



Carnivore Damage Prevention News

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Notes from the Editors

The discussion about the effectiveness of Livestock Guarding Dogs (LGDs) has as much to do with politics as with reality. On one hand, many sheep breeders are reluctant to even try LGDs, because saying yes to the use of dogs is regarded as saying yes to the presence of large carnivores - and many sheep breeders throughout the world are trying to resist the return of carnivores in any form. As an argument these groups often down play the utility of LGDs. On the other hand, many pro-carnivore conservation groups underestimate, or ignore, the difficulties associated with effectively integrating LGDs into established sheep husbandry systems. These last 2 issues of Carnivore Damage Prevention News have attempted to cut through the politics by presenting a balanced view of LGDs. The evidence is clear that in many cases LGDs do work. However, it is also clear that they can sometimes cause problems, and that it is a long process to reintegrate them into many husbandry systems. Despite the accumulation of experience from many countries and many years there are still many questions left to answer. For instance, is aggressiveness towards humans in LGDs related to their ability to protect flocks against predators? How does a group of LGDs function to protect sheep against wolves? What is the influence of genetic factors on LGDs' emotional ties to livestock, playfulness in pups, and protectiveness in adults? Is it possible to predict the temperament of a LGD at early stages of its development using a simple test? What are the rules that regulate the distribution of dogs in and around the flock when several of them are present? What behavioural changes are observed after castration/sterilisation? And so on. Our basic message is twofold. Firstly, LGDs are one of the most successful ways of reducing depredation, but, secondly, each region must find its own solutions as to how best to integrate them into the local situation, if they can function at all. What we challenge people to do is to document the effect in quantitative and qualitative way so that we can all learn from each others experience.

The Editors

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Livestock Guarding Dogs: from the Transhumance to Pre-Zygotic Selection

by
Raymond Coppinger and Lorna Coppinger

Introduction

Why do livestock guarding dogs look and behave the way they do? It is because of their life-style and their very early development. It is because they were formed, over centuries of active working lives, by the rigors of the transhumance migrations in Europe and Asia.

This paper is about the effects of transhumance migrations on the populations of dogs used to protect the flocks. It begins with the most common questions people ask us about livestock guarding dogs:

- Do these dogs really work to protect livestock?
- Which breed is best?

Although we knew quite a bit about dogs when we began working with LGDs, mostly we knew about sled dogs, retrievers, and our own pets. We were as much novices about LGDs as the people who ask us those two questions. Our initial working and breeding stock came from Italy, Macedonia, and Turkey. We had seen dogs working with sheep there, and so we proceeded on the assumption that the dogs could also work in the USA. But as we tried to introduce dogs into American agriculture we were faced immediately by a debate on their effectiveness. It was a difficult question to answer because often farmers and ranchers had little record of how many livestock they lost to predators. Therefore it was impossible to measure any reduction brought about by adding a LGD. Adding to the quantification problem

was that predation rates are variable from year to year and even season to season. Thus an immediate drop in predation was not always attributable to the dog.

Do livestock guardian dogs really work?

The way to get data for analysis is to have a large sample size over many years. By the time we published a paper in 1988 on "A decade of use of livestock guarding dogs" (Coppinger et al. 1988), we were keeping records on 1,091 dogs that had been placed on farms and ranches in 37 states (Table 1). For the analysis, however, we relied on data collected from 1980 to 1986, dropping the first two years because of the youthfulness of the dogs. We collated 1,113 reports (individual dogs appear more than once, in succeeding years), and found good support for a "yes" answer to our first question. Some individual cases were spectacular, reducing losses from over two hundred animals per year to practically none. In other cases no benefit could be detected. Rarely were there increases in predation in the presence of a dog, but there were many producers who had problems with the dog itself. The dogs helped to reduce predation in the USA; not much variation occurred between years or between management systems.

Even with the indication of the data, the controversy about whether or not the dogs work still follows us around. Often it seems to be driven by self-interested motivations. Many leaders in agriculture, including government personnel, claimed that the dogs did not work, or that they may be successful in Eurasia but they could not work in the USA because of the kinds of predators or the differences in management systems. Often these detractors represented some agency, policy, or special-interest group for which it would not be in their interest to have the

Tab. 1: Effects of LGDs on predation by management system. Ranch: open range; Farm/Ranch: combination open range and fenced pasture; Farm: fenced pasture (Coppinger et al. 1988).

Management System	No Predation		Reduced Predation		Increase or No Change	
	No	%	No	%	No	%
Ranches	12	16	46	61	17	23
Farm/Ranches	18	11	113	72	26	17
Farms	190	22	559	63	132	15
TOTAL	220	20	718	64	175	16

dogs work. Sometimes the negative reactions appeared out of fear that the dogs **would** work—which might lead to unwanted changes in employment opportunities. For example, the US Department of Agriculture has a sub-section on Animal Damage Control, which has an annual budget of millions of dollars to support the trapping of depredatory animals.

In a law suit by the State of Wyoming vs the Environmental Protection Agency, the claim was made that poison was the only form of anti-predatory methodology that worked, and thus the farmers needed the rights to use the illegal and lethal compound 1080. In the USA, agency personnel involved with wolf reintroduction programs tend to emphasize stories where dogs have failed for one reason or other. Thus the data rarely are given as a ratio of good to bad dogs, but rather the reports focus on incidents where the dogs failed. Here again, such reports are intended to infer that dogs do not work and thus we need to keep the wolf control personnel on the payroll.

On the other hand, conservation organizations tend to want the dogs to be successful and often they exaggerate the case in their favor. Dogs and electric fences tend to be the only two working methodologies that are non-lethal, and thus are favored by those who wish to protect and preserve predators. There are others, however, such as fladry, which show some promise (see Musiani & Visalberghi, 2001, Rilling et al. 2002, Volpi et al. 2002).

And then there are the dog breeders. With the importation of dozens, perhaps hundreds, of Eurasian LGDs into the USA, the dog breeders have become part of every discussion about the abilities of the dogs. They tend to emphasize that their breed is best. The assertion is that this ancient breed (sexually isolated for several hundred years?) has proven its worth—with the emphasis on the assumption that the protecting behavior is genetic – which of course is only minorly true.

Do the dogs work? The question is a little like an assignment in a beginning logic course. Do all dogs work all the time against all possible predators? A Masai warrior told us that his dog protected his cattle against lions. “But a

lion would eat that dog!” was our incredulous response. “We hope he barks first,” was his proud reply.

Thus success or failure of the dog is a function of owner expectation.

Owner expectation, in many parts of the world, varies from flock to flock and region to region. Many areas have a unique race of dogs of which they are proud. Often these will be labeled “the national dog,” and there are countless claims to their success. Within regions there are dog experts who are knowledgeable about the nature of dogs. This culture can be dated back 2000 years to the Roman scholar Varro, who understood the need for LGDs to be “accustomed to follow the sheep”, and to Darwin, who described in 1859 how important early environment is in order to develop flock guardians. Darwin was reporting from Uruguay on the technique still used in Mexico today: the tradition of shepherds suckling their pups on sheep or goats in order to develop a bond between them.

Which breed is best?

Areas of the world that produce flock guardians have a tradition of livestock culture. Part of this culture is transhumance, the seasonal migration of sheep, goats and cattle, accompanied by shepherds and dogs, over distances of 500 to 1000 km from winter to summer grazing and back again. They have done this for hundreds and hundreds of years, wearing trails along



Fig. 1: Sheep flock on migration in Turkey. These trips on the transhumance are long and arduous, often with severe weather and difficult topography. (Photo: Ray Coppinger)

valleys and across mountains. The shepherds are not nomads but rather have a firm social and political base. They own property, have family and are part of a community structure. This is very important for the production of dogs that accompany livestock between the seasonal pastures.

Traditionally the brood bitches were often dogs of a village, dogs not owned by any individual, nor are they supported in any real sense, but rather they scavenged the village for food. The litters were born in places selected by the bitch, often in the proximity of livestock. Pup mortality was high. If discovered, the litters are commonly culled to two male pups. These formed social bonds with livestock, humans and other dogs.

Most of the dogs on the transhumance migration were males. This is because of culling practices and because the burden of rearing puppies left the females in poor condition. But many dogs, male and female, remained behind unless – and even if – the village was totally abandoned by people. Dogs that accompanied livestock were prone to high mortality rates. The trips were long and arduous, often with severe weather and difficult topography, a shortage of food, accidents and exposure to disease (Figure 1). Natural selection favored those animals that were the proper size for an easy, efficient gait, and also hardy and cautious. Following a transhumance migration, one observed many lost and dead dogs. Nowadays, in many countries, livestock are simply trucked between the two seasonal pastures. Dogs are still lost if they don't get back on the truck after a stop for feeding and watering the stock.

Dogs that complete a round trip (the survivors) have a better chance of reproduction. Dogs that are liked by humans for whatever reason – abilities as a sheepdog, size, color, or perhaps some unique conformation – have a better chance for survival and reproductive access. LGDs look the way they do because the humans they associated with came to prefer certain colors or sizes or behaviors, and they favored those dogs with extra attention, care and feeding. Biologists refer to this type of selection as post-zygotic, or post-mating – the dog already “on the ground” has the selective advantage. Their adaptive traits are important for their survival.

Not until the end of the nineteenth century was pre-zygotic selection widely practiced. In this case, selection occurs before any mating. Humans select which individual dogs to breed, and they often select on the sole basis of color, size, or morphology, with no reference to the adaptive quality of the desired trait.

The power of Post-Zygotic Selection

LGDs and other working types, races, or breeds of dogs were created by post-zygotic selection where humans favored and cared for dogs which had some morphological or behavioral characteristic that enabled the dog to outshine other dogs in the performance of some task. These animals were never sexually isolated from the greater dog population until recent times, and then mostly in the West by dog fanciers. Among the working LGDs on migration, dogs have a non-random frequency of morphological characters produced either by post-zygotic culling or founder effects. Due to the high disease rates in the dogs, population numbers oscillate widely. Repopulation by a few individuals will invariably affect the allelic frequency, commonly giving rise to populations of animals that are different and more uniform in some trait than was their ancestral population. Because of this, so-called breed characteristics such as color tend to be local and temporal – but never capricious.

Local dogs, so-called village dogs, do not kill domestic stock. LGDs born into livestock cultures also tend not to prey on domestic stock. Animals that do molest livestock are killed. It is often thought that because of this culling practice, not killing stock is a genetic characteristic. This is only partly true. Village dogs can be trained for hounding genets and other vermin, even though they don't kill animals in the village.

Creating a livestock guarding dog

The key to the lack of predatory behavior in village dogs and their descendants such as LGDs is early socialization. Dogs go through a period of social development between 3 and 16 weeks, with the early weeks being the most important. The developing pups learn their species identity and who they will socialize with. They tend not to direct predatory behaviors to species with which they have been socialized. Thus, livestock in a village tend not to be preyed on by village-reared dogs. In our experience, many good sheep guarding dogs would, however, kill wildlife, because it is not part of the village environment.

Dogs that are raised in sheep cultures imprint on sheep and shepherds. During this period species imprinting is probably olfactory. It is a matter of fact that sheep and the shepherds who associate with them have common odors, which increases the bonding. Shepherds will often say, “The dogs won't bite

me because they know I'm a shepherd." Well, it's probably more like, "The dogs won't bite me because I smell like a sheep." On the other hand, dogs may be aggressive to other people who approach the flock, such as hikers, because of their novel appearance and odor. The same odor imprint applies to other livestock a dog may encounter. Dogs imprinted on sheep won't behave similarly to goats or cows. But whatever species of livestock the pup was socialized with during the critical period will escape any predatory tendencies the dog might have as an adult. The one little glitch in the system is that not all members of a species are identical, and people or goats or cattle can have novel characteristics, unusual among those the dog was socialized with, and the dog will react to that novelty. We have seen perfectly good dogs pick on an individual sheep – "for no apparent reason."

The most important point is that a livestock culture develops its own dogs. It is almost unavoidable. The evolving dogs look like breeds of dogs. This is also almost unavoidable, but it is deceptive. The LGDs of any region are going to be shaped by the climate, the terrain, the length of the migrations, as well as diseases and the nature of the food they are scavenging. Humans have little to do with any of the selective forces. They can however adopt favorite animals and care and support them, which will lead to a differential mortality within the population. By supporting a color variation, for example, the shepherds may increase the frequency of that color within the population. This is all post-zygotic selection. None of this shaping is done by design, by pre-zygotic selection of breeding pairs.

Most working LGDs were born either in the winter lowland village or perhaps the summer encampment. Being born in any other location increases the mortality. Newborn pups born on a migration are almost certainly lost to the system unless extraordinary care is given by the shepherds.

If most of the surviving pups were born in villages then why did they follow the livestock either to the pastures or on the migration? A variety of motivations will get a dog to move. They will move to forage, to reproduce, or to avoid hazards. Moving

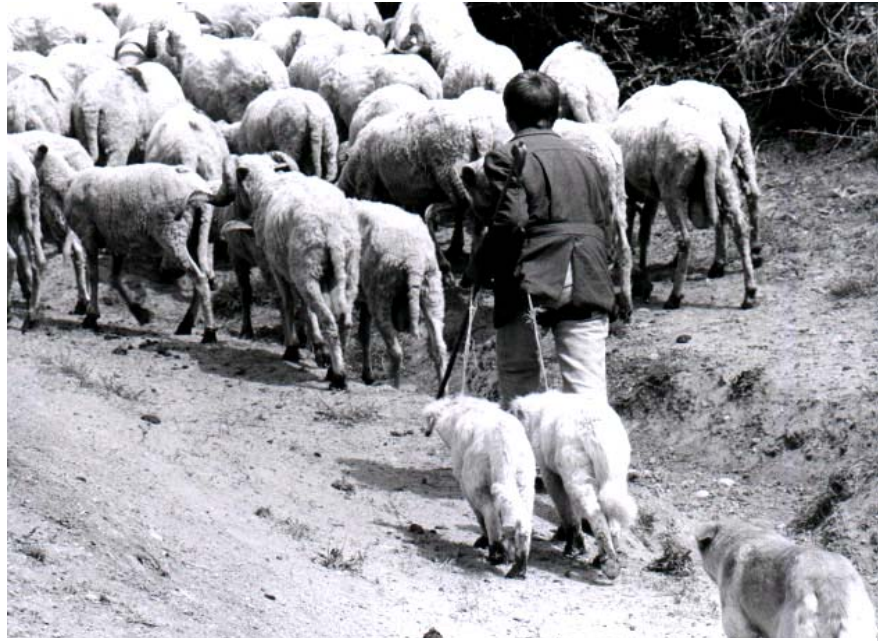


Fig. 2: The young dogs in this picture, on migration in the former Yugoslavia, are obviously favored by their shepherds. The young shepherd is making sure they do not stray from the trail. (Photo: Ray Coppinger)

away from a village where the dog has been feeding successfully is not likely. If however the source of food moves out then the dog will go out. Dogs are a social animal and react nervously to being abandoned. But abandoned by whom? Perhaps the peculiar nature of the bonding process compels the dog to follow a certain individual preferentially (Figure 2). In our studies of shepherded flocks in the Italian *Gran Sasso* we found that 60% of the dogs were motivated to move by sheep movement and 30% by the movement of the shepherd. Ten percent of the dogs never left camp to follow on the daily foraging for grass (Coppinger et al. 1983).

