

FARMERS' ACCEPTANCE OF WOLVES IN PORTUGAL: JUST A QUESTION OF TIME?

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1. Introduction

Understanding attitudes toward wolves and wolf management is important because it can help researchers and managers to predict how people may behave toward wolves and respond to wolf-management actions (Bruskotter et al., 2009). In Portugal, wolves live in close contact with people and feed mainly on livestock (>70%) (Álvares et al., 2015), thus creating frequent situations of potential conflict between farmers and the national administration, which may result in wolf persecution. Official records from the Institute for Nature Conservation and Forests (ICNF) report 96 wolves found dead between 1995 and 2015 in Portugal, 42% of which as a result of poaching (18 were shot, 18 caught with snares and 4 poisoned) (Barroso et al., 2016).

Wolves are fully protected under Portuguese law (Law no. 90/1988) and damage to livestock is compensated by the government. Compensation covers

the payment of the market value for killed livestock and treatment costs of injured animals, but not of missing animals or indirect losses such as milk production. The legislation (Decree no. 139/1990) foresees eligibility for compensation when livestock is guarded by shepherds and livestock guarding dogs (LGDs) or confined, although confinement conditions are not defined and hence they are usually not wolf-proof. The revision of the legislation that is being undertaken requires livestock, if not guarded by a shepherd or LGD, to be confined in infrastructures that are considered wolf-proof (Decree no. 54/2016). The ICNF is responsible for assessing damages and payments, with values being defined according to weekly local market values. According to the law, payments should be made within 60 days, but this is seldom achieved.

Wolf presence is not uniform throughout its range, with higher densities in the NW and NE of the country and less stable packs at the edge of the distribution, particularly south of the Douro river (Godinho et al.,

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2012; Pimenta et al., 2005). According to the national wolf census conducted in 1997/97 and 2002/03 (Pimenta et al., 2005), the Portuguese wolf population seems to be stable, occupying less than 20% of its original range, which corresponded to the entire country (Petrucci-Fonseca 1990). Nevertheless, recent and localized monitoring studies reveal episodes of extinction of some packs and establishment of others with expansion of the wolf range in recolonisation events (Álvares et al., 2015).

We examined the results of two human dimension studies (Espírito-Santo, 2006, 2013) developed in different regions in order to see how farmers from regions with distinct characteristics and coexistence habits, namely concerning wolf presence (long-standing and stable vs. recent and irregular) and density (medium vs. low), damage risk and levels, husbandry systems and damage prevention measures, feel about wolves and how they accept the presence of the species.

In 2005, under the LIFE COEX project (LIFE-04NAT/IT/000144), farmers were interviewed in two regions with long-standing presence of wolves and where damage to livestock was high at the time of the survey (Pimenta et al., 2005). The main goal was to understand the conditions for coexistence of

humans and wolves. In 2013, under the LIFE MED-WOLF Project (LIFE11NAT/IT/069), farmers were interviewed south of the Douro River along the Spanish border (Fig. 1). The goal was to document farmers' attitudes toward wolves and wolf management, their knowledge and fear about wolves in a region with irregular but increasing wolf presence.

2. Study area

The study areas were selected based on wolf densities and levels of damage to livestock. The study area sampled in 2005 included a region north of the Douro river with four wolf packs and 1.6 to 3.0 wolves/100 km² and a region south of the river with six wolf packs and 0.5 to 1.3 wolves/100 km² (Pimenta et al., 2005) (Fig. 1). In both regions, 86% of damage caused by wolves was to sheep and goats (Álvares et al., 2015; Pimenta et al., 2005). Livestock was usually guarded by shepherds and LGDs and confined during the night (Fig. 2). The area covers 2,409 km² and includes nine counties and 125 parishes (“freguesias”), mostly with small rural villages in mountainous regions that reach a maximum altitude of 1,382 m (Fig. 3). According to the last census before the survey, there was a human population density of 53 people/km² (INE, 2001).

