BEST PRACTICE ACTIONS FOR WOLF CONSERVATION IN MEDITERRANEAN-TYPE AREAS

Action A.3

Ex-ante survey of damages suffered in the Portuguese project areas

Final Report

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1. State of the Art

The project area has low or sporadic presence of Iberian wolf (*Canis lupus signatus*) or is being recolonized by the species, after many year of absence. The wolf presence in areas where it had disappeared for a long period of time has a high potential for conflicts with human activities in rural areas, particularly with livestock husbandry. In such areas, livestock owners and shepherds have lost the habit of protecting their animals, thus making them highly vulnerable to predation. The extent and intensity of conflicts between wolf and livestock raising activities gives an indication of the intensity of threats to the expansion of the wolf population, and guides the application of prevention measures in the future. The collection of such data was an essential starting point, designed to be integrated with existing information.

1.1. Wolf distribution

One of the primary causes behind the persecution of large carnivores, like the wolf, is the damage they cause on livestock (Boitani 2000, Treves & Karanth 2003). This persecution was an intense phenomenon, becoming part of the official policy, and reached high levels in some periods of time and regions in Portugal (Petrucci-Fonseca 1990). Wolf hunting of adult wolves and the destruction of litters was a common practice, deeply rooted in the pastoral communities. In some mountainous regions it implied a great effort (e.g. wolf drives involving a hunting party of large numbers of villagers, who would steer wolves to pit-falls) (Álvares *et al*. 2011).

Since the 19th century, the use of poison, like strychnine, became widespread, decreasing the effort needed and increasing the killing rate (Álvares 2003). As a consequence, since the 1970s, wolves started disappearing from the South and West of the country (Petrucci-Fonseca 1990); the extermination was only curtailed by the implementation of the wolf protection law, in 1988.

Currently, the wolf is limited to the North and Central regions of the country, corresponding to 20% of its original distribution, which used to include the entire country. The population, estimated around 300 wolves, is divided in two nuclei by the Douro River, which constitutes a natural barrier. The North nucleus is larger and more stable, being in contact with the Spanish wolf population, while the nucleus South of the Douro River is smaller, fragmented and isolated from the rest of the Iberian wolf population, being considered highly threatened (Grilo *et al*. 2002a; Pimenta *et al.* 2005). According to the last national survey, conducted in 2002/2003, in the latter nucleus 9 packs were detected, with 6 packs confirmed and the 3

eastern packs considered probable (Pimenta *et al.* 2005). Two of these, in the regions of Guarda (Jarmelo) and Sabugal, have their home range inside the MedWolf Project study area. More recently, in the MedWolf Project, during the wolf survey developed in 2013 by Grupo Lobo in action A2, another pack has been identified in the North of the study area, in the Almeida region. The estimated densities ranged from 0.6 to 1.4 wolves/100 km^2, similar to the ones estimated for the entire nucleus South of the Douro River (0.5 to 1.3 wolves/100 km^2) (Pimenta *et al.* 2005).

1.2. Wolf diet

The dependence of the wolf on domestic animals is almost obligatory due to the lack of wild prey (ungulates), hunted almost to extinction in most of the country, and replaced by livestock. Being an opportunistic predator the wolf preys on what is available - livestock that occurs in high densities and is more vulnerable (most livestock breeds have lost their anti-predatory behaviours and herds are often insufficiently protected) than wild ungulates. Several studies confirm this dependency, revealing that in some regions the percentage of domestic prey in the wolf's diet is very high, and the opportunistic predatory behaviour of wolves, with the main prey changing according to local densities. For instance, in the Northern nucleus, goats or cows and horses may represent almost 90% of the diet of some packs (Álvares 1995, Carreira & Petrucci-Fonseca 2000), while in the nucleus South of the Douro River, domestic ungulates reach 82% (Grilo *et al.* 2002b). In this nucleus it is also common for wolves to feed on carrion (carcasses of cows, pigs, chicken or rabbits), dumped in farms, revealing the adaptability of the species (Roque *et al.* 2005).

Throughout the year the wolf diet will also depend on the seasonal fluctuations of prey density and vulnerability (e.g. breeding season) (Álvares 2011).

Nevertheless, when wild prey densities are higher, like in the Northeast of Portugal, where red deer (*Cervus elaphus*) reaches densities of 4.7/km^2 (Santos 2009), wolves may incorporate them in more than 60% of their diet (Pimenta 1998). Other studies also reveal that even slight increases in the density of wild prey, are accompanied by an increase in their occurrence in the wolf's diet and a reduction in the number of damages on livestock (Álvares 2011).

In the MedWolf study area not many studies exist about the wolf diet. The most recent study in the wolf nucleus south of the Douro River, implemented from 2001 to 2003, indicates the increasing presence of roe deer (*Capreolus capreolus*) in the diet of some of the packs (Roque *et al.* 2005).

1.3. Wild prey distribution

Roe and red deer are native species in Portugal, which had their populations greatly reduced by over-hunting and habitat fragmentation. Due to their low abundance, hunting is very restricted, occurring in a few touristic hunting grounds only. Wild populations of both species were reduced in Portugal before the 1970s, being limited to small patches: North of the Douro River for the roe deer; and North of the Douro and Centre and South of the country for the red deer. Since then, benefiting from the abandonment of rural areas and the decreasing number of livestock, they have greatly expanded and increased in numbers, mainly due to animals that naturally dispersed from Spain or were re-introduced, to provide game or to increase the density of wild prey for the wolf (Vingada *et al.* 2010, Torres *et al.* 2012). One of these re-introductions was in the Gardunha Mountain, located west of the central region of the MedWolf study area), in 2001, after an absence of more than a century (Carvalho *et al.* 2008).

Vingada *et al.* (2010) estimated populations of wild roe deer to be between 3,000 and 5,000 individuals. According to official statistics, around 2,000 red deer were harvested annually, mostly on touristic hunting grounds (Vingada *et al.* 2010).

In the final years of the 20th century, in the Northern half of the Project's area, including the municipalities of Figueira de Castelo Rodrigo, Pinhel, Almeida, Guarda and Sabugal, there are references to the presence of roe deer, probably resulting from dispersal from Spain (Salazar 2009).

The distribution of red deer in the Project's study area has also been increasing, mainly since the 1980s, when it started to expand from the South (municipalities of Castelo Branco and Idanha-a-Nova), from an initial small nucleus located close to the border with Spain, derived from incursions of individuals originating from Spain (Afonso 1995, Salazar 2009). In 2009 this nucleus extended West and North to the municipalities of Sabugal (Salazar 2009), reaching the Malcata Mountain Natural Reserve. It is considered one of the most important red deer populations in the country (Fonseca 2004a).

Although no density data exist for the entire Project's area, surveys have been made in order to understand the local population tendencies of the red deer. In the region of Idanha-a-Nova (Herdade da Poupa, Rosmaninhal), for instance, a density of 0.32 deer/ha was estimated (Robalo 1997).

Wild boar, after becoming almost extinct in the beginning of the 20th century, recovered from an outbreak of classic swine fever in the 1960s and from continued over-hunting, is now common throughout the country (Fonseca 2004b). Nevertheless, adults are not an easy prey

for wolves.

Despite some negative aspects of its expansion, like damage to irrigated crops, the wild boar also constitutes a valuable hunting resource.

Population data for this species are rare, but Borsch *et al.* (2012) developed an analytical model combining official hunting data and potential resources (land use) to assess the population size and density of the wild boar in the Iberian Peninsula. According to the National Forest Authority (Autoridade Florestal Nacional), the number of wild boars hunted in the districts of the Project's study area, Guarda and Castelo Branco, was 206 and 1,346, respectively.

Those authors obtained a global value of 0.13 boars/km^2 in Portugal, lower than the one obtained for Spain (0.38 boars/km^2). In what concerns the Project's area, they estimated densities ranging from 0.0 to 0.17 boars/km^2 in its North half (included in the Guarda district) and from 1.7 to 0.31 boars/km^2 in the Southern half (included in the Castelo Branco district).

1.4. Livestock densities

In Portugal, as in most of Europe, changes in socio-economical conditions resulted in the progressive decline in livestock numbers, mainly of goat and sheep (Table 1).

Table 1. Number of sheep and goats per Regional Agriculture Area in the wolf range, from 1998 to 2004 (Source: Instituto Nacional de Estatística - www.ine.pt 2005).

	Regional Agriculture Areas			
	Minho e Alto Douro	**Trás-os-Montes**	**Beira Litoral**	**Beira Interior**
	Sheep			
1998	157,000	352,000	239,000	537,000
1999	155,000	325,000	246,000	524,000
2000	157,000	322,000	243,000	527,000
2001	no data	no data	no data	no data
2002	147,000	294,000	225,000	508,000
2003	144,000	284,000	206,000	489,000
2004	164,000	315,000	197,000	503,000
	Goat			
1998	73,000	103,000	88,000	137,000
1999	73,000	85,000	89,000	134,000
2000	72,000	84,000	88,000	132,000
2001	no data	no data	no data	no data
2002	63,000	74,000	81,000	116,000
2003	59,000	71,000	77,000	106,000
2004	68,000	75,000	87,000	109,000

This tendency had no correspondence in the evolution of the number of farms, however. Despite the decrease of around 182,000 goat and sheep, from 2005 to 2009, there was an increase of 6,500 farms. In what concerns cattle the opposite was observed, with an increase in cow numbers accompanied by a drastic reduction in the number of farms (less 1,022,000), resulting in the necessary increase in the number of cows per farm (Fig. 1).

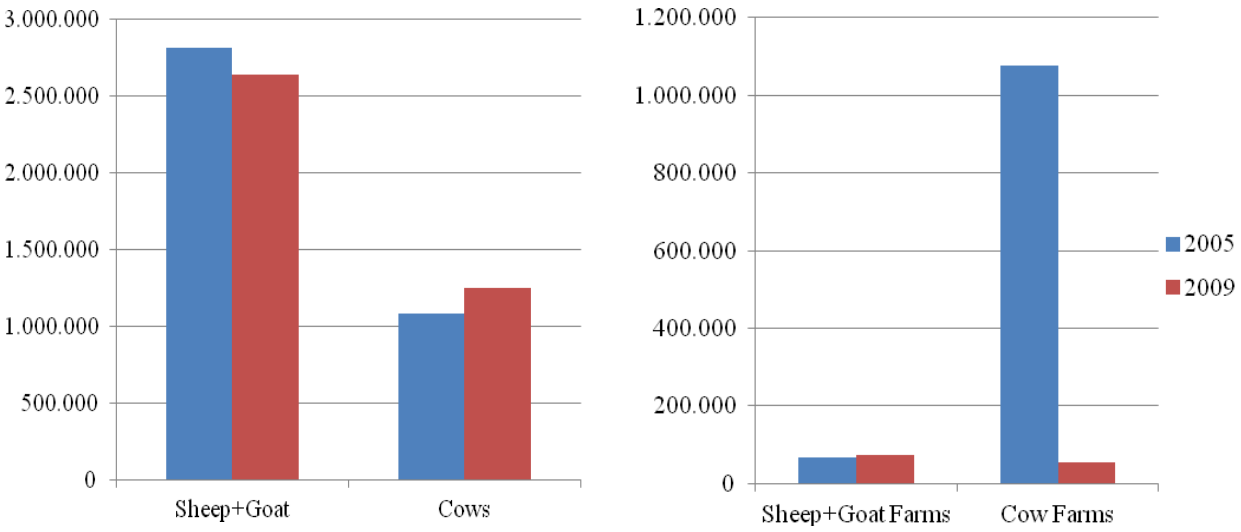

Figure 1. Evolution of the number of livestock (small ruminants and cows) and farms, in Portugal, in 2005 and 2009. (Source: Direcção Geral de Veterinária - www.dgv.min-agricultura.pt 2009).

The distribution of cattle (excluding dairy cows), goats and sheep (main domestic wolf prey), is presented in detail in Figure 2, according to the 1999 national agricultural survey data, after an analysis by Pimenta *et al.* (2005). We can see that sheep are the most common species in the wolf range with the highest densities located south of the Douro River. Goat densities are particularly high in the mountain areas inside the wolf range.

Note that these data do not represent the livestock available to wolves, since some are penned, but shows the differences in the availability of domestic prey throughout the wolf range. Regions with less human density have higher densities of sheep and goat, which are mainly grazed extensively in the mountains tops and slopes, while in more humanized areas, cows are more common, being produced mainly in intensive systems.

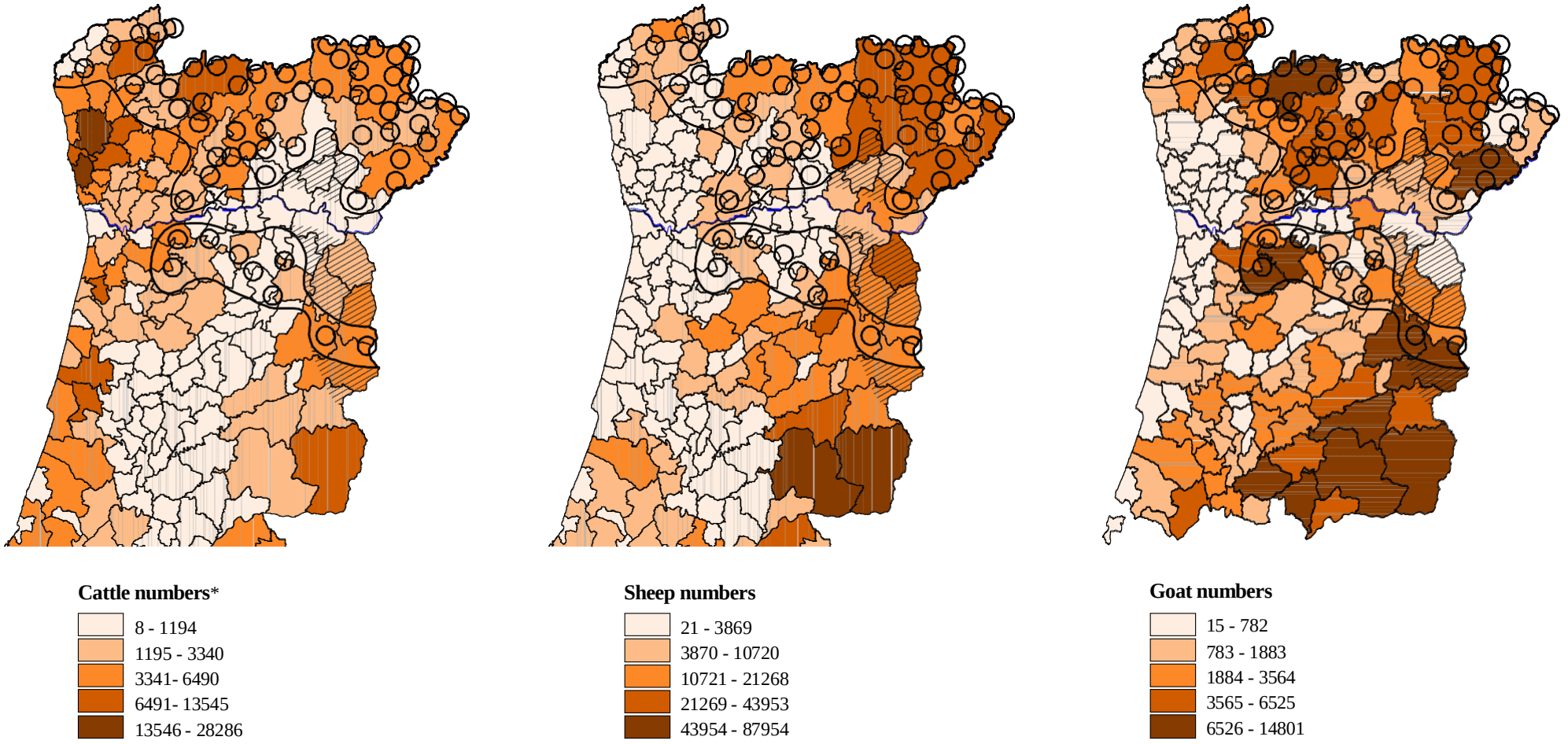

Figure 2. Distribution of livestock numbers in 1999, per municipality, overlaid by the wolf range and the packs identified in the last national survey. (Source: Recenseamento Geral da Agricultura de 1999, www.ine.pt) * Excluding dairy cows. (Adapted from: Pimenta *et al.* 2005)

1.5. Grazing systems

Livestock grazing systems vary according to livestock species and breed, as well as habitat and climate conditions. An overall view of the systems used throughout the country will be presented here.

In most mountainous areas, flocks are usually grazed in mountain pastures (private and communal) leaving the stable in the morning and returning in the evening, always accompanied by 1 or 2 shepherds. Flocks are accompanied by an average of 2-3 dogs, although this number can range from 0 to 10 dogs, depending on the size of the flock.

In lower or milder regions flocks, are mainly of sheep and are grazed in pastures or agricultural fields, usually accompanied by a shepherd, or in fenced pastures (delimited by stone walls or mesh wire fences) during some or most hours of the day, usually alone but sometimes accompanied by dogs. In the summer these flocks may sometimes be confined during the night in corrals set-up in pastures, which may be protected by dogs.

Cows usually graze in fenced pastures (delimited by stone walls or a couple of electric wires), closer to villages, un-surveilled or only with dogs, being penned during the night, and in some regions they are kept outside the whole year. In some cases they are herded to the mountain pastures in the morning, regrouped in the evening and confined in the stables during the night. In some regions herds are free-ranging during the summer, in mountain pastures, without any type of protection, but an occasional night confinement to nearby fences.

Donkeys are usually left alone in pastures closer to villages, sometimes even during the night, or integrated into small flocks of sheep.

1.6. Damage compensation system

In Portugal, the damage compensation system was implemented in 1990, after the approval of the wolf protection law in 1988, and limits damage compensation to the cases where minimal protection conditions exists, namely: the livestock has to be protected by shepherds and dogs (ratio of 1 dog/50 head of livestock in the herd) or confined (Law-Decree 139/90).

The Institute for Nature Conservation and Forestry (ICNF) is the public body responsible for compensation decisions and payments. The funds for compensation come from the budget of the State and are established on an annual basis.