There are also developmental relationships in a dog's life. Within a flock, four or five dogs might have a hierarchy. Thus if an older, upper-level dog was following the shepherd, lower or subordinate individuals would always be on the opposite side of the flock. Dogs staying in camp might not follow the flock because they were not properly bonded with the livestock, or the herdsman, or they had a food supply that needed protection. Maybe there was some social relationship with animals in the herd, be they the herdsman, other dogs or even some other animal that they were avoiding. Perhaps they had a health problem that inhibited movement. The rule is that a dog will move to a place where it feels physically and socially comfortable. In the several studies we did on the different aspects of LGD behavior, both in the USA and in Italy, we found the dogs to

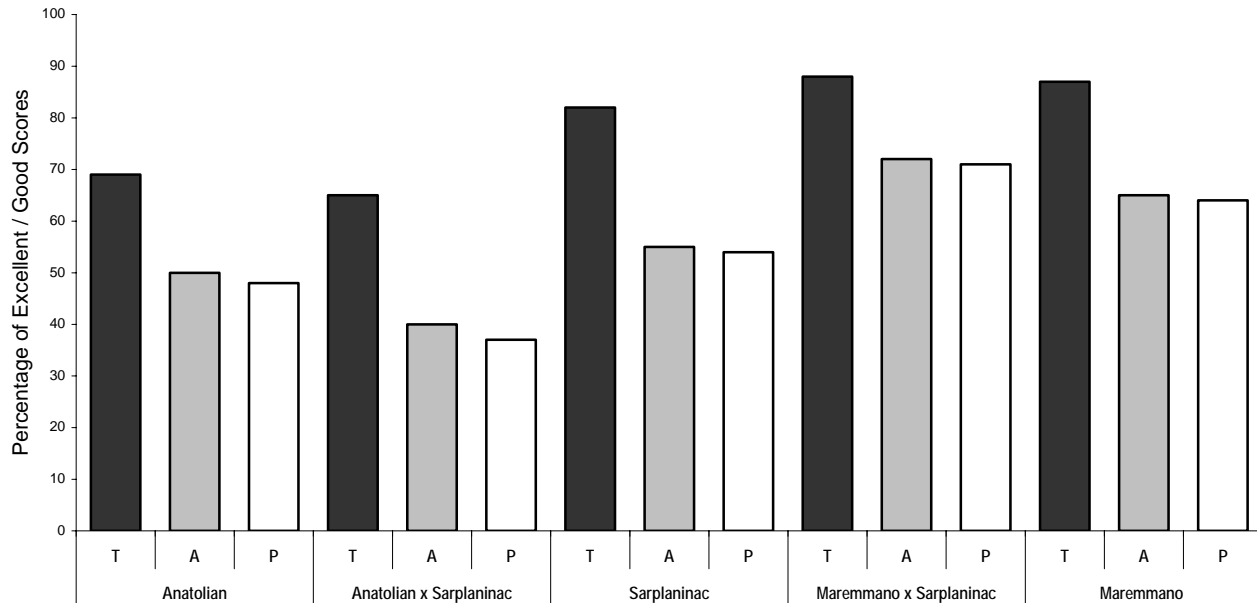


Fig. 2: Trustworthy, attentiveness and protectiveness of over 1100 LGDs of different breeds. The difference between the breeds is not significant. T = Trustworthy; A = Attentive; P = Protective (Coppinger et al. 1988)

be attentive to the sheep about 60% of the time (Coppinger et al. 1983).

Assuming that dogs are raised properly and are attentive to their livestock companions, why do they protect them? The answer is that dogs do what dogs do under their immediate circumstances. Dogs act toward other dogs, coyotes, jackals, or wolves in species-typical ways. The dogs in our studies treated male wolves and female wolves differently (Coppinger & Coppinger 1995). How they treated any individual depended on the age of the dog compared with the age and sex of the intruder. In many cases we observed that the dog appeared to “know” the animals in a given area. It also treated individual coyotes in a way that reflected the age, sex and intention of the coyote. Strange coyotes were treated in a similar way as a strange person, in that the dog might bark at them or show aggression. Familiar wolves might get the tail-sniffing routine, and the proximity of multiple wolves or coyotes might trigger a fear response from a number of dogs.

Reaction to a predator also depends on whether it was displaying predatory motor patterns. Or it might depend on the reaction of the livestock to the advancing predator. It is not just that the dog is bonded to the livestock, but the livestock too can be bonded to the dog. Often in transhumance cultures there are clear signs that the livestock look for the dog. They will bunch together with the dog if threatened. In our experiments on Western ranches we could effect a bond between the dog and sheep but not between

sheep and dog. The problems occurring with wolves and cattle in the Yellowstone National Park area are almost certainly of this type. Bonding dogs to cows is more difficult than to the smaller livestock species. Our own sheep that were accustomed to dogs would elicit very different behaviors from even good dogs, than did sheep that were nervous of dogs. The scenario of a good dog with nervous cows that takes up with a lonely wolf is not strange. The dog is a social animal with complex social behaviors – and it will take care of its social needs first.

So which breed of dog is best? After reading what the developmental requirements are for any single dog, the best response to the “Which breed is best?” question is, “All things being equal, then. . .” And of course all things are never equal. If we could, we would avoid the breed issue entirely and go directly to working stock. See a dog standing out in a pasture doing what you want it to do, and get a pup from that stock. Breed to the dog that does it right. Behavior is the most important quality.

Trustworthy, attentive, and protective behavior

In our studies we measured three behaviors that LGDs must display in order to be effective: Trustworthy, Attentive and Protective. We arranged them by “breed” (and “crossbreed”) to see if any one breed outshone any other. Trustworthy behavior seemed to be created when pups were raised with sheep, as described above. Attentive behavior also

resulted from that bonding with sheep, because the growing dog would feel most comfortable being near the animals it was raised with. Trustworthy and Attentive behavior usually resulted in Protective behavior. It would be a rare dog that could be trained with a whistle or a treat or a punishment to behave in any of these ways. The three behaviors result from the correct environment beginning at a pup's birth.

The chart shows that just under 60% of the dogs were judged by their owners to be Protective. When they were sorted by breed, the crossbred maremma x sarplaninac scored best in all behaviors. Maybe it was hybrid vigor or maybe it was chance. Even with over 1100 dogs in the sample we were never able to detect a significant difference – with the exception of two years when we could measure significance in Trustworthy and Attentive behaviors between breeds. Our favorite report came from an Italian, who argued that the *Maremmano-Abruzzese* had to be the best breed, because the Renaissance started in Italy. Fair enough.

The mistake of pre-zygotic selection

Breeds as we know them are a twentieth-century invention. The operative words here are “as we know them.” In most of the nineteenth century the term “breed” was used for a phenotype – what the dog looked like or how it behaved. There were books that would instruct on how to get two breeds in the same litter. And there are records of both komondors and kuvaz in the same litter. For nineteenth-century breeders, breeds were differences in color or coat length and other characteristics that had little to do with behavior. The major selective character in nineteenth-century breeding practices was performance. Selection for other traits was simply capricious.

Twentieth-century breeders changed the definition of a breed from phenotype to genotype. A breed became a lineage or a genealogy. There was a changing assumption in Western Europe in about Darwin's time that traits were the product of nature and had little to do with nurture. Rich people were rich and famous because they had the nature – the genes to be that way. The same became true of dogs. Good dogs came from good pedigrees. The assumption is, if you have a dog with papers as long as your arm, it must be a good dog.

Thus when someone asks which breed is best, they are assuming that the quality of the dog's performance is in its genes. The dog will perform because it has genes for guarding sheep. Cattle dogs naturally have an attraction to cattle. Those assump-

tions got many of us in a lot of trouble in the early days of introducing LGDs to the American western agricultural community. Breeds are the products of breed clubs. The *Anatolian Shepherd Dog* club sent us to Turkey to purchase some foundation stock for their newly-formed club. Of all the different dogs that were in Turkey at the time, our criterion for selection was first and foremost working performance, at least for their parents, and then for superficial characteristics. It was generally assumed that the *karabash* coloration, a fawn color with a black muzzle, was preferred. Later, other collectors for other clubs preferred white animals and only collected white animals – from an infinite variety of colors, sizes and shapes.

For these new clubs this was the transition moment when a few individual dogs were selected for export to the USA from the existing **race** of dogs in Turkey that had been created by natural selection, founder effect, and post-zygotic selection. Once in the USA, those few dogs were bred to each other in order to establish a **breed** (pre-zygotic selection). Those exported Anatolians that had existed in Turkey as a phenotype became a genotype in America.

If the initial selection process demands that the animals have the working qualities, and the superficial qualities of coat color or size are just an extra, then one might argue that this system of creating a genotypic breed isn't that bad. But it is probably a disaster.

First, it is hard for the collector to judge working quality. One is often buying pups, which have no record. It is hard to buy good adult dogs simply because the shepherds feel they need and depend on those animals. And for most of us there is the underlying assumption that the working behavior is built in and if the proper phenotype is selected then the working behavior will appear miraculously. The collector probably does not understand that good working behavior is the ability of the genotype to respond appropriately to the developmental environment. It is not the guarding behavior that is represented in the genes – but rather the response of those genes during development – that is being selected for.

Second, selecting a small number of dogs of a particular genotype leads to a massive reduction in genetic variability. To collect even as many as a hundred animals from some remote location and close the gene pool to them, immediately places them in genetic jeopardy. To create a breed by bringing a few animals from some faraway pasture to the USA or anywhere else immediately reduces the genetic diversity that enables succeeding generations to

adapt to its environment. Those few individuals could not possibly represent the genetic spectrum of the population they were taken from. Thus, the breed is not a breed in the purebred sense, but really it is a race, a nonrandom distribution of gene alleles removed from its geographic source.

Breeds result from what geneticists call a “founder effect”

Founder effects are common in the animal world. Sometimes they are referred to as genetic bottlenecks. In any given area the population of dogs will grow until it reaches the limits of its resources (in the niche). The population should stabilize at that point and selection will occur. But quite often dog populations are severely reduced by disease, e.g., rabies, distemper, or parvovirus, all of which we observed in Turkey. A few individuals will be spared and these are the animals that create the new population. The few individuals that start the re-population process cannot possibly represent the total genetic variation of the population they descended from. Thus the allelic variance will be reduced. And across the population, allelic variance will be non-randomly distributed. The non-random distribution of genes geographically distributed is the definition of subspecies and race. Thus every region will have a race of dogs. These races are not created by people breeding dogs (although they could be created by post-zygotic selection) but rather by chance events. Founder principle simply states that the founding individuals of any population will not and cannot genetically represent their ancestors.

Were the genes for some undefined developmental processes that produced good guarding dogs in their native sheep cultures captured and represented in the new founding population? The real question would be: Is the developmental environment in the western sheep culture similar enough to that ancestral sheep culture to elicit the proper behavior from the dogs? – if indeed they had any of those genes left because of founder effects.

Non-lethal control with large guarding dogs

Breeds are the products of hobbyists, who rarely know anything about genetics, especially behavioral genetics. The number of hobbyists who use the term “developmental environment” is small. Breeds come with a lot of mythological baggage. The stories of single dogs defending against packs of wolves are fantasies. And yet the wolf-kill stories are prominent

among breed chauvinists. It is hard to impress upon them that the reason we want LGDs is because they don’t kill wolves – the methodology is called non-lethal predator control. We are trying to create a peaceable kingdom model where the lion lies down with the lamb. For many years the American sheep and goat industry was seriously frightened of ever trying a LGD. The dogs were advertised by breeders as big and aggressive, and producers were afraid of the liabilities of owning such a dog. Nobody was selling the image of our 25-kg female Ellen who belonged to a Community Supported Garden where the public was coming every day to pick up vegetables, and their little kids reached through the fence to pat her. Coyotes created a predation problem, which Ellen did well with. She stayed in the sheep pasture, was sweet with the paying customers and worked well in the small family farm culture. Would she be great – and she was a great dog – on a western ranch next to Yellowstone National Park protecting cows against wolves? Of course not. The different livestock cultures need to develop their own dogs.

So, which breed is best? That is the wrong question. The answer to the problem of developing good LGDs is not in the selection of a breed. The point is that there are many breeds or races or types of LGDs available, adapted to the local livestock cultures, and working well to protect their animals. They are not necessarily large. Most of the time their job is to distract or warn away a potential predator. Predators avoid fights, where they might get injured. In the flock as in the wild, animals rely on ritualized face-offs to discourage encroachments. The answer is, select individuals from the parents of working dogs. Having done this and established their offspring with your flock or herd, very quickly you should return to post-zygotic culling. The good dogs are those that stick with your livestock and successfully defend them from wolves or coyotes – in other words those dogs that are cost effective. They should be supported and cared for and allowed to breed with other cost-effective guarding dogs. We need a system that emulates the centuries-old traditions. We need to develop our own dogs, adapted to our own livestock cultures.

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What is wrong with Romanian Livestock Guarding Dogs? A Discussion

by

Annette Mertens and Helga Schneider

Introduction

Romania is one of the few places in Europe where livestock guarding dogs (LGDs) are still commonly used. This is because the coexistence of livestock and wild predators (wolves *Canis lupus*, bears *Ursus arctos* and lynx *Lynx lynx*) has encouraged the maintenance of traditional damage prevention methods.

In most of the livestock camps in the mountains the sheep are grazed on pastures interspersed in the forest. The pastures are of very variable sizes and in several cases sheep are grazed in the vicinity of the forest edge. Although it is forbidden, the flocks often enter the forests to graze, also because many pastures that are used by the same herd are separated by forested areas. Once they are brought back to the camps in the evening, the flocks are kept in close proximity of the camp, either penned or free. In most cases at least the ewes are penned at night, usually in wooden corrals/enclosures (Figure 1). Also the other animals are kept in the vicinity of the camp. The cattle and pigs are sometimes penned whereas horses



Fig. 1: Typical Romanian livestock camp with wooden enclosure. (Photo: Annette Mertens)

and donkeys are tied up in the vicinity of the hut where the shepherds live. By day the flocks are always accompanied by at least one shepherd and by a number of livestock guarding dogs. Some shepherds in the camps are specially hired for taking care of the sheep (while others may have the responsibility for other tasks such as milk processing). They sleep in wooden boxes or on the ground near the flock. When they are alerted by the dogs they are supposed to chase potential predators with torches and sticks.

Many specialists agree that LGDs are essential for effective damage prevention (Coppinger & Coppinger 1980; Andelt 1999, Smith et al. 2000). The success of the use of such dogs in Romania is also demonstrated by the results of a 5-year study made in the Carpathian Large Carnivore Project (CLCP) which has shown that the number of sheep killed by wolves and bears in mountain livestock camps increased with an increasing sheep to LGD ratio ($p = 0.007^1$) as well as with an increasing sheep to shepherd ratio; ($p = 0.049^2$). This confirms what has already been observed many times both in the USA and in Europe (Robel et al. 1981, Stahl et al. 2001).

However, if the linear regression analysis was performed separately for wolves and bears the relationship between number of dogs and number of kills appeared to exist only for wolves ($p = 0.007^3$). In other words, only wolf attacks decreased with increasing LGD and shepherd numbers, whereas numbers lost to bears remained unchanged. The reason for this is not clear because in the reported study we did not analyse the differences in the predatory patterns of wolves and bears. However, an explanation could be found in the following fact: although a correlation existed, in the Romanian

study LGD numbers in the flocks increased more slowly than sheep numbers. Therefore, large flocks were guarded by comparably less dogs than small ones. This might be the explanation for the missing correlation for bear kills, as bear attacks commonly seem to be more independent of flock size (Sagor et al. 1997) whereas wolves appear to be more attracted by large flocks (Mech et al. 2000).

Regardless of the difference we found in the influence of the presence of dogs and shepherds on wolf and bear we did not observe any significant difference in the number of sheep killed per attack by bears ($N = 1.47$) and by wolves ($N = 1.56$) ($p = 0.196^4$).

Livestock guarding dogs

There is no information on the quality of used LGDs in Romanian livestock camps before and during the communist regime. However, in the study performed by the CLCP, all the 115 analysed livestock camps had LDGs with their sheep. In Romania there are three LGD breeds, the *Ciobănesc Român Carpatin* (*Carpathian Shepherd Dog*; Figure 2), the *Ciobănesc Român Mioritic* (*Mioritic Shepherd Dog*; Figure 3) and the *Ciobănesc Român de Bucovina* (*Bucovinian Shepherd Dog*) for which the Romanian Canine Association is making efforts to achieve registration in the FIC (Federation of International Canines). These are ancient breeds and it is likely that these dogs have been commonly used by shepherds until not too long ago.

Still, depredation occurs and actually in the CLCP study 1.29% of the sheep present in the monitored flocks appeared to have been killed by wolves and bears. It seems questionable why flocks are still vulnerable although they were always



Fig. 2: Dogs commonly found in livestock camps, showing similarity to the *Ciobănesc Român Carpatin*. (Photo: Annette Mertens)



Fig. 3: Dogs commonly found in livestock camps, showing similarity to the *Ciobănesc Român Mioritic*. (Photo: Annette Mertens)

¹ We have used a simple linear regression after normalizing the data ($N = 88$ camps, $R^2 = 0.04$; $F_{1,86,95\%} = 7.58$; $p = 0.007$).