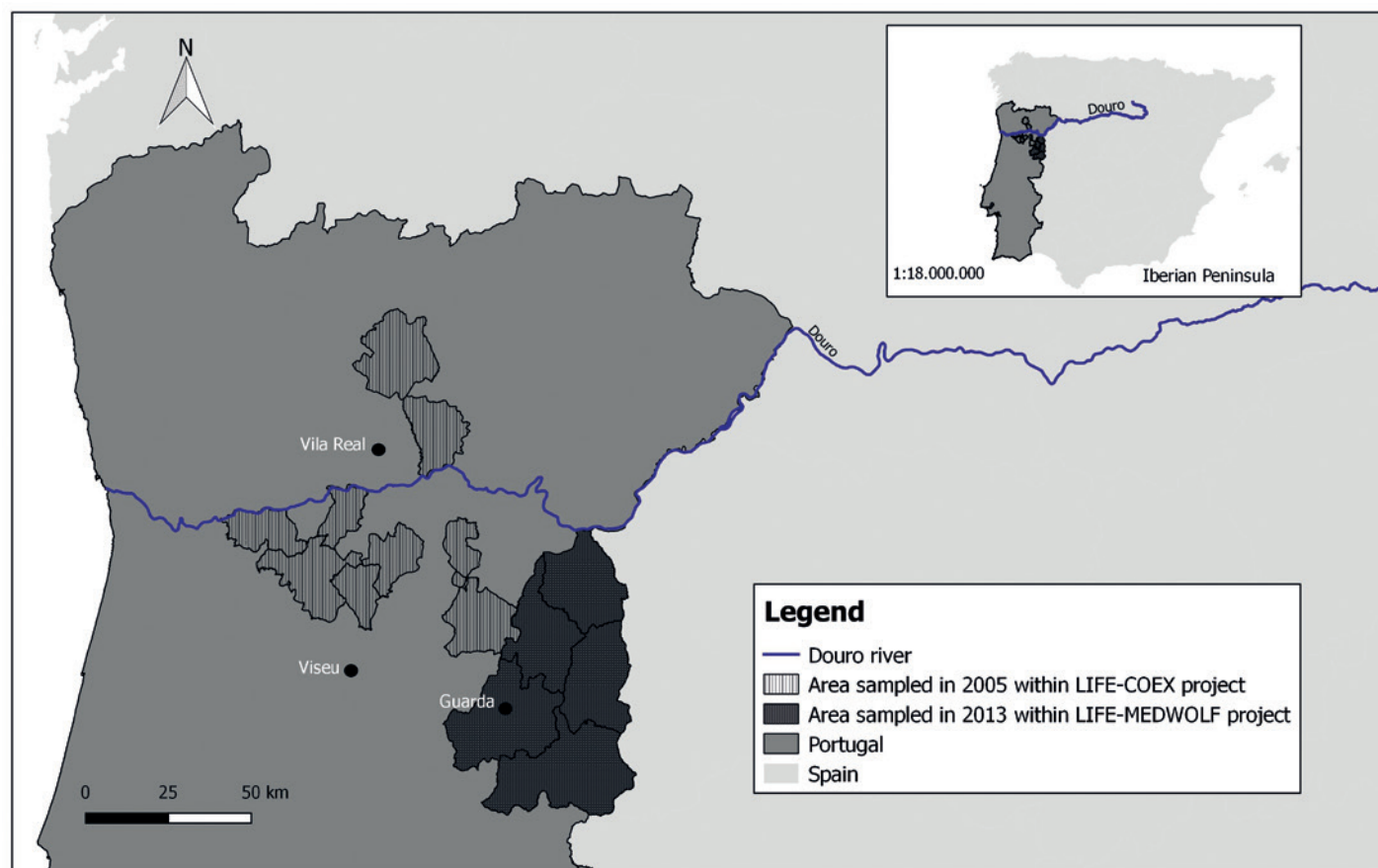


Fig. 1. Study areas where farmers were interviewed in 2005 and 2013.



Fig. 2. Livestock guarded by shepherd and dogs in Vila Real and Viseu regions. Photos: Clara Espirito-Santo, Sílvia Ribeiro.