According to the regulations, livestock owners must report each damage 48h after learning about it, after which in a 5 day period (usually 1-3 days), wardens from one of the Natural Protected Areas will visit the site to make an assessment of the damage: analysing the

carcasses, the wounded animals, looking for the signs of predator attack and presence, gathering the description of the attack and characterizing the herd, the husbandry system and the prevention measures used. The livestock owner is later informed of the decision, and if it is positive, receives the payment, which according to the law must be complete 60 days after the complaint. Unfortunately this is not the case most of the times, and a delay period of one year is frequent, which is detrimental for wolf conservation.

Only carcasses that are found or the veterinary expenses for animal injuries resulting from an attack are compensated; animals that disappear are not compensated. The reference for the compensation value is a price list issued weekly by the Ministry of Agriculture, indicating livestock prices according to the different regions and markets.

1.7. Man-wolf conflict

Where wolves and livestock coexist the potential for conflict arises, particularly in rural areas where livestock production is a major economic activity (Fritts *et al.* 2003). This conflict is enhanced in areas where wolves have disappeared or had their populations greatly reduced, resulting in the decreased use of prevention measures and loss of the related knowledge. In the Project's area the existence of unprotected and thus more vulnerable livestock represents a high potential for conflicts, increased by the loss of the pastoral communities' habit of living with the predator. The subsidies from the ACP have been contributing to this situation, by promoting larger herds per owner with no requirements regarding the adoption of preventive measures inside the wolf range.

But although the damage may be significant to the farmer who suffered it, the overall damages, seen as a percentage of the livestock industry, are almost always irrelevant (ranging between 0.5 and 5%) (Álvares 2011, Boitani 2000).

Nevertheless, when analysing human-wolf conflicts, besides the reality of damages, another dimension must be considered: the perception of the damages by humans. Often, livestock losses attributed to wolves tend to be exaggerated, either by mistake or deliberately (Rigg *et al.* 2011). Indeed, the damage caused by wolves is usually low when compared with other causes of livestock mortality and is often perceived as excessively important. These perceptions can have strong emotional and political consequences, ultimately resulting in the persecution of carnivores (Kellert *et al.* 1996).

In this context, wolf conservation constitutes a complex challenge, one that depends greatly on the involvement and support of pastoral communities, and poses major management

problems. The solutions should be situation-specific and driven by scientific data and not by fear or prejudices, based on an increased use of mixed strategies involving non-lethal approaches to the prevention of conflicts (Treves & Karanth 2003).

1.8. Illegal persecution

Despite being forbidden by law, the use of poison (commonly herbicides and pesticides that can be easily acquired for agricultural purposes) to control predators (mostly canids but also birds of prey) is still a common practice in the study area, motivated mainly by damage caused by wolves or stray dogs on livestock, but also with the goal to reduce predation by mesocarnivores on game species (e.g. rabbit or partridge) in the hunting grounds that cover most of the Project's area. Since 2003, and according to the data gathered by the Antídoto Program (www.antidoto-portugal.org), 84 poisoning events were confirmed in the Project's area (22% of the total number of events in the country), corresponding to 318 animals poisoned, of which 61% were dogs. This situation is worrying since stray dogs are frequent in the wolf range and both canids behave similarly, thus making wolves highly susceptible to poison meant to control dogs. This would necessarily result in a significant impact on the small wolf population and on the re-colonizing wolves. This was the case in 2004, when one dispersing wolf was found poisoned in the south of the Project's area, in the Idanha-a-Nova municipality.

The same should be said for the use of snares, frequently used to control stray dogs and mostly wild boar, as a consequence of the damage this species inflicts on pastures and crops. Damage caused by both species, not compensated by the government, results in farmers frequently taking matters into their own hands, resorting to illegal control methods. Wolf mortality due to snares is the third most important cause of wolf mortality in the country (after car accidents and shooting), corresponding to 15% of the wolves found dead from 1999 to 2011, according to official registry, and the second most important in the nucleus South of the Douro river (after car accidents) (Pimenta *et al.* 2005, Barroso *et al.* 2011). However, this is supposed to be largely underestimated (as well as deaths by poisoning), since animals killed in snares are less probably to be found than those run over by cars, as snares are usually set-up in less accessible sites, with abundant vegetation.

Wolves and stray dogs are sympatric in the study area, as was confirmed by the wolf survey developed in action A2, although more frequent in the district of Castelo Branco, south of the study area, where they also cause higher damage to livestock (Ribeiro 1996).

2. Goal

Directly or indirectly, damage on livestock is a major concern for wolf conservation, efforts, resulting in direct persecution to the species or turning it into a collateral victim of illegal controls of other predators. A detailed analysis of damages in the study area and a mapping of the existing and potential conflict hotspots are thus fundamental to predict predation occurrence and to mitigate conflicts. Specifically, we examined spatial, seasonal and periodic patterns in wolf attacks, based on the official damage reports. Complementary a comprehensive survey was conducted at the holdings with a high level of damage to characterize as best as possible the existing conditions and husbandry systems, while indentifying the main problems and possible solutions to be implemented in order to prevent damage.

The knowledge acquired and the identification of the risk areas and of the main needs will be important to mitigate conflicts and facilitate the application of sound predation management actions. It will guide the implementation of damage preventive measures, to be developed in actions C1 and C3 of the Project.

The data will also be used as a baseline for comparison with the results obtained during the development of the Project.

3. Study area

The area studied corresponds to the Project's area, but comparisons with data from the whole country and from specific wolf nuclei will also be done.

The Project's study area is located in the region along the national border with Spain, in the centre of the country, limited by the Douro River in the North and the Tejo River in the South. With an area of 5,026 km^2, it overlaps 7 municipalities: Figueira de Castelo Rodrigo, Pinhel, Almeida, Guarda, Sabugal, Penamacor and Idanha-a-Nova. The average human population density ranges from 21 to 67 inhabitants/km^2, in the main cities, being smaller in the North and South extremes of the study area and closer to the border. It is much lower than the national average of 114 inhabitants/km^2 (Pordata 2011 – www.pordata.pt).

The economy is based on agriculture (involving from 3,300 to 9,700 persons, per municipality, Pordata 2011 – www.pordata.pt) and the land is mainly divided in small to medium sized properties.

The area is mountainous, with elevation ranging from 200m in the Southern and plainer region, to 1,072 m, in the mountainous Northern region. Several river valleys and small

streams cross the area and the associated vegetation is mainly common alder *Alnus glutinosa*, narrow-leafed ash *Fraxinus angustifolia*, black poplar *Populus nigra* and *Salix salviifolia* strongly linked to mountain meadows.

The landscape is characterized by a mosaic of deciduous and coniferous forest, fragmented by small-cultivated fields, being increasingly changing to scrublands. This is the result of the abandonment of agriculture and husbandry activities, that is taking place in most mountainous regions of Portugal. The vegetation is varied and characterised by oaks *Quercus pyrenaica, Quercus rotundifolia* and *Quercus ilex*, sweet chestnut *Castanea sativa*, Scots pine *Pinus sylvestris*, maritime pine *Pinus pinaster*. Main understory species are heather *Erica australis*, *Pterospartum tridentatum*, rockrose *Halimium alyssoides*, gum rockrose *Cistus ladanifer* and *Lavandula sampaioana*.

The climate is typical Mediterranean, with pronounced differences in precipitation and temperature between winter and summer. The average of maximum daily temperatures reached in July is around 32ºC, and the daily average minimum temperature, reached in January is around 1ºC, with the northern half of the study area (included in the Guarda district) being slightly (3 - 7ºC) colder than the southern part (included in the Castelo Branco district). The mean annual precipitation varies between around 20 - 100 mm (Instituto Português do Mar e da Atmosfera 2000 - www.ipma.pt).

Faunal community is very diverse, from small to mesocarnivores (e.g. *Mustela foina, Lutra lutra, Genetta genetta, Mustela putorius, Herpestes ichneumon, Felis silvestris*, and the red fox, *Vulpes vulpes,* that is widespread and frequent), to a number of species of birds of prey in need of strict protection and of communitarian interest (*Aegypius monachus, Neophron percnopterus, Aquila chrysaetos, Aquila fasciata, Aquila adalberti, Ciconia nigra,* and *Gyps fulvus*, which is common along the border region), most common in the International Tejo Natural Park, the Côa River and the Malcata Mountain (Loureiro *et al.* 2012, Aves de Portugal 2013 – www.avesdeportugal.info). Ungulates, red and roe deer and wild boar, are also present (refer to the Introduction).

The project area overlaps four protected areas that are part of the Portuguese conservation network areas and the European Natura 2000 network: the International Douro Natural Park, the Malcata Mountain Natural Reserve, the Estrela Mountain Natural Park and the International Tejo Natural Park (Fig. 3).

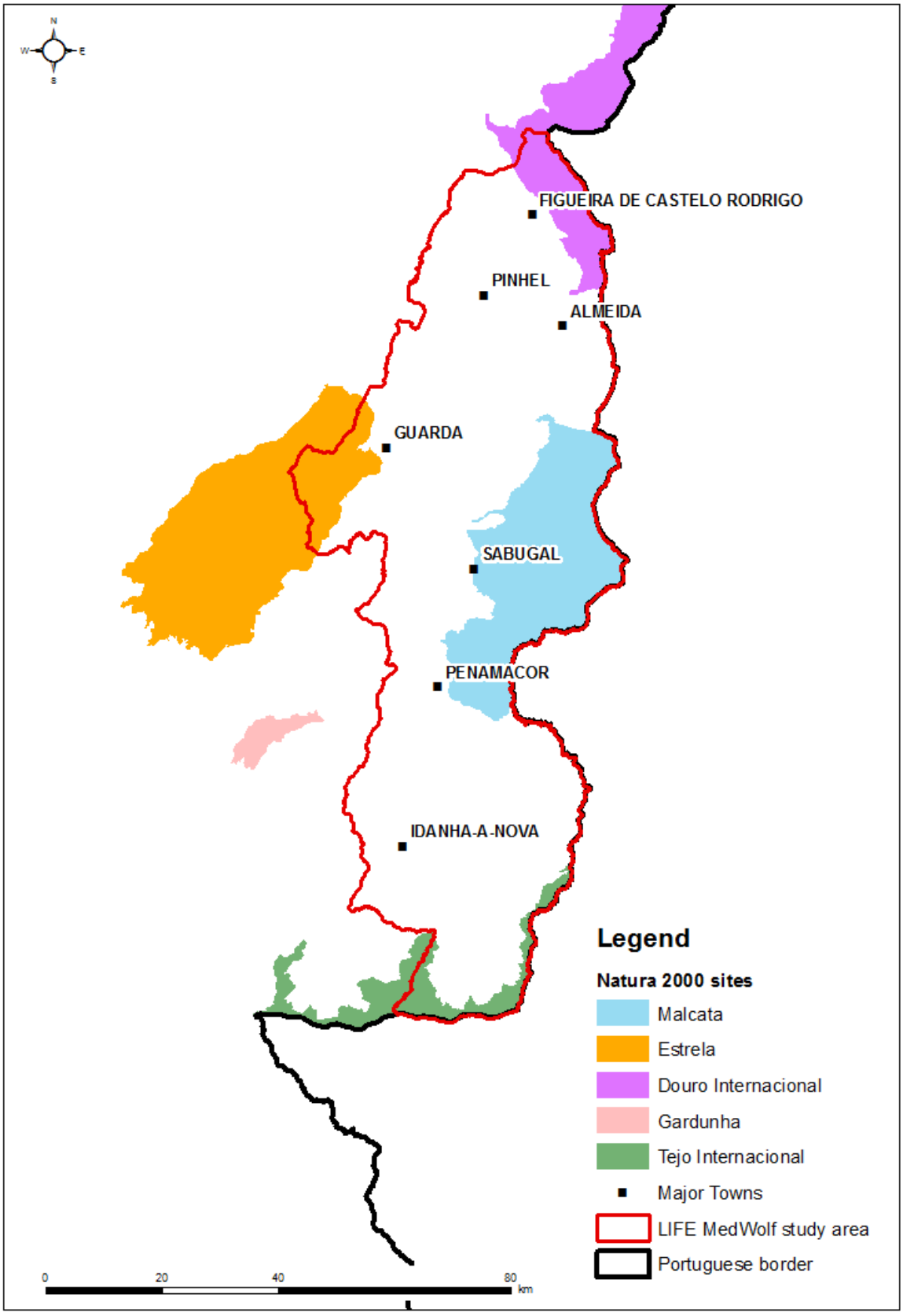

Figure 3. Natura 2000 sites in and around the Project's study area.

4. Material and Methods

4.1. Official data

Livestock numbers were gathered from the official databases of animal registry and veterinary control (PISA.net; SNIRA 2013) and concern the year of 2013. It was only possible to obtain data for cows and small ruminants (sheep and goat). No data were available for donkeys, but attacks on this species are a rare event.

Damage data was gathered from the official database, compiled by the Institute for Nature Conservation and Forestry (ICNF), the authority responsible for assessing and compensating wolf attacks on domestic animals. The information provided was detailed to the parish level and comprehended the period from January 2012 to October 2013 (22 months).

Only those events confirmed to have been caused by wolves were considered in the analysis. Nevertheless, in some cases dog attacks to livestock may be difficult to distinguish from attacks made by wolves. However, in most of the doubtful cases that occurred, a genetic forensic analysis was carried out to identify the predator responsible.

Furthermore, results should be considered with care since not all wolf attacks may have been reported to the authorities. Several reasons can contribute to this: i) not finding the carcasses, which is frequent when new-born or young animals are attacked, because they can be rapidly consumed and easily moved by predators (Ribeiro 1996); ii) not considering the attack to have been made by wolves or not being aware of the compensation program, which is frequent in areas of recent wolf expansion, and where the predator's presence is not stable and stray dogs are common; iii) not reporting the attack due to conflicts with the authorities, usually caused by delays in the compensation or disagreements over the compensation values.

For this analysis, the number of animals attacked includes the total number of animals killed, injured or that disappeared as a consequence of an attack.

4.2. Farm survey

A systematic survey of the damages endured by livestock owners was undertaken in the project area through direct interviews during visits to the farms where high levels of wolf damage had been reported in previous years. This information was provided by the ICNF and complemented with data about new livestock owners, gathered by Grupo Lobo's staff during the development of actions A2 and A11, and occasionally with additional information obtained by the staff of ESACB during these interviews.

Personal interviews were done using a semi-structured questionnaire either with multiple choices and categorical scales of responses or with open questions (Annex). This questionnaire was based on a previous instrument developed in the LIFE-COEX and improved with the inputs of other partners and the ICNF. Its goal was to gather updated and complete information to assess the damages suffered, the predation risk and the willingness of the livestock owners and shepherds to collaborate in the project and benefit from damage prevention measures (e.g. livestock guarding dogs and fences). The collected data was integrated in a geographical information system (GIS) in order to have a spatial representation of the damage hot spot areas.

A comprehensive database on any damage caused by wolves was developed and represented in a GIS as maps to be used for guidance, implementation of concrete conservation activities and as a baseline for comparison with further results obtained during the course of the project.

Interviews were conducted between March and November 2013 in the Project area.

4.3. Data analysis

For measuring correlations, the Spearman rank correlation coefficient was used. The significance level was set at $p<0.05$. Statistical analyses were performed with SPSS for Windows version 20.00 (SPSS Inc, 2011).

5. Results

5.1. Official Data Analysis

5.1.1. Livestock densities

In the study area small ruminants are more common than cows, representing almost 76% of the livestock, with nearly 153,000 animals (Table 2).

The data does not include information about donkeys nor ostriches, but donkeys are rare in the study area, and as far as it was possible to gather, there is only one ostrich farm in the study area. Besides this one, the nearest ostrich farm is located in the municipally of Castelo Branco, southeast of the study area.

Domestic animals (goat, sheep and cattle) are unevenly distributed throughout the study area, with similar numbers in most of the municipalities (ranging from 21,500-26,200), but with reduced numbers in the municipality of Penamacor (12,079), and very high numbers in Idanha-a-Nova (almost 80,000), in the southern zone of the study area (representing almost 40% of the total livestock in the study area). A high potential for conflicts exists in this

municipality, which could nevertheless be effectively reduced by the use of prevention measures, since the high densities of wild ungulates constitute an important alternative prey to wolves.

Table 2. Number and densities (nr/km^2) of livestock, per municipality of the study area, in 2013.

Municipalities	Goat + Sheep	%	Cattle	%	Total	Densities
Fig. Castelo Rodrigo	19,323	89.6	2,249	10.4	21,572	42.4
Pinhel	12,420	72.1	4,816	27.9	17,236	41.6
Almeida	13,126	60.9	8,427	39.1	21,553	35.6
Guarda	18,100	75.3	5,949	24.7	24,049	33.8
Sabugal	16,612	63.3	9,623	36.7	26,235	31.9
Penamacor	10,677	88.4	1,402	11.6	12,079	21.4
Idanha-a-Nova	62,714	79.4	16,225	20.6	78,939	55.7
Total	**152,972**	75.9	**48,691**	24.1	**201,663**	**40.1**

However, livestock densities are not that different across the study area, ranging from 21.4 animals/km^2 in Penamacor, to 55.7 animals/km^2 in Idanha-a-Nova, the largest municipality of the study area with 1,416 km^2. These densities are very high when compared to those of wild ungulates (<0.32/km^2), explaining the differential impact of wolf predation on domestic ungulates.

5.1.2. Damage evolution

At a national level, the cost of wolf damages has been increasing steadily from approximately 93,500 Euro in 1992 to around 724,000 Euros in 2001, with a small reduction in the following 8 years (stabilized between 630,000 and 690,000 Euros), only to reach the maximum of 764,00 Euros in 2010 (ICNF) (Fig. 4). This upward trend is probably due to an increase in animal prices, which inflates the compensation values, but also to the increase in the number of declared damages, due to the improvement of the compensation system and the increasing awareness of its existence.

The number of animals attacked has also been steadily increasing since 1991, from 91 to 2,743 animals in 2003, showing slight fluctuations in the following years, ranging from 2,300 to 2,700 animals (Fig. 4).