² ($N = 87$ camps, $R^2 = 0.04$; $F_{1,85,95\%} = 3.96$; $p = 0.049$).

³ ($N = 87$, $R^2 = 0.044$; $F_{1,85,95\%} = 7.58$; $p = 0.007$).

⁴ ($\chi^2 = 1.81$; df. 1; $p = 0.196$).

guarded by LGDs. The reason for this is what we want to analyse in the present article.

LGDs become victim of wolves

Problems in damage prevention can appear where LGDs not **only** do not manage to prevent carnivores from attacking the livestock, but are even themselves the victims of wolves. This appeared evident in a case that was analysed by the CLCP in the county of *Brasov*. Cases of wolf predation on dogs were analysed in seven villages on the foothills of the *Bucegi* massif, from January 2001 until October 2002.

The study area covered roughly 235 km² and consisted of three communities: *Bran* (approx. 1905 households), *Moeciu* (approx. 978 households) and *Fundata* (approx. 189 households). We refer to an individual household as a person or a family group who share the same budget, their house, stables and land. Most of the households own hay meadows, used for livestock grazing or hay production, which are either situated on the slopes behind the houses or in the neighbouring villages (Figure 4).

From January 2001 to October 2002 wolves were reported to have attacked livestock in 149 households on an area of 69.9 km², killing 62 sheep, 7 cattle, 1 kid, 2 foals and 186 dogs (157 adult LGDs, 2 pups and 27 small dogs (herding dogs)). Dogs were killed in 137 households, other livestock in 24. The amount of attacks per household ranged between 1 (74%) to 2 (17%), exceptionally up to ten. Only four attacks (2%) were unsuccessful in with the animals were neither injured nor killed. The amount of animals attacked per household ranged between 1 to 14 animals. In most of them one animal was attacked (65%) and in only 5% between 5 and 14 animals.

Livestock as victim of wolves

The amount of attacks varied within the survey period: In 2001 the number of attacked livestock ranged between 1 and 4 per month, except August and October with high numbers of attacked animals (12 and 9 respectively). These high numbers were due to persistent attacks on only 3 households. Simi-



Fig. 4: Typical household in the study area in the county of *Brasov*. (Photo: Annette Mertens)

larly, in 2002 the number of attacked animals ranged between 1 and 6 per month, with an exceptionally high number in April (19) due to persistent attacks on 4 households.

59% of the attacks happened during the day, 32% at night and 9% at dusk or dawn; the high amount of attacks during daytime was mainly due to the absence of the homeowner and the poorly trained dogs. In 79% of the cases the animals were running free, in 19% they were in a wooden enclosure. Only 2% were killed in a stable, which seemed to be the most effective protection against predators. The LGDs were near the animals in 77% of the attacks whereas only in 23% of all cases were LGDs absent.

Dogs

Dogs were attacked throughout the whole year, ranging from 1 to 6 animals per month, with peaks in January, September, October, November and December in 2001 and in January, February, March and April in 2002. During these attacks all but 3 dogs were killed: 84% were adult LGDs, the rest were small dogs and pups. The share of dogs running free out of all killed ones (52%) was similar to the range of those that were chained up (48%). 91% of the attacks on dogs occurred at night followed by those at dusk or dawn (6%) and the ones during the day (3%).

The amount of dogs in the households that suffered attacks ranged from 1 to 15: in most of them there was one (39%) or two dogs (33%). Although

we did not find significant correlation (Spearman correlation) between these factors, this suggests that wolves preferred households with lesser dog numbers, which agrees with the finding that numbers killed sheep decrease with increasing relative numbers of LGDs (Par. 1).

We found no significance when we tested for Spearman correlation between the amount of attacked animals and the distance of the household to the forest or to the border of the village. However, we found that the most affected households were remote and close to the forest and therefore easily accessible for the wolves. In most of the cases in which the attack was observed by the owners or their neighbours, people reported that the wolves attacked outside the forest, killed the animals and tried to escape with their kill into the forest.

The attacks were not analysed by trained people; as killed animals are not compensated the damage is usually not reported to the authorities. However, clear evidence existed in 51% of the cases that the predators were wolves: the household owners either directly observed the attack or heard the attack or they found tracks. In the other 49% of the cases there was no proof that the predator was a wolf but we assume that this was the case. The assumption is based on the following facts:

The monitored wolf pack had its rendezvous-site near the village of Simon, the village that suffered the most attacks. The rendezvous-site of the pack was close to the border of the village (2.2 km) and the nearest frequently used forest-road (860 m). In addition, the radio-tracking data showed, that the home range of this pack corresponded approximately to the area of the villages that suffered the attacks (CLCP unpubl. data).

Also, during the analysis of wolf scats that were found while tracking the wolf pack found dog hair and skin and dog claws (Barbara Promberger-Fürpaß unpubl. data).

For this reason we also believe that the high amount of killed LGD cannot be explained with territorial conflicts: 77% of the LGDs that were killed were near the livestock, which was left unhurt, whereas in almost all cases about 80 to 100% of the killed dog was consumed (Figure 5).

Socio-economic changes

Causes of conflict can also be found in the socio-economic situation of Romanian agriculture. Until the late 1970's every household in rural areas owned at least one dog, usually kept in people's gardens.



Fig. 5: The remains of a livestock guarding dog killed by wolves. (Photo: Annette Mertens)

But during the last years of the communist regime a strong “rationalisation” occurred in Romania: in order to use the national territory as effectively as possible, families in rural environments were resettled into apartment blocks while their houses with courtyards and orchards were destroyed and the land was turned into arable land. The families could not keep their animals in the apartments, and as a result during that period millions of dogs were abandoned, turning into stray dogs. The number of these dogs has grown throughout the years and, although it is not known how many there are, they nowadays represent a serious problem in the country. Many LGDs, whose breeding activities are not controlled by shepherds, freely mate with such stray dogs, giving birth to litters that are then used for guarding the livestock. Generations of such uncontrolled breeding has led to the present situation where almost no pure breed LGDs exist. The commonly used dogs are slightly smaller than the pure-breed ones, weighing some 25-35 kg. The guarding skills of such dogs are very variable among different camps.

The dogs are never actively trained by the shepherds. Rather, as soon as they are big enough to follow the sheep the pups are put in the flocks and

thus are expected to learn their job from the other dogs. This is one major issue that influences the quality of these dogs: The dogs that prove to be good LGDs are those that are part of a group (often a family group) of dogs, that are kept together with the livestock also during winter and thus maintain their socialization throughout. However, many dogs are kept alone on a leash throughout all the fall and winter, in the courtyards of livestock owners. In summer they are taken to the mountain camps and are supposed to guard the livestock together with the other dogs. This often fails because these dogs do not have the possibility to develop and maintain their socialization with the sheep and the other dogs and because they do not have the possibility to learn how to coordinate themselves with the other dogs. Furthermore, often these dogs are not accepted by others, already present groups of dogs, which work as packs.

There is no law that specifically regulates the use of LGDs. The national veterinary service does not check the health status of dogs. Therefore, most of the LGDs are not adequately vaccinated and treated, which results in a high number of sick and weak dogs in the camps. On the other hand, according to the law of hunting grounds and game protection (103/1996) in mountain areas a maximum of 3 LGDs can be kept with each flock, whereas on the lowlands a maximum of 2 can be kept.

Another real problem is probably the increasing poverty of small livestock breeders due to poor competitiveness of this sector on the international market. Cheese, the main product of traditional livestock breeding, cannot be exported to EU Member States at present unless substantial investments in infrastructure are made to meet the rigorous EU hygiene, welfare, and quality requirements. On the other hand, the competition of foreign imported products is decreasing the market for local cheese on the national level.

Therefore, the net income from extensive livestock raising decreases constantly and shepherds are becoming increasingly poor. The purchase and maintenance of good quality dogs is beyond the means of many people. Furthermore, for economic reasons in the camps, the dogs are commonly fed only "mamaliga" – a cornmeal puree – and whey from the milk, and are rarely fed meat. Therefore many dogs are undernourished and weak, which makes them less self confident and increasingly scared of predators. Moreover, many of the dogs leave the flocks for long periods to search for additional food.

Conclusions

The percentage of livestock killed by carnivores in the present study is not big if compared with other situations (Sagor et al. 1997; Fourli 1999; Poulle et al. 1999; Carrasco Gomez 2002). However, in most European situations in which the damage is higher this is in part due to the fact that in these areas the use of damage prevention methods has been totally or partially abandoned. This is not the case in Romania, which is why in this country a very low level of carnivore-livestock conflict occurs. However, it appears that the traditional prevention methods are not always optimally used.

Although the phenomenon of wolves killing dogs can affect the quality of damage prevention, we believe that the present case was probably an isolated one of a wolf pack having specialized on preying on dogs. Thus, we believe this cannot be identified as the main problem in damage prevention. Rather the vulnerability of livestock is probably due to a combination of several socio-economic problems. In fact, it appears obvious that a high number of LGDs does not itself represent an effective solution unless the socio-economic conditions of livestock raisers will allow them to keep the dogs adequately. This includes maintaining pure-bred dogs, taking proper care of the dogs, feeding them proper food, and "training" (allowing for the effective creation and maintenance of socialised animals) them adequately. The fact that the law only allows for a maximum of 3 LGDs in the livestock camps is probably not a real problem at present as this regulation is usually not followed – in most camps there are over 3 LGDs (in the present study there were 7.5 ± 2.9).

An adequate strategy for reducing damage to livestock would imply:

- A legal background that promotes the conservation of extensive livestock breeding techniques and adequate damage prevention methods
- An agricultural and rural development policy that supports better marketing conditions for small livestock producers
- An infrastructure that supports the livestock raisers in assuring the sanitary and veterinary treatments of LGDs
- A governmental strategy to drastically reduce the numbers of stray dogs in the country

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The *Karakachan Dog* - Continuation of an old Bulgarian Tradition

by
Sider Sedefchev

Introduction

The *Karakachan Dog* (Figure 1) is the breed which has been traditionally used in Bulgaria for centuries for both the protection of livestock and property. *Karakachan Dogs* work well with sheep, goats and cattle against wolves *Canis lupus*, bears *Ursus arctos* and golden jackals *Canis aureus*. The 50 years of socialist regime in Bulgaria almost exterminated this breed, which happened with many other native breeds.

I can not explain the exact reason, but these dogs impressed me a lot during my childhood. Working beside my grandfathers who had sheep I had the possibility to have direct contact with these dogs in their natural environment. 13 years ago my brother and I started to seriously work on this breed and started breeding such dogs. Searching for the last dogs left with the flocks and finding all the information that existed about the breed turned into a kind of mania for us. The hundreds of expeditions and meetings with shepherds and their dogs are the base on which we build up our knowledge of the working *Karakachan Dog*. A lot of dogs passed through our hands. We purchased them from shepherds. They are the base of the breeding work in our breeding station. Not all these original dogs are live anymore, but they



Fig. 1: *Karakachan Dog*. (Photo: Atila Sedefchev)



Fig. 2 & 3: Flocks guarded with *Karakachan Dogs* on typical grazing areas. (Photo: Sider Sedefchev)

gave us the possibility to breed many of their descendants. In 1997, with other colleagues, we registered the Bulgarian Biodiversity Preservation Society - SEMPERVIVA, which main part of work is dedicated to saving rare native breeds of domestic animals. Within the framework of this activity, society established and own flocks of rare sheep and goat breeds guarded by *Karakachan Dog*. In 1997, together with the BALKANI Wildlife Society and particularly with their Wolf Conservation team, we started a project to support herdsmen with *Karakachan Dog* to help protect their flocks. The main goal of this activity is to reduce the conflict between local people and large carnivores. Another important aim for us was to return and maintain working *Karakachan Dog* populations. During the first project phases, we worked in areas where livestock losses are mainly caused by wolves. In that period the work was financially supported mainly by EURONATUR, but also by the Wolf Protection Society (GzSW) and the Wolf Conservation Trust (UK). Since 2002 the same activity is being continued with the financial support of the ALERTIS Foundation, formerly the International Bear Foundation, and the work is done in regions, where bear attacks on livestock occur. This is done in order to decrease the human – bear conflict and as a consequence improve the conservation of the wild bear populations.

Study area

In Bulgaria livestock grazing is traditionally extensive and such dogs have been used for millennia. Large carnivores such as wolf, brown bear and lynx *Lynx lynx* have always been present in Bulgaria. The numbers and the densities of the wolf and the brown bear are among the highest in Europe. On a territory of about 20,000-25,000 km², which is suitable for

large carnivores, there are about 1,200 wolves and 600 bears (Tsingarska 2005). The golden jackal has become a very numerous predator too, particularly during the last 20 years, when it spread across the country. The type of terrain in this country is mountainous and forested. Usually flocks are grazed in such rough areas which makes the dog's work complicated (Figure 2 & 3). In summer some of the flocks are moved up to the alpine pastures for 3-4 months (Figure 4).

Project

There are several main principles in the work on this project. We very carefully choose the herdsmen, who will be provided with dogs. We never had the idea to give dogs in large numbers. According to our opinion it is better to select livestock owners, who will not only use the dogs but who will also continue this process by producing puppies and giving them to other owners. In this way, the effect of the natural dispersion of these dogs is achieved. That is the reason we always give a male and a female puppy at 2-3 month's age which are not related to each other and which can potentially breed together. Thus, the owners make minimum efforts for breeding the dogs and in the same time the selection of the breeding pair is made by us. In some cases we give more than two dogs to an owner. This happens when we consider it is necessary, because of large number of livestock, difficult terrain for the dogs and suitable for predator attacks, or high carnivore density. Another important factor when selecting a dog owner is the effect which will be achieved by the work of the dogs guarding the flock. For instance, if the animals in the flock are gathered together from several owners, the effect of this activity will be bigger. We hope that if people have less problems with predators, that there will be



Fig. 4: On the summer alpine pastures (up to 2500m.) in the *Pirin* mountain. (Photo: Sider Sedefchev)

less reason to poach bears or wolves. Often we choose common flocks, in which the livestock is gathered together from all the people in the village. In one flock, numbering 1,200 animals, where sheep were gathered from 114 different owners, we gave four dogs. Later the shepherd of this flock produced many puppies and kept 4 of them for himself.

We have a contract with every livestock owner who takes a LGD. The contract also contains passages concerning future puppies. Particularly, there is text which says that he has to give them to other herdsmen after consulting us. Up to date 76 *Karakachan Dog* have been given to livestock owners. Most of the puppies socialized easily with livestock. Many experienced shepherds were pleased to see how the puppies started going with the flock of their own will on the second or third day. We choose puppies, which clearly show suitable LGD behavior from an early age, i.e. vigilant, tough, courageous and with good physique.

Effectiveness of the *Karakachan Dog*

The effectiveness of the dog's work is very high. Since 1998 there have been altogether three cases of successful predator attacks in the flocks provided with dogs in the frames of this project. In one big flock of 650 sheep, four had been killed. Actually, the mistake in that case has been done by the shepherds who had divided the flock in two parts during grazing and one of the two parts had been left without dogs.

The *Karakachan Dog* is strictly territorial. It accepts the flock as its territory, whenever it is. Being close to the flock, they become visible aggressive. If stranger tries to catch an animal from the herd this person can be exposed to serious aggression. However, when a flock is passing through a village the dogs walk calmly without paying attention to people. But I do not remember a case of a person been bitten by project *Karakachan Dog* guarding livestock. There is another reason for the lack of accidents. Namely, the tradition of guarding livestock with big, aggressive dogs has always existed in Bulgaria. Everyone knows about them and people simply avoid the flocks so conflicts don't occur. Also there are dogs,

which do not express aggressiveness towards people, but in same time are excellent guards against predators. The trends are in breeding dogs that are less aggressive towards people.

