Final Publishable Summary report

In our project, we set out the role of the dog in modulating the human – wolf relationships in the Former Yugoslav Republic of Macedonia, Poland, and Norway. These countries have different practices in terms of hunting and sheep breeding, allowing us to compare different type of human – wolf relationships according to the use of hunting dogs and livestock guarding dogs (LGDs). Our main conclusions concern 1) the potential impact LGDs on landscape in a context of rural abandonment, 2) the different uses of LGDs in traditional context and in the context of modern mitigation measures, and 3) the surprising potential negative effect of LGDs in a context of shared landscape between livestock breeders and hunters. These conclusions allow us to draw some practical recommendations in terms of mitigation measures in carnivore conservation actions. We observed differences in sheep breeding practices and also differences in the way local people are using LGDs between Macedonia and the Bieszczady area in Poland. These differences are mainly due to the fact that while livestock breeding traditions have been kept in Macedonia, few traditional livestock breeders remain in Bieszczady and most of our informants there were new livestock breeders also working with other agricultural activities.

1. Livestock guarding dogs can help maintain open landscapes in a context of rural abandonment

Beyond the differences between countries, we could observe the impact LGDs can have on livestock breeders' use of their landscape. Indeed, most Macedonian livestock breeders from the Shara Mountains are still transhumant and go to alpine pastures during summer, grazing their sheep in open landscapes with the help of shepherds and LGDs (Figure 1). In a context of rural abandonment and shrub encroachment of alpine pastures (Figure 2 & 3), LGDs allow the maintenance of sheep grazing in places where it would be dangerous to go without dogs, i.e. in shrub covered places or even in the forest when temperatures are too hot for the flock. Dogs are always actively scanning the area when the flock is moving and especially emboldened by the shepherds when coming close to dangerous areas.

In the Bieszczady area, only a few livestock breeders we met were still transhumant. Many sheep breeders keep their sheep close to the village, inside fenced fields or on meadows with one or two livestock guarding dogs inside (figure 4). There are no shepherds staying with the sheep and they freely graze inside their enclosures. In this context, LGDs are not helping the flock grazing into bushy places or in the forest. However, most of these fenced meadows are surrounded by forest and highly exposed to wolf attacks. Only the electric fence is effectively protecting sheep but, except for small flocks, it is only being used to protect sheep during the night in Bieszczady. Therefore, in this situation only the use of LGDs prevents the wolf from coming into the enclosure, and allows livestock breeders to keep sheep without shepherds in meadows surrounded by forest and wolves.

Although we have not conducted empirical data collection among Norwegian sheep breeders, the system is well studied from many points of view, permitting some comparisons. In Norway, sheep are only bred for meat and most of the traditional husbandry methods have been lost. Farmers release sheep into forest and mountain areas with neither shepherds nor livestock guarding dogs nor electric fences. Losses are very high in general and even higher now that wolves have returned.

Our investigations clearly show that LGDs have a potential impact on the landscape, since they are permitting shepherds to avail of grazing sites close to and even inside the forest. Moreover, in a context of rural abandonment and bush encroachment like in the Balkans, LGDs are slowing down the vicious cycle of land abandonment leading to loss of grazing pastures and increased difficulties to maintain livestock breeding activities. Our results also show contrasting approaches to landscape and wolf presence in contrasting situations that we can analyse following the ancient Roman classification of landscape. In the Balkans wolves have always been present and shepherds kept their traditional husbandry methods to protect the flock. They fight against the wolf which is crossing the border between *silva* and *saltus* (Lescureux and Linnell 2010) by using their dogs to maintain this border (between the flock – domestic and the wolf – wild) and also to cross it in the other direction, going into the forest (*silva*) with the sheep. In the Bieszczady area, wolves have always been present too, and it is more livestock breeding which is coming back and having to adapt to a difficult situation (meadows surrounded by forest), adopting some of the traditional husbandry methods which are still in use in the Tatra Mountains but also adapting them to the context of village meadows close to the forest, not using shepherds but combining the livestock guarding dog and the electric fence. Thus, they can maintain the presence of *saltus* enclaves inside the *silva* landscape. In Norway, wolves had disappeared and livestock breeding has been maintained but lost most of its traditional methods especially concerning the protection of the flock. *Silva* as well as *saltus* (Norwegian "*utmark*") are used for sheep grazing. Therefore, it looks there cannot be any acceptance for a border (and there is none in practice) between wolf space and sheep space, the only solution foreseen by livestock breeders being to lobby government to exclude the wolf from forest and mountain areas.