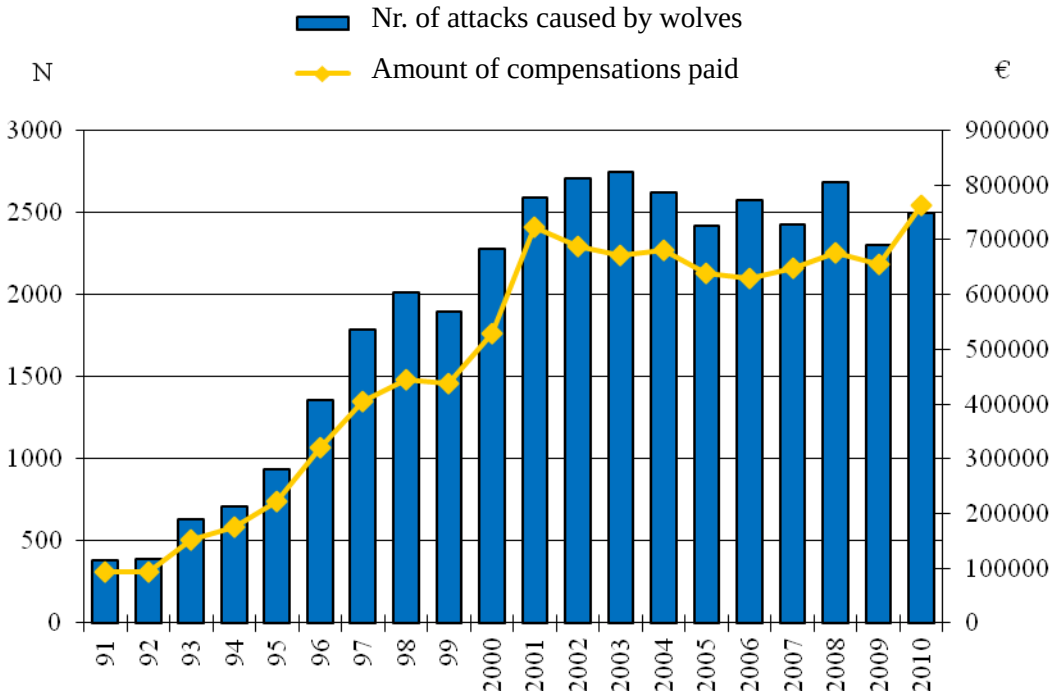

Figure 4. Evolution of the number of wolf damages and compensations paid, per year, from 1991 to 2010 (Source: ICNF).

5.1.3. Spatial analysis

The cost of livestock damages by wolves is unevenly distributed in the wolf range, as expected, since it depends on many factors, like the density of predators and availability of domestic and wild prey, the type of husbandry and the use of prevention measures.

The region with the highest number of damages and compensation values is the NW of the country. In 2003 it corresponded to more than 40% of the number of damage reports in the country, despite having only 25% of the wolf packs identified in the last survey (Pimenta *et al.* 2005) (Fig. 5).

This may be explained by the fact that in this area most damages are made to high value livestock, like cows and horses, that are mostly freely ranged, and thus not surveilled and protected (Pimenta *et al.* 2005). It is also the area of the country with one of the highest wolf densities (3.7 to 6.0 wolves/km^2) and with low densities of wild ungulates (Álvares *et al.* 2000).

The region south of the Douro River, along the border with Spain, that includes the Project's study area, was the region within the wolf range with the least number of reported damages in 2003. However, comparing with more recent data (years 2012 and 2013), we can see that the number and distribution of damages has greatly increased in the last ten years (Figs. 6,7,8).

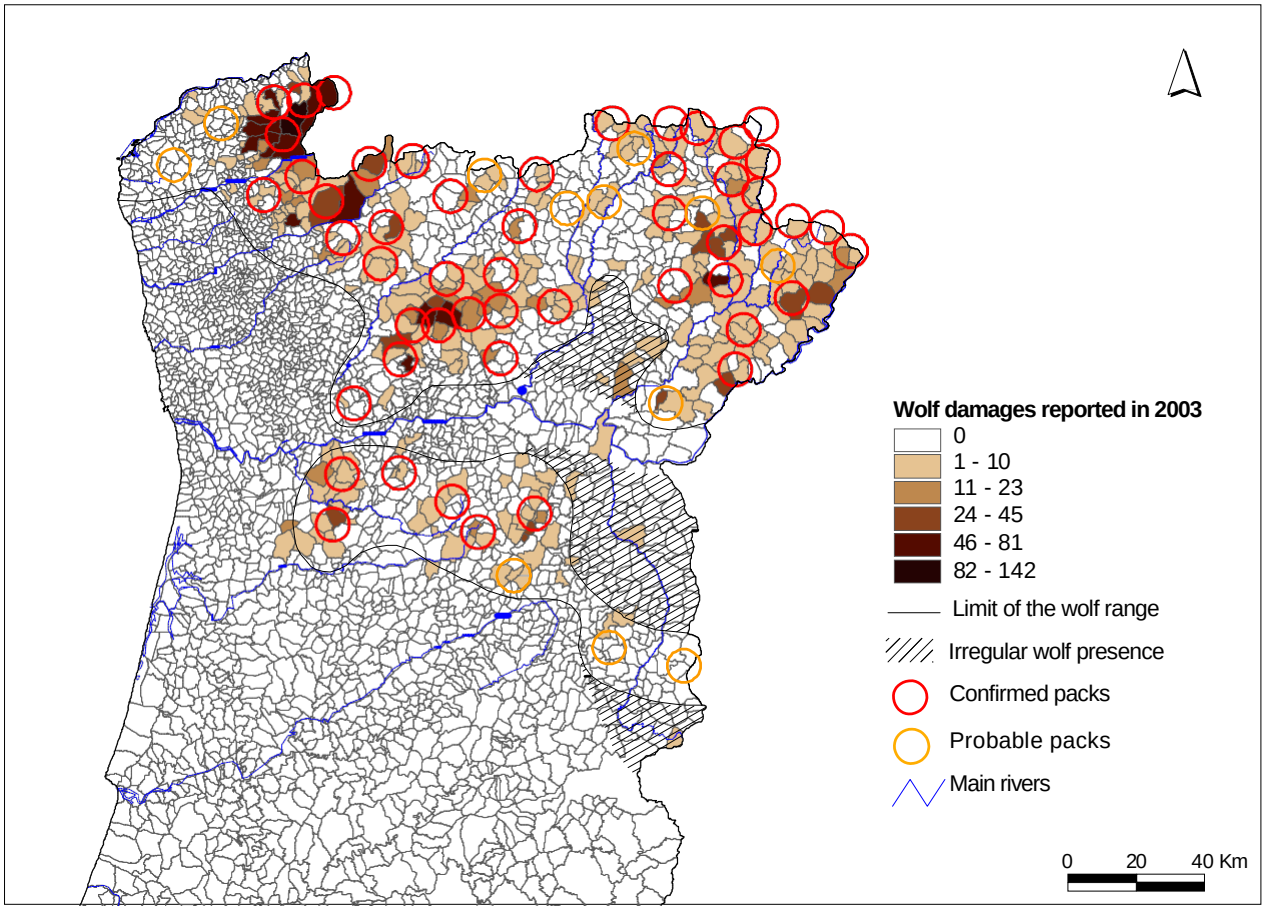

Figure 5. Distribution of wolf damages in 2003, per parish, overlaid by the wolf range and the packs identified in the last national survey. (Adapted from: Pimenta *et al.* 2005)

The distribution pattern of the recent damages was not regular, occurring only in 4 of the 7 municipalities, mainly located in the North of the study area (Table 3, Fig. 6), with Almeida reporting the higher number of wolf attacks (61.4%), and the highest number of animals attacked (31.1%), followed by Sabugal and Guarda (with 32.1% and 31.5% animals attacked, respectively), and Pinhel reporting only 9 attacks. In Figueira de Castelo Rodrigo (in the North) and in Penamacor and Idanha-a-Nova, the southern municipalities, no wolf damages were reported.

Nevertheless, if we exclude the ostrich damages, Almeida drops to the third municipality in terms of the number of animals attacked (n=120), although the number of attacks remains the highest (n=51). This may result from the fact that the number of attacks on cattle is higher, but the number of cows attacked per wolf attack are usually smaller; contrary to smaller prey, like sheep, where the average number of animals attacked is nearly 9 (see 5.6.).

Table 3. Number of attacks and of animals attacked (killed, injured, disappeared) per municipality of the study area, from January 2012 to October 2013.

Municipalities	Animals Attacked				Attacks	Main Livestock
	Killed	Injured	Disappeared	Total		
Fig. Castelo Rodrigo	0	0	0	0	0	-
Pinhel	23	1	4	28	9	Sheep
Almeida	106	42	15	163	81	Ostrich/Sheep/Cow
Guarda	60	13	92	165	22	Sheep/Cow
Sabugal	74	50	44	168	20	Sheep/Cow
Penamacor	0	0	0	0	0	-
Idanha-a-Nova	0	0	0	0	0	-
Total	**268**	**118**	**155**	**541**	**133**	

When comparing damage on small ruminants and cattle and the respective livestock numbers, we can conclude that the percentage of the existing livestock attacked was around 0.23%, being higher in Guarda (0.68%), Sabugal and Almeida, and very small in Pinhel (0.15%) (Table 4).

Table 4. Percentage of livestock attacked, per municipality of the study area, from January 2012 to October 2013.

Municipalities	Goat + Sheep	Cattle	Total
Fig. Castelo Rodrigo	0.00%	0.00%	0.00%
Pinhel	0.20%	0.00%	0.15%
Almeida	0.55%	0.52%	0.54%
Guarda	0.85%	0.15%	0.68%
Sabugal	0.99%	0.03%	0.64%
Penamacor	0.00%	0.00%	0.00%
Idanha-a-Nova	0.00%	0.00%	0.00%
Total	**0.27%**	**0.12%**	**0.23%**

We can also identify a general preference for sheep and goat flocks (reaching almost 1% in Sabugal), except in the municipality of Almeida, where cows are attacked in similar rates as those of the small ruminants. This may be a consequence of the husbandry system of cows in this municipality, usually grazed in fenced pastures all year round, un-penned even during calving season, without confinement of newborns and younger animals.

The maps of figures 7 and 8 show the distribution of the number of reported wolf attacks to all species of livestock, in the parishes of the study area, in 2012 and 2013 (10 months).

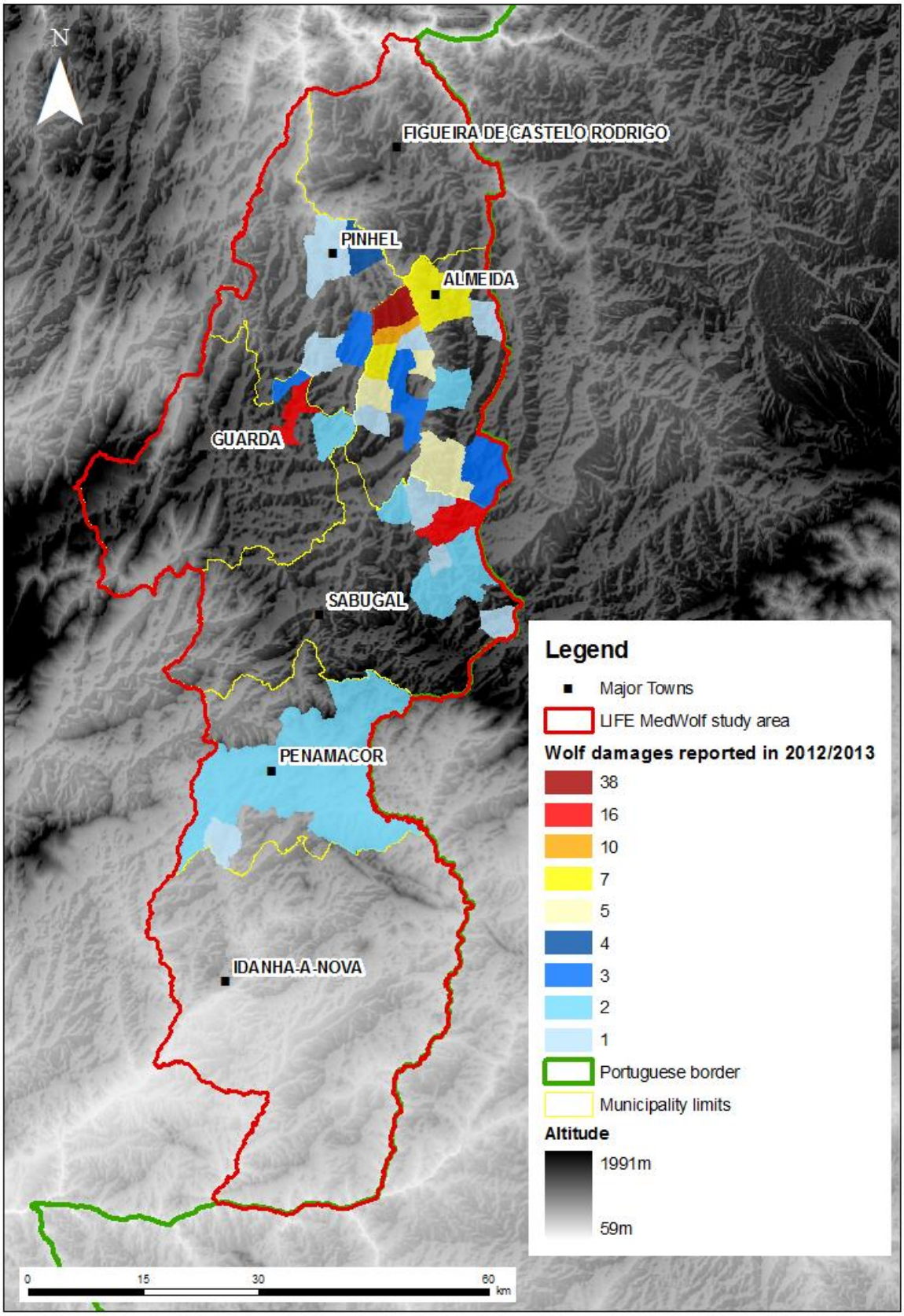

Figure 6. Distribution of reported damages per parish, in the study area, in 2012 and 2013.

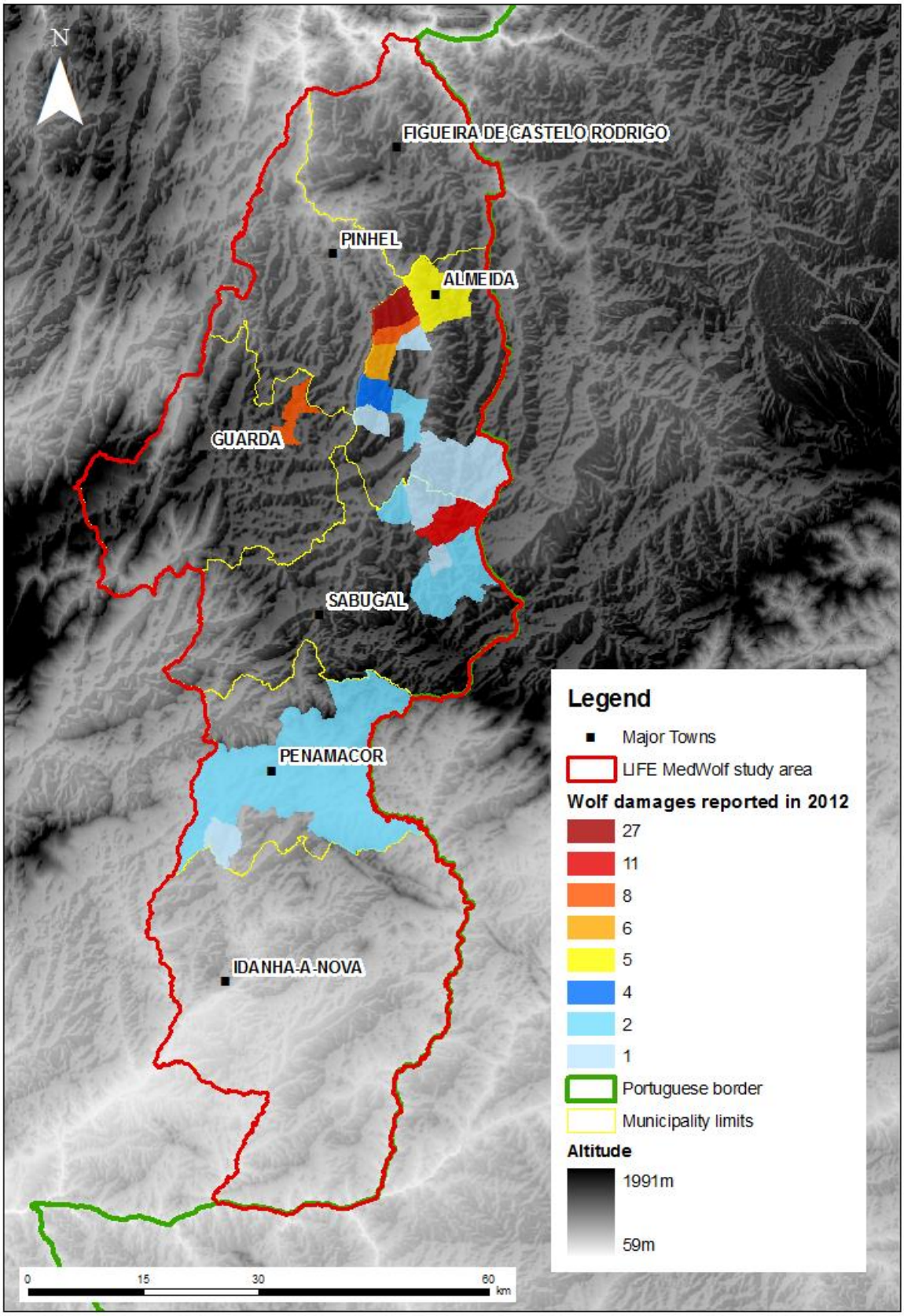

Figure 7. Distribution of reported damages per parish, in the study area, in 2012.