Our own project flock is protected by five *Karakachan Dogs*. The two males MURCHO and PERUN, work very well together. It is typical for PERUN that he always moves behind the last sheep and if he does not come back with the flock it means that some sheep had dropped behind and he is there. In the evening when the flock is resting he takes the position from where most potential attacks occur. On the other hand MURCHO moves in front of the animals and when the flock turns in a different direction he literally searches the area. This behavior is innate and I have observed it with other dogs. The other three dogs in our flock make the team really effective. For four years there were many attacks on the flock, but none of them were successful. All these years we had the possibility to observe the dogs reaction against wolf and bear attacks. They register the presence of a predator in time and chase it sometimes up to two kilometers. We have seen that if a wolf stops for a moment to scare them, the dogs go in directly, fighting with a clear intention to kill the wolf. However, it is very unusual that dogs manage to catch or kill a wolf. Usually the wolves outrun them. In the cases when this happens most often these are young wolves around 1 year old. Some people may consider that this behavior is worse than the accepted opinion that the dogs should always keep close to the flock. However, when I saw a film



Fig. 5. *Karakachan Dog* wearing a stick which acts as a hindrance to prevent the dog from running. (Photo: Sider Sedefchev)

made with thermo-sensitive camera in the French Alps I saw how the Great Pyrenees chased the wolf only short distances before leaving it. Even if the predator stops, the dogs also stop, and start barking at it. It is visible that this doesn't scare the wolf. Just the opposite, the dogs show him with their behavior that they are not a real obstacle and the wolf's success is just a question of time. And this was exactly the result in the documentary. When the dogs chase the wolf with the intention to kill it, this means much more for the wolf. In Bulgaria the theory: "The dog barks – the wolf runs away" is not valid. If it was like this there wouldn't have been cases of dogs killed by wolves and more seldom the opposite. Probably the reason is that both the dogs and the predators are experienced with one another. The wolf can see if the dog is not determined enough and would make attempts to attack if it is not seriously disturbed. On the other hand dogs see that they should clearly show that intruders can get in troubles.

Problems

One of the most common problems we encountered was poor feeding of the dogs while growing up. This was against the contract clauses. But on the other hand shepherds are among the poorest people in Bulgaria. Eventually, the owners themselves loose from the result, because their dogs do not develop well. Certainly, sometimes other contract clauses are not

respected, but this did not disturb the main process. Until now, there has been only one case where we had to take back two dogs.

The most serious problem is killing of the dogs by hunters. Actually, this problem exists in the whole country and is getting worse recently. In practice, a lot of livestock guarding dogs die after they have eaten poisonous baits distributed illegally by hunters for predators. Others are directly shot by hunters. Shooting of these dogs is done on purpose. Unfortunately, in certain conditions it is

even legal. There is an absurd law, according to which shepherds are obliged to put a 30 cm long stick on the collar of their dogs (Figure 5), which hangs to the elbow joint. This stick is supposed to act as a hindrance to prevent the dog from running, and dog without one can legally be shot by any hunter. In Bulgaria the hunters are a powerful lobby, which is the main reason for this law. Shepherds do not agree with the use of these sticks because they are an obstacle to the dog's work and view it as being too humiliating for the dog.

The real reason for the hunter's hatred of livestock guarding dogs is the fact that they sometimes kill hunting dogs, which try to penetrate into a flock. Hunting dogs are often left outside alone after the hunting day ends and they chase wildlife. Unfortunately there is no regulation which controls this free hunting dog movement in the forest. Another problem we met is that two of the given dogs were stolen. Unfortunately, we can't control and prevent such cases. Thus, until now there haven't been problems with the given dogs. The main problem is the human factor.

Genetics are important

A main topic in our work is the selection of dogs from which we would get offspring to be distributed later. The criteria of a good working LGD in Bulgaria – and my personal criteria – differs from the criteria of some colleagues from western countries.

The socialization process is accepted as a key factor for the future dog's development and work. In many publications concerning LGD behavior, the same methods are described for proper socialization of a puppy (Mazover 1956, Coppinger et al. 1988, Green & Woodruff 1990, Landry 1999, Coppinger & Coppinger 2001; Dawydiak & Sims 2004). As a very important factor, the right age to introduce the dog in the flock is pointed out and a feature of successful socialization is a submissive position towards livestock. Certainly, I would not like to underestimate the role of the socialization, however there are other crucial and important factors for the dog's protective effectiveness.

Quite often there is the statement that the dog should create a feeling of being one of the sheep. I think this is not possible and I can't understand why so much attention is paid on this as a factor of good guarding behavior. According to my opinion based on my practice the dog realizes very well that it is required to protect livestock. At the same time the dog keeps its bright individuality, which is leading to this type of protective behavior. Why should the last one in the hierarchy protect its "bosses"?!

The good behavior is expressed mainly by the effectiveness of the dog as a flock guardian (Labunskij 1994). According to my practice I am convinced that it is possible to socialize an already adult dog with livestock. One of the many examples is the bitch BELKA, which we gave to an experienced shepherd five years ago. She is living in a remote area in the Rila Mountains. When we brought her to the shepherd's sheep, she was four years old. She was born in our breeding station and had lived there until then. The first thing she did was to attack the shepherd's female dog, which was twice as big and a mixture of *Karakachan Dog* and *St Bernard Dog*. BELKA has always had the wish for fighting. She bit the other female in such a way that we hardly managed to separate them. The other bitch was psychologically broken from Belka's self-confidence and ran away leaving the flock. Exactly this moment is the important one in this story, because BELKA could potentially have been a wolf, and if she had, the mixed breed dog would have proven to be ineffective. On the same day BELKA made efforts to get to know all the sheep, licking them under their tails showing that she is open for contact. On the next day the shepherd led her on leash with the sheep. In a week BELKA was already staying with the flock without the shepherd. Her innate hatred to predators and her energetic nature helped her to become a livestock guarding dog in the real sense. I think the main factor for her

success was her origin, but also the good approach of the shepherd. The competition between the livestock guarding dog and the wolf is leading to a high degree on psychological level. Many times I have observed how a physically strong dog with a confident character enters undisturbed the territory of a group of other LGDs. Those dogs keep on barking on him but they did not touch him, and even allowed him to walk into the sheep pen among the animals. Hence, what is the result of the good socialization and lots of barking by these labile dogs? Since we have had a guarded sheep flock, two dogs have been killed by wolves. They were very young and too brave, but not experienced enough. Such cases happen sometimes. The point is that the good *Karakachan Dog* should die rather than leave the flock without protection during an attack. It is not important if it will be a *Karakachan Dog* or another LGD breed. Each LGD must act like this, with the purpose to give a real opposition to predators. Certainly, my criteria for dog's characters and psyche are different from the criteria of other authors. This is because LGD breeds are different from one another. The conditions these qualities can be expressed under are also very variable.

Another example is our dog MURCHO, who lived in the station till 10 month's age, after which we introduced him into our sheep flock. The process was quite simple and quick. The first night MURCHO stayed chained in the sheep pen. On the next day I took him with the sheep and the next night he was with the sheep again. On the second day the shepherd led him for a while on leash and then he let him free. Since that day MURCHO has never left the flock. It is difficult to explain in two sentences the mentality of the real, experienced LGD dog, but for me MURCHO is exactly such a dog. These are the dogs which live and die as soldiers.

Conclusion

I think that certain theories about LGD behavior should be searched in places, where real conditions exists. Such conditions still exists in some countries in Europe and Asia, where the tradition of using LGDs are oldest and are still alive. In these countries large carnivores have always occurred in significant numbers, the extensive livestock breeding has long traditions, and flocks are guarded by dogs selected only for work, not for the show ring.

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Providing Livestock Guarding Dogs and Compensation of Livestock Losses Caused by Large Carnivores in Bulgaria

by
 Emilian Stoynov

Introduction

Predation on livestock in Bulgaria is a serious problem. Not just because of the number of animals killed but rather because livestock losses motivate the livestock breeders to kill large carnivores in revenge, even using poison baits which are illegal in Bulgaria. Carnivores that kill livestock in Bulgaria include the brown bear *Ursus arctos*, wolf *Canis lupus*, jackal *Canis aureus* and exceptionally, the red fox *Vulpes vulpes*. The deployment of poison baits has unfavourable impact on the populations of carrion eating species as vultures, namely: black vulture *Aegypius monachus*, bearded vulture *Gypaetus barbatus*, griffon vulture *Gyps fulvus*, egyptian vulture *Neophron percnopterus* and several eagles: imperial eagle *Aquila heliaca* and golden eagle *Aquila chrysaetos*. Most of these species are threatened and some of them have even been exterminated from Bulgaria due to the use of poison baits in the past.

Livestock depredation

Wolves are present in the southwestern part of Bulgaria in altitudes of 350-1800 m.a.s.l. while brown bears occur in the mountains Rila and Pirin. In addition, there are many feral and free-ranging dogs which greatly outnumber wolves and bears, although few dogs are believed to attack livestock as local hunters or poachers quickly kill aggressive dogs when sheep owner ask them.

The Fund for the Wild Flora & Fauna's (FWFF) project area covers the municipalities of the SW edge of Bulgaria on territory of about 2000 km². There the wolf causes the most numerous livestock kills (Figure 1), while the bear is the one that causes the highest economical losses by killing larger livestock like cattle and horses. The jackal and the red fox are rarely responsible for livestock losses. The feral dogs are a very serious problem in the settlements and the areas where wolves and bears are absent. The livestock density in the study area is 38 animals per 1 km² in total. The density of the larger



Fig. 1: Sheep killed by wolves in the village of *Strumyani* SW Bulgaria with their owners. (Photo: FWFF)

livestock species is 6 animals per 1 km². Density of goats and sheep is 32 individuals per km².

The mortality due to predation is up to 10 % in the herds where no LGDs are used and less than 1% in herds with good LGDs. The mortality due to feral dogs is about 1.1%. Mortality due to other reasons, thunderstorms, diseases etc., is about 1.2 %.

Livestock husbandry systems

There are several different livestock husbandry systems in the study area. Livestock breeders have different numbers of livestock and are organised as follows:

Livestock breeders with small flocks owning 2-5 sheep. They co-operate during the summer period by forming a common herd. From May to November each owner herds the common herd 1 or 2 days per month on a rotational principle. During the summer the sheep in the cooperative herds are shepherded during the day. During the night they are in common corrals but they are protected well enough against predators. During this summer period they loose many sheep due to predation. This leads to several problems. First of all the shepherds are not very experienced as this is not their daily job. Therefore, sheep can stray from the flock and spend the night outside of the barn, such that they are vulnerable to wolf predation. Secondly, the livestock breeders which co-operate in this way usually are not able to

raise and to train livestock guarding dogs (LGDs) properly. During the winter season each owner herds his own sheep (2-5 individuals) or leaves in the barn. This group can loose up to 30-40 % of their sheep during the summer. In the same time this group does not have problems with the predators during the winter, because they keep their 2-5 sheep in the barn and feed them all the winter with hay and forage.

Livestock breeders with medium size flocks owning 6-25 sheep. This group also co-operates during the summer. Their livestock is exposed to predator attacks in the same manner as those of the small flock owners, but there is less economic pressure in the conflict.

Because they own more sheep it is very rare that they loose all their animals due to depredation. But as they own more sheep they use every possibility to graze their sheep on pastures in winter, making them more vulnerable to predation. Often the weather changes in winter and the wolves are very successful in their attacks. This way during winter there are some 15-20 small sheep herds (6-25 sheep) herded by their owner in the area next to the village. This group is not suitable to keep a LGD because they have too few sheep such that it is not economically effective, and the seasonal merging of flocks makes it hard to integrate LGDs from different flocks.

Livestock breeders with large flocks owning more than 25 sheep. This group is the best for taking actions against predator attacks. They usually maintain two or more LGDs, and they are very experienced shepherds. They are only exceptionally affected by livestock depredation. The only problem in this group is that they are usually very conservative people and it is very difficult to collaborate with them. These people in the project are forming 0.8% of all livestock breeders and are keeping about 10% of the livestock.

In Bulgaria the recent structure of livestock husbandry is such that it is more like an extra work for the owners, rather than their main profession. Most of the livestock breeders are retired or have another job and spend only a part of their time with the animals.

Compensation herd project

The Fund for the Wild Flora & Fauna (FWFF) is a nature conservation NGO with branches in Bulgaria and Macedonia. It is working for species and habitat conservation promoting sustainable agricultural practices. The organization has established a compensation program in 2000, which provides for direct replacement of stock losses due to confirmed predator attacks. It turned out to be the most effective strategy to reduce revenge killings. It offers immediate and positive incentive for behaviour change in this historical response by livestock breeder in the conflict with native predators. At the same time it serves to “build bridges” between Bulgaria’s environmental community and the rural population, which continues to subsist largely on traditional and natural resource use, encouraging cooperation for future conservation endeavours.

Organisation of the compensation project

In order to be compensated if predators kill livestock, the farmers must fulfil the following criteria:

- They should use good guarding dogs for the protection of their herd;
- The herd should always be herded by a shepherd;
- The herd should never be left outside the corrals during the night.



Fig. 2: Compensation of the livestock owners in the village of *Strumyani* with sheep from the FWFF’s compensation flock. (Photo: FWFF)

When livestock depredation occurs the shepherd should call the FWFF team and the case is investigated. Depending on the level of coverage of the criteria for compensation, the FWFF team decides how to compensate the farmer. The compensation can be conducted as follows:

- Replacing the killed sheep or goat with a live one out of the FWFF compensation herd of 200 sheep and goats (Figure 2); FWFF has provided 38 live animals (sheep and goats) from its compensation herd in SW Bulgaria during 2004 (Tab. 1). The success is visible since the local people are less negative towards predators, when they receive a live animal as reimbursement of the lost one. The FWFF compensation herd consists of more than 200 Karakachan sheep, that are herded by a professional shepherd and are guarded by 4 Karakachan dogs (2 castrated females, 1 fertile female and 1 fertile male).
- Providing a good guard dog. FWFF has provided more than 20 dogs since 2000 to shepherds in SW Bulgaria and in the eastern Balkan Mountain. The dogs come from breeding centres in Bulgaria as well as from the FWFF’s own dogs that guard the compensation herd. The breeding centres for Karakachan Dogs are usually located in the towns where dogs are produced for selling. They have never seen sheep before bringing them to the herd. Nevertheless, even these herd dogs show satisfactory.
 - Providing forage for the remaining stock. The breeders are always happy to receive something as compensation. Forage is one of the cheapest things that could be provided to the livestock owners, when they do not fulfil the criteria for full compensation by FWFF.
 - FWFF pays the insurance bill for the rest of the animals in the herd. The FWFF works in collaboration with a private insurance company called HDI.

LGD project

There have been two target municipalities chosen – *Kresna* and *Strumyani* in SW Bulgaria – with 28 settle-

ments with which we are working with LGDs. About 50 cases of livestock being killed by predators were investigated in the target region in 2004. In most of the cases the shepherds did not cover the criteria for compensation set by FWFF. The need to improve the livestock breeding practices in order to reduce the predator kills was obvious.

We have introduced 3 adults, 4 immature and 11 puppy *Karakachan Dogs* (Figure 3). The best results are shown from the puppies introduced in the herd (later castrated to keep prevent wandering). But the training is of highest importance. Even an adult dog with a good trainer shows satisfactory results. That means the shepherds must pay attention to the dogs behaviour and correct it if necessary. The number of dogs needed in a herd depends on the size of the herd. The best result we observed was at a rate of 1 dog per 50 sheep and the minimum number of the dogs should be 2 dogs per herd.

Effectiveness

Generally it could be stated that predators do not attack the herds guarded by well-trained mature *Karakachan Dogs*. In two cases feral dogs were responsible for livestock losses into the barn, mainly killing lambs. But this happened during the day when the dominant LGDs are away from the barn with the herd. The problem is that when we introduced *Karakachan Dogs* in some of the herds in the area, the other neighbouring herds remained unprotected. The wolves then appear to increase their depredation on the unprotected herds. It would be interesting to see what would happen if all the herds were supplied with good guarding dogs. After the introduction of immature LGDs in two herds where livestock losses were common in 2004, the losses were reduced to half. The shepherds believe that when those dogs become mature the losses will totally be stopped, as they have had experience with such dogs in the past.