Livestock represents around 70% of wolf diet in Portugal, primarily goats north of the Douro river (Carreira and Petrucci-Fonseca, 2000) and cattle south of it (Quaresma, 2002) (Fig. 4). In the latter case it is also common for wolves to feed on carrion (carcasses of cows, pigs, chicken or rabbits) dumped in farms (Roque et al., 2005). The prevalence of livestock in the diet of wolves is due to a lack of roe (*Capreolus capreolus*) and red deer (*Cervus elaphus*), which were almost eradicated by hunting (Salazar, 2009) and currently face a lack of ecological conditions for recovery as a viable prey for wolves.

In the 2013 study area, one of the two probable wolf packs identified in the previous national wolf



Fig. 3. Mountain pastures and village in the region of Vila Real. Photos: Clara Espirito-Santo.





Fig. 4. Goats are the main domestic prey of wolves north of the Douro river and cattle south of it. Photos: Clara Espirito-Santo.

survey (2002–2003) (Pimenta et al., 2005) had disappeared and one new pack (in Almeida) was detected (Cadete et al., 2012). More recently, the results obtained in the MEDWOLF Project indicated a 6-fold increase of wolf presence in the area but confirmed the presence of only one established pack with a minimum of eight members (although no reproduction has been confirmed since 1995) and two other probable packs, one of them sharing its territory with Spain (García et al., 2016). The wolf population density in this region is therefore estimated at 1.55 wolves/100 km² (Palacios et al., 2017).

The area covers 3,046 km² and includes five counties and 118 rural parishes in mountainous and plateau regions reaching a maximum altitude of 1,286 m, with a human density of 26 people/km² (INE, 2011) (Fig. 5).

There are not many studies of wolf diet in the region. The most recent study south of the Douro River, implemented from 2001 to 2003, indicated the in-



Fig. 5. Grazing areas in the MEDWOLF project region include plateaus and human density is lower closer to Spain.
Photos: Clara Espirito-Santo.





Fig. 6. Cattle grazed extensively in wolf country near Guarda (Portugal). Photo: Clara Espirito-Santo.

creasing presence of roe deer in the diet of some packs (Roque et al., 2005).

Wolf predation on cattle gradually increased between 2003 and 2013 (Álvares et al., 2015). According to the official records of wolf attacks on bovines provided by ICNF, there was an increase of 34% to 74% from 2012 and 2015. The number of bovines injured or killed increased from 14% to 45% in the same time period. This was due to an increase in the number of animals per farm, corresponding to an increase in the number of farms with >100 cattle heads, and a sharp decline in the number of farms with smaller herds (INE, 2016; Pimenta et al., 2017). It was also due to a lack of prevention methods, since cattle are mostly extensively grazed day and night, 365 days/year with no surveillance, LGDs or wolf-proof fences (Fig. 6). In the same period, the percentage of wolf attacks on sheep and goats decreased from 31% to 23%, and the percentage of animals killed went from 73% to 53% (data from ICNF) (Fig. 7).

In all areas, the density of roe deer was low, similar to its situation in other parts of the country (Torres et

al., 2011), but there are some signs of recovery due to natural dispersal processes and re-introduction programmes (Lovari et al., 2016a; Salazar, 2009; Vingada et al., 2010). Red deer was absent from both study areas but the population in Portugal is increasing



Fig. 7. Livestock guarded by shepherd and dogs in the county of Guarda. Photo: Clara Espirito-Santo.

(Lovari et al., 2016b; Salazar, 2009). It is uncertain whether the species has already reached the south-eastern tip of the area sampled in 2013, resulting from its expansion from subpopulations reintroduced further south or from trans-border Spanish populations. The wild boar (*Sus scrofa*) has shown a significant increase in number and distribution in Portugal (Fonseca, 1999) and is now widespread across the country, including most of the study areas (Fonseca et al., 2011; Oliveira and Carmo, 2000).

3. Methods

In 2005 and 2013, respectively 30 and 62 farmers were interviewed by the same person (female) through face-to-face interviews, in areas with the highest level of damage to livestock caused by wolves, selected according to official records made available by ICNF (Fig. 8). Farmers were selected randomly, not by socio-demographic characteristics such as gender, age or level of education, in areas with frequent livestock depredation by wolves.

