Published by Associazione Teriologica Italiana
Volume 23 (1): 73–79, 2012
Hystrix, the Italian Journal of Mammalogy
Available online at:
http://www.italian-journal-of-mammalogy.it/article/view/4548/pdf doi:10.4404/hystrix-23.1-4548

Research Article

# Damage prevention methods in Europe: experiences from LIFE nature projects

Valeria Salvatori[a,*], Annette D. Mertens[a]
[a] *Istituto di Ecologia Applicata, Via B. Eustachio, 10, 00162 Roma, Italy*

*Keywords:*
Wolf damages
LIFE Nature
damage prevention

*Article history:*
Received: 1 December 2010
Accepted: 8 February 2012

*Acknowledgements*
The project was co-funded by the European Commission (LIFENAT04/IT/000144) and the Junta de Castilla y Léon. We thank Grupo Lobo, Fundación Oso Pardo, Escola Superior Agraria de Castelo Branco, Provincia di Perugia, Provincia di Terni, Parco Nazionale del Gran Sasso e Monti della Laga, Parco Nazionale della Majella, Parco Nazionale d'Abruzzo, Lazio e Molise. We are grateful to L. Boitani and two anonymous referees who provided comments for improving the manuscript.

## Abstract

Management of damage caused by wolf to domestic livestock is a crucial measure that must be part of an integrated management strategy. Despite the existence of responsible authorities for tackling such aspects, resources are often insufficient for addressing the complex issues. LIFE Nature projects represent a valid tool for the implementation of measures for wolf conservation as the species is included in the Annexes of the Habitat Directive as a priority species. In the last ten years, over 30 LIFE Nature projects targeting wolf conservation were financed by the EU. Measures adopted in the projects were largely consistent and coherent with the Action plan for the Conservation of Wolf in Europe published by the Council of Europe in 2000.

The LIFE COEX project was implemented in Portugal, Spain, France, Italy and Croatia from 2004 to 2008, and represented an excellent example of international collaboration and amplification of knowledge and experiences of management measures adopted at different levels. Adapted to local conditions, the measures implemented achieved extremely positive results, particularly in areas where wolves are expanding. As an example, after installation of electric fences, the damage suffered by holdings from wolf attacks decreased by 100% in Portugal, 99% in Spain and 58% in Italy. In France and Croatia measures were adopted for intersectoral involvement (tourism and agriculture), which have contributed to the development of a participatory approach for wolf management.

The experiences acquired during the COEX project are in the process of being transferred to other places through the implementation of the LIFE EX-TRA and LIFE WOLFNET projects. The former involves Italy, Bulgaria, Greece and Romania, while the latter is implemented in three national parks in Italy. The results obtained are encouraging and future LIFE Nature Projects should capitalise on the experiences done, making use of studies and researches that will allow the maximisation of efficacy of adopted management measures.

# Introduction

Conservation of large carnivores in areas at high density human population is particularly challenging because of the conflicts between different interests (Treves at al., 2004). Such conflicts have for decades represented the justification for intensive extermination campaigns, bringing to local extinctions of large carnivores, particularly wolves, in many countries of Europe (Boitani, 1995, 2003). Nevertheless, the changes in attitudes and interests that have resulted in the development of national and international conventions and policies for improving the conservation status of wolves, bears and lynx, have

*Corresponding author
*Email address:* valeria.salvatori@gmail.com (Valeria Salvatori)



doi:10.4404/hystrix-23.1-4548

contributed to the increase of population and extent of occurrence of these carnivores. Above all the EC Directive 92/43/EEC (Habitats Directive) that lists the three species in the annexes as species whose conservation requires the designation of special areas of conservation (Annex II) and which need strict protection (Annex IV). This directive must be implemented by all members of the European Union through the development of national legislation.

In order to assist the member States in the implementation of the Habitats Directive, the European Commission has developed the LIFE programme (*L'Instrument Financier pour l'Environnement*), which allows the development of projects aimed at conserving habitats and species in its *Nature* brand (http://ec.europa.eu/environment/life/). The LIFE instrument started in 1992 and its fourth cycle is planned to end in 2013. Its main aim is to provide funds for the implementation of management measures coherent with the Habitats Directive, and it has been generously used for the conservation of wolf.

The implementation of national environmental policies and the raise of social environmental movements, together with the general abandonment of rural areas that has allowed the regeneration of natural vegetation and forests, has allowed the increase of small populations of carnivores that survived in some countries, leading to subsequent expansion of their distribution ranges (Falcucci et al., 2007, 2008). Such increase in density and extent of occurrence of wolves is most often associated to increasing conflicts with human activities on the land, particularly in areas where the wolf has been absent for decades and has made a comeback, occupying ranges where people have lost the habit to protect their domestic animals.