My impression is that the predators – mainly wolves – keep away from the herds with mature *Karakachan Dogs*, although we have not observed any direct encounters. In the herds with immature dogs the wolves kill sheep not far from the dogs as no adequate

Tab. 1: Livestock killed by large carnivores (n=147) in the year 2004 in the municipalities of *Kresna* and *Strumyani*. About 300 km², with some 30.000 sheep and goats. The information received is believed to be less than 40 % of the actual number of cases of depredation.

Livestock species	Number	Percent
Sheep	104	70.7 %
Goats	32	21.7 %
Donkeys	7	4.7 %
Cows	4	2.7 %
Total	147	

reaction from the side of the dog is expected until the shepherd is intervening. But developing this behaviour is part of the training.

The best practice according to our observations is to introduce two castrated dogs – sisters or brothers, or a sister and a brother – up until their 5th month. Of great help would be the presence of a mature, well-trained dog. The presence of people around the herd while these dogs reach maturity should be minimized and the dogs should be fed inside the barn.

Cost of a LGD

The LGDs cost about 50-150 euros per pup and 100-250 euros per adult. A single dog costs about 120 euros per year to maintain. Keeping 4 dogs means 40



Fig. 3: Working *Karakachan Dog*, castrated female. (Photo by Emilian Stoynov/FWFF)

euros per month or 1/3 to 1/5 of a shepherd's salary (the average shepherd's salary is about 150-200 euros per month).

Problems with LGDs

Since the beginning of the project in the year 2000 till the beginning of 2005, 5 dogs died due to the following reasons: poisoning (2), killed by a car (1), shot (1), infection of the castration wound (1).

Aggressiveness

The dogs are quite aggressive against hikers, bikers or anything else that is approaching the flock. But they will immediately stop when the shepherd commands them. There have been some incidents where hikers have been bitten by the dogs when the shepherds haven't been near the flock. But these hikers haven't been injured seriously. Hikers often are afraid of the dogs and sometimes very aggressive towards the shepherds because of the dogs. Some are even willing to insist that the dogs are killed. Our dogs also killed a hiker's dog that was approaching a flock when the shepherd was away. In some areas the hunters are also known to lose their hunting dogs due to shepherd dogs. In some cases hunters set poison to kill the shepherd dogs.

Main problems within the project

We face several problems within our project that are:

- The bad organization of the livestock breeding – with many shepherds unable to raise and keep guarding dogs;
- The loss of traditions on how to breed livestock and guarding dogs;
- The huge number of livestock breeders with very few head of livestock.

Main problems with LGDs

We are also facing problems dealing with the LGDs. But these problems are also connected with the problems dealing with livestock husbandry.

- Bad training, due to inexperienced shepherds, or in the cooperative herds where there is a constant turn over of shepherd.
- Lack of aggression of the castrated dogs against feral dogs, such that we must use groups of LGDs consisting of both castrated and uncastrated ones
- Uncastrated dogs abandoning the herd looking for females in heat.

Recommendations

- The organization of the livestock breeding should be improved and fewer owners should breed larger numbers of livestock. Creation of co-operatives should be encouraged and training of professional shepherds should be started.
- Keeping of *Karakachan* Dogs in the areas of predator presence should be set as a criteria for livestock insurance. This measure will be much more effective after the introduction of the measure 1, stated above. LGDs should also be introduced in the National and Nature Parks. The shepherds that are grazing their livestock in the National and Nature Parks should be obliged to pay insurance for their livestock.
- Organizing courses for shepherds (how to breed the sheep in accordance with the local circumstances, how to train the guarding dogs etc.).

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Livestock Guardian Dogs Protect Sheep in the Alberta Foothills, Canada

by
Sondra Corff

I have had several livestock guardian dogs for more than 10 years. They are one of several strategies I use to protect my sheep from opportunistic predation and deliberate predation, mainly by coyotes. Around my farm, the most common predators are coyote *Canis latrans*, fox *Vulpes vulpes* and raven *Corvus corax*. There are also hawks *Buteo spec.*, occasional eagles *Aquila chrysaetos*, *Haliaeetus spec.* and, some times in winter, a wolf *Canis lupus*. Bears *Ursus arctos* are not a problem in my area. My land also supports deer *Odocoileus hemionus*, *Odocoileus virginianus* and elk *Cervus canadensis* (seasonally), Richardson ground squirrels *Spermophilus richardsonii*, and occasionally, badgers *Taxidea taxus*.

In 2004, when I was asked to write an article about the events and challenges of raising sheep in the foothill country of Alberta, I hesitated in doing so because my observations are casual and anecdotal and not the results of scientifically designed, 'controlled' research. However, these comments may provide a snapshot of my 'laboratory' and may be useful and encouraging to others.

Livestock depredation

My 230 acre (93 ha) farm contains rolling mixed

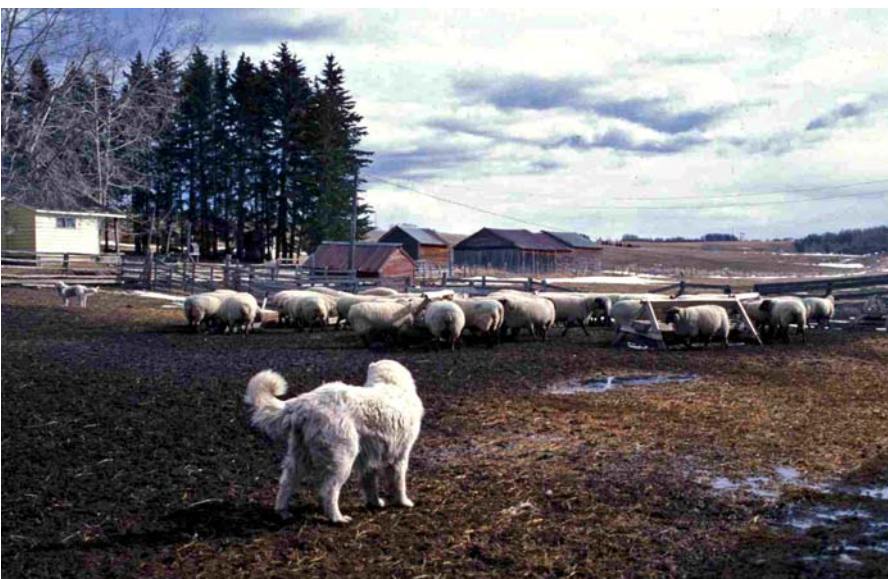


Fig. 1: Sheep in the corral guarded by two LGDs. (Photo: Colleen Campbell)

prairie land (Figure 1), some aspen *Populus spec.* stands, 70 acres of tame hay, and several large sloughs where long slough grasses and willow *Salix spec.* grow, providing excellent cover for the coyotes. Their boldness was demonstrated early in my farming experience, when two coyotes each took a small lamb while I was bottle-feeding another nearby, in the same pasture. I did give chase, causing them to drop the lambs, which recovered with appropriate treatment. The rolling landscape hides sheep and predators from the vigilant eye of both shepherd and guardian dog.

Whenever the sheep are in the paddock, I have spend a lot of time there, as well. It is an unfortunate condition of timing that lambs are present when coyotes are feeding their annual litter of pups, and then teaching them to hunt. Before I acquired the LGDs, I lost five or six lambs a summer to coyote predation. With myself and the LGDs present, there has been no loss to predation in recent years.

I first asked regional wildlife officers for advice and help in dealing with my coyote population problem. They suggested three options for controlling predators, particularly coyotes: trapping, poisoning, or shooting. They gave me poison pellets, in a chicken head, to be inserted in the carcass of a dead lamb and left for the coyotes. I considered this particular strategy undesirable because of the possibility of poisoning other wildlife, including birds, as well as dogs, possibly my own, without necessarily killing the coyotes that were taking the lambs.

I also had a coyote hunter try to get a shot at them, but he was not successful. All three approaches – poisoning, trapping, shooting – seemed inadequate. They all required continued use to be effective; when a breeding pair of coyotes is removed, other coyotes will simply move in. In my experience, when the grass in the pastures is high the coyotes simply slink towards their prey, quietly and unseen. What I wanted was a safe, effective solution with long-term efficacy. None of the above approaches had these attributes.

Electric fencing

At great expense, I pursued a second option that had been suggested, and surrounded the



Fig. 2: Sondra with some of her dogs. (Photo: Steve Swettenham)

pastures with an eight-strand electric fence. This was initially effective though I soon discovered that electric fencing requires regular maintenance to remove grass load and molehills from the bottom strands. Additionally, coyotes quickly learn to exploit any weakness in the fence: to dig under it and to jump through the horizontal strands. With all four feet in the air, they are no longer grounded and do not receive a strong enough deterring jolt. With some electric fencing, coyotes also learned to climb posts bracing the corner posts.

My first LGD

I hesitated getting a livestock guarding dog (LGD) because of my *Border Collies*, but in 1993, I bought CHARLIE, my first *Maremmano-Abruzzese* puppy from a sheep rancher in *Sundre*, Alberta (Figure 2). I raised him with the sheep and lambs and trained him as advised. The rancher from whom I purchased him was very helpful and I also gleaned advice from various shepherds' journals and provincial government literature, I also kept in mind that CHARLIE would also have contact with people visiting the farm. It was important to socialize him with humans as well as ensure that he bond with the sheep – a precarious balance of attributes.

It is testimony to their intelligence that *Maremmano-Abruzzeses* distinguish these equally important and very separate conditions. Prior to lambing, the sheep are sheared, given vaccination shots, dewormed and have their feet trimmed. Many inexperienced "farmhands" come to help and although the

sheep are being handled and disturbed, the LGDs stay out of the way while maintaining a watchful eye on the proceedings.

I have a commercial flock of mostly Suffolk (Blackface) sheep, a non-flocking breed. The size of my flock has varied over the years, growing from a few dozen to 250 to 300 at its most numerous. In Alberta, this is considered a substantial sheep operation. Recently, I have reduced the herd to about 50 sheep. It was clear that in the rolling terrain I would need more than one *Maremmano-Abruzzese* to guard my sheep effectively. CLYDE joined us in 1994, CASPER in 1997 and CANDY in 2001, all as puppies. In 2003, CANDY had a litter of pups and two of the litter, CLARA and CANDY, now work with their mother. Over the years, it became apparent to me that when the pups are strongly bonded to the sheep and when the flock was threatened, most of the sheep would gather and the dog would stay with them, possibly leaving sleeping lambs or slower sheep at risk, especially if no shepherd was present. I thought it might be beneficial in my situation to have some dogs not so tightly bonded to the sheep, who would be willing to leave them and chase the coyotes. When CANDY was a young dog and not strongly bonded she chased coyotes long distances from the main corral. Sometimes I could actually see three or four coyotes spaced around her as she was being lured away. As she matured, she continued to challenge coyotes even when they were far from the sheep but visible to her.

Maremmano-Abruzzese are very visual dogs and constantly scan the surroundings for anything that

appears threatening to their territory. As coyotes are willing to encroach right up to, and even into, the corrals, I wanted to encourage CANDY *and* her two female pups to respond to the more distant approach of predators – that is, to assume a slightly different role from the dogs closely living *with* the sheep. Consequently, the females are marginally bonded to the sheep and more willing to challenge intruders when they appear at a distance from the flock. The three females are also alert to warning barks from the dogs with the sheep, especially when they are all in the corrals. The three females are usually near each other and tend to position themselves where they can see along the drive to the road, as well as into the corrals and across the slope to the pastures and hills beyond. During a good part of the day, they may be seen catching up on their sleep in the corral with the sheep.

Initially, CANDY was very protective while teaching her pups who are now fully grown. I notice that they often play in ways that hone their skills for any potential contact fighting with predators. The presence of the three “patrolling” dogs has pushed the predators back from the main pastures and the corrals. Though coyotes can be seen and heard in habitat that is surrounding the sheep pastures, they have become more cautious about approaching my sheep. Summer 2004 was the first season I was able to leave sheep and lambs in pasture without a shepherd for many hours without the loss of any animals to coyotes.

The *Maremmano-Abruzzese* is considered less territorial and less aggressive than some other LGD breeds. I have no evidence that my guardian dogs have ever killed a coyote, although I have watched them chase coyotes into the woods. I no longer must get up at 3:00 a.m. to protect the sheep and lambs in panic from the howls or presence of a predator.

In my situation, the LDGs are definitely advantageous in protecting livestock. Of course they require monitoring and regular attention. When the *Maremmano-Abbruzeses* were young, they had to be carefully disciplined and socialized to the livestock. Vigilance is especially important when lambs are present with young pups. Coyote predation is greater in the late summer when coyote pups are growing and learning to hunt for themselves. In addition, dispersing coyotes are opportunistic hunters; at any time of day, a coyote can happen across a young lamb. The hills around the farm give resident coyotes perfect vantage and I can feel their eyes monitoring my every move.

To date, I have only lost *Maremmano-Abruzzeses* to the deteriorating health of old age, never to predators or accident.

Recommendations

- Shepherds need to be educated about the nature of LGDs and how to work with them.
- Puppies should be selected from working lines to ensure good traits.
- The most effective breed of LGD should be selected for the particular needs of the rancher.
- Flock management and monitoring by a shepherd is always required for effective use of LGDs.
- It is important to keep yards and corrals clean, removing livestock carcasses before they might be scavenged.
- It might be useful to teach LGDs to work with each other by first bonding them independently to livestock and, while they are still young, putting them into situations where they work together with the livestock.
- In some situations, it may be necessary to socialize LGDs pups with people.

Sheep ranching in Alberta depends on small operations, with most ranchers subsidizing their sheep operation with other kinds of farming and/or off-farm work. Though the neighbouring province, Saskatchewan, pays half the costs of LGD puppies and supports some of the other costs of keeping LGDs, Alberta offers no subsidies for any preventative methods a sheep operator might engage to protect their flock. Current statistics about sheep farming in Alberta is available through the the Alberta Sheep and Wool Commission (<http://www.absheep.com>). The value of a lamb ranges from \$50 to \$125, depending on when it is taken to market. Sheep loss to predation is not compensated by government programs. Overall, it is hard to imagine sheep ranching without the dogs to protect my flocks. They are partners in the care of my sheep and it is part of my work to ensure their general well being. This requires both time and financial commitment. Well-bred livestock guardian pups cost about (Canadian) \$300 and the average per year cost for food and veterinary care is about (Canadian) \$550. In conclusion, LGDs are very effective in my situation as a solo rancher and for this particular landscape.

Lastly, thanks to my friends Colleen Campbell and Marco Musiani for the prodding and encouragement without which this article would not have been written.

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The Use of Livestock Guarding Dogs in Portugal

by
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Introduction

Conflicts with wolves that result from depredation on livestock are not new and different strategies have been used to deal with them. Historically people aimed to reduce conflicts by exterminating the predator. In Portugal, human persecution led to Iberian wolf, *Canis lupus signatus*, extinction in 80% of the country, particularly since the 1970s (Petrucci-Fonseca 1990). Alternatively and simultaneously to wolf persecution, original and effective non-lethal methods of livestock protection have also been developed. These methods reflect an ancient knowledge that resulted from a long coexistence between wolves and livestock. The most widespread is the presence of a shepherd accompanied by livestock guarding dogs (LGDs). Nevertheless, in Portugal the use of good LGDs and the knowledge on how to raise them is being lost and non-efficient dogs, namely small-medium sized hunting or mongrel dogs and dogs not raised in a correct manner are generally used. Since the wolf became protected in



Fig. 1: Juvenile female *Cão de Castro Laboreiro* alert to the presence of strangers near the flock on a mountain pasture. (Photo: Raquel Simões)

1988, the inefficient protection of most livestock has led to increased depredation and conflicts.