In 2005, using an open-ended questionnaire, we analysed the major concerns of farmers and saw how important wolf related issues were in comparison to other agricultural issues mentioned by the respondents. They were also asked about the positive and negative aspects of having wolves in the region where they lived, if coexistence of humans and wolves was possible and, if yes, under what conditions. Questions were open-ended in order to allow respondents to provide more complete answers and to develop their ideas as deeply and freely as possible. The issue of wolf damage to livestock or coexistence of humans and wolves was not mentioned right at the beginning of the interview. The interviewer waited for the respondent to mention wolf-related issues and then continued with questions about these issues. Responses were hand-written as the respondents answered freely, and a content analysis was then done in order to identify all the issues and count the

number of times each issue was mentioned during interview. Although this is not a quantitative analysis, it provides useful information on the importance of each issue. A descriptive analysis was done based on diagrams presented ahead.

In 2013, a questionnaire with closed questions was used. This was mainly based on the attitudinal and belief items used in several previous human dimension studies (Bath and Buchanan, 1989; Bath and Majic, 2001; Espirito-Santo, 2007) and attempted to address the four components of attitude: affective, cognitive, behavioural intention and behaviour (Fishbein and Ajzen, 1975). Screening and preparation of the data followed the procedures described in Espirito-Santo (2007, 2013). For each respondent, several attitudinal scores were computed using Principal Component Analysis, with the 32 items resulting in several components (attitude scores) that represented how respondents felt about wolves and wolf management. A knowledge score was computed for each respondent by summing all the correct answers given to twelve questions about wolf biology and ecology (0 represents no knowledge; 12 represents high knowledge). A fear score resulted from the sum of answers to four fear items, which were coded in a gradient of fear (4 represents no fear; 18 represents strong fear). Descriptive analysis was used for examining responses to attitudinal questions and Spearman correlation coefficient to check the correlation between attitudes, knowledge and fear. A p-value of 0.05 was considered for significance of statistical results. More details on the methodology are available in Espirito-Santo (2007, 2013).



Fig. 8. Livestock owner interviewed in 2013 for the MEDWOLF Project survey. Photo: Duarte Cadete.

Data from the two studies are not directly comparable, but a qualitative comparative analysis provides some understanding of farmers' attitudes regarding wolves and wolf management in two areas with distinct levels of wolf presence and of coexistence with this predator.

4. Results

Results revealed that in areas with a long-standing presence of wolves, damage caused by wolves to livestock and compensation issues are not major problems for farmers in comparison with other concerns