The strategies for conservation of large carnivores in Europe necessarily include tools for mitigating the conflicts with agricultural practices, particularly livestock husbandry (Boitani, 2000; Breitenmoser et al., 2000; Swenson et al., 2000). Mitigating measures include the adoption of tools for (i) preventing damages (Linnell et al., 1996) and (ii) compensating for damages suffered (Giannuzzi-Savelli et al., 1997). These should be associated to information campaigns and the improvement of agricultural practices that include at least the protection of newborn in stalls, as well as an improved land use planning that considers the risk of attacks to flocks left in pasturelands where carnivores are known to exist. While damage preventive tools adopt a pro-active approach and require a high level of responsibility and collaboration with livestock owners and shepherds, damage compensation is a re-active approach that is to be considered a short-term solution to a damage suffered (Antonelli et al., 2005; Breitenmoser, 1998). Thus, the policies that encourage the adoption of measures for preventing predators' damage should be preferred by national and local authorities. Given that the presence of wolves and other wildlife has an impact on the agricultural production in rural areas, some instruments have been envisaged within the agricultural policy that also contribute to the minimisation of such losses. In fact some regional administrations in Italy include subsidies for purchasing electric fences and dogs to protect livestock as part of the rural development funds for agriculture. This represents a recent approach to the more traditional one of compensating for damages suffered (without any prevention), associated with much discontent among both the ones who suffer the damage, as they never receive as much as they think they deserve, and the paying authorities who see no collaboration from the public (at least in S-European countries). These approaches are also often supported by non-structured programmes for monitoring damage occurrence, presence of carnivores, and agricultural methods used, often stemming from short-time projects which receive funds for only few years, and which do not allow a systematic monitoring of damage consistence and the efficacy of damage prevention tools in relation to carnivores presence.

From the available database of the EC, the number of LIFE projects targeting wolf in Europe between 1999 and 2008 is over 30. Most of them were focused on the mitigation of conflicts with domestic animals, namely minimisation of damages to livestock, associated to more or less intensive public awareness campaigns (Caporioni and Teofili, 2005). The measures used in all projects are the provision of livestock guarding

dogs and electric or metallic fences to protect livestock.

The LIFE COEX project *"Improving coexistence between large carnivores and agriculture in S-Europe"* started in 2004 and represented an international experience for coordinating activities aimed at mitigating conflicts that the presence of wolves and bears posed on the project areas. The project was developed during four years in different areas in Portugal, Spain, France, Italy and Croatia. It included a total of 18 partners in the five countries, and received co-financing form the Government of Castilla y Léon. The project stemmed from the baseline experience of authorities in the five countries, that appeared to have similar agricultural practices and having to tackle similar socio-economic issues associated to the conservation of wolf and bear. Particularly, with the exception of Croatia, all the project countries experience problems caused by the presence of wolves and bears in areas where they had disappeared for many decades and which are now used for agricultural practices, thus leading the rural communities living of livestock raising and agriculture to abandon some of the traditional practices used for protecting livestock from predator's attacks. The aim of the project was to implement practices for minimizing such conflicts and amplifying the experience gained through exchange of information and results.

# Methods

In its preparatory phase the LIFE COEX project included the estimation of presence of wolves and bears in the project areas through snow tracking, induced wolf howling, direct observations and DNA analyses; the evaluation of the knowledge basis of the local communities through a set of structured face-to-face questionnaires; the evaluation of damages suffered in the past and the establishment of partnerships with local livestock producers who agreed to participate to the project.

## Damage prevention tools

The core of the project was represented by activities to encourage the use of livestock and orchard protection devices and livestock guarding dogs in order to prevent damages from wolves and bears. The criteria used for selecting the beneficiaries of such measures were: (i) damage suffered in the past, (ii) importance of agricultural practices in their livelihood, (iii) flock size and presence of livestock guarding dogs. These measurable criteria were associated to non-measurable ones such as the availability to take part to the project and the trustful relationship established with project staff that allowed an evaluation of the correct use of the measures adopted.

