27	88
Shepherd present during attack (sheep)	Yes	54	32	21	107
	No	14	9	14	37
Shepherd present during attack (cattle, horse, donkey)	Yes	21	2	0	23
	No	12	24	13	49

Attempts to identify attack hotspots, by combining data from all years (Fig. 19) reveal that concentrations of attack sites tend to occur around farms and are either the result of nighttime attacks, when livestock were sleeping, or attacks on sick animals kept back from the pastures. These attacks account for 35% of the total. No clustering could be identified that coincide with pasture-based events but this may become clearer with more data.

Figure 19: *Attack sites in the study area for all years surveyed*



Recommendations for future surveys

Inevitably when implementing surveys and monitoring regimes, problems and issues with the methodology will emerge. If we apply adaptive management, this should lead to recommendations for improving how we collect, group and analyzing data. In the content of the current monitoring programme, several recommendations can be made:

1. Interviews should be implemented twice a year;

    a. when livestock begin to arrive at the winter pastures in order to gauge farm and livestock demographics and to provide an opportunity for the HCCRT to remind livestock owners and shepherds about the team, emphasizing their role as investigators of HCC events.

    b. at the end of the season, before livestock begins to leave but as late as possible, to collect information about losses, owners' perceptions, and additional (see below) attack events,

In addition to the split-interview survey, and during winter season, the HCCRT will aim to carry out at least two visits to each farm to collect attack data. This will provide some insurance against farmers not reporting wolf attacks to the team, giving more accurate attack details overall. Between this visits RT will be occupied with entering data, maintain Access and GIS databases, react on received information about attacks (if will have any) and other activities. This scheme will allow us to collect as many data as possible as well as making analysis more accurate.

The following changes to the respective datasheets would also be required:

<u>Interview Datasheet (Appendix I)</u>

1. Q5 is age of respondent, should be year of birth.

2. Q6 asks home region of respondent better to have home region and village. Tushetians and Chechens both are from Akhmeta region, knowing home village we will identify their nationality which might be useful in some cases.

<u>Datasheet for livestock predation event Appendix II)</u>

1. Q9 Flock activity during attack – should be added "kept near farm" because it seems 2nd common activity of flock when they were attacked.

Appendix I:

Datasheet for livestock owner interviews

1. Interview #:_____ 2. Date:_____ 3. Interviewer:

_____

4. Name of interviewee: _____ 5. Age: _____

6. Home district: _____ 7. Contact details:

_____

Farm details

8. Farm number: _____ [according to map] 9: Livestock

Owner(s):_____

_____

_____

10. Buildings and facilities at farm (also write a brief description, in the remarks section, taking note of the general condition and maintenance of each)*:*

house *large barn* *smaller barn(s) for lambs*

corral (give details) _____ *other*

_____

11. Size of the pasture: _____ha *owned* *leased* *rented*

12. How many livestock owners: _____ and herders: _____ are at the farm?

13. When did you arrive here? _____ 14. When do you expect to leave?

_____

15. For how many years have you used the same farm? _____

Livestock numbers

16. Sheep/Goats*:*_____ 17. Cattle*:*_____ 18. Horses: _____ 19. Donkeys: _____

Preventive measures

20. What measures do you use to protect your livestock from predators? *rank in order of importance:*

dogs ( ) *sleep with flock ( )* *scare devices ( )* *shooting ( )*

avoid risky places ( ) *flock in barn ( )* *patrols ( )* *remove carcass ( )*

other _____

21. Number of LGDs: _____ of which adults (>1 yr): _____ juveniles (<1 yr): _____

22. Are they: *Caucasian* *Georgian* *mixed* *other* _____

23. Do you think you have good dogs? *yes* *no* *partly*

*explanation:*_____

_____

24. How do you raise them to ensure that they will protect your sheep?

_____

_____

_____

Details of attacks

25. Have you had any problems with predators this winter 2011/2012?

26. How many head of livestock and what type have you lost since arriving at Vashlovani?

Sheep: killed____ injured_____

Cattle: killed____ injured_____

Other _____: killed____ injured_____

27. Is this: *less than usual* *about average* *more than usual?*

28. For your income is this loss: *big* *medium* *small* *insignificant*?

29. What happens to the killed animals?_____

Losses to predators

30. In general are predators a big problem for you? *yes* *no* *partly*

31. Are the problems worse in winter pastures, in summer pastures or during the migration?

Circle applicable: w*inter* *summer* *migration*

32. Do you lose more money because of predation or because of disease or other causes?

Rank by importance: *disease* _____ *predation* _____ *theft* _____

other ____(*specify*

_____)

33. Which is the most troublesome predator?

Rank in order of importance: *bear* _____ *jackal* _____ *lynx* _____ *wolf* _____

*other*___ (*specify*

_____)

34. In which month(s) do you tend to lose most stock to predators?

_____

Remarks

Appendix II:

Datasheet for livestock predation event (ID_____)

1. Interviewer:_____ 2. Farm #: ____ 3. Name of complainant: _____

4. Contact details: _____ 5: Livestock Owner(s):_____

_____

_____

Details of attack

6. Date of attack: _____ 7. GPS attack site: _____

_____

8. Time of attack: *dawn* *am* *pm* *dusk* *night-time*

approx. time if known _____

9. Activity of flock immediately before the attack:

grazing on pasture *drinking at water source* *sleeping at farm*

resting on pasture *walking to/from pasture* *other:*

_____

_____

_____

10. Weather at time of attack*:* *clear* *cloudy* *mist/fog* *rain* *snow*

other:

_____

11. Number of: s*heep:* *killed* ____ *injured* ____ *in flock* _____

lambs *killed* ____ *injured* ____ *in flock* _____

cattle: *killed* ____ *injured* ____ *in herd* _____

calves *killed* ____ *injured* ____ *in herd* _____

other _____*:* *killed* ____ *injured* ____ *total* _____

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

13. Dogs present: *yes (if so, how many____)* *no*

14. Dog behaviour toward predator*:*

no reaction *bark* *chase* *bite/contact*

run away *other:*

_____

15. Herder/owner present: *yes (if yes, how many____)* *no*

16. Herder/owner's behaviour toward predator*:* *no reaction* *shout* *chase*

shoot

*other*_____

_____

17. What will you do with the killed/injured animals from this attack?

left at site ( ) disposed of (details)

_____

fed to dogs ( ) other

*(details)*_____

18. Distance of attack site to nearest: tree cover: ____ m. ravine: ____ m

farm: ____ m. water source: ____ m.

19. Degree to which attack site is overgrown with bushes/trees*:*

0% *1–10%* *11–25%* *26–50%*

>50%

20. Was an assessment made of the carcass? *Yes* *no* If yes, what was the conclusion *(continue on separate sheet if necessary)*:

_____

_____

_____

Remarks/Sketches