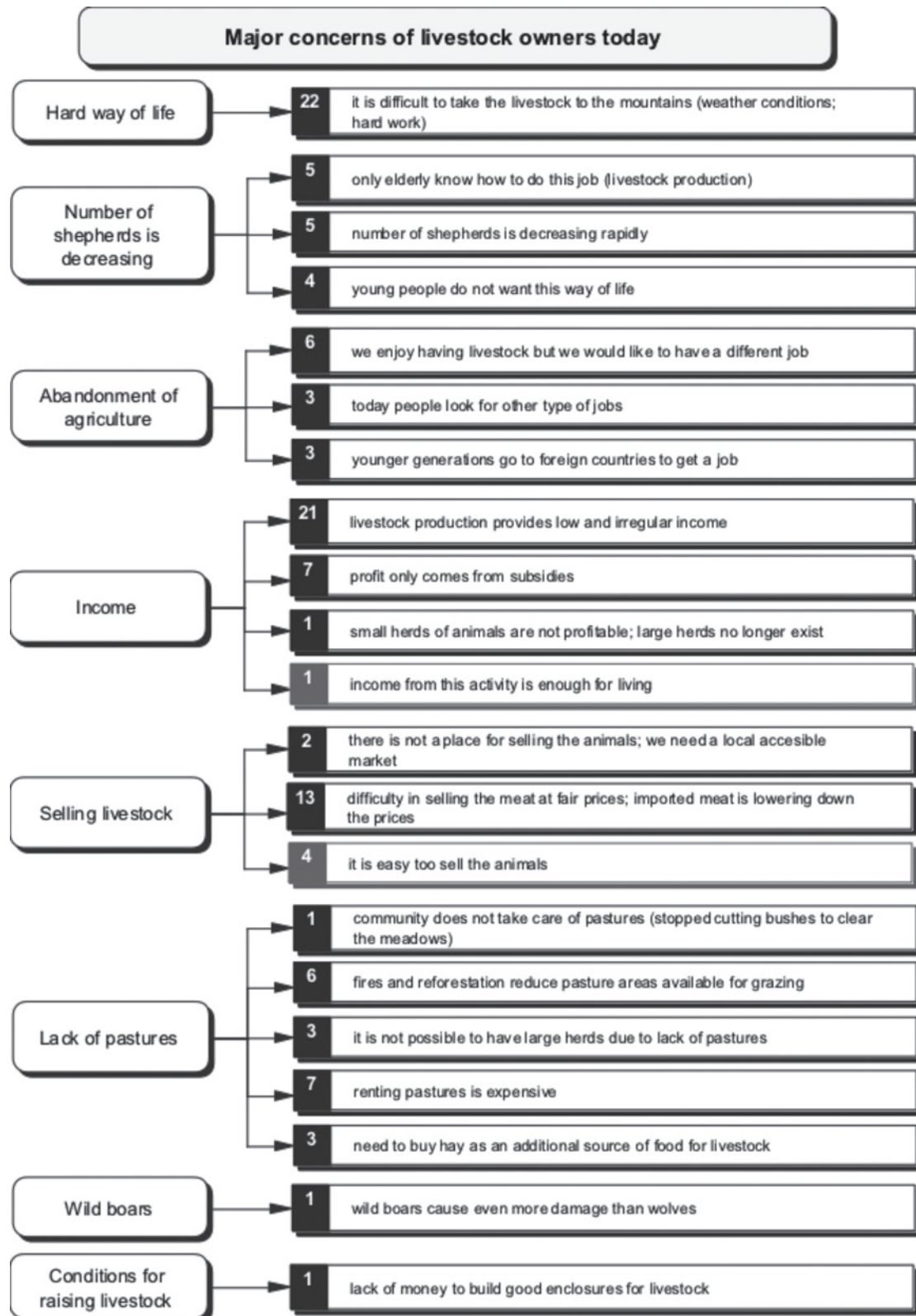


Fig. 9. Major concerns of farmers in areas with a long-standing presence of wolves. Numbers inside the black boxes refer to the number of times the issue was mentioned by farmers. Text boxes in grey present opposing points of view.

in their lives, although 77% of them claimed to have suffered damage by wolves. Most important were the harshness of the farmers' lives, the availability of pastures and economic issues related to low prices/demand, low/irregular income, livestock mortality due to diseases and fear of losing subsidies (Figs. 9, 10). Only when asked specifically about wolves did

farmers mention predation and compensation issues as relevant.

When asked about the negative impacts of having wolves nearby, respondents mentioned 11 different negative impacts, repeated 54 times in 30 interviews. The most negative consequence of having wolves nearby was said to be damage caused by wolf