## Electric fences

Different kinds of electric fences were installed, according to the needs of eventual beneficiaries, the kind and size of the stock owned and the places where the fences would have been set up. As a general approach, wire and net fences were used, with a battery and a solar panel for charging. Their length and number of wires were variable, according to the size of the flock and the items to be protected (fighting bulls, cattle, goats, sheep, bee-hives, orchards), ranging from 3 to 6 electric wires, or mesh nets of 50 m modules. Height ranged from 100 to 135 cm above the ground. Constant assistance was provided to the beneficiaries of the fences, in order to ensure the correct use and the material integrity. Regular visits and phone contact were maintained with the raisers, and the project staff intervened whenever a problem was expressed by the raiser. The amount of damage cause by carnivores in the holdings that installed the fences before and after the installation was recorded.

## Livestock guarding dogs

Different breeds of livestock guarding dogs were selected, according to local traditional breeds. Dogs were given in Portugal, Spain and Italy. The dogs were selected according to parameters that could be assessed in the known parent dogs (Coppinger and Coppinger, 1980): absence of aggressive behaviour, good working behaviour, absence of infections and malformations, morphological characteristics. One or two dogs were given to each selected holding. The dogs were integrated in the flocks during their socialization period, that ranges from 6 to 14-16 weeks of age (Coppinger and Schneider, 1995; Scott and Fuller, 1965). The two years after a dog was assigned, were used to monitor the dog behaviour through observational studies and for visiting the holdings in order to assist the new owner in veterinary cares and correcting any eventual misbehaviour of the dog. During the last trimester of the project surveys were undertaken in order to assess the owner satisfaction and the amount of damage suffered since the dog was present in the holding.

### Satisfaction of beneficiaries

All the holdings that received dogs and/or fences in Spain and Portugal were interviewed for assessing their degree of satisfaction. In Italy a sample representing 32.6% of the holdings in the project areas (n = 78) were interviewed. The interviews were semi-structured with multiple choice options that allowed a quantification of the replies on a 5 degree scale (Kellert, 1986).

## Results and discussion

### Electric fences

A total of 290 electric fences were set up during the project, of which 207 for protecting holdings against wolf attacks. All but ten were mobile electric fences aimed at protecting sheep, while the ten fixed ones where set up for cattle (and one for bull-fighting calves).

In Portugal the effectiveness of the fences was 100%, with none of the holding where domestic animals were protected by fences (total n = 10) having suffered any additional damage. During the period 2000-2006, prior to the installation of the fences, the holdings experienced 6.6 attacks per year. With the fences they had no further attack. In Spain we registered a decrease in frequency of attacks of 98.3%, with 99% reduction of livestock killed or injured (total holdings with electric fences installed, n = 30). In Italy no attacks were reported to orchards or beehives protected by the fences, while only in 5 cases livestock was attacked while confined in the fence. It must be mentioned that in all these cases some technical problem had existed in the fence (not properly charged, posts fallen down, etc.). On average, the amount of domestic livestock damaged by wolves decreased by 57.8% in Italian holdings where electric fences were set up (n = 239), but this datum should be taken with caution, as some of the holdings are large and do not keep all the animals inside the fence. In Croatia the effectiveness of the fences was 100% as no attacks were reported after their installation (n = 11).

### Livestock guarding dogs

A total of 245 dogs were given to 148 holdings during the first two years of the project. In Portugal a total of 92 dogs were given to 64 holdings. In Spain 75 dogs were given to 42 holdings (15 holdings received 1 dog, and 30 holdings received 2 dogs). In Italy 78 dogs were given (23 holdings received 1 dog, 23 holdings received 2 dogs, and 3 holdings received 3 dogs). The results report a decrease in the damage suffered of 27% in Portugal (average annual animals killed before the dog: n = 11.1 and after the dog: n = 6.4), and 65% in Spain (average yearly frequency of animals killed-injured per holding before the dog: n = 15.1 and after the dog: n = 5.3) in holdings where dogs were not present before the project started. No specific results from Italy are available as the dogs were always associated to other dogs (taken by the livestock owner independently) or with fences. The presence of project staff was constant throughout the project duration, as the dogs usually took few years before they became effective against damage prevention and the new owners perceived them as an additional burden to their workload. Assistance provided ranged from veterinary care to provision of dog food for the first year of dog life, as well as re-location of dogs that were incompatible with a specific holding.

### Satisfaction of beneficiaries

Satisfaction of the new dog owners in Italy was very high, with 72-90% of the holders interviewed declaring to be very satisfied with the dogs.

The satisfaction of holding owners where fences were installed was positive in 85.2% of the interviewed sample, declaring that the fences were easy to use and manage, provided security at night and were effective also against other predators than wolf. All the holdings in Portugal and Spain expressed their degree of satisfaction as Very satisfied. Particularly, in Spain and Portugal some of the shepherds declared the presence of the fences correctly functioning allowed them not to sleep in the field overnight, thus increasing their quality of life.