2. The shepherd – dog team as the traditional way to use LGDs: implications for LGDs use in different contexts

During our investigations we had the opportunity to meet three types of LGDs' users. Indeed, we met 1) livestock breeders who are traditionally using LGDs, but also 2) livestock breeders who were using dogs but not LGD breeds and then recently started to use LGDs, and lastly 3) some livestock breeders we met (especially in the Carpathians) started this activity without familial traditions and also starting to use LGDs.

In the Balkans, where traditional use of LGDs has been kept, sheep are always grazed by one or several shepherds accompanied by several livestock guarding dogs whereas in the northern Carpathians we met many people who are letting the sheep alone with generally one or two dogs in an enclosure. Therefore, even if the livestock guarding dogs are always considered as relatively independent animals, it appeared quite obvious that when shepherds are present on the Balkan pasture, dogs and shepherds are acting as partners. Both shepherds and dogs are observing each other to know how to react. If dogs smell something, shepherds will notice it and encourage them to search and eventually to attack the intruder if it is dangerous for the flock.

This partnership between LGDs and shepherds appears to be characteristic of their traditional use and has to be kept in mind in the different projects trying to reintroduce usage of LGDs in places where they have disappeared. The danger is that dogs can show unwanted behaviour and will not be corrected if used in the absence of a shepherd. The use of dogs without shepherds is quite a common feature where LGDs are being reintroduced in Western Europe because of high labour costs. This

form of use may require a selection for very different traits (i.e. less aggression) than previously which may reduce their effectiveness.

3. Livestock guarding dogs: a mitigation measure which can potentially raise new conflicts

In the Balkans, hunters are traditionally hunting in groups, especially for wild boar, and are using several dogs (figure 5) which are released in the forest in order to drive the wild boar towards the hunters. The coexistence of this hunting method with wolf presence is generating two types of conflicts. Firstly, there is a direct conflict between hunters and wolves since dogs are sometimes going far from hunters, at least out of sight, and it happens they are killed by wolves. Almost all hunters we met in the Balkans experienced having had their dogs injured or killed by wolves. Secondly, with this hunting method it also happens dogs are lost for several days. Looking for food, they go out of the forest and end-up in the mountain pastures. Even if they are not attacking the flock, they can be killed by livestock guarding dogs which are protecting the sheep against intruders. Therefore, some conflicts appeared to emerge between hunters and livestock breeders and there are cases when hunters have killed livestock guarding dogs in revenge. Such conflicts didn't appear to exist in the Bieszczady area since the hunts are operated in a different way and hunting dogs are rarely lost in the forest, and rarely killed by wolves. No conflicts appeared to exist between hunters and livestock breeders about livestock guarding dogs killing hunting dogs.

The first interesting conclusion that can be drawn from these conflicts is that behind an apparently homogenous rural response to an agent like the wolf, there can be internal divisions and conflicts between different traditional practices related to the wolf management occurring in the same landscape. The second conclusion is that some conservation actions aiming at mitigating conflict, like the introduction of livestock guarding dogs in places they were absent or from where they disappeared can cause unexpected new conflicts if not well studied in places where they are still in use and not properly implemented in accordance with the other existing practices in the landscape like hunting in the Balkans or tourism in the French and Swiss Alps.

The socio-economic impacts of this project include a better understanding of the complexity of human – wildlife relationships and the important role domestic animals can have on these relationships. Our conclusions can also be included into the more general framework of human relationships with the environment and human categorization of the world, especially the dichotomy between nature and culture, as well as between domestic and wild. Moreover, our main conclusions will be communicated to the general public, scientists, and wildlife managers and should promote a careful use of LGDs as a mitigation measure, showing their numerous advantages but also their potential to create conflicts. In that sense, our project is contributing to a trans-European transfer of knowledge between traditional and new users of LGDs giving a special attention to the importance of socio-economic and ecological contexts.