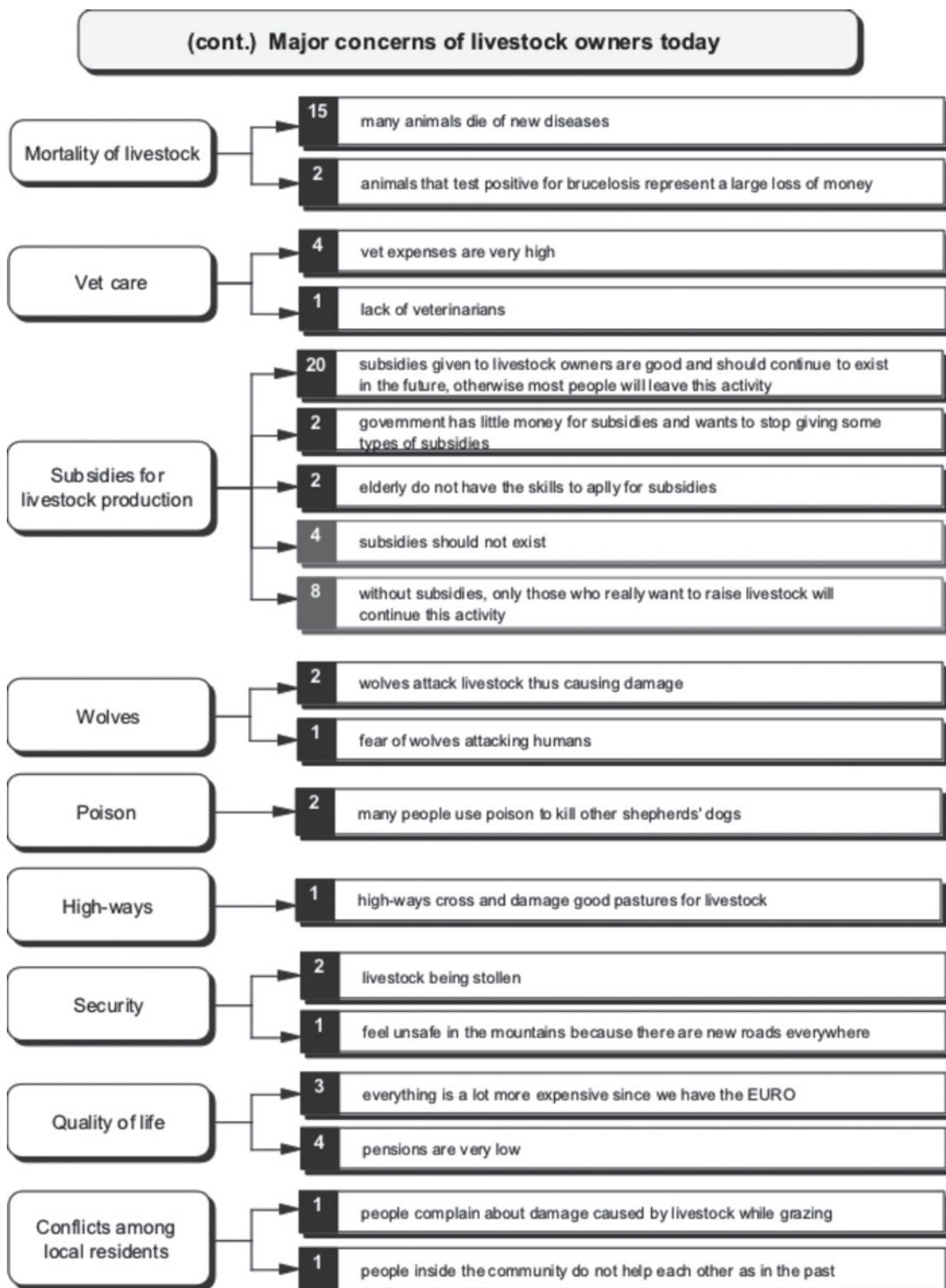


Fig. 10. Major concerns of farmers in areas with a long-standing presence of wolves (continuation). Numbers inside the black boxes refer to the number of times the issue was mentioned by farmers. Text boxes in grey present opposing points of view.

predation on livestock (#40) [# is number of times the issue was mentioned by respondents]. The fear of wolves attacking people was mentioned six times, followed by the concern with compensation for damage caused by wolves (#3), emotional impact (#2), dislike of wolves (#2) and predation on dogs (#1).

Although half the respondents argued that wolves had no positive effects, the other half listed seven different positive effects of wolf presence nearby, which were mentioned 44 times. Wolves were seen as part of nature (#21) and some respondents argued that people enjoyed seeing a wild wolf in its natural habitat (#7). The utilitarian role of wolves was also important (#16), whether it be their potential for wolf watching tours (#2), their “cleaning” role of dead animals in the wild (#4) or their indirect effect over shepherds who feel obliged to herd livestock to prevent depredation, thus keeping herds out of crops and avoiding conflict among shepherds (#10).

Although many farmers argued that coexistence of humans and wolves is not possible either because wolf survival is threatened (#23) or because traditional livestock production and shepherds tend to disappear (#11), some farmers believe wolves will naturally continue to live in the wild (#14) and most think coexistence is possible under certain conditions, namely rapid and fair payment of compensation for damage (#13), receipt of subsidies for livestock production (#8) and use of prevention methods such as livestock guarding dogs (#7), among 22 other conditions (Espírito-Santo, 2006). Although payment of compensation for damage was the most important issue, it was not unanimous since some respondents argued (#5) that livestock has to be guarded appropriately, and this is not a responsibility of the government. Even some respondents who had already had damage caused by wolves shared this opinion.