The cost/effectiveness ratio of dogs was as-

sessed in Portugal and an estimate of the annual maintenance expenses (including food, vaccinations, dewormings and annual registry) varied from 140€ to 330€. If an estimate of the expenses with occasional veterinary care, corresponding to urgent treatments, is also included, this value increased in an order of 250-500€.

To be cost-effective one year after reaching adulthood (i.e. 16 months after integration) a LGD must cause a reduction in damage of at least 520€. In 37% of the studied flocks (n = 57) the use of LGD saved more than 520€ in the year after the dog reached adulthood. In these flocks where predation impact was medium to high the use of LGD was profitable and savings could reach 1445€. This was not true in those 43% cases where predation was low (less than 7 animals per year), where there was no reduction in the number of damage (9%) or where there was an increase (11%). In those cases where savings are low the expenses with the dogs can only be paid after three to four years. Nevertheless an important aspect to take into account in this case is the high mortality rate of LGD namely in the first two years of life. This will reduce their economic efficiency, since it means acquiring and raising another pup.

### Other activities

Other management activities, that were undertaken for contributing to the minimisation of conflicts between carnivore presence and human activities, addressed aspects indirectly linked to the presence of wolves, but that had an effect on the local communities who shared the environment with them. Ecotourism activities in the French Pyrenees, in Croatia, in Italy and in Portugal were supported through the test of eco-tours, the development of a brand for local products, and, most importantly, the revision of policies regulating compensation for damages.

Within the latter activity we developed an open source software that allowed the easy and quick management of the compensation paperwork. This was installed in Majella National Park and became functional during the last year of the project. The system networks all the relevant authorities (Park Administration, Sanitary Services, Forestry offices) involved in the procedure for damage compensation, without need of several visits to the holding damaged (it is only visited once immediately after declaration of damage). It applies a hierarchical permission system that allows each authority to check details under its responsibility and pass the procedure to the following authority. This has led to 60% decrease of time lag between damage occurrence and damage compensation, increasing trustfulness and support from the livestock owners to the relevant authorities.

The software is certainly a useful tool that allowed (i) coordinated and consistent assessment of the damage caused by predators, and (ii) significant reduction of time for obtaining the compensation. Nevertheless the policies for damage management were revised in order to make compensation conditional to the presence of damage prevention measures actively used in the holding. This is a crucial aspect to be considered as it raises the level of responsibility among livestock owners, who certainly need to be assisted while directly dealing with the presence of predators.

## Conclusion and way forward

Notwithstanding the improvement of conditions and procedures for damage management, we generally detected a very low degree of tolerance towards the damage caused by wolves and bears. The damage suffered by rural dwellers is often emotional rather than economic, and the payment of money for compensating such damage is not perceived as being enough for tolerating the losses incurred. The most commonly declared condition by the holding owners visited was one where they felt a complete lack of assistance from the local authorities and perceived the latter were giving priority to wildlife conservation rather than assisting them in improving their own livelihood.

Livestock owners often use wolf as a scapegoat for demonstrating their disagreement with the local and national policies, which is an extremely dangerous process for the conservation of wildlife in general.

We learned that early cooperation and constant assistance are key factors for building a

trustful relationship with livestock owners. Also these professional groups should be assisted, either economically or physically, in testing new devices and measures for damage prevention, as they seldom are aware of the available tools and sometimes lack of economic resources for acquiring them.

The experiences acquired throughout the LIFE COEX project are being amplified and transferred to other local administrations through two ongoing LIFE projects: EX-TRA *"Improving the conditions for large carnivore conservation: a transfer of best practices"*, and WOLFNET *"Development of coordinated protection measures for wolf in the Apennines"*.

LIFE EX-TRA is a four-year project started in 2009 and coordinated by the Gran Sasso Monti della Laga National Park, and includes the adoption of measures for damage prevention and management in Italy, Greece, Romania and Bulgaria. The core of the project is social-oriented, with a high level of attention paid to the understanding of needs and expectations of relevant stakeholders and the implementation of negotiation meetings where the main conflicts with these people shall be addressed.

LIFE WOLFNET also started in 2009 and will last for four years. It is coordinated by the Majella National Park and includes activities for improving the management of damage caused by wolves in Italy. The project focuses on procedures for damage assessment and management, as well as reduction of sanitary risk for wolf and livestock. Within WOLFNET project the software developed during the LIFE COEX project will be modified and installed in Pollino National Park and Foreste Casentinesi National Park, in central and southern Italy.