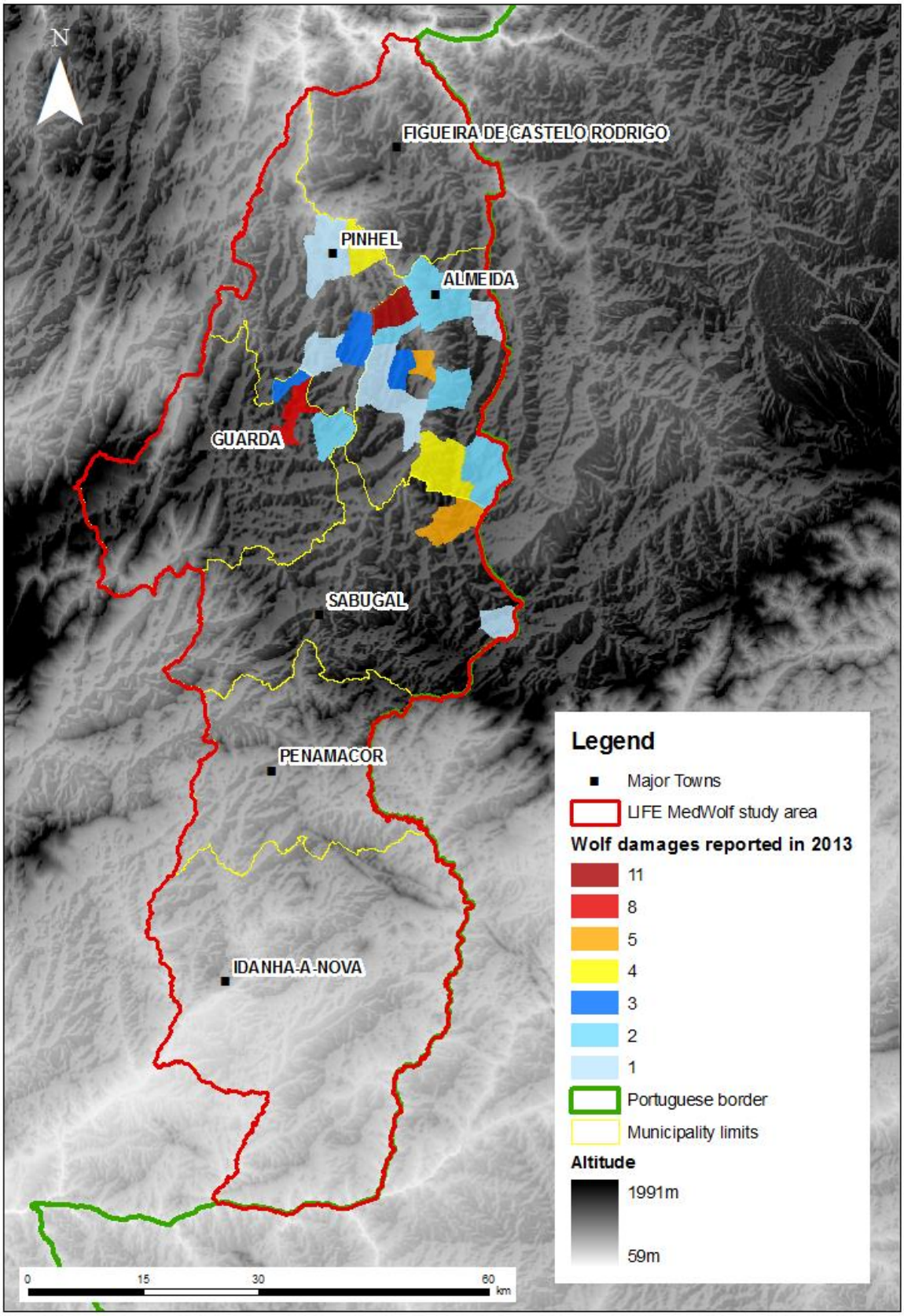

Figure 8. Distribution of reported damages per parish in the study area, in 2013 (10 months).

5.1.4. Seasonal analysis

Seasonal variations in the number of damages was observed, with the number of attacks greatly increasing during spring and slightly in the beginning of autumn (Figs. 9, 10).

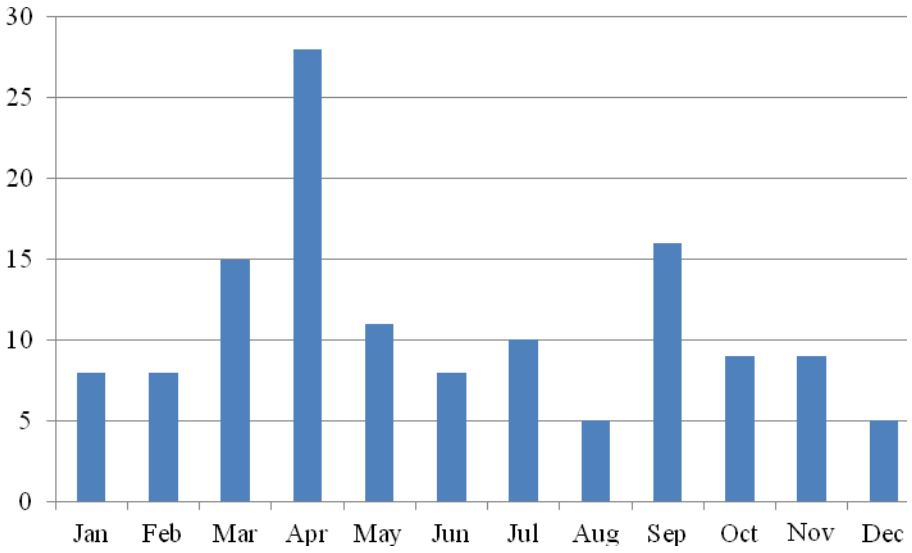

Figure 9. Number of wolf attacks per month in the study area, from January 2012 to October 2013.

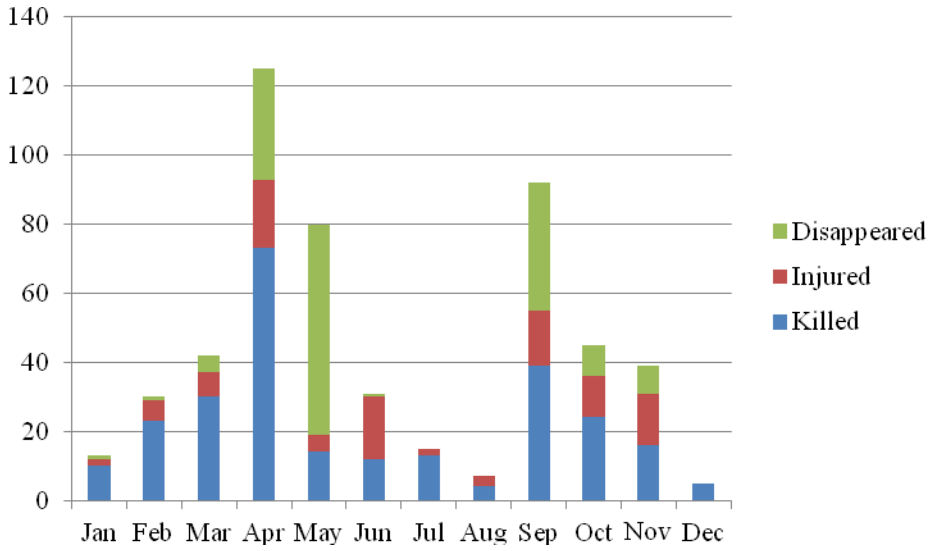

Figure 10. Number of animals attacked by wolves per month in the study area, from January 2012 to October 2013.

This was expected, since not only the numbers of livestock may change along the year (e.g. in winter animals are less available, being usually more confined and the grazing areas more limited), but especially their vulnerability increases – Spring is the breeding season for most livestock, thus increasing the availability of young animals, which are easier to capture. These

variations may also reflect the wolf biological cycle and dynamics of the wolf population (e.g. pack size variations, breeding).

5.1.5. Circadian analysis

Analysing the period of the day, for the 127 reports for wich that information was provided by the livestock owners, 63.0% of the attacks are supposedly taking place during the night and some (23.6%) at dawn (Fig. 11). This is expected, since wolves are essentialy crepuscular/nocturnal animals, being more active during the first hours of the night and before the sunrise (Álvares 2011).

This also reveals that all types of livestock (ostrich, cows, sheep, donkeys and goat) are defficiently protected during the night, being left in fenced pastures permeable to wolves, with no vigilance or dogs present, instead of adequatly confined and protected. Thus any minor improvement to be implemented by the livestock owners could greatly reduce predation.

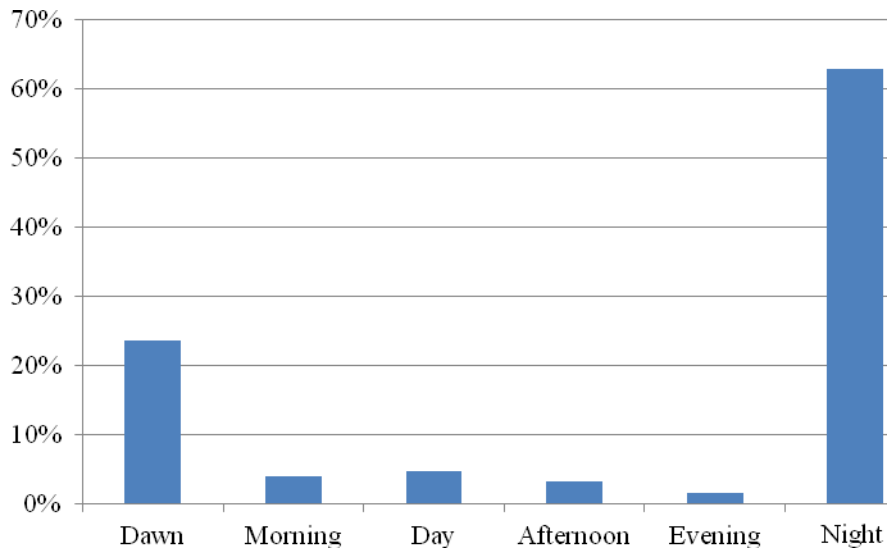

Figure 11. Percentage of wolf attacks per circadian periods in the study area, from January 2012 to October 2013.

5.1.6. Livestock attacked

A total of 524 animals, mostly sheep (77.5%), cows (10.7%) and ostriches (8.2%), were attacked by wolves in the study area from January 2012 to October 2013 (Fig. 12). Of these 50.2% were killed, 29.6% disappeared and 20.2% were injured, in 132 attacks (Table 5).

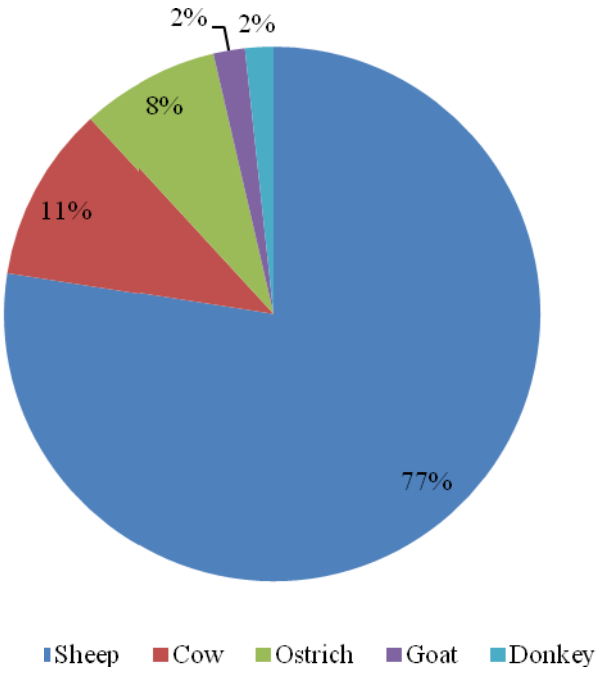

Figure 12. Livestock species attacked by wolves in the study area, from January 2012 to October 2013.

The average number of animals attacked, per wolf attack was significantly higher in sheep than in any other species (Table 5). The number of sheep that disappear per attack is very high, 29.0% of the animals attacked, in contrast to other species, where almost no animals disappear. However, the majority of those sheep (n=122, 78.7%) disappeared in only four attacks (ranging from 7 to 55 disappeared sheep in each of those attacks).

Table 5. Number of attacks and of animals attacked (killed, injured, disappeared) per livestock species, from January 2012 to October 2013.

Livestock Species	Animals Attacked				Average /Attack	Attacks
	Killed	Injured	Disappeared	Total		
Sheep	176	78	152	406	8.81	48
Cow	40	16	0	56	1.37	41
Ostrich	33	8	2	43	1.43	30
Goat	6	3	1	10	1.67	6
Donkey	8	1	0	9	1.13	8
Total	**263**	**106**	**155**	**524**	**3.97**	**132**

Worth noticing is the predation on an exotic species, the ostrich, originating from Africa, not commonly referred as wolf prey. These attacks occurred in one farm and stopped after the

building of an adequate fence (supported by this project in the scope of action C3), during the month of June, thus decreasing the number of expected losses in 2013 (19 animals attacked in 9 attacks, in the first 6 months of the year), considering the values from the previous year (24 animals attacked in 21 attacks).

This is not an isolated damage incident, since two similar cases had already been reported ten years ago in two ostrich farms, one in the North of the country (Chaves municipality, Vila Real district), in 2004, and another between 2002 and 2004, west of the study area, in the Trancoso municipality, adjacent to Pinhel, although both with smaller losses.

In most predation events (55.0%) animals attacked were adults, but in 29.8% of the attacks newly born or very young animals (<6 months old), mostly calves (76.9%) were preyed. Calves and lambs are very vulnerable, especially after birth, as well as ewes or cows during and following lambing and calving (especially in the case of difficult births).

The number of small ruminants attacked is higher in Sabugal (39.7%) and Guarda (37.0%) and lower in Almeida (17.3%), where the number of head of cattle attacked is higher, accounting for 78.6% of the animals of the species attacked in the study area (Table 6).

Table 6. Number of livestock attacked, per municipality of the study area, from January 2012 to October 2013.

Municipalities	Goat + Sheep	Cattle	Donkeys	Ostriches	Total
Fig. Castelo Rodrigo	0	0	0	0	0
Pinhel	25	0	3	0	28
Almeida	72	44	4	43	163
Guarda	154	9	2	0	165
Sabugal	165	3	0	0	168
Penamacor	0	0	0	0	0
Idanha-a-Nova	0	0	0	0	0
Total	**416**	**56**	**9**	**43**	**524**

5.1.7. Livestock owners affected

It was not possible to analyse the damage impact per livestock owner, since no identification of the livestock owners was available in the data provided by the ICNF.

Only in the case of the predation on ostriches, occurring all in the same farm, in the municipality of Almeida, was it possible to identify the sole owner. These animals, produced mainly for meat and egg production, are very valuable (one adult may cost 2,500 Euros) and thus the attacks, on 43 adults and young, constituted a heavy economic loss, unparalleled with

any other cases. Due to this reason, this farm was prematurely included in the MedWolf Project, in the scope of action C3 (anticipated for this purpose), to enable the building of a wolf-proof fence.

5.1.8. Herd size

The herd or flock size ranged from 1 to 600 head (considering 124 cases with available data about herd size). Donkeys are either alone or in groups up to 5 animals; ostrich groups vary greatly in number, from 1 to 80 animals (mean of 10); cattle herds range from 4 to 100 head (mean of 36); and small ruminants (goat and sheep) are kept in flocks ranging from 5 to 600 animals (mean of 79).

There is a direct correlation between the size of the flock and the number of animals attacked (r_s=0.407, p<0.01), that is, there is a tendency for a higher number of animals to be attacked in bigger flocks. This is not surprising since bigger flocks tend to scatter through a wider area thus being easier to spot by wolves, and more difficult to control and protect by the shepherds and dogs. Also, due to the wolves' predatory behaviour (if undisturbed and with access to many prey, wolves may continue to chase and attack prey), the probability of having more animals attacked in larger herds is higher. This phenomena, named surplus killing, is uncommon with wild prey, but very common with domestic prey, particularly if they are not well protected (Kruuk 1972).

Furthermore, smaller flocks are usually grazed in smaller pastures and closer to villages.

5.1.9. Livestock protection

Only in 7.9% of the cases were shepherds present, while in more than 92.1% the herds were left unattended (considering 114 cases with available data about the presence of shepherds). In all of those cases when shepherds were present, the livestock was goat and/or sheep flocks. The presence of shepherds is not common practice in the study area, and seems never to be used in cattle grazing.

In most predation events (n=85, 71.4%, considering 119 cases with available data about the presence of dogs), livestock (including ostriches) was not protected by dogs.

A positive, though weak correlation, was found between the number of dogs and the animals attacked (r_s=0.318, p<0.01). This seems to be a direct consequence of the correlation between the number of dogs and the herd size, since larger herds tend to have more dogs (r_s=0.269, p<0.01), and of the fact that in larger flocks there is a higher number of animals attacked (see

5.8). Furthermore, the simple correlation between the number of dogs and the number of animals attacked does not take into account the fact that, despite the higher number of dogs in larger herds, the head/dogs ratio may still be higher than in smaller herds.

A more realistic analysis would be to use the number of head per dog ratio (calculated as the size of the herd divided by the number of dogs). When using this ratio we found no correlation between the number of head per dog and the number of animals attacked.

In the 34 cases when dogs were said to be with the livestock, the ratio head/dogs ranged from 2 to 120.5, with a mean of 32.7. Only 4 of those herds had less than 50 head per dog, that is, the number of required dogs per head of livestock (1 dog per 50 head) to be eligible for compensation.

When they were present the number of dogs ranged from 1 to 5 (the maximum number of dogs required for receiving compensation), with a mean of 1.9. The size of the dogs varied from small to large.

Nevertheless, the number of existing dogs may not always be a valid indication of the level of protection since they may not be effective in guarding the livestock: they may not follow the flock; they may not have the necessary characteristics (morphologic and behaviour), not belonging to a recognized breed of livestock guarding dog; or may not be well bonded with the livestock.

Other factors may also influence the level of protection of the flock and the success of attacks by wolves, namely habitat characteristics and weather conditions.