In areas where wolves are now recovering after decades of absence, farmers' attitudes toward an increasing wolf population were negative (82%), 95% agreed that wolves cause substantial damage to livestock, 79% stated they were entitled to compensation independent of the use of prevention measures, 76% disagreed with full protection of the species and opinions were divided concerning mandatory insurance for wolf predation on livestock. Data from a previous study on public attitudes, done in 2002 in the region south of Douro river where wolves have always been present, are in contrast to this view, as 55% of farmers agreed with payment of compen-

sation only to those who used preventive measures (Espírito-Santo, 2007), while in the MEDWOLF region only 18% agreed.

Farmers' attitudes toward wolves and wolf management were not correlated with their knowledge about biological and ecological aspects of wolves. The average knowledge score was low (4.24 on a scale from 0 to 12) and almost all respondents informally stated “what are the benefits of having wolves in the wild? If, at least, we could understand what wolves are useful for...”. These spontaneous statements show a possible link between knowledge on the benefits of wolf presence and increased acceptance of the species. However, farmers' negative attitudes toward wolves were correlated with fear, mostly fear of wolves attacking children. The average fear score was 9.89 on a scale from 4 to 18.

5. Conclusions

The objectives and methods of the two studies were different, but the results provide important clues on the acceptance of wolves by local agricultural communities in areas of recent and potential future recolonization. The differences between regions reveal the effect that different time-spans of cohabitation with wolves can have on the level of social tolerance. Acceptance is higher in areas with a long-standing wolf presence and where traditional herding techniques and prevention methods for reducing depredation have always been in place. The existence value of wolves is also visible in regions where wolves have always existed, but not so evident in areas now being reoccupied by wolves, such as the MEDWOLF Project area. Coexistence in this area requires an adaptation of herding techniques by local farmers but results show some resistance to that change. Social acceptance of wolves in these areas is a complex achievement that can more easily be reached through an effective and fair compensation system that farmers agree with. Economic incentives can be used to increase tolerance for some predators and protect some from poaching, but these are not a panacea (Treves and Bruskotter, 2014). We recommend working with farmers in the improvement of prevention methods in wolf areas where social conflict is high, or expected to be high, providing early technical support as well as specific/increased subsidies to implement them. We also recommend developing communication campaigns to reduce fear and increase awareness of the ecological and socio-economic benefits of wolf presence in those areas,

since providing information about the benefits people gain from predators, in combination with information about how to reduce risks posed by predators, may increase people's acceptance of predators in their region (Slagle et al., 2013).

As the proportion of people with a negative attitude increases to a maximum with the arrival of large carnivores, and decreases with experience over time (Zimmermann et al., 2001), we highlight the importance of reducing the chances of negative experiences, such as episodes of surplus killing or livestock depredation in general, as these are likely to deteriorate attitudes toward wolves. In areas showing the first signs of wolf recolonization and in potential wolf re-appearance areas, as identified through a GIS model-

ling approach implemented within the MEDWOLF Project (Ferrão da Costa and Petrucci-Fonseca, 2013) and integrated in the Portuguese Wolf Action Plan (Álvares et al., 2015), it is important to document people's attitudes, values and intentional behaviours toward wolves, and work ahead with farmers on effective damage prevention measures.

Results highlight the importance of economic issues to farmers, reveal the potential controversy of changes in the compensation system to increase requisites for compensation and reduce amounts paid, and stress the need to involve farmers in the development of wolf management actions. A collaborative approach involving livestock owners in the decision-making process is highly recommended.

Acknowledgements

We would like to thank all livestock owners who agreed to answer the questionnaire and ICNF for data on wolf damage to livestock. Funding was provided by the LIFE COEX Project (LIFE04NAT/IT/000144) and the LIFE MEDWOLF Project (LIFE11NAT/IT/069). Logistical support was provided by Grupo Lobo.

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