Predation on livestock

Due to the scarcity of wild ungulates, wolf diet is based on livestock leading to considerable damages. On a national level, annual damages to livestock reach a total of 1,000-1,500 goats or sheep and 250-300 cattle or horses (data supplied by the Institute for Nature Conservation – ICN). Confirmed wolf damages are compensated by the ICN according to the current market value. Compensation has presently reached a total annual amount of 600,000 € (729,000 US\$) (ICN). Wolves prey on the domestic species available. This availability depends not only on the abundance of the species but also on the ease of capture by the predator. In wolf range there are around 347,000 sheep, 123,000 goats, 131,000 cattle and 28,800 horses. Roe deer, *Capreolus capreolus*, densities are low to moderate and red deer, *Cervus elaphus*, is only locally common in the North-eastern part of the country. Despite being very abundant the wild boar, *Sus scrofa*, is a difficult prey for the wolf. In *Alvão* Natural Park and adjacent mountains (North), the wolf diet is essentially based on goat (70%) and wild boar (14%) (Carreira & Petrucci-Fonseca 2000). However, in the most Northern mountains in *Peneda-Gerês* National Park, where cattle and horses are free-grazed, wolves prey mainly on goats (37%), horses (27%), especially young, and cattle (19%) (Álvares et al. 2000). In the Centre of the country wolves feed mainly on cattle (33%) and goats (23%), and to a lesser extent on horses/donkeys (9%), sheep (7%) and wild boar (7%) (Quaresma 2002). Outside the wolf distribution range, stray dogs are also responsible for damages on livestock (Ribeiro & Petrucci-Fonseca 1998). In these areas, the use of livestock protection measures has decreased since wolf disappearance and attacks by dogs usually result in multiple killing or maiming of livestock.

Implementation of the LGD project

To help reduce this constant conflict Grupo Lobo has developed an

action plan that aims to recover the use of LGDs and evaluate its use as an efficient livestock protection method to contribute to wolf conservation. At the same time it also aims to contribute to the conservation of the Portuguese breeds of LGDs, some of them also endangered, like the *Cão de Castro Laboreiro* (Figure 1) or the short-haired variety of the *Cão da Serra da Estrela* (Figure 2).

Although initially defined in 1988 this action plan only began in 1996. Since then a series of consecutive funds enabled the continuation and expansion of the project. Besides its experimental basis, the project also promoted a series of studies on LGD behaviour, genetics and morphology. These studies have been performed by several undergraduate, master and doctoral students. Behaviour studies have been developed to increase the knowledge about LGD behavioural development and the process of socialization that are the basis for efficient LGD. Besides considerations about the origin and relationship between breeds, inbreeding analysis and biometric studies are also very useful for breed management and conservation. Other methods of livestock protection are also being tested and implemented as well as the gathering of information on methods traditionally used.

The project operates in 4 phases. The first consists in the selection of livestock producers (based on the number of damages, the existence of conditions to receive a dog and the willingness to participate, which is evaluated during a personal interview) and of the litters and dogs available (based on the characteristics and working ability of the parents and on the behaviour/health/morphology of the pups).

In the second phase the pup is integrated into the flock and in the third phase dog's behavioural and physical development is monitored until it reaches adulthood (18-24 months of age). During monthly visits the dogs are physically examined and their behaviour is evaluated. This evaluation is based on observations of the dog during the grazing period of the flock or while with the livestock in the barns and complemented with inquiries to the livestock producer.

In the last phase the evaluation of the dog's efficiency is performed. This is done according to three criteria: 1) reduction in damages; 2) behaviour of the dog; and 3) satisfaction of the owner. The behaviour is evaluated according to the model proposed for



Fig. 2: Adult female *Cão da Serra da Estrela* of the short-hair variety integrated into a sheep flock on the plains in the Northeast of Portugal. (Photo: Silvia Ribeiro)

LGDs by Coppinger & Coppinger (1980) that defines three components: 1) attentiveness; 2) trustworthiness; 3) protectiveness. Attentiveness is evaluated according to the methodology defined by Coppinger et al. (1983).

Veterinary care and food are provided until the dog reaches adulthood. To guarantee the correct education and welfare of the dog, and consequently its efficiency, an agreement is signed with the livestock producers establishing the rules to be followed regarding dog ownership, education, health care, feeding, breeding and legal responsibility. Dogs that died were replaced, if their death did not result from a fault of the livestock producer. To improve the knowledge of livestock producers about LGD breeds, education and behaviour, a leaflet was produced and given to participating and other interested livestock producers. A second leaflet was also produced concerning basic veterinary care, feeding and breeding of LGD as well as general legal aspects regarding dog ownership.

Project intervention area

The project is being developed mainly in the mountainous areas of the North and Centre of Portugal, including the Districts of *Vila Real*, *Viseu* and *Guarda*. In these regions livestock production has a big economic importance, human density is low and distributed through small villages. Geography is very diverse and can change from plateaus to steep valleys with altitudes that can reach 1,400 meters. Due



Fig. 3: Juvenile male *Cão da Serra da Estrela* of the short-hair variety near the corral where its flock is confined during the night. (Photo: Raquel Simões)

to the frequent fires, vegetation cover consists mainly of bushes that can sometimes attain considerable heights (Figure 1). Pine, *Pinus sp.*, eucalyptus, *Eucalyptus sp.*, or oak, *Quercus sp.*, woods are still found. Precipitation is medium to high, occasionally with snow, and temperatures are low in winter. Goats are the most common livestock species. Previous studies found a density of 2.6 wolves/100 km² in the North (Carreira & Petrucci-Fonseca 2000) and of 3.4 wolves/100 km² in the Centre of the country (Alexandre et al. 2000).

Some dogs have also been introduced in flocks in the eastern parts of the Centre and North of the country, in the Districts of *Castelo Branco* and *Bragança*, respectively. These are less mountainous regions located outside or at the border of the wolf distribution area. In these areas the climate is drier and warmer and sheep are more abundant. Plantations of olive, *Olea europaea*, and cork trees, *Quercus suber*, and occasionally eucalyptus are common (Figure 2). Stray dogs are present although their abundance can vary considerably between years and time of the year.

Husbandry systems

Livestock production focuses mainly on meat and occasionally also on milk production. Flocks can vary from 10 to 700 animals - although bigger communal flocks can occur, with a mean number of 180, and are typically herded by one, and occasionally, two shepherds. In mountainous areas flocks are

guarded during the day and confined during the night in stables located close to villages. Although some flocks of sheep can be kept unguarded in fenced pastures, this is rare and is usually only for some hours of the day. In the flatter and warmer regions flocks are usually confined into light and mobile corrals for the night, during the summer, protected by dogs (Figure 3). Scaring devices like plastic bags or old clothes are occasionally hung close to the corral. Flocks are accompanied by an average of 2-3 dogs, although this number can range from 0-10 dogs, depending on the size of the flock. These dogs are usually small mongrel/hunting dogs or dogs raised incorrectly that are not effective. The reasons why

small dogs are used are not known, but it may be related with the wolf decrease and the cross-breeding of the existing LGDs with smaller hunting dogs and their consequent and progressive replacement with smaller and hunting type or mongrel dogs.

Livestock mortality

Prophylactic veterinary care for livestock is not very common and mortality due to disease can be very high, especially among young animals. During 2004, according to the data gathered through an inquiry to participating livestock producers, in 22 flocks an average of 54 animals died per flock, ranging from 2 to 260 animals, mainly due to diseases. This corresponds to a mortality rate of 15%, 88% of which were young animals. An overall juvenile mortality rate of 28% was registered, reaching 63% of the yearly kid or lamb production in some flocks and an economic loss of 13,750 €. Wolf damages are comparatively low and correspond to an average of 26% of the overall livestock mortality. In flocks with high mortality wolf damages can be as low as 8% of the total mortality.

LGDs

Since 1997 a total of 97 dogs, 48 males and 49 females have been integrated into 63 flocks. These dogs are mainly from the *Cão de Castro Laboreiro* (n = 44) and the short-haired variety of *Cão da Serra da Estrela* breeds (n = 32), although 11 belong to the



Fig. 4: Fig. 4. Adult female *Rafeiro do Alentejo* integrated into a sheep flock on the Eastern plains in the Centre of Portugal. (Photo: Silvia Ribeiro)

long-haired variety of the *Cão da Serra da Estrela* and 10 to the *Rafeiro do Alentejo* breeds (Figure 4). The dogs were selected from litters after weaning and were mainly integrated into the flocks at the age of 7-13 weeks, although 27 were integrated at an older age, at 14-25 weeks of age. Most of the older puppies were descendent from working dogs and were born in the midst of livestock and others were offered by dog breeders (Figure 5).

Pups were integrated into sheep, goat or mixed flocks that range in size from 30-400 animals, with a mean number of 175 animals. After integration, pups were always kept with the livestock. This was also recommended for adult dogs to prevent wandering and other potential problems or accidents (Figure 6). Usually only one dog was integrated per flock although in 9 and 6 flocks, respectively, one or two additional pups were later integrated to increase protection and also to form breeding pairs. This enabled the production of 57 new pups that were integrated into flocks, 38 of which were monitored by the project.

Behaviour and efficiency of LGD

Of all the adult dogs, 92% were evaluated as excellent or good in attentive behaviour, 98% in trustworthy behaviour and 90% in protective behaviour. It is interesting to note that 8 of the 10 dogs that were integrated later into flocks and survived until adulthood, are considered excellent or good. Of those, 5 dogs were descendents from guard/companion dogs and 3 from working dogs and were born among live-

stock. Of all the dogs that were born among livestock and later integrated, the adults are considered excellent and the juveniles good and exhibiting adequate behaviours. Three dogs were transferred to other flocks due to non-compliance of the livestock producers with the guidelines initially established regarding LGD raising and education. Four adult and juvenile dogs were also transferred due to inadequate behaviours towards livestock (inattentiveness and untrustworthiness) and recovered/improved. One dog was transferred due to excessive aggressiveness toward strange livestock leading to attacks to neighbouring flocks, seriously in-

cluding three animals. Three dogs were excluded, one because of reduced attentiveness to the flock and two because of untrustworthy behaviour. Lack of protection was only registered in the case of attacks by stray dogs. This situation happened in two flocks and can be explained by the fact that LGDs became habituated to the presence of familiar stray dogs, since they were previously observed chasing dogs from the flock. Regular monthly monitoring of 19 dogs during the grazing period after they were integrated into the flock revealed that before 6 months of age pups exhibit an unstable behaviour. Before that age interactions with livestock (e.g. investigatory behaviours) are frequent, especially play behaviour that steadily increases until 6 months and then abruptly decreases. After 5-6 months of age pups progressively increased their distance from shepherds and reduce their distance to the flock (staying most of the time at less than 5 meters). Pups exhibit a progressive independence from the shepherds and an increased orientation towards the flock. Agonistic behaviour has only been observed from livestock to dogs, except for adult dogs that protected their food from livestock and the above mentioned dogs that exhibited untrustworthy behaviour.

Data on the efficiency and behaviour of 40 dogs was also gathered during personal interviews with livestock producers. The effect on damage was analysed by comparing yearly livestock losses to predation before and after the dogs' integration. According to the obtained data, after the integration of the dogs damages decreased in 75% of the cases, did not change in 7.5% while 17.5% of the livestock produc-



Fig. 5: Litter of *Cão de Castro Laboreiro* that was born in the stable among a goat flock. (Photo: Silvia Ribeiro)

ers said they increased or did not know. Dogs were always considered responsible for the observed damage reduction that ranged from 13-100%. Interestingly, in some cases where the amount of damage did not change or even increased, dogs were also considered responsible for reducing potential damages (taking into account the depredation in neighbouring flocks). In fact, annual predation rate is dependent on many factors that influence predator density and availability of prey and can change significantly from one year to the next (Ribeiro & Petrucci-Fonseca 2004). The mean number of animals killed before and after the dogs' integration was 8 and 5, respectively. In terms of performance 90% of the adult dogs were classified by livestock producers as being excellent or good, only 3 were considered sufficient and none was considered bad. Regarding the behavioural components, livestock producers evaluated 80% of the dogs as excellent-good in attentiveness, as well as 98% in trustworthiness and 92% in protectiveness.

Nearly 23% of the pups injured young animals in the flock and one killed a kid goat during play behaviour. After they have grown up no other incidents have been recorded and dogs are left together with lambing goats/ewes without causing problems. During pursuit of strange animals most dogs did not go farther than 500 meters from the flock and returned within 5-30 minutes, although some could go away for longer periods and distances.

On 10 occasions dogs were observed to face wolves that attacked the flocks, but only one dog was slightly injured on the shoulder. Most dogs barked at (83%) and barked/pursued (65%) dogs that approached the flock, while 43% attacked and 23%



Fig. 6: Adult male *Cão da Serra da Estrela* of the short-hair variety confined in the stable with its flock. (Photo: Silvia Ribeiro)

wounded other dogs. Most dogs were not considered to be aggressive towards strange people that approached the flock. They usually barked at (90%) and approached/followed (23%) the stranger until he went away from the flock. Only two females and one male were considered to be more aggressive: two tried to attack a person that entered the stable where the dog was with the livestock and the other tried to attack a person that passed through the flock. In both cases no injuries resulted. Regarding strange domestic animals that approach the flock (cattle and other flocks) 73% of the dogs barked and 48% also pursued them away from the flock. Encounters with other livestock were less frequent for the remaining dogs. One dog attacked and seriously injured three animals from other flocks (see above). Nearly 83% of the dogs were observed chasing wildlife (mainly foxes, *Vulpes vulpes*, but also rabbits, *Oryctolagus cuniculus*, and wild boar) but only on three occasions were foxes or rabbits killed. Contrary to chasing foxes, that usually lasted for 15-20 minutes (but could be longer), chases to rabbits did not last long and did not result in active hunting behaviour, but were elicited when a rabbit suddenly ran past a dog.

Mortality of LGDs

During the last 7.5 years a total of 25 dogs died, corresponding to a mortality rate of 26%. This rate is higher before the age of 24 months, with 68% of all deaths occurring during this period. After two years of age, mortality was reduced to 0.7 dogs per year. No significant differences were found between male and female mortality. The main causes of mortality (including also dogs that disappeared or were ex-

cluded because of disease) were disease (44%) (e.g. leishamniosis, leptospirosis, hip dysplasia) and accidents (56%). Two dogs (1 adult and 1 pup) were killed by wolves and 5 (4 adults and 1 pup) disappeared while accompanying the flock. Four dogs died after eating illegal poisoned baits (meant for predators) and one was shot by hunters (unintentionally).

Costs of using LGDs

The price of a LGD pup can vary widely, from 250 € to 500 €, depending on the parents and the breed. These costs include first vaccinations, microchips and registry in the Portuguese Kennel Club. An estimate of the annual maintenance expenses (including medium quality food, vaccinations and parasite treatment) can vary from 170 € to 300 €, if an estimate of the expenses with occasional veterinary care is also included. Expenses in the first year are mainly due to the dogs' acquisition and in the following years to feeding expenses. To be cost-effective, in the first two years after being integrated a LGD must cause a reduction in the damages of at least 600 €. In practical terms, it means the dog should prevent the killing of 5-9 (depending on the expenditure value considered) adult animals of the flock in its first year of life and of 2-4 in the following years, considering the mean current market value of adult goat/sheep. In the studied flocks where predation rate was medium to high, the use of LGD was very profitable and the amount saved in damages could reach 3,000 €. This was not true in those cases where predation was low (less than 5 animals per year) or no reduction in the number of damages was observed. In many cases the expenses with the dogs were paid off after two years. When predation is an episodic event the constant presence of a LGD can be compensatory, because livestock producers can have significant damages in only 1 or 2 attacks for a period of several years. We should also consider the fact that most livestock producers spend little money on dog food (using less expensive food or leftovers), thus greatly reducing maintenance expenses. Another important aspect to take into account in this analysis is the high mortality rate of LGD in the first two years of life. This will reduce their economic efficiency, since it means acquiring and raising another pup. Providing pups at reduced (or no) cost and supporting part (or all) of the occasional veterinary expenses with the dogs are important to reduce the costs associated with the use of LGDs, thus making them cost effective even when predation rates are low.