5.2. Survey Data Analysis

50 interviews were made in 6 of the municipalities of the study area: 14 in Figueira de Castelo Rodrigo, 20 in Almeida, 6 in Pinhel, 3 in Guarda, 6 in Sabugal, and 1 in Penamacor (Fig. 13). The southernmost municipality, Idanha-a-Nova, was not surveyed since no wolf damages have been reported in the last decades. All the 27 holdings indicated by ICNF has having registered wolf damage in recent years were interviewed.

All interviews were done to the owner of the farm, except one that was answered by an owner's son.

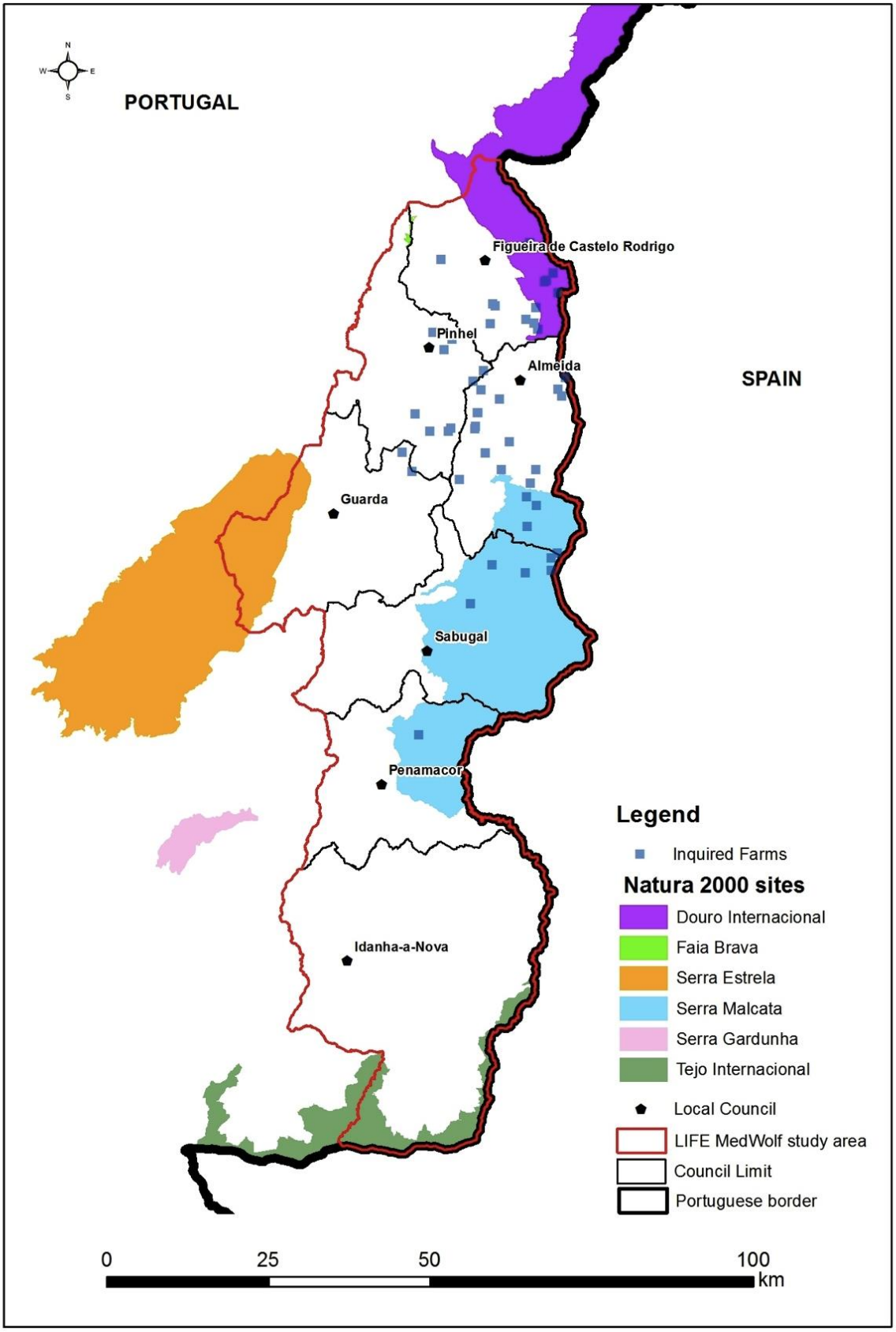

Figure 13. Distribution of the farms included in the survey by municipality in the project area.

5.2.1. Farm management and labour force

Most of the farms (84%) are exclusively family-based, without any employed labour and only 16% have salary workers (Table 7).

Table 7. Type of holding by municipality.

	Family-based		Employed labour		
Municipalities	**Nr.**	**%**	**Nr.**	**%**	**Total**
Almeida	17	85.0	3	15.0	20
Fig. Castelo Rodrigo	11	78.6	3	21.4	14
Guarda	3	100.0	-	-	3
Penamacor	1	100.0	-	-	1
Pinhel	4	66.7	2	33.3	6
Sabugal	6	100.0	-	-	6
Total	**42**	**84.0**	**8**	**16.0**	**50**

Only 30.1% of the farmers have less than 20 years of productive activity (approximately 70% of farms with more than 20 years) (Table 8).

Table 8. Length of farm productive activity.

Years	**Nr.**	**Mean**
<10	5	4.4
10-19	6	13.3
20-29	13	20.5
≥30	12	36.9
Total	**36**	**22.6**

5.2.2. Farmers' age

Some of the farmers had an advanced age for this type of activity: 54.9% under 50 years and 45.1% older than 50 years (Tables 9, 10).

Table 9. Mean age of the farmers by municipality.

Municipalities	**Nr.**	**Mean**
Almeida	17	48.3
Fig. Castelo Rodrigo	11	41.5
Guarda	2	59.5
Penamacor	1	45.0
Pinhel	5	56.4
Sabugal	6	50.5
Total	**42**	**48.2**

Table 10. Age classes of the farmers.

Age Classes	Nr.	%	Mean
<30	2	4.8	26.5
30-39	8	19.1	35.1
40-49	13	31.0	44.4
50-59	14	33.3	54.6
60-69	2	4.8	64.5
≥ 70	3	7.0	73.2
Total	**42**	**100.0**	**48.2**

5.2.3. Farm production types and off-farm activities

Of the surveyed farmers 82% devote their full time to agricultural activities (livestock production or animal and plant production). Only 18% of respondents are part-time in agriculture, developing other activities - ranging from municipality presidency, to the commercial (e.g. owners of coffee shops) or agrifood sectors (Table 11).

Table 11. Time devoted by farmers to agriculture by municipality.

	Full Time		Part Time		
Municipalities	**Nr.**	**%**	**Nr.**	**%**	**Total**
Almeida	17	85.0	3	15.0	20
Fig. Castelo Rodrigo	12	86.7	2	14.3	14
Guarda	2	66.7	1	33.3	3
Penamacor	-	-	1	100.0	1
Pinhel	4	66.7	2	33.3	6
Sabugal	6	100.0	-	-	6
Total	**41**	**82.0**	**9**	**18.0**	**50**

In 26% of the cases, the farmers' primary activity was animal and plant production. Only 4 (8.0%) reported an equal or greater weight of the vegetable production in relation to animal production. The 9 (18.0%) farmers that have both productions, refer to livestock production as contributing from 80% to over 90% to the farm income. The majority (74%) declare animal production as their farms' only source of income (Table 12).

5.2.4. Holding area

The surveyed farms represent a total area of 12,791 ha (Table 13). As for the holding area, 56% of the farms have up to 80 ha and 8% have more than 640 ha. The mean values reported for the project area present a distortion resulting from a survey of an abnormally large farm with 5,000 ha, located in the municipality of Almeida. The average farm area is 159 ha (n=49). The average farm area in the municipality of Almeida is 156.2 ha (n=19).

Table 12. Livestock *vs.* crop production by municipality.

	Animal and Plant Productions		Animal Production		
Municipalities	**Nr.**	**%**	**Nr.**	**%**	**Total**
Almeida	2	10.0	18	90.0	20
Fig. Castelo Rodrigo	7	50.0	7	50.0	14
Guarda	1	33.3	2	66.7	3
Penamacor	1	100.0	0	-	1
Pinhel	2	33.3	4	66.7	6
Sabugal	0	-	6	100.0	6
Total	**13**	**26.0**	**37**	**74.0**	**50**

Table 13. Size of the holding areas by municipality.

Municipalities	**Nr. Farms**	**Nr. ha per Farm**	**Mean (ha)**
Almeida	20	9,028	451.2
Fig. Castelo Rodrigo	14	1,510	107.9
Guarda	3	97	32.3
Penamacor	1	83	83.0
Pinhel	6	947	157.8
Sabugal	6	1,130	188.3
Total	**50**	**12,791**	**255.8**

The most representative classes in terms of holding area are: 40-80 ha with 24% of the holdings and 80-320 ha with 36% of the holdings (Table 14).

Table 14. The holding areas, per size classes.

Size Class (ha)	**Nr. Farms**	**Mean**	**%**
<20	8	11.0	16
20-39	5	26.0	10
40-79	12	56.7	24
80-159	9	108.1	18
160-319	9	213.3	18
320-639	3	383.3	6
640-1,279	3	950.0	6
>1,279	1	5,000.0	2
Total	**50**	**255.8**	**100**

5.2.5. Land ownership

As for the ownership of the land, 28% of the producers are working their own land, 68% work their own and rented land, while 4% are not landowners (Table 15).

Table 15. Land ownership (pasture) by municipality.

Municipalities	Own		Own and Rented		Landless		
	Nr.	%	Nr.	%	Nr.	%	Total
Almeida	7	35.0	13	65.0	-	-	20
Fig. Castelo Rodrigo	2	14.3	11	78.6	1	7.1	14
Guarda	2	66.7	1	33.3	-	-	3
Penamacor	1	100.0	-	-	-	-	1
Pinhel	2	33.3	3	50.0	1	16.7	6
Sabugal	-	-	6	100.0	-	-	6
Total	**14**	**28.0**	**34**	**68.0**	**2**	**4.0**	**50**

5.2.6. Livestock

The 50 surveyed farms contained, at the time of the survey, a total of 8,462 animals, from diverse species: cattle, sheep, goats, horses, donkeys and ostriches. The average number of head per farm, regardless of species, is 168.2 animals (Table 16).

Table 16. Livestock numbers per farm by municipality.

Municipalities	Nr.	Nr. Head	Mean	Range
Almeida	20	3,257	162.9	6-626
Fig. Castelo Rodrigo	14	3,239	231.4	43-504
Guarda	3	65	21.7	11-36
Penamacor	1	53	-	-
Pinhel	6	712	118.7	10-262
Sabugal	6	1,136	189.3	135-289
Total	**50**	**8,462**	**169.2**	**6-626**

In the surveyed farms, 52% produce cattle in a total of 2,534 animals, with an average of 97.5 animals per farm and with the number of head ranging from 4 to 512 animals. If farms with less than 10 cows are excluded from the analysis, the mean number of head per farm is 131.5 (n = 19) (Table 17).

Table 17. Number of cattle per farm by municipality.

Municipalities	Farms		Cattle		
	Without	With	Nr.	Mean	Range
Almeida	8	12	1,841	153.4	4-512
Fig. Castelo Rodrigo	9	5	306	61.2	5-117
Guarda	0	3	16	5.3	4-7
Penamacor	1	-	-	-	-
Pinhel	3	3	80	26.7	4-41
Sabugal	3	3	291	97.0	18-173
Total	**24**	**26**	**2,534**	**97.5**	**4-512**

Only 18% of the farms produce goats, with a total of 293 animals with an average of 32.6 animals per farm, ranging between 2 and 125 animals (Table 18).

Table 18. Number of goats per farm by municipality.

Municipalities	Farms		Goats		
	Without	**With**	**Nr.**	**Mean**	**Range**
Almeida	18	2	60	30	2-58
Fig. Castelo Rodrigo	14	0	0	-	-
Guarda	1	2	35	17.5	4-31
Penamacor	-	1	51	51	-
Pinhel	4	2	17	8.5	4-13
Sabugal	4	2	130	65	5-125
Total	**41**	**9**	**293**	**32.6**	**2-125**

As for horses and/or donkeys, 44% of the farms produce these species, containing a total of 99 animals with an average of 4.5 heads per farm, ranging between 1 and 34 animals. They are used for mainly for production, leisure, and also some as work animals (Table 19).

Table 19. Number of horses and donkeys per farm by municipality.

Municipalities	Farms		Horses and Donkeys		
	Without	**With**	**Nr.**	**Mean**	**Range**
Almeida	14	6	17	2.8	1-6
Fig. Castelo Rodrigo	8	6	49	8.2	1-34
Guarda	2	1	7	7	-
Penamacor	0	1	2	2	-
Pinhel	2	4	15	3.8	1-10
Sabugal	2	4	9	2.3	1-6
Total	**28**	**22**	**99**	**4.5**	**1-34**

The production of sheep is done in 58% of farms accounting for a total of 5,466 animals, with an average of 188.5 heads per farm, ranging from 1 to 626 animals. If holdings with less than 10 sheep are excluded from the analysis, the average number increases to 210 animals per farm (n = 26) (Table 20).

The production of ostriches is only done in one farm, in the municipality of Almeida, with 70 animals (adults and young).

Table 20. Number of sheep per farm by municipality.

Municipalities	Farms		Sheep		
	Without	**With**	**Nr.**	**Mean**	**Range**
Almeida	12	8	1,269	158.6	1-626
Fig. Castelo Rodrigo	3	11	2,884	262.2	75-502
Guarda	2	1	7	7	-
Penamacor	1	0	-	-	-
Pinhel	2	4	600	150	14-262
Sabugal	1	5	706	141.2	62-266
Total	**21**	**29**	**5,466**	**188.5**	**1-626**

5.2.7. Grazing area

In the inquired farms we found mainly rough grazing, natural and improved. Medium to steep slopes with rocky outcrops that in some farms are close to 80% of the exploration area. The predominant habitat in grazing areas ranged from open grassland to grassland with shrub vegetation (44/50) (80%). The predominant land cover is undergrowth shrubs in 42% of the farms, but 14% have tall shrublands (1 m or more).

The holdings consist mainly of grassland with shrubs (66%) and 22% of open grassland, being, in general, very heterogeneous in terms of predominant vegetation cover. In nearly all of them we can see the various types of vegetation cover in different proportions (Tables 21, 22). The tree cover is limited, consisting mainly of young oaks, and some Holm Oak.

Table 21. Habitat type in the farms.

Habitat	%
Grassland with shrub vegetation	66
Open grassland	22
Pasture and woodland	10
Highland (rocky outcrop)	2

Table 22. Predominant land cover in the farms.

Land cover	%
Undergrowth shrubs	42
Low scrub	24
Tall shrublands	14
Forest	8
Rocky outcrops	10
Other	2

5.2.8. Predation and predators

In 84% of the inquired farmers know of predation and attacks on neighbouring farms (Table 23).

Table 23. Predation on neighbouring farms.

Predation on neighbouring farms	Nr.	%
Yes	42	84
No	5	10
Does not know / does not respond	3	6
Total	**50**	**100**

In 92% of the cases, farmers indicate the wolf as the responsible for those attacks (Table 24). Nevertheless, some farmers do not consider attacks to lambs made by foxes, since they are usually not relevant or difficult to identify. We should emphasize that the data presented result from the opinion of the inquired producers and may not correspond to the real damage impact.

Table 24. Predators responsible for damage.

Predator Species	Nr.	%
Wolf	46	92
Fox and vultures	1	2
Do not know / does not respond	2	4
No attack	1	2
Total	**50**	**100**

In what concerns the presence of predators, responsible for attacks on livestock (either as the result of direct observation, suspicion or evidence presence), mentioned in 65 responses, only 4.6% refer the presence of dogs (abandoned, feral or belonging to neighbours) (Table 25). The wolf is reported in 58.5% of the cases, and fox and Egyptian mongoose in 23.1%. However, the livestock attacked by wolves create more serious problems to the producers.

Table 25. Presence of predators responsible for damage on livestock.

Predator species	Nr.	%
Dog	3	4.6
Wolf	38	58.3
Fox	9	13.8
Egyptian mongoose	6	9.3
No predator	9	13.8
Total	**65**	**100.0**

In 98% (49/50) of the surveyed farms there is reference to the existence of attacks in the past 6 years, as would be expected, since most of the interviewees were selected on the basis of having suffered wolf damage.

In 2012 and 2013, 84% of the farms suffered one or more attacks to their livestock, with an average of 3.31 attacks per farm. The average number of attacks by holding was 2.78. For the last two years (2012-2013) the results are shown in Table 26.

Table 26. Distribution of the attacks by municipality, in 2012 and 2013.

Municipalities	Nr.	Nr. Farms with Attacks	Nr. Attacks	Nr. Attacks per Farm
Almeida	20	20	85	4.3
Fig. Castelo Rodrigo	14	8	13	1.6
Guarda	3	3	4	1.3
Penamacor	1	1	5	5.0
Pinhel	6	5	13	2.6
Sabugal	6	5	19	3.8
Total	**50**	**42**	**139**	**3.3**

In the municipality of Figueira de Castelo Rodrigo, the percentage of farms attacked is 57.1%. The average number of attacks is very high in the municipalities of Almeida (4.3) and Sabugal (3.8), decreasing in the other municipalities, which may result from being located closer to the wolf distribution range (Fig. 14).

No animals were reported missing. 74% of the surveyed farms reported having animals killed by predators, 38% had animals injured and 84% had livestock killed and/or injured. An average of 10.7 animals were attacked per farm (considering animals killed and injured), with the highest number, 16.6 animals, being registered in Sabugal. Above the average predation rates are 9 farms, with a total of 265 killed and wounded animals and an average of 29 animals attacked per farm, a very high value (Tables 27, 28). Two are located in Figueira de Castelo Rodrigo, 4 in Almeida, 1 in Guarda, 1 in Pinhel and 1 in Sabugal.