## Lessons learned

- Prevention of damage has higher probability to be a long-term solution of conflicts between wolf and humans than just compensation of damages suffered.
- Livestock guarding dogs require a considerable investment and assistance for at least the first two years of pup life and it is worth only for holdings that suffered considerable damage in the past.
- Electric fences are welcome by livestock owners but their correct use should be monitored constantly.
- The damage suffered is most often emotional rather than economic, and protected species might be used for attracting the attention of the local authorities onto problems more strongly affecting the professional groups (e.g. hard working conditions).
- Involvement of livestock owners should be undertaken at early stages when projects are started, in order to obtain their support.
- The responsible authorities should carry the burden of assisting livestock owners in testing and adopting new measures for damage prevention, prioritising such approach to the one of compensating for occurred damage.

# References

Antonelli F., Giannuzzi-Savelli B., Boitani L., 2005. Role of financial support to the livestock sector in the conflicts with wild carnivores. In: Ciucci P., Teofili C., Boitani L. (Eds.). Grandi Carnivori e Zootecnia tra conflitto e coesistenza. Biol. Cons. Fauna 115: 64–73.

Boitani L., 1995. Ecological and cultural diversities in the evolution of wolf-human relationships In: Carbyn L., Fritts S.H., Seip D. (Eds.). Ecology and conservation of wolves in a changing world. 3–11. Circumpolar Institute Occasional Pub. 35, Edmonton, Canada.

Boitani L., 2000. Action Plan for the conservation of wolves (*Canis lupus*) in Europe. Nature and Environment 113. Council of Europe Publishing, Strasbourg.

Boitani L., 2003. Wolf conservation and recovery. In: Mech D., Boitani L. (Eds). Wolves: behaviour, ecology and conservation. 317–340. University of Chicago Press, Chicago and London.

Breitenmoser U., 1998. Large Predators in the Alps: the Fall and Rise of Man's Competitors. Biological Conservation 83(3): 279–289.

Breitenmoser U., Breitenmoser-Würsten C., Okarma H., Kaphegyi T., Kaphygyi-Wallmann U., Müller U.M., 2000. Action Plan for the conservation of the Eurasian Lynx (*Lynx lynx*) in Europe. Nature and Environment 112. Council of Europe Publishing, Strasbourg.

Caporioni M., Teofili C., 2005. Conflitti tra carnivori e zootecnia, indagine sull'utilizzo dei sistemi di prevenzione dei danni nei progetti LIFE. In: Ciucci P., Teofili

C., Boitani L. (Eds.). Grandi Carnivori e Zootecnia tra conflitto e coesistenza. Biol. Cons. Fauna 115: 74–87.

Coppinger L., Coppinger R., 1980. So firm a friendship. Natural History 83(3): 12–26

Coppinger R., Schneider R., 1995. Evolution of Working Dogs. In: Serpell J. (Ed.). The Domestic Dog, its evolution, behaviour and interactions with people. 21–47. Cambridge University Press, Cambridge.

Falcucci A., Maiorano L., Boitani L., 2007. Changes in land-use/land-cover patterns in Italy and their implications for biodiversity conservation. Landscape Ecology 22: 617–631.

Falcucci A., Maiorano L., Garton E.O., Ciucci P., Boitani L., 2008. Land-use change and the future of the Apennine brown bear: a perspective from the past. Journal of Mammalogy 89: 1502–1511.

Giannuzzi-Savelli B., Antonelli F., Boitani L., 1997. Livestock subsidy systems and reform proposal to benefit large carnivore conservation. Istituto di Ecologia Applicata, Roma.

Kellert, S.R., 1986. The public and the timber wolf in Minnesota. Trans. N.A. Wildl. Nat. Res. Conf. 51: 193–200.

Linnell J.D.C., Smith M.E., Odden J., Kaczensky P., Swenson J.E., 1996. Strategies for the reduction of carnivore-livestock conflicts: a review. Norsk Institutt for naturforskning, Trondheim, Norway. 116 pp.

Scott J., Fuller J., 1965. Genetics and the social behavior of the dog. University of Chicago Press, Chicago.

Swenson J., Gerstl N., Dahle B., Zedrosser A., 2000. Action plan for the conservation of the brown bear (*Ursus arctos*) in Europe. Nature and Environment 114. Council of Europe Publishing, Strasbourg.

Treves, A., Naughton-Treves L., Harper E.K., Mladenoff D.J., Rose R.A., Sickley T.A., Wydeven A.P., 2004. Predicting human-carnivore conflict: a spatial model derived from 25 years of data on wolf predation on livestock. Conservation Biology 18: 114–125.

*Associate Editors:* F. Marucco, L. Boitani