Problems and recommendations

The lack of compliance of livestock producers with the guidelines for LGD integration and education was the major cause for inattentive behaviour. This stresses the need for monitoring the social conditions where LGDs are raised. On the other hand reduced socialization with people made it difficult to catch and examine the dogs when necessary. This was more common in some litters and with pups that were integrated later. Untrustworthy behaviour of pups, due to excessive play, occasionally caused serious injuries or the death of very young animals, so special attention should be taken during the first lambing season. These situations should be promptly solved by rephending the dog immediately after it happens or, in more serious cases, by separating it from the animals that elicit the behaviour until the dog "grows out of it". Nevertheless, in most cases livestock producers were very tolerant to these situations since they would be compensated by the future benefits in using the dog. In some cases LGDs can attack hunting dogs that approach the flock or chase vehicles. These behaviours should be prevented and controlled by the shepherd during the dog's development to avoid reinforcing them. Cases of inappropriate behaviour can sometimes be corrected or improved by changing the dog to a different environment (flock). Monitoring the social environment in which the dog is raised is crucial for developing its potential effectiveness. This should be done during the socialization period but it is also important to control the raising conditions until the dog reaches maturity. Another problem is the fact that males often stray when females (from villages or other flocks) are in heat, thus leaving the flock unprotected. To avoid potential accidents males should be restrained during a couple of weeks. The initial selection of the livestock producers to participate in the project also proved to be very important. Selecting the most motivated livestock producers (and not necessarily those with higher damages) made it easier to successfully raise efficient LGDs. This greatly contributed to overcome the initial distrust regarding the use of LGDs from the project and increased the willingness of other livestock producers to start using them after recognizing the working abilities of the dogs that were integrated.

Impacts of the project

One important impact has been the increased tolerance towards the wolf. The support given by the pro-

ject in what concerns LGDs and the payment of damages are referred by some livestock producers as the main causes that prevent the use of illegal lethal methods to reduce predation. Another impact was the overall increase in concern by livestock producers regarding the welfare of the dogs integrated in the project. There was also a higher regard for these dogs in comparison to others, due to their performance and contribution to flock protection. One factor that contributed to the acceptance of the project and the acknowledgment of the importance of using good LGDs has been the reputation achieved by some of the dogs integrated in the project. One of the most important means of diffusion of the use of LGDs has been the transfer of information between livestock producers. This is evident in the more than 40 requests for dogs by new livestock producers, in the last few years.

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Briefing on the Re-Introduction of LGDs in Catalonia (Spain)

by
Meri Icardo

In 1996, 3 adult bears arrived from Slovenia, thus strengthening the dwindling population found at that time in the Pyrenees (6 individuals). Since then, attacks on sheep have increased significantly. These 3 individuals came from a country where there were relatively few sheep, and where sheep usually grazed in the vicinity of little villages in the countryside. Whilst local bears were responsible for only 3-4 sheep kills per year, newly arrived bears MELBA, ZIVA and PYROS killed between 20 and 25 sheep annually (these figures have been revised). Furthermore, cubs born from these individuals appeared to have acquired similar alimentary habits.

Naturally, Catalanian shepherds in the area protested vehemently against the situation. Most were already opposed to the bear re-introductions sponsored by the European Union "Life Program", which also supports the re-introduction of other large mammals. The idea of capturing and relocating the problem individuals to Slovenia became increasingly popular among the local population, though lethal methods were not seriously envisaged.

In reaction to these conflicts, as members of the Spanish Great Pyrenean Club, we offered to share our knowledge on *Great Pyrenean Mountain Dogs* (GPRs) with the Department of the Environment in Catalonia. We were convinced that this breed – used effectively to prevent predation in North America, Canada, France, and Israel – could benefit both shepherds and wildlife.

Our report was ignored for two years, despite frequent calls we made to politicians. In 1998 however, we were solicited by the Endangered Species Department, who wished to implement LGD protection methods that were commonly practiced by sheep owners on the French side of the Pyrenees.

Efforts were made to put such plans into action and during the years of 1998 and 1999, twenty-nine *Great Pyrenean* puppies (all born in flocks, mainly issued from the French Pyrenees) were purchased by the administration from the Spanish Great Pyrenean Club, to be given to stockowners to protect their flocks. The speed at which these changes took place was unfortunately detrimental to the efficiency of dogs, which were handed over to shepherds with few

instructions and no funding for technical surveillance or veterinary care.

In an attempt to resolve this problem, we formed a Commission within the Spanish Great Pyrenean Mountain Dog Club. This Commission recommended that the introduction of LGDs in pastoral areas should be arrested until the program was reassessed. In a survey conducted in the fall of 2001, we found that shepherds in possession of female GPRs did not keep them under control during reproductive periods. They declined the sterilization or pharmacological control of oestrus methods, which we offered. Female GPRs were allowed to breed with virtually no intervention, and unwanted puppies were sometimes eliminated. Nevertheless, 6 of the 7 re-introduced females gave birth to puppies that were later used as livestock guarding dogs themselves. However, the pedigree and working abilities of these possibly crossbred individuals were not assessed.

The Department of Medi Ambient (Department of Environment) eventually examined the outcome of these reintroductions. Results revealed an alarming mortality rate of LGDs (21%). Moreover, 23 % of the owners showed unsatisfactory procedures, while only 3 % were qualified as excellent. However, 80 % of the LGDs showed attentive behaviors towards the flock (Carnota 2002).

We also surveyed the Val d'Aran and Ribagorça areas in order to assess awareness among the shepherds concerning LGDs and predation problems. Val d'Aran shepherds showed little interest in LGDs, although predation problems are mainly due to bears and in another extent by wandering dogs. In the opposite, Ribagorça suffered predation mainly by foxes and wandering dogs and less by bears. When asked whether they wished to introduce an LGD into their flock to protect it, 66% of Val d'Aran and 49% of Ribagorça owners were not interested at all. The difference between the two valleys may partly be explained by an article published in the local newspaper of Ribagorça on the 19th of July 2001: two LGDs faced up to Ziva and managed to drive her away from the flock!

Present day LGD introduction methods

Since January 2001, we provide funding for the program and are in charge of decision-making processes. LGDs have been allocated at a limited ratio of 4 per year. However, we plan to distribute 8 per year between 2005 and 2008, in anticipation of the arrival of 5 new bears. Protection zones around natural reserves are a priority for LGD re-introductions,

though the total area extends to 15,000km². This area represents the total extension of the mountain area in Catalonia where flocks have suffered predation (wild and domestic predators) and are more likely to suffer predation from bears or, more recently, wolves.

In order to ensure that the introduction of LGDs is successful, we monitor puppies and provide technical surveillance and veterinary assistance during the first year after they have been placed. Because the area we cover is large and the terrain is mountainous, each shepherd's designated veterinary is contracted him or herself to make 4 annual visits to check the LGD's sanitary status and to report critical information about its socialization with the flock and with its owner. A complete survey is carried out during each visit.

Health coverage is also provided in the first year, including medication against internal and external parasites, vaccinations and sterilization at one year of age. We also cover accidental damage. Sterilizing working animals is standard practice; it prevents the spread of large, crossbred dogs that may represent a threat to flocks, keeps males from roaming and stops out of season breeding in females. Such problems indeed developed in areas where sterilization was not made compulsory. Exceptions can be made when shepherds accept tutoring on how to select dams or sires and how to make decisions as to where to place the pups.

A survey is conducted at the end of the first year to determine the degree of acceptance, utility and effectiveness of the pre-adult LGD introduced. In general, once reared, an LGD becomes a valuable asset. Stockowners from neighboring farm exploitations tend to follow the example and frequently ask for their own LGD; their flocks suddenly might become more vulnerable when an LGD is introduced nearby.

Our puppies are issued from professional breeders belonging to the Spanish Great Pyrenean Mountain Dog Club. The sire and dam of all puppies to be introduced is screened for hip dysplasia (Grades A, B, C accepted) and must pass the Test for Natural Abilities, which takes place annually during the *Great Pyrenean* breed exhibition. Once the puppies are born, the less sociable, less dominant and most passive individual is selected to be submitted to an easy test. The breeder's opinion is often helpful. We help cover the costs of x-rays to detect hip dysplasia.

Willingness and awareness among shepherds are both crucial when dealing with LGDs. Rearing pups is costly in terms of time and effort, and owners that are poorly motivated or trained may hinder the dog's efficiency, despite its initial capabilities. Shepherds

may acquire a puppy for a 200 € fee that is refunded after the first year of rearing. For the time being, the one year-control period has not been extended, due to time and financial constraints.

Our Association

The Commission has now become an independent non-profit Association. No fees are charged and new members with knowledge on and experience with LGDs are welcome to join. Some members of the Association are also part of the Board of the Spanish Pyrenean Mountain Dog Club. Technicians of the Department of the Environment are also considered to be members, as we share the aim of addressing conservation issues in and around the Natural Parks.

We also encourage shepherds to join the Association, as we believe effective project management involves many different approaches and disciplines. Please feel free to contact us with any queries at akar@eresmas.com. We will soon have a new Test of Natural Abilities thanks to one of our associates (the vice-president) who is professor of Ethology at the University of Barcelona. We are also searching for funds to edit a booklet on effective LGD management.

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The Institutionalisation of Livestock Protection in the Alps with respect to the Small Scale Agriculture of Switzerland

by
Daniel Mettler

The transmission from pilot projects to institutionalisation

The return of the wolf *Canis lupus* to the Alpine arc has renewed an age old conflict between man and carnivores. With an increase in livestock depredation by wolves in the Alps since the early 1990's, several prevention methods have experienced a revival in this region. Reinstating these old traditional methods into modern husbandry system required a lot of developmental work because the traditional knowledge in the Alpine arc had been forgotten, and animal husbandry practices had changed. After the first signs of the return of the wolf to Switzerland in 1995 (Landry 1997), there was a major political discussion and some developmental work with livestock guarding dogs was started (Landry *et al.* 2005). In 1999 the Swiss Agency for the Environment, Forests and Landscape (SAEFL) mandated KORA (Coordinated research projects for the conservation and management of carnivores in Switzerland) to develop prevention measures to minimize livestock depredation by returning wolves (Landry *et al.* 2005). Based on the experience with the lynx *Lynx lynx* since its reintroduction in the early 1970's in the Alps and the Jura Mountains there was experience available about depredation identification, compensation, monitoring, and prevention methods.

More responsibilities for the livestock husbandry

The return of the wolf soon turned out to be an almost unsolvable problem because of the strong opposition of the rural population. It quickly turned out that the management of the wolf was very different to that of the lynx. Not only in a technical but also in a symbolical way. Based on the experience in the regions where the wolf has already returned to Switzerland and the neighbouring countries like France and Italy, the SAEFL decided in 2003 to anchor the coordination of damage prevention more firmly within the agricultural sector. Therefore, the Service Romand de Vulgarisation Agricole (SRVA, agricultural consultancy service) was mandated by the

SAEFL for a 3-year coordination of the damage prevention in Switzerland ("Livestock protection program"). In 2004 there was therefore a kind of a milestone in the renaissance of damage prevention in Switzerland. By passing the responsibility to the agricultural sector, the first experimental stage had come to an end and a new organisation had been initiated. This organization aims to foster sustainable damage prevention in the different regions and in the agricultural institutions. The aim of the institutional integration is to promote the exchange of experience and knowledge from the experimental stage, and integrate this with scientific knowledge, and the experience from the administration and the livestock breeders.

A peripheral and flexible organisation of experience

The concept of the new organisation is based on a nationwide net of competence, which is sustained by *livestock protection centres*. At the moment they only exist in the southern cantons (Valais, Ticino and Grisons). Local farmers, who are already experienced in livestock protection, are acting as consultants in these three cantons. Their major task is to advise livestock breeders in the breeding and training of livestock guarding dogs (LGDs). These specialists are working with the agricultural schools, the cantonal authorities and the agricultural information centres. These activities are coordinated by SRVA.

As most of the wolf attacks on livestock happen during the summer (Doutaz & Koenig 2004), when the sheep are summered on alpine pastures, an *intervention group* has been hired (Figure 1.), which is assisting and helping livestock breeders in emergencies. They bring along some LGDs from one of the *livestock protection centre* for an immediate protection of the flocks that suffer wolf attacks. The rapid integration of LGDs into flocks on alpine pastures is a very delicate job which needs a lot of experience and knowledge. After the very restricted assignments so far it is too early to give a general evaluation of its success. For a sustainable protection of the flocks in the case of wolf pack establishment, this method of emergency won't be a realistic option anymore. But at the moment there is no long term solution in sight. Nevertheless one has to bear in mind that Switzerland hasn't yet been colonized by wolf packs, but only by single wolves.

This first aid concept only doesn't meet the need for a continuity of damage prevention on alpine pastures in areas where wolf attacks occur regularly.



Fig. 1: The head of the *livestock protection centre* (right) with the herdsman of the *intervention group* and three *Marremmanos* on an alpine pasture. (Photo: Daniel Mettler)

Therefore, the state financially supports the costs associated with maintaining shepherds on alpine pastures. Together with the salaries of shepherds, the cost for night time enclosures is paid as well. Furthermore LGDs are financially supported in order to guarantee maintenance cost. The budget to support the farmers is limited. That's why only sheep owners who have experienced livestock damages (proven wolf damages, see Weber 2004) within the last 3 years will be supported. To prevent the abuse of financial support, 3 categories have been created in the beginning of 2005:

Category 1: Farmers who have damages by large carnivores.

Category 2: Direct neighbours of farms with damages or farmers who have been involved in the livestock protection program.

Category 3: Region with potential habitat for large carnivores.

The financial amount for protection measures will be adapted to the evolution of the large carnivore populations and the political will to support the coexistence of livestock and large carnivores.

LGDs as an innovative symbol

LGDs have been shown to be efficient to decrease livestock depredation throughout the northern hemisphere (Landry 2004). Therefore the promotion and breeding of LGDs will be of high priority in the future. LGDs have become a symbol as a groundbreaking solution for livestock breeders and conservationists in regard to the possible coexistence of carni-

vores and livestock. After more or less positive experiences the expectations are very high to keep wolf attacks on a low level by means of LGDs. Because of the small pastures and the small flock sizes, the potential for conflicts still remains high (Figure 2.).

In July 2004, a LGD working group was constituted to respond to questions like breeding, husbandry and the legal status of LGDs. The main goals of the working group is the elaboration of a stud book and breeding guidelines as well as the formalisation of training and husbandry practices for the two LGD breeds, the *Marremmanos* and the *Great Pyrenees*. Dog specialists from different dog associations and clubs as well as the members of the most important sheep dog associations are members of this group. In the future it will be important to find a pragmatic consensus between the national and cantonal veterinary authorities and the dog associations. Herding dogs as well as LGDs have to be legally accepted as working dogs in order to be able to work safely with livestock.

The quest for a sustainable concept between science, practice and policy

The results of the research and the practical experiences gathered by KORA since the return of the wolf are the basis on which we build as we acquire further experience. These results are published in a KORA report (Burri et al. 2004). Different LGD projects have shown some Do's and Don't's concerning LGD's behaviours (Green & Woodruff 1999, see conclusions in Lüthi and Mettler in this issue). On the other hand, the efficiency of LGDs is very hard to measure and it is not easy to quantify their behaviours systematically. In the context of the transmission from the pilot work to a widely accepted practice within Swiss agriculture, the following unsolved questions remain:

- How should the transfer of the knowledge work if the political opposition, a result of traditional structures and habits, does not accept a change in the practice?
- How can a lasting change take place in the traditional structures if the work load on shepherds and livestock breeders is getting too big?
- Who is bearing the financial consequences of the additional work that will accrue in the livestock husbandry and the administration?

Even if the scientific input at an early stage of a pilot phase is encouraging the adaptation of the breeders, only political will and the financial support



Fig. 2: Alpine pasture in the southern part of Switzerland. Due to the small pastures and small flock sizes the potential for conflicts with carnivores is still high. This flock of 1000 sheep, however, is an exception for the norm within Swiss sheep husbandry. (Photo: Daniel Mettler)

for livestock breeders will be responsible for a lasting livestock protection.

A lasting outlook for the mountain region

Agriculture has been evolving for millennia because of technical achievements, cyclical fluctuations, demographic and ecological changes. The return of the wolf is presently forcing a change in the Alps where rural culture is encountering conflicts with natural forces. The return of wild Nature to the Alpine arc and the associated decline of agricultural activities is the result of a socio-economic change. In the last decades, the Swiss policy for the regions and agriculture has initiated different actions to stop the depopulation of the valleys and the loss of agricultural land to reforestation. In the midst of this change, the role of livestock protection remains ambivalent: on the one hand, livestock protection is a response to a natural change, the return of the wolf. On the other hand, livestock protection is trying to protect exactly these animals, which are threatened by these long term changes, the return of wild Nature. An institutionalised livestock protection must challenge itself over and over again. The wolf and the resulting livestock protection is therefore a symbol which is fundamentally challenging the extensive and small scale alpine husbandry.