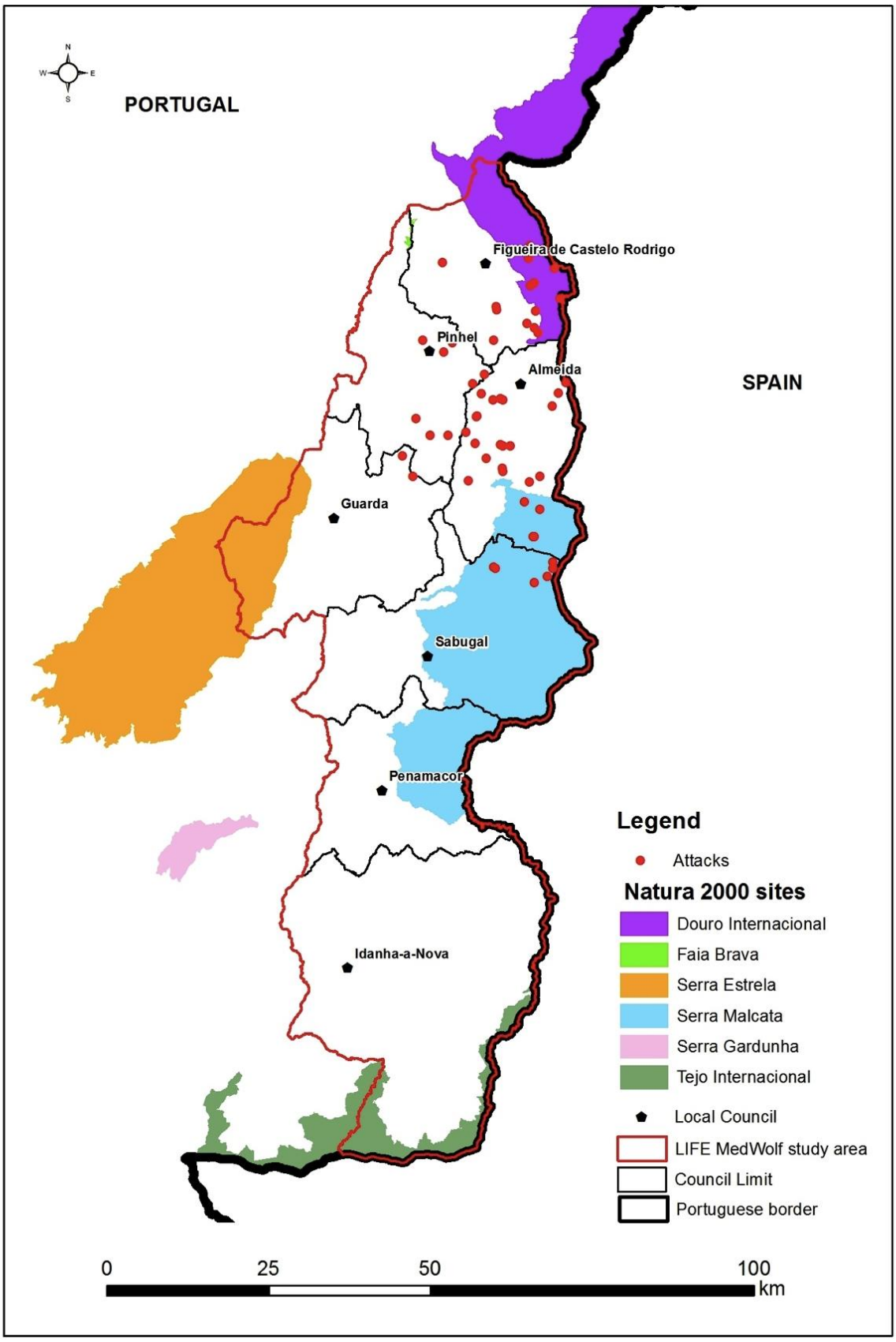

Figure 14. Distribution of the attacks on livestock by municipality in the project area.

Table 27. Predation impact on farms by municipality.

Municipalities	Without Killed Animals	With Killed Animals			Without Injured Animals	With Injured animals		
	Nr. Farms	Nr. Farms	Nr. Killed	Mean	Nr. Farms	Nr. Farms	Nr. Injured	Mean
Almeida	3	17	148	8.7	11	9	37	4.1
Fig. Castelo Rodrigo	8	6	69	11.5	10	4	31	7.8
Guarda	0	3	24	8.0	2	1	1	1
Penamacor	0	1	5	5.0	1	-	-	-
Pinhel	1	5	36	7.2	4	2	7.5	7.5
Sabugal	1	5	62	12.4	3	3	7.0	7.0
Total	**13**	**37**	**344**	**9.3**	**31**	**19**	**5.5**	**5.5**

Table 28. Total predation impact (killed and injured animals) on farms by municipality.

Municipalities	Farms Without Attacks	With Attacks (Killed + Injured)		
	Nr.	Nr. Farms	Nr. Animals	Mean
Almeida	0	20	85	4,25
Fig. Castelo Rodrigo	6	8	100	12.5
Guarda	0	3	25	8.3
Penamacor	0	1	5	5.0
Pinhel	1	5	51	10.2
Sabugal	1	5	83	16.6
Total	**8**	**42**	**449**	**10.7**

5.2.9. Damage reporting to the authorities

Of the 42 farms with predatory attacks to the livestock in 2012-13, only 2.4% of the farmers did not attribute responsibility to the wolf. Of the 97.6% who blamed the wolf for the attacks to their livestock, 17.1% did not report them to the competent authority (ICNF). This was either due to small damage value, or to the bureaucracy involved in the compensation process, or even because in most cases the results of the evaluation do not confirm the predator responsible as being the wolf, despite a positive expectation after the damage evaluation done by ICNF technicians. Furthermore, the delay in the payments, that can reach one year, also contribute to this situation. Nevertheless, the majority of the farmers (82.9%) reported the attacks to the ICNF (Table 29).

It appears that the attacks on farms, that were not reported them to the ICNF, are relatively infrequent and entail smaller economic losses (1.5 attacks/farm, and 3.6animals killed and injured/farm) relatively to farms where the attacks were reported (4.0 attacks/farm and 12.3 animals killed and injured/farm).

Table 29. Attacks reported to the ICNF.

Attacks	Nr. Farms	Nr. Attacks	Mean	Total (Killed + Injured)	Mean (Killed + Injured)
Not attributed to wolves	1	5	5	5	5
Attributed to wolves	41	134	3.3	444	10,8
Not stated	7	11	1.5	25	3.6
Reported	34	123	4.0	4,9	12.3

The results to this question are not very reliable, because the willingness to provide the information was less evident (Table 30).

Table 30. Reported attacks and replies from the ICNF.

Attacks	Nr. Farms	Nr. Attacks	Mean	Total (Killed + Injured)	Mean (Killed + Injured)
Reported	34	123	4.0	419	12.3
Positives	10	68	7.0	150	15.0
Negatives	13	29	2.2	193	14.8
Pending	10	19	1.9	69	6.9
Does not know / does not respond	1	7.0	7.0	7.0	7.0

Apparently no differences were observed in the number of animals killed and injured between farms with positive and negative replies. But a rather large difference exists between the mean number of attacks on farms with positive (7.0) and negative (2.2) replies. There seems to be a relationship between the number of attacks and the fact that they are confirmed as being done by wolves. In cases where the number of attacks is small they are usually confirmed as caused by dogs. This is in line with the existing knowledge about wolf ecology and stray dog predation events. The latter are usually occasional and thus have a reduced impact on livestock, whereas wolves, once established in a given region, produce repeated attacks to the same flock or to neighbouring flocks (Table 31).

The number and frequency of attacks seems to be associated with the fact that they are confirmed as having been done by wolves. More than 75% of the farms with 2 or less attacks had a negative evaluation, while more than 60% of the farms with more than 3 attacks had a positive one.

Table 31. Reply from the ICNF to the holdings that report attacks.

Nr. Attacks per Farm	Nr. Farms	Positive Reply		Negative Reply		Pending	
		%	Mean (Killed + Injured)	%	Mean (Killed + Injured)	Nr.	Mean (Killed + Injured)
1	13	33.3	3	66.7	7	4	5.0
2	10	25.0	13	75.0	15	5	4.4
4	4	75.0	21	25.0	41	-	-
5	3	50.0	6	50.0	34	1	27
6	1	-	-	100.0	10	-	-
7	1	-	-	100.0	7	-	-
15	1	100.0	28	-	-	-	-
31	1	100.0	36	-	-	-	-
≤ 2	23	28.6	-	71.4	-	-	-
≥ 3	11	60.0	-	40.0	-	-	-

5.2.10. Interest in collaborating with the project

The damage prevention method that gathers more interest from farmers is livestock guardian dogs (LGD), with 46% of the interviewed farmers, followed by the permanent fences, with around 40%. One producer expressed interest in electrical fences but with the purpose of pasture management instead of livestock protection from predation.

26% of the producers declare that they do not need any support, some show some unwillingness to collaborate, and other request measures not proposed by the project or propose unfeasible solutions (e.g. wolf disappearance) (Table 32).

Table 32. Type of support requested by farmers by municipality.

Municipalities	Nr.	LGD	Permanent Fence	LGD + Permanent Fence	No Support
Almeida	20	7	5	1	7
Fig. Castelo Rodrigo	14	3	6	3	2
Guarda	3	1	1	-	1
Penamacor	1	-	1	-	-
Pinhel	6	2	1	1	2
Sabugal	6	4	-	1	1
Total	**50**	**17**	**14**	**6**	**13**

No significant differences were observed in the mean number of attacks between farms willing and not willing to collaborate (2.8 *vs.* 2.7, respectively) (Table 33). Nevertheless, in one cattle farm that is unwilling to collaborate due to being discouraged by the compensation system, the incidence of predation was unusually high (15 attacks in 2012-2013).

Table 33. Predation on farms *vs*. willingness to collaborate.

Willingness to collaborate	Nr.	Nr. Attacks	Mean	Total (Killed + Injured)	Mean (Killed + Injured)
Yes	37	104	2.8	337	9.1
No	13	35	2.7	112	8.6

In Almeida all the surveyed farmers had attacks, although 7 were not willing to collaborate. In Figueira de Castelo Rodrigo the 2 farmers who have not requested support had no attacks in 2012-13. Of the 12 farmers who requested support in this municipality, 4 had no attacks but felt the need to implement prevention measures, 1 had 4 attacks and the others only 1 or 2. Three of the surveyed farms in Figueira de Castelo Rodrigo that requested support had 8 attacks with 81 animals killed and injured (mean = 27). In Pinhel 66.7% of the surveyed farms where willing to collaborate, and had an average of 10.3 animals killed and injure (Table 34). As expected, farms with a higher incidence of attacks had more losses (Table 35).

Table 34. Predation on farms *vs*. willingness to collaborate by municipality.

	Farms that do not want any support					Farms wanting support				
Municipalities	**Nr.**	**Nr. Attacks**	**Mean**	**Total (Killed + Injured)**	**Mean (Killed + Injured)**	**Nr.**	**Nr. Attacks**	**Mean**	**Total (Killed + Injured)**	**Mean (Killed + Injured)**
Almeida	7	25	3.6	76	10.9	13	60	4.6	109	8.4
Fig. Castelo Rodrigo	2	-	-	-	-	12	13	1.1	100	8.3
Guarda	1	1	1	20	20	2	3	1.5	5	2.5
Penamacor	-	-	-	-	-	1	5	5	5	5
Pinhel	2	4	2	10	5.0	4	9	2.3	4.1	10.3
Sabugal	1	5	5	6	6	5	14	2.8	77	15.4
Total	**13**	**35**	**2.7**	**112**	**8.6**	**37**	**104**	**2.8**	**337**	**9.1**

Table 35. Predation in farms, according to classes of number of attacks.

Nr. Attacks	Nr.	Nr. (Killed + Injured)	Mean (Killed + Injured)
0	8	-	-
1	18	82	4.6
2	11	99	9.0
3	-	-	-
4	5	110	22
5	4	7.2	18
6	1	15	15
7	1	7	7
8-14	-	-	-
15	1	28	28
16-30	-	-	-
31	1	36	36
Total	**50**		

5.2.11. Livestock management

An enormous heterogeneity in the handling of animals in the surveyed farms is observed. Considering the predominant livestock species (cattle and sheep) the major differences are specifically related with the type of livestock and the production target (meat or milk).

Meat sheep tend to be extensively grazed all year-round, in smooth or woven wire fences (Table 36). In milk production sheep the flock is divided, especially during the milking season. The dry flock being managed as the sheep meant for meat while the milking ewes are headed off to the paddock once or twice a day (Table 37).

Meat cattle tend to remain permanently in the pasture. The division into groups is a function of the number of head, of the holding size, the season and of the physiological state of the animals. Calving cows are usually separated from the rest of the herd, and gaze in different pastures. Generally, when the head number is small (cattle and sheep) flocks are not divided. In the larger size groups, 56% of the farms divide the flock.

There is no case of joint operations; only in one farm the livestock belongs to 2 owners, father and son, but is kept permanently together.

5.2.12. Protective structures

Within the same holding it is possible to find various types of fencing: woven or smooth wire, sometimes taking advantage of existing walls (brick or stone), with 1 or 2 barbed wires on top, but not always (Tables 36, 37). Most livestock is kept outside in pastures. The 8% who reported no structural protection in pastures, are permanently shepherded.

Table 36. Protective structures used in pastures.

Type of structure	Nr.	%
Smooth or woven wire fence	45	90
Stone wall	1	2
Nothing	4	8

Table 37. Protective structures used for night confinement.

Type of structure	Nr.	%
Smooth or woven wire fence	33	66
Corral	8	16
Barn	9	18

5.2.13. Calving season

The calving period is different between farms, being spread throughout the year in 46% of the farms (both cattle and sheep), or restricted to autumn/winter (40%) or to spring (12%) (Table 38).

Table 38. Calving season.

Period	Nr. Farms	%
All year	23	46
September to March	20	40
February to May	6	12
No births	1	2

5.2.14. Offspring management

Offspring may be kept in stalls, pastures or in the paddock and pasture, during the day and also the night, always from birth, or depending on the age. The tendency to keep lambs in paddocks is justified to protect them from climatic stress but also to prevent attacks of small predators. However most births occur on the pastures, after which the mother and offspring are moved into the stable (Table 39).

Table 39. Offspring management.

Nursery location	Nr. Farms	%
Stalls / shelter	27	54
Pasture	16	32
Pasture and Stalls	6	12
No births	1	2

The calves born on pastures are kept in groups with calved or calving females. The behaviour of the species prevents daily separation. Medium or large herds of calving cows (within the variation observed in the survey) are unable to be housed, due to welfare concerns (normal behaviour, animal density, hygiene conditions). In general, livestock is not surveilled during the night, and during the day it is surveilled in less than 50% of the cases (Table 40).

Table 40. Livestock surveillance.

	Day		Night	
Surveillance	Nr.	%	Nr.	%
No	17	34	46	92
Occasional	12	24	4	8
Yes	21	42	-	-

5.2.15. Presence of dogs

Of the farmers with no dogs 17/19 were cattle owners. Of those with livestock guarding dogs (LGDs), some did not used them to protect livestock (Table 41).

Table 41. Presence and type of dogs.

Dog type	Nr.	%
No dog	19	38
Herding dog	2	4
LGD	22	44
Herding dog + LGD	4	8
Other	3	6

The average number of attacks on farms with LGDs is 2.1, with herding dogs or other kind of dog is 2.0, while in farms without dogs it is 3.4 (Table 42). The effect of the presence of livestock guarding dogs in reducing the average number of attacks per farm is not clear, since we should consider that in some cases these dogs are not correctly used (e.g. serving as watch dogs, or kept chained).

Of the farmers inquired, 87.5% considered LGDs important to protect livestock, and only 8.3% did not refer to them as being important. As for the effectiveness of LGDs in reducing losses, 40.9% had a positive opinion, 18.2% reported that they have not reduced the losses, and 40.9% reported not knowing.

Table 42. Predation and the presence of dogs.

Type of dog	Nr. Farms	Without Attacks	With Attacks	Nr. Attacks	Mean
LGD	19	2	17	57	3.4
	7 *	3	3	6	2
	9	1	8	14	1.75
	3	1	2	6	3
	2	1	1	5	5
	5	1	4	6	1.5
Herding dogs + Other	5	0	5	10	2.0

6. Discussion

Most of the surveyed area is characterized by having poor or skeletal soils, mostly derived from granite, with steep slopes and many rock outcrops (e.g. a farm of 1000 ha of which 80% are rocky outcrops). Difficult climate, dry in summer and cold in winter, explains the predominance of livestock production in relation to crop production. The predominant habitat of grazing areas ranges from open grassland to grassland with scrub vegetation.

Small ruminants (sheep/goats) represent most of the livestock, with cows representing only 24%. Livestock densities are not very different across the study area, with Penamacor and Idanha-a-Nova municipalities having the lowest and highest densities, respectively, but livestock species are unevenly distributed with more cattle in Idanha-a-Nova, Sabugal and Almeida, and vey high sheep densities in Idanha-a-Nova.

Official wolf damage, registered from January 2012 to October 2013, reveals and uneven distribution, with damage concentrating in the municipalities of Almeida, Sabugal and Guarda, with Pinhel reporting only 9 attacks, and no damage in Figueira de Castelo Rodrigo, Penamacor and Idanha-a-Nova. The overall impact on livestock is very low, representing only 0.23% of the existing livestock in the whole study area, with the highest impact reaching 0.68% in Guarda municipality. Nonetheless, the economic impact to individual holdings can be relevant.

Wolves seem to have a general preference for small ruminants, except in Almeida where cows are attacked at similar rates. Half of the total number of animals attacked where injured or simply disappeared, mainly during attacks to sheep flocks, with some incidents of surplus killing. In almost 1/3 of the attacks young animals, mostly calves, were preyed. There is a tendency for a higher number of animals to be attacked in larger flocks.

Most attacks take place during the night and dawn being more frequent in spring and early autumn, and average 11 events per month in the whole study area. In more than 92% of the cases, livestock was not shepherded and in 71% LGDs were not present.

Results from the 50 holdings surveyed, reveal that most farms are family-based with no employed labor, having a productive activity with more than 20 years, with most farmers being of advanced age and devoting most of their time to agricultural activities. The average holding area is around 160 ha, with most of the farmers renting part of the grazing and agricultural lands, and having an average of 168 head. Around half produce cattle, with an average of 100 head per holding, and 76% produce sheep and goats, with sheep being most

common and with an average of 200 head. Almost half produce also donkeys/horses, averaging 5 animals per holding. And there is the ostrich farm with 70 head.

Almost all farmers registered predation events during the last 6 years, and had an average of 3 attacks in the last two years, mainly attributed to wolves, resulting in 11 animals killed/injured per farm, but in 9 holdings, throughout the study area, the numbers were higher, reaching almost 30 animals. Of the farms suffering wolf attacks, 17% did not reported the attacks to ICNF, but these correspond to occasional events and small damage values.

Meat cattle and sheep are mostly extensively grazed all year-round in fenced pastures (mostly wire fences), while milk sheep are headed twice a day to the paddock for milking. Calving occurs mostly throughout the year or in autumn/winter. Lambs, despite most births occurring in the pastures, are moved to paddocks, while calves are usually kept with calves or calving females in the pastures.

Only 42% are shepherded during the day and almost never during the night and only in half of the cases had LGDs, mostly in sheep flocks. Nevertheless, almost 88% considered dogs to be important to protect livestock.

In the study area livestock production is based on extensive to very extensive systems (1 cow/10 ha) essentially by grazing, where the size and scale of farming are effective determinants of the economic viability (especially for the meat component, in both sheep and cattle). Those systems are mainly characterized by low inputs of capital but also by low productivity. Predation can easily derail the survival of these production units.

Most predation problems seem to be related with deficient protection and inadequate management and husbandry: the absence of livestock guarding dogs, especially during the night, when the herds are left in fenced pastures, and the fact that cattle is kept in a free-ranging system, and calves are born outdoors, in the pasture, being thus extremely vulnerable to predators.

One of the first measures to prevent predation that a livestock producer can implement is assessing, and if necessary modifying the animal husbandry practices. Shed lambing, synchronizing birthing, and confining or concentrating young animals in areas with little vegetation coverage and in close proximity to human activities, mainly during periods of higher vulnerability (e.g. at night or during lambing), will contribute to reduce the risk of predation. Besides these management practices the use of guard animals, like livestock guarding dogs, is frequently suggested as a means of reducing losses. The use of dogs can be combined with other prevention measures, like the presence of shepherds, or the setting up of predator-proof fences.

Nevertheless, the proposed solutions have limitations, since they represent extra work and expense that are not always economically viable. Holdings with significant areas and with livestock numbers requiring walking through these areas to get the scant food, can hardly be confined during the night and cannot be confined during the day.

Any minor improvement in damage prevention, mainly during the night, can greatly reduce damages and the number of animals attacked per wolf attack. This could be especially evident in those holdings with higher level of damage and where episodes of surplus killing occur, and a relevant reduction in damage could be achieved. A good example is the ostrich farm that registered very high levels of damage that were reduced to zero (100% reduction) after the building of a permanent fence with the support of the MedWolf.

Despite the expected problems resulting from the inadequacy of the husbandry system and the lack of prevention measures in most holdings, 76% of the livestock breeders are interested to collaborate with the Project, and to implement prevention measures. LGDs are the most interesting method for farmers, followed by permanent fences.

The obtained results provide very useful information about the damage caused by wolves in the study area, and point to possible solutions. Nevertheless, these results must be confirmed with interviews, to assess the existing conditions in the most problematic farms, the possibility of implementing specific prevention measures, and the willingness of the livestock breeders to use them.

6.1. Management Implications

Three prevention methods are proposed to be implemented by MedWolf: i) livestock guarding dogs; ii) electric fences; and ii) permanent fences. The results obtained from the data gathered during the surveys and the official damage analysis may have relevant implications in what concerns the implementation of those two methods that will be discussed here.

The use of livestock guarding dogs can be very effective and easy to implement in flocks or herds that return daily or frequently (e.g. seasonally) to the stable/corral thus enabling the establishment of social bonds, fundamental for the dog protective behavior to develop. Nevertheless, in the case of extensive cattle that is rarely or never confined in stables bonding is more difficult to promote. This type of situation is very common in the study area, where wolves have been absent or exist in very low densities, and husbandry systems, especially in cattle farms (52% of the holdings), have evolved into increasingly extensive ones due to the low predation risk and the lack of necessity for prevention measures. In these cases a change

in the husbandry system may be necessary, at least during some months (from 2 to 6 months of the dog's age) so the dog can be bonded with the cattle and that these may become familiar with the dog. These changes may be difficult to implement since they imply an extra effort to gather the cattle during the night, for instance, and probably additional costs to build a temporary corral to confine the cattle and dog, as well as the dog acquisition and maintenance (food and veterinary expenses).

Another aspect to consider is the need to integrate at least two dogs (preferably at the same time, so they can form close bonds, reach adulthood simultaneously and start protecting the herd together), since one single dog may hardly be a match for one or two wolves, especially without the support of the shepherd as in the case of extensive cattle. Furthermore, there is the question of the regulations that stipulate that there should be 1 dog per 50 head for wolf damages to be compensated, while the average number of head per holding is around 170.

Regarding electric fences, results show very little interest in the use of these type of fences, since they are considered less effective in larger pastures, with several dozen ha, most common in the study area. There is also the problem of the regular fence maintenance, requiring extra work that is difficult to provide in such a husbandry system where availability for cattle surveillance is already minimal.

Permanent predator-proof fences represent higher costs for farmers and for the project, and are undoubtedly considered a very interesting asset, at least for fencing smaller areas to confine the cattle in specific situations (during the night, calving, etc). The increase in costs for the project can be compensated by a predefined contribution by the farmer, for instance by providing the manpower for the construction, some of the equipment or materials. This financial contribution will also result in a deeper involvement of livestock breeders, highly beneficial to the success of this prevention measure.

To evaluate the success of the prevention measures apart from the traditional economic assessment, comparing the number of damage before and after the implementation of the measure (in the case of LGDs should be done after reaching adulthood, 18-24 months of age), other criteria should also be used, namely the behavior of the dogs (evaluated according to the components proposed for this type of dogs, by Coppinger & Coppinger, 1980), the constraints arising during the building and maintenance of the fences or raising of the dogs, and finally the overall satisfaction of the farmers with each method.

The technical and financial support provided by the project should be promoted as a good opportunity to start implementing efficient management and prevention systems, by reducing initial implementation costs. These prevention measures can also be useful to protect against

stray and feral dogs and other predators or raptors (e.g. foxes, vultures in the case of LGDs).

Another aspect to consider is the reluctance of farmers to change their practices, in many cases reduced to minimum of effort and cost, and to invest in prevention measures they are not confident that will work. Finally the not very favorable attitudes toward wolves may render the use and dissemination of the prevention measures more difficult to achieve.

Evidently, future actions should focus on those holdings with high wolf damage, where the economic benefit will be greater, and where the willingness of livestock breeders to collaborate and implement the prevention measures by adapting the husbandry system is higher, making the implementation process easier and enabling the success of the measures. These holdings can be useful to show the local community that it is possible and economically viable to change current husbandry practices, introduce prevention measures and reduce damage. An economic analysis of the holdings (the most successful and problematic) should also be undertaken since it could help define the most adequate management options, and identify the soundest investments.

Apart from LGDs and fences, and some husbandry changes, other measures should also be considered, namely in situations where the previous methods are less effective or harder to implement. For instance, the development of smart technologies ("virtual fencing" or "virtual shepherd", Rutter, 2014), or the implementation of existing electronic devices (e.g. E-Shepherd collars) that alert the farmer to the existence of stressed animals or launch a series of scaring stimuli (sounds, lights) to keep predators away. Promising results exist and the adaptation of these new technologies to our husbandry systems should definitely be assessed.

Future studies should also focus on the feeding ecology of the species, to enable comparisons with the reported damage data and to evaluate the importance of wild ungulates, namely roe deer and wild board, as a food resource for the wolf.

7. Bibliography

Afonso S.A. 1995. *Uma abordagem à avaliação da condição física da população veado (*Cervus elaphus*) da Tapada Nacional de Mafra*. Tese de Mestrado em Ecologia Aplicada. Faculdade de Ciências. Universidade do Porto, Porto. 122 pp.

Álvares F. 1995. *Aspectos da distribuição e ecologia do lobo no Noroeste de Portugal. O caso do PNPG*. Relatório de estágio profissionalizante para obtenção da Licenciatura em Recursos Faunísticos e Ambiente. Faculdade de Ciências da Universidade de Lisboa, Lisboa.

Álvares F. 2003. *A Problemática dos Venenos na Conservação do Lobo e o seu Impacto na Biodiversidade dos Ecossistemas*. Relatório Técnico. Programa Antídoto – Portugal. Lisboa. 17 pp.

Álvares F. 2011. *Ecologia e conservação do lobo (*Canis lupus, *L.) no Noroeste de Portugal*. Tese de Doutoramento. Universidade de Lisboa, Portugal.

Álvares F., Barroso I,; Blanco J.C., Correia J., Cortés Y., Costa G., Llaneza L., Moreira L., Nascimento J., Palacios V., Petrucci-Fonseca F., Pimenta V., Roque S. & Santos E. 2005. *Wolf status and conservation in the Iberian Peninsula.* Poster apresentado no Wolf International Congress (Colorado).

Álvares F., Domingues J., Sierra P. & Primavera P. 2011. Cultural dimension of wolves in the Iberian Peninsula: implications of ethnozoology in conservation biology. *Innovation*, 24(3): 313-331.

Álvares F., Pereira E. & Petrucci-Fonseca F. 2000. O lobo no Parque Internacional Gerês-Xurês: situação populacional, aspectos ecológicos e perpectivas de conservação. *Galemys*, 12: 223-239.

Barroso I., Virgínia Pimenta V., Santos N., Pimenta C. & Godinho R. 2012. Sistema de Monitorização de Lobos Mortos: resultados entre 1999 e 2011. Poster apresentado no III Congresso Ibérico do Lobo (Lugo, Espanha).

Bosch J., Salvador P., Fonseca C., Martinez, M., de la Torre, A., Iglesias I. & Muñoz M.J. 2012. Distribution, abundance and density of the wild boar on the Iberian Peninsula, based on the CORINE program and hunting statistics. *Folia Zoologica*, 61(2): 138–151.

Carreira R. & Petrucci-Fonseca F. 2000. Lobo na região Oeste de Trás-os-Montes (Portugal). *Galemys*, 12: 123-134.

Carvalho P., Nogueira A., Soares A. & Fonseca C. 2008. Ranging behaviour of translocated roe deer in a Mediterranean habitat: seasonal and altitudinal influences on home range size and patterns of range use. *Mammalia*, 72: 89–94.

Coppinger, L. & R. Coppinger (1980a). So firm a friendship. *Natural history*, 89: 12-26.

Fonseca C. 2004a. Berros na Serra: O regresso dos veados à Serra da Lousã. *National Geographic Magazine – Portugal*, 38: 11–21.

Fonseca C. 2004b. *Population dynamics and management of wild boar (*Sus scrofa *L.) in Central Portugal and South-eastern Poland*. PhD Thesis, University of Aveiro.

Fritts S.H., Stephenson R.O., Hayes R.D. &. Boitani L. 2003. Wolves and Humans. Pp. 289-316. In: L.D. Mech & L. Boitani (eds). *Wolves: behavior, ecology and conservation.* University of Chicago Press, Chicago, Illinois, USA.

Grilo C., Moço G., Cândido A.T., Alexandre A.S. & Petrucci-Fonseca F. 2002a. Challenges for the recovery of the Iberian wolf in the Douro river south region. *Revista de Biologia*, 20: 121-133.

Grilo C., Moço G., Cândido A.T., Alexandre A.S. & Petrucci-Fonseca F. 2002b. *Bases para definição de corredores ecológicos na conservação de uma população marginal e fragmentada: o caso da população lupina a sul do rio Douro*. 1.ª Fase, Relatório Técnico PRAXIS XXI, Centro de Biologia Ambiental, Lisboa.

Kellert S.R., Black M., Rush C.R. & Bath A.J. 1996. Human Culture and Large Carnivore Conservation in North America. *Conservation Biology*, 10: 977-990.

Kruuk H. 1972. Surplus killing by carnivores. *Journal of Zoology*, 166 (2): 233–244.

Loureiro F., Pedroso N., Santos, M.J. & Rosalino L.M. (eds.) 2012. *Um olhar sobre os carnívoros portugueses*. Carnivora, Lisboa

Petrucci-Fonseca F. 1990. *O lobo (*Canis lupus signatus *Cabrera, 1907) em Portugal: Problemática da sua conservação.* Tese de Doutoramento. Faculdade de Ciências da Universidade de Lisboa, Lisboa.

Pimenta, V. 1998. *Estudo comparativo de duas alcateias no nordeste do distrito de Bragança. Utilização do espaço e do tempo e hábitos alimentares.* Relatório de estágio profissionalizante para a obtenção de Licenciatura em Biologia Aplicada aos Recursos Animais. Faculdade de Ciências da Universidade de Lisboa, Lisboa.

Pimenta V., Barroso I., Álvares F., Correia J., Ferrão da Costa G., Moreira L., Nascimento J., Petrucci-Fonseca F., Roque S. & Santos E. 2005. *Situação populacional do lobo em Portugal: Resultados do censo nacional 2002/2003*. Relatório Técnico, Instituto de Conservação da Natureza / Grupo Lobo, Lisboa. 158 pp+Anexos.

Rigg R., Findo S., Wechselberger M., Gorman M.L., Sillero-Zubiri C. & Macdonald D.W. 2011. Mitigating carnivore-livestock conflict in Europe: lessons from Slovakia. *Oryx*, 45: 272–280.

Robalo P. 1997. Variação da Densidade de Veados (*Cervus elaphus* L.) numa Área do Tejo Internacional: Influência do Habitat, Pastoreio e Caça. *Silva Lusitana,* 5(2): 225-240.

Roque S., Espírito Santo C., Grilo C., Rio-Maior H. & Petrucci-Fonseca F. 2005. *A população lupina a sul do Rio Douro em Portugal: análise temporal, atitudes públicas e aperfeiçoamento dos corredores ecológicos*. Relatório Final do Projecto. Centro de Biologia Ambiental, Faculdade de Ciências da Universidade de Lisboa. Lisboa.

Rutter, S.M. (2014). Smart technologies for detecting animal welfare status and delivering health remedies for rangeland systems. Revue Scientifique et Technique (International

Office of Epizootics), 33: 181-187.

Salazar D. 2009. *Distribuição e estatuto do veado e corço em Portugal.* Master Thesis. University of Aveiro, Aveiro, 62 pp.

Santos J.P.V. 2009. *Estudo populacional do veado (*Cervus elaphus *L.) no Nordeste Transmontano*. M.Sc. Thesis. Universidade de Aveiro, Aveiro.

Treves A. & Karanth K.U. 2003. Human-Carnivore Conflict and Perspectives on Carnivore Management Worldwide. *Conservation Biology*, 17: 1491-1499.

Vingada J., Fonseca C., Cancela J., Ferreira J. & Eira C. 2010. Ungulates and their management in Portugal. In: M. Apollonio, R. Andersen & R.J. Putman (Eds.) *European Ungulates and Their Management in the 21st Century*. Cambridge University Press, Cambridge.

Annex

FORMULÁRIO A.3 - Descrição Geral das Explorações N.º _ _

I. Informação Geral

1. Data: ...../...../20….. **2.** Hora: ..... : ..... **3.** Entrevistador:.....

4. Nome do entrevistado: ……

5. Telefones: ……

6. Localização da exploração:

6.1. Localidade: ……. 6.2. Freguesia: …….

6.3. Concelho: ……. 6.4. Distrito: …….

7. Coordenadas GPS do assento de lavoura:

UTM X __ __ __ __ __ __ __ __ UTM Y __ __ __ __ __ __ __ __

8. Altitude (m) ….....

II. Características Administrativas

9. A empresa opera na região desde o ano de: ……

10. Qual o tipo de propriedade legal da exploração?

- ☐ Empresa do tipo familiar
- ☐ Empresa com contratação de funcionários
- ☐ Outro ……

11. Qual o cargo desempenhado na exploração pelo entrevistado:

- ☐ Gerente / dono
- ☐ Encarregado
- ☐ Pastor
- ☐ Ajudante
- ☐ Outro ……

12. O entrevistado é agricultor a tempo inteiro?

☐ Sim ☐ Não, a percentagem de tempo dedicada ao maneio é: ……. %

13. Quais os principais rendimentos da exploração?

- ☐ Produção animal ……. %
- ☐ Produção vegetal ……. %
- ☐ Produção florestal
- ☐ Trabalho noutras explorações
- ☐ Reforma
- ☐ Subsídio de desemprego
- ☐ Negócio próprio
- ☐ Outro ……

14. Quantos funcionários trabalham na exploração ? **14.1.** E quais as suas idades ?

Pessoal	N.º	Idades
☐ Proprietário dos animais		
☐ Encarregado de pessoal		
☐ Pastor – ovinos		
☐ Pastor – caprinos		
☐ Vaqueiro		
☐ Agricultor		
☐ Ajudante		
☐ Outros		

15. Se a exploração tem mais que um proprietário identificar os restantes:

Nome	Localidade

III. Características da Exploração e das Áreas de Pastoreio

16. Qual a área total da exploração? ..... ha

17. As pastagens pertencem a diferentes proprietários? ☐ Sim ☐ Não

17.1. Se sim, qual é a distribuição do número de hectares por proprietário?

☐ Proprietário da exploração ..... ha
☐ Arrendadas ..... ha
☐ Comunitárias ..... ha
☐ Outros .... ha

18. Qual a percentagem da área de pastoreio, em relação à área total da exploração?

☐ Até 25 % ☐ 26-50% ☐ 51-75% ☐ >75%

Caracterização das pastagens habitualmente utilizadas

19-21. Qual a propriedade, localização e o número de ataques ocorridos nas pastagens no último ano?

Nº	Propriedade	Coordenadas		Distância a abrigos / edifícios / estradas (metros)				Nº de ataques no último ano		
		UTM X	UTM Y	0-500	500-1000	1000-5000	>5000	0	1-3	≥ 3
1										
2										
3										
4										
5										

* P-Própria / A-Arrendada / C-Comunitária / O- Outra (especificar)

22. Qual o habitat predominante das áreas de pastoreio? **23.** Qual o coberto vegetal predominante? Em que percentagens?

Nº	Habitat Predominante				Vegetação Predominante (%)					
	Pastagens abertas	Vegetação arbustiva	Bosque (montado sobro/azinho)	Outro	Matos rasteiros	Matos baixos (≈50cm)	Matos altos (≈1m)	Floresta	Afloramentos rochosos	Outros ……
1										
2										
3										
4										
5										

24. Existem precipícios na área de pastoreio? ☐ Sim ☐ Não

25. Existe linhas ou pontos de água nas áreas de pastoreio? ☐ Sim ☐ Não

25.1. Se sim, de que tipo? ☐ Linha de água ☐ Charca
☐ Barragem ☐ Poço

26. Em que meses do ano o gado utiliza a pastagem?

Jan	Fev	Mar	Abr	Mai	Jun	Jul	Ago	Set	Out	Nov	Dez

IV. Infra-Estruturas no Acento de Lavoura

27. Qual o número de abrigos existentes? Para pessoas ……. Para animais ……..

28. Tem eletricidade disponível? ☐ Sim ☐ Não

29. Tem água canalizada disponível? ☐ Sim ☐ Não

30. Qual a forma de acesso à propriedade? **30.1.** E qual o tempo necessário?

☐ Estrada asfaltada ..... minutos
☐ Estrada sem pavimento, veículo 2x4 ..... minutos
☐ Estrada sem pavimento, veículo 4x4 ..... minutos
☐ Nenhuma estrada, veículo 4x4 ..... minutos
☐ A pé ..... minutos

V. Maneio dos Animais

31. Quando em pastoreio, o efetivo é dividido em?

31.1. Anualmente:

☐ 2 grupos ☐ 3 grupos ☐ ≥4 grupos ☐ O efetivo não é dividido

31.2. Sazonalmente:

☐ 2 grupos ☐ 3 grupos ☐ ≥4 grupos ☐ O efetivo não é dividido

31.3. Época em que não divide: …….

31.4. Época em que divide: …….

32. Quais as épocas de parto dos animais?

Animais	**1ª Época (meses)**	**2ª Época (meses)**	**Outra**
Ovelhas			
Cabras			
Vacas			
Éguas			
…….....			

33. Onde são mantidas as crias após o nascimento?

34. Com que idade começam a acompanhar os adultos?

Animais	**Vedações**	**Estábulos**	**Pastagens**	.....	**Idade***
Borregos	☐	☐	☐	☐	
Cabritos	☐	☐	☐	☐	
Vitelos	☐	☐	☐	☐	
Poldros	☐	☐	☐	☐	
.....……....	☐	☐	☐	☐	

* Menos ou mais de 15 dias (<15<) ou idade em meses (x m)

35. O efetivo é junto com outros de diferentes proprietários durante o pastoreio?

☐ Não ☐ Sim

35.1. Se sim, em que altura do ano? …….

35.2. Qual o motivo? ……..

36. Se respondeu Sim, indique o nome e a localidade do(s) outros proprietário(s):

Nome	**Localidade**

37. Se o efetivo é dividido sazonalmente ou junto com o de outros proprietários, qual a dimensão do(s) grupo(s) em pastoreio, por época do ano?

Animais	**Verão***	**Inverno***
Ovino		
Caprino		
Bovino		
Equino		
Asinino		
…….		

***** Verão (~ Maio a Outubro) e Inverno (~ Novembro a Abril)

38. Como são eliminadas as carcaças dos animais que morrem?

Enterra (valas) ☐
Aproveita para alimentar cães ☐
Envia ao laboratório ☐
SIRCA ☐
Abandona no campo ☐
Outro …… ☐

VI. Espécies Pecuárias e Pastoreio

Efetivo	Número	Principais raças	Principais produtos	Pastoreio*		Horário de pastoreio	
				Verão**	Inverno**	Verão**	Inverno**
Ovino							
Ovelhas							
Carneiro							
Borregos							
Caprino							
Cabras							
Bodes							
Cabritos							
Suíno							
Porcas							
Porcos							
Leitões							
Bovino							
Vacas							
Touros							
Vitelos							
Equino							
Éguas							
Garanhões							
Poldros							
Asinino							
Outras							

*** Organização Pastoril:** SED – Sedentária; PED – Pendular; TRA – Transumante
Regime de Exploração: EXT – Extensivo; MXT – Semi-Estabulado (Misto); INT - Estabulação Permanente (Intensivo)
Sistema de Pastoreio: PER – Percurso; CONT – Contínuo (em cerca); SEMI-LIB – Semi-Liberdade

****** Verão (~ Maio a Outubro) e Inverno (~ Novembro a Abril)

VII. Defesa e Proteção

39. Quais as estruturas de proteção do gado utilizadas no **Verão**?

39.1. Durante o dia? **39.2.** E durante a noite?

	Ovinos		**Caprinos**		**Bovinos**		**Equinos**		**……..**	
Tipo de proteção	Dia	Noite	Dia	Noite	Dia	Noite	Dia	Noite	Dia	Noite
Nenhuma	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cerca tradicional Arame	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cerca tradicional Rede	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cerca elétrica	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bardo	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pátio	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Estábulo	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Outro …….	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

40. Quais as estruturas de proteção do gado utilizadas durante o **Inverno**?

40.1. Durante o dia? **40.2.** E durante a noite?

	Ovinos		**Caprinos**		**Bovinos**		**Equinos**		**……..**	
Tipo de proteção	Dia	Noite	Dia	Noite	Dia	Noite	Dia	Noite	Dia	Noite
Nenhuma	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cerca tradicional Arame	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cerca tradicional Rede	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cerca elétrica	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bardo	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pátio	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Estábulo	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Outro …….	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

41. O gado é vigiado por pastores durante o pastoreio? ☐ Sim ☐ Não

41.1. Se sim, por quantos? ……

41.2. Qual a regularidade da vigilância pelo pastor?

☐ Presença permanente

☐ Presença temporária ☐ Manhã .....-..... horas

☐ Tarde .....-..... horas

☐ Fim do dia/Noite .....-..... horas

☐ Visitas ocasionais Qual a periodicidade? a cada ..... dias

42. Descrição das cercas convencionais:

42.1. Material: ☐ Madeira ☐ Metal

☐ Aramadas ☐ Cordas ☐ Pedras

42.2. Altura: ……. m

42.3. Área: …….. m^2: ……. m x …… m

42.4. Forma da cerca: ☐ Circular ☐ Quadrada ☐ Outra ……

43. Características da Rede

43.1. Dimensão da malha: …… cm x …… cm

43.2. Está enterrada? Sim ☐ Não ☐ Se sim, a que profundidade?.....(cm)

43.3. Cravada no chão? Sim ☐ Não ☐

44. Quais os principais problemas relacionados com a utilização das cercas tradicionais?

☐ Tempo .....

☐ Custos .....

☐ Mão de Obra .....

☐ Técnicos.....

☐ Outros .....

45. Descrição das cercas elétricas:

45.1. Tipo de cerca: ☐ Fio ☐ Rede ☐ Arame ☐ Cabo

45.2. Altura da cerca: ……. m **45.3.** Número de fios: ……..

45.4. Altura do fio mais alto: ……. m **45.5.** Altura do fio mais baixo: ……. m

45.6. Distância entre fios: ……. m **45.7.** Distância entre postes: ……. m

46. Alimentação: Rede ☐220V

Bateria: ☐9 V ☐12 V

Painel Solar: Potência …….. Watt

47. Portão: ☐ Arame ☐ Ferro ☐ Outro ……

48. Área: …….. m^2: ……. m x …… m

49. Estado de conservação: ☐ Bom ☐ Médio ☐ Reduzido

50. Com que frequência a cerca é movida? ……. dias

51. Em que períodos a cerca é instalada? De ……..…….. a ……..……

52. Tempo necessário para a mudar? ……. minutos

53. Onde é que a adquiriu? ☐ Compra ☐ Oferecida ☐Outro ……

53.1. Quando a adquiriu? ……

54. Motivo de utilização da cerca elétrica? ……
……

55. Foi útil? ☐ Sim ☐ Não ☐ Não sabe

56. Houve diminuição nos prejuízos? ☐ Sim ☐ Não ☐ Não sabe

57. Quais os principais problemas relacionados com a utilização da cerca elétrica?

☐ Tempo .....

☐ Custos .....

☐ Mão de Obra .....

☐ Técnicos.....

☐ Outros .....

58. Usa dupla cerca (elétrica + convencional)? ☐ Sim ☐ Não

59. Tem outros sistemas de proteção e/ou de prevenção? ☐ Sim ☐ Não

59.1. Se sim, quais? ☐ Dissuasor acústico. Descrever: ……..

☐ Dissuasor visual. Descrever: ……

☐ Dissuasor Olfativo. Descrever: ……..

☐ Fladry. Descrever: ……...

59.2. Outros métodos de prevenção e de controlo utilizados:

……

……

……

……

……

60. Qual o número e o tipo de cães que vão com o gado?

	1	2	3	4	5	6	7	8	9	10
Tipo / Porte										
Raça										
Sexo										
Idade										
Com que idade o cão foi integrado no gado?										
Com que idade o cão começou a acompanhar o gado?										
O cão dorme com o gado?										
O cão acompanha sempre o gado?										
O cão foi educado / treinado para a função que exerce?										
O cão fica acorrentado? Quando?										
Qual a origem do cão?										
Período do dia em que acompanha o gado?*										
Nº de dias por semana em que acompanha o gado?										

Tipo: CG – Cão de Gado / CV – Cão de Virar / CC – Cão de Caça / O – Outro **Porte:** G – Grande (>60cm) / M – Médio (40-60cm) / P – Pequeno (<40cm)
Raça: CL – Castro Laboreiro / SE – Serra da Estrela / RA – Rafeiro do Alentejo / CGT – Cão de Gado Transmontano / PO – Podengo / IND - Indeterminada
Sexo: M – Macho / F – Fêmea / C – Castrado **Idade:** M – Meses / A – Anos / Ad – Adulto / C – Cachorro **Origem:** Comprado / Oferecido / Descendente seus cães
Período Dia: PP - presença permanente (dia e noite) / PT - presença temporária (M-manhã, T-tarde, N-noite) / PO - presença ocasional

61. Alimentação dos cães:

61.1. Que tipo de alimento costuma dar aos seus cães?

☐ Concentrado ☐ Aparas talho ☐ Leite

☐ Restos ☐ Partes de animais mortos

61.2. Quando costuma alimentar os seus cães?

☐ Manhã (antes da saída do gado)
☐ Meio do dia
☐ Fim do dia (depois do regresso do gado)

62. Há quantos anos tem cães de guarda do rebanho? ……

63. Têm sido úteis? ☐ Sim ☐ Não ☐ Não sabe

64. Os prejuízos têm diminuído? ☐ Sim ☐ Não ☐ Não sabe

65. Quais os principais problemas relacionados com a utilização de cães de guarda do rebanho?

☐ Tempo .....
☐ Custos .....
☐ Mão de Obra .....
☐ Técnicos.....
☐ Veterinários .....
☐ Circulação de pessoas desconhecidas .....
☐ Outros .....

66. Comportamento dos cães de guarda do rebanho?

66.1. Fizeram ataques a outros rebanhos/manadas? ☐ Sim ☐ Não
66.2. Fizeram ataques a pessoas? ☐ Sim ☐ Não
66.3. Fizeram ataques a outros cães? ☐ Sim ☐ Não
66.4. Fizeram ataques a espécies silvestres? ☐ Sim ☐ Não

66.5. Se sim, a quais?

☐ Javalis ☐ Veados / Corços ☐ Coelhos / Lebres ☐ Perdizes

VIII. Predação nos Animais Domésticos

67. O efetivo já sofreu ataques de predadores? ☐ Sim ☐ Não

68. Quando?

- ☐ Últimos 5 anos (2008-2013)
- ☐ Entre os últimos 5 e 10 anos (2003-2008)
- ☐ Entre os últimos 10 e 20 anos (1993-2003)
- ☐ Anteriormente (antes de 1993)

69. Houve alterações significativas na exploração entre estes períodos? ☐ Sim ☐ Não
Se sim, a que nível(eis)?

69.1. Animais

☐ Efetivo. Especifique: ……..
☐ Espécie. Especifique: ……
☐ Raça. Especifique: ……

69.2. Maneio

☐ Confinamento. Especifique: ……..
☐ Horário pastoreio. Especifique: ……..
☐ Outro. Especifique: ……

69.3. Proteção

☐ Pastor. Especifique: ……..
☐ Cães gado. Especifique: ……
☐ Vedações. Especifique: ……
☐ Outra. Especifique: ……

70. Porque razão não tem, tem poucos ou tem muitos ataques atribuídos ao lobo ?

.....

.....

71. Quais os predadores responsáveis? Qual o número de ataques e animais atacados?

Lobo ☐	**2013**			**2012**			**2011**			**2010**			**2009**			**2008**		
Efetivo	F	M	D	F	M	D	F	M	D	F	M	D	F	M	D	F	M	D
Ovino																		
Caprino																		
Bovino																		
Equino																		
Asinino																		
……..																		
Total																		
Nº Ataques																		
Prejuízo (€)																		

F – Feridos / M – Mortos / D - Desaparecidos

72. Qual a data do último ataque? ……

73. Recorreu ao sistema de compensação do ICNF? ☐ Sim ☐ Não

73.1. Se não, quais os motivos? ……..……..

74. Que reclamações apresenta acerca do sistema? ……..……

……

75. Cães vadios e outros cães ☐

	2012			2011			2010			2009			2008			2007		
Gado	F	M	D	F	M	D	F	M	D	F	M	D	F	M	D	F	M	D
Ovino																		
Caprino																		
Bovino																		
Equino																		
Asinino																		
……..																		
Total																		
Nº Ataques																		
Prejuízo (€)																		

F – Feridos / M – Mortos / D - Desaparecidos

76. Qual a data do último ataque? ……

77. Recebeu alguma compensação pelos danos? ☐ Sim ☐ Não

78. Qual a origem dessa compensação? ☐ Seguradora ☐ Dono do cão

79. Outros predadores ☐

Quais ? .....

	2012			2011			2010			2009			2008			2007		
Gado	F	M	D	F	M	D	F	M	D	F	M	D	F	M	D	F	M	D
Ovino																		
Caprino																		
Bovino																		
Equino																		
Asinino																		
……..																		
Total																		
Nº Ataques																		
Prejuízo (€)																		

F – Feridos / M – Mortos / D - Desaparecidos

80. Quando e a que horas ocorreram os ataques?

80.1. ☐ Dia ……. horas ☐ Noite ……. horas

80.2. ☐ Dia ……. horas ☐ Noite ……. horas

80.3. ☐ Dia ……. horas ☐ Noite ……. horas

81. Qual a atividade do rebanho no momento do ataque?

☐ Pastoreio: ☐ Percurso ☐ Aramada

☐ Repouso: ☐ Bardo ☐ Estábulo

☐ Marcha: ☐ Ida para pastagem ☐ Regresso da pastagem

82. O ataque foi no rebanho: ☐ Seco ☐ Alavão

83. Coordenadas GPS dos locais de ataque:

UTM X __ __ __ __ __ __ __ __ UTM Y __ __ __ __ __ __ __ __

UTM X __ __ __ __ __ __ __ __ UTM Y __ __ __ __ __ __ __ __

UTM X __ __ __ __ __ __ __ __ UTM Y __ __ __ __ __ __ __ __

UTM X __ __ __ __ __ __ __ __ UTM Y __ __ __ __ __ __ __ __

UTM X __ __ __ __ __ __ __ __ UTM Y __ __ __ __ __ __ __ __

IX. Presença de Predadores (incluindo cães desconhecidos)

84. Presença de predadores na região:

	Observados	Suspeitos	Indícios
Lobo	☐	☐	☐
Cães assilvestrados	☐	☐	☐
Cães abandonados	☐	☐	☐
Cães dos vizinhos	☐	☐	☐
Raposa	☐	☐	☐
Saca-rabos	☐	☐	☐
Outros. Quais? …….	☐	☐	☐

85. Viu predadores nos últimos 3 meses? ☐ Não ☐ Sim, quantos? ……..

Tipo de predador: ……

86. Dentro da exploração? ☐ Não ☐ Sim, quantos? …….

87. Momento do dia em que os viu? ☐ Manhã ☐ Tarde ☐ Noite

88. O(s) dia(s) em que viu os predadores (incluindo cães) tem alguma relação com épocas especificas?

☐ Caça ☐ Montarias ☐ Férias
☐ Outro ……..

89. Onde avistou os predadores?	Sim	Não
Perto do rebanho	☐	☐
Perto do local onde o rebanho esteve localizado em dias anteriores	☐	☐
Perto dos acentos de lavoura	☐	☐
A deambular pela pastagem em percurso de serventia	☐	☐

90. Os seus vizinhos também tiveram prejuízos com predadores (incluindo cães vadios)?

☐ Sim ☐ Não

X. Opinião e Disponibilidade para Usar Sistemas de Proteção

91. No passado, recebeu apoios financeiros para intervir na prevenção de ataques de predadores (Cercas elétricas, Cães de guarda, Dissuasores, etc...)?

☐ Não ☐ Sim, quais? ……

91.1. No caso de ter recebido, qual o seu grau de satisfação geral?

☐ Muito Satisfeito ☐ Satisfeito ☐ Nem satisfeito nem insatisfeito

☐ Pouco satisfeito ☐ Nada satisfeito

91.2. Porquê?

……

92. Está interessado em receber instrumentos de prevenção de ataques e contribuir para a avaliação experimental de sua funcionalidade?

☐ Não está interessado ☐ Não precisa ☐ Sim

92.1. Se está interessado, em quais?

☐ Cães de guarda de rebanho
☐ Cercas elétricas
☐ Cercas fixas
☐ Cercas fixas + elétricas
☐ Outros ……

92.2. Talvez, mas nas seguintes condições (especificar):

……

……

93. Se estiver interessado em receber cães de guarda do rebanho, tem preferência por?

Sexo: ☐ Macho ☐ Fêmea

Raça: .....

Tipo de pelagem: ☐ Curta ☐ Comprida

Cor da pelagem: .....

94. Comentários adicionais:

……

……

……

……