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Experiences with the *Maremmano-Abruzzese* as a Livestock Guarding Dog in Switzerland

by
Riccarda Lüthi and Daniel Mettler

Introduction

The *Maremmano-Abruzzese* (*Maremmano*; Figure 1) originates from the *Abruzze* province, Italy, where its use as a livestock guardian dog (LGD) has been known for 2000 years (Kaufmann und Deckert 2004). This majestic and strong, yet at the same time agile and active dog has been bred with a strong instinct to guard and protect sheep and goat herds against predators; mostly wolves *Canis lupus* and the European brown bear *Ursus arctos*. Since these large carnivores have never been eradicated in Italy, the *Maremmano* breed shows continuous bloodlines in which every dog has been bred from working parents. A study conducted at the University of Idaho in 1986 that compared five different LGD breeds, out of which *Maremmanos* made up for 3 %, has shown no significant differences in the success rates of the LGD breeds (Green and Woodruff 1999). However, behavioural differences were noted. For example, the *Great Pyrenees* seemed to be less aggressive to unfam-

iliar dogs than other guardian breeds. According to experience in Switzerland (not statistically tested) from 1999 up to now, the *Maremmano* tends to show a more vivid temperament than the *Great Pyrenees*. Taking into account the lighter bodyweight (males: 35-45kg, females 30-40kg) and agility of the *Maremmano*, he appears to be well adapted to steep and mountainous terrain.

The reintroduction of the Lynx *Lynx lynx* in Switzerland in the early 1970's and the reappearance of the wolf in 1995 (www.kora.unibe.ch) have led to the need for livestock protection measures. The first livestock guarding dogs were imported and introduced into sheep flocks in 1996. In 1999 the SAEFL initiated the Swiss Wolf Project which dealt with prevention measures in a series of pilot projects. This project ended in 2003 (Landry et al. 2005). At present, the Livestock Protection Project - initiated by the SAEFL in 2004 - is led by the Service Romand de Vulgarisation Agricole (SRVA, agricultural consultancy service) and its structure is the topic of the article written by Daniel Mettler in this issue of CDPNews.

Aim of the project

The aim of the "Livestock Damage Prevention Program" is to improve and adapt methods that enable sheep farmers to efficiently protect their livestock against large carnivores. These methods include the integration of LGDs, electric fencing at night (often in combination with the use of LGDs), and in some cases financial support for the reintroduction of a shepherd on alpine pastures where animals have been free ranging prior to wolf attacks. Since most of the damage caused by large predators occurs during the summer months when 250.000 sheep (<http://www.bfs.admin.ch/>) and goats are taken to the alpine pastures (Doutaz & Koenig 2004), special atten-



Fig. 1: A *Maremmano* dog establishes close contact with the goats he will have to protect.
(Photo: Kathrin Rudolf)

tion is given to livestock protection measures that are practical in a mountainous environment. Specific problems arising from this environment include difficult terrain, transport and feeding difficulties, unfenced pastures with hiking trails crossing etc.

The *Centre for Livestock Protection in Jeizinen*, led by W. Hildbrand, is part of the project. Its objective is to breed *Maremmanos* that are reliable in their guarding behaviour, cause no damage to livestock, are tolerant *with* respect to people and thus can gain acceptance among sheep farmers and the public. The *Centre for Livestock Protection* offers professional practical and advisory assistance with the integration of LGDs into herds affected by wolf or lynx attacks. Furthermore, support is provided to farmers who are facing problems with LGDs that are already working on their farm.

Breeding

From the beginning of the pilot phase in 1999 up to the present, a total of 10 *Maremmano* dogs have been imported from Italy. During this period, 13 litters have been born and there are presently 43 individuals of the *Maremmano* population working as protection dogs. Breeding occurred with the first *Maremmanos* taken to Switzerland as livestock guarding dogs, their offspring and additional dogs imported from Italy. However, the breeding was based on rather limited genetic material. Currently, we are facing the situation where a majority of the *Maremmano* LGD population in Switzerland are close relatives. At the *National Meeting on Livestock-Protection* on January 2005 in Andermatt, organised by the SRVA, an urgent need for a breeding program with clear goals and selective reproduction has been voiced by several participants. Furthermore, an expert group was founded in 2004 consisting of breeders of LGDs, sheep farmers, a veterinary surgeon, project coordinator, a representative of the Swiss Kynological Society SKG, SLGDA, SSDS,

and the chairwomen of both the *Maremmano Abruzzese* and the *Great Pyrenees* clubs in Switzerland. The group deals with pressing issues concerning LGDs in Switzerland and is currently developing feasible and appropriate breeding guidelines and criteria. In the context of controlled reproduction, neutering of dogs has become an important and much discussed issue. Studies in America (Green and Woodruff 1999) and experiences in Namibia (Marker et al. 2005) with neutered dogs did not indicate any detrimental effects on the guarding qualities of the animals. Changes in the dog's hormone system do not seem to alter their instinct to guard. However, the question remains at what age the dogs should be neutered or chosen to be part of the breeding program, respectively. The efforts to establish controlled breeding standards for the *Maremmano* LGD in Switzerland should also be seen in the context of an intensified international cooperation, especially with the neighbouring countries Italy and France.

Dog rearing at the *Centre for Livestock Protection*

The *Maremmano* puppies are born in the sheep barn, in order to ensure the development of a close bond with the sheep, their noises and odours from the first day on. The behaviour of the growing puppies is constantly observed and corrected if necessary. Special attention is given to the interaction of the puppies with lambs in order to prevent injuries like ear-



Fig. 2: Two young *Maremmanos* are being trained to walk on the leash. (Photo: Kathrin Rudolf)

¹ The Swiss Sheep Association of sheep breeders owners of Livestock Guarding Dogs

² The Swiss Sheep Dog Society



Fig. 3 : Three *Maremmanos*, a male, a female and a 4 month old puppy, are being fed inside the night pen and close to the flock into which they have been introduced 3 days ago. (Photo: *Riccarda Lüthi*)

biting or other aggression. Basic training on the farm of the *Centre for Livestock Protection* consists of the dogs learning to come near when called, respecting a negative command, walking on the leash (Figure 2), knowing and respecting electric fences and fitting into different groups of sheep and other LGD teams. Throughout the training, it is a major challenge to identify dogs that are both completely loyal to their flock and at the same time sufficiently socialised with people.

We observed behavioural maturity in the *Maremano* at an age of approximately 2 years, which corresponds well with results *from* studies in America (Green and Woodruff 2002). During the first two years of maturation, the trainer needs patience and time to observe, educate and correct the LGD. It is crucial for the future success of a dog that possible misbehaviour is corrected immediately. Experience from LGDs working on farms in Namibia indicated that most dogs showed problematic behaviour at some stage, but that most problems were correctable with the appropriate training (Marker et al. 2005).

While some dogs stay on the *farm* for several years, others are already introduced into a herd of

sheep or goats on open alpine pastures at the age of 4-5 months. In these cases we strongly recommend placing the young dog together with at least one older and more experienced LGD. This will have a positive and reassuring influence on the young dog's maturation process. In general, better results were obtained with the introduction of *Maremmanos* in teams of at least two dogs, be it on alpine pastures, in pens, or in the barn during winter, than with single dogs working in a flock on their own. (Although Green and Woodruff 1999 recommend one dog for first-time users of a LGD). To achieve a balanced social structure within a team of *Maremmanos*, it is very important that aspects of sex, dominance and age are considered carefully. For example, two females with the same age or same dominant position are likely to fight with each other, which may result in the suppressed individual causing damage to livestock due to her frustration. In observed cases like this, the problems disappeared instantly after the female has been put together with a younger male LGD.

It has also been discussed whether it could be helpful to *import* competent and matured *Mare-*

manos from the *Abruzzes* (Italy) and integrate them into flocks in Switzerland. However, the few dogs that have been brought to Switzerland at an older age did not show convincing results. It must be pointed out that the conditions for a LGD working in the Swiss alps are not the same as in the *Abruzze* province. The conditions in the *Abruzze* province are certainly less restrictive than in Switzerland where population, farm and wildlife densities are considerably higher and where the alpine environment is being intensively used for tourist activities. Consequently, different aspects need to be considered and different expectations concerning the dog's behaviour are evident, for example a better socialisation with people (tourists) is necessary. A grown up *Maremmano* that has been working well in the *Abruzzes* may cause problems if taken to Switzerland and put into the new context. Difficulties were observed especially with one dog coming from the *Abruzzes* at an age of 1 year: he was very shy and showed a habit for roaming too far away from his flock, covering a huge territory and hunting for wildlife. Extreme shyness could possibly also lead to fear-aggression behaviour.

Integration into flocks

To date, 43 *Maremmanos* have been introduced into flocks (Figure 3) in Switzerland and the majority are working successfully (not considering the recent litters with the puppies (24) that have not been placed yet). In 2004 *Maremmanos* were introduced into a herd of dairy goats for the first time in Switzerland with very good results. Within the project, five *Maremmanos* had to be put down for behavioural reasons:

- One was too aggressive toward other dogs, especially females. This dog started to work within the project at a relatively old age of 7 months and may not have gone through an appropriate basic training and lacked a correct socialisation with dogs;
- One wandered too far away from the flock and hunted for wildlife. This dog has been imported from Italy at a relatively old age of 1 year and may also not have gone through an appropriate basic training;
- One dog – although bonded with sheep – caused injuries through playfulness and the attempt to keep all sheep in one corner. This dog was integrated into a flock at a juvenile age as a single dog. The training and integration of this dog was out of our control and may have been inadequate;
- One dog caused problems at a juvenile age of 7-10

months, starting with intense playfulness that had not been corrected at the right time and resulted in severe injuries to livestock;

- One dog was too restless and was disturbing the livestock.

Two dogs have shown an insufficient bonding with livestock and were therefore removed from their open alpine pastures: one has been placed in a context where there are no unfenced pastures and the other one has been taken back to the *Livestock Protection Centre*, kept at more distance from people and given time to mature. The integration of the *Maremmano* dogs has often to be done in summertime on alpine pastures, although this cannot be considered to be the ideal time to integrate dogs into new flocks. French authors pointed out in an article in 2004 that the integration of LGD pups in winter is more advantageous because of the following reasons:

- the dog can be observed easily and permanently by the farmer and correction measures can be taken right away;
- the limited environment inside the sheep pen increases close contact between the two animal species and enforces the relationship of the dog with each individual of the flock;
- there are no risks for the livestock because of the absence of rugged and dangerous terrain that characterises summer pastures (Rousselot and Pitt 2004).

These three points are also true for the integration of an adult LGD, although they are of less importance for more experienced dogs. However, as the return of the wolf to Switzerland is also a strongly political issue, the livestock protection measures have to be offered at the prime time of the experienced wolf attacks, which is in summer. To support such integration measures under sometimes difficult conditions, an *Intervention Group* has been founded in 2003. This group of shepherds is specialised in the use of LGDs and is on stand-by from April to October to implement protection measures - integration of *Maremmanos*, use of night pens, support of the herder, gathering of missing sheep - on alpine pastures throughout Switzerland. The exact procedure of integration and the time needed varies in each case and depends on different aspects:

- the number, age and character of the dogs that are going to be integrated;
- the flock size and reaction of the sheep/goats to the dogs;

- the condition of the terrain and infrastructure of the pasture;
- the presence, professionalism and cooperation of the herder;
- if there was a pack of wolves, the number of dogs would need to be increased, and good guidance and control of the flock by the herder and night pens would be even more important.

For a successful introduction and long term use of the *Maremmanos* on alpine pastures, the responsible herder plays a very important role. He is the person who will have to deal with the dogs every day. He will feed, observe and correct them if necessary and he never lets them get close to his hut or picnic place. Moreover, on unfenced alpine pastures, the herder keeps the flock together, avoiding scattering of the animals in small groups, and thus considerably increases the efficiency of the LGDs. Ideally, the most experienced LGDs should be integrated in urgent cases after wolf attacks on alpine pastures. However, the number of experienced LGDs in Switzerland has been limited and thus also younger dogs have been integrated. It must be considered as well that it is advantageous if the already experienced dogs can be acquired by the sheep farmers and that they should be interested in LGDs as a long term option to protect their flocks. After all, the removal of a well integrated dog and the integration of a new one will be time consuming and causing disturbances among the sheep.

Conclusions

The use of LGDs as a measure to protect livestock against large predators has been a direct response to the return of the wolf to Switzerland in 1995/96. This was a new concept for Swiss sheep farmers, which did not demonstrate much acceptance in the beginning. Experience and knowledge about the use of LGDs and their behaviour still were at an early stage, and its feasibility in the Swiss context had to be demonstrated. In many instances, however, sheep farmers who were first very critical about LGDs protecting their flocks were later absolutely satisfied with the way these dogs were working. Both from the majority of functional *Maremmanos* and from the minority of problematic cases important lessons have been learnt:

- Playfulness that leads to injuries and losses has been a common problem especially in young dogs and it must be taken seriously. But, with careful observations, the appropriate training and correc-

tion at the right time, the chances are good that the dog will not take his playfulness as a habit into his adult life but will become a trustworthy guardian.

- “Mobbing” and unbalanced social structure within a team of *Maremmanos* can be successfully controlled by removing or exchanging individual members of a team. Taking into consideration the age, sex and dominance of the dogs this problem can be often avoided from the very beginning. Better results have been obtained with *Maremmanos* working in a team than with single dogs.
- Attachment to people: Two *Maremmanos* have shown more attachment to people than to livestock and thus were insufficiently loyal and attentive to their flock. This probably depends on the individual character/temperament of a dog plus its experiences with people during his young age and process of maturation. This behaviour is not desirable and can render a dog ineffective as a LGD. But, since the encounter between tourists and LGDs on alpine pastures in Switzerland is rather the rule than the exception, it is still safer to have a dog that is too friendly rather than too aggressive.
- LGDs Roaming too far from the flock. There may be different reasons for this behaviour: females in heat, hunting for wildlife, searching for food leftovers near huts or houses. Roaming in male dogs may be reduced if the dog is neutered (Green and Woodruff 1999).
- Harassment of sick individuals that stay behind or show abnormal behaviour has been observed in some cases; mainly with dogs younger than 2 years. In this situation it can be difficult to correct the dog; whenever possible the sick animal should be separated until its recovery.
- Too aggressive guarding behaviour (with respect to other dogs, people). This behaviour raises questions concerning the further use of the dog, unless an obvious reason for the dog’s behaviour can be detected and excluded for the future. Such individuals have to be consequently eliminated. None of the working dogs showed such an aggressive behaviour.
- Imported adult dogs coming from a different context should be treated carefully, especially if it is unclear how the puppies have been raised. It may be safer to import puppies from the *Abruzzo* province at a very young age (8-12 weeks) and to do the basic training in Switzerland.

These experiences from the past years will certainly facilitate the integration and use of the *Maremmano* dog as well as other LGD breeds in

Switzerland in the future. For sure, the process of learning more about the LGDs and developing a better understanding of the various interactions between dogs, livestock and people is a continuing challenge with the goal to improve the methods of introducing and working with LGDs. An important step to be implemented in the near future is to get control over the breeding lines, and to establish a breeding program which takes into consideration aspects of the dog's behaviour, genetics and health.

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Publications

Ikeda, N. 2004: Economic impacts of livestock depredation by snow leopard *Uncia uncia* in the Kanchenjunga Conservation Area, Nepal Himalaya. *Environmental Conservation* (2004), 31:4:322-330

It is necessary to fully understand the economic conditions of local herders in order to find solutions to the conflicts between wildlife conservation and livestock rearing in remote areas of low-income countries. In the Kanchenjunga Conservation Area (KCA), Nepal, livestock depredation by snow leopards impacts on yak herders' livelihoods. Retaliatory killings of snow leopard by the herders have been reported and the concerned authorities recently initiated snow leopard conservation programmes. In 2001, interviews with the yak herders who used the pastures in the Ghunsa valley in the preceding year collected data on the incidence of livestock death caused by snow leopards. The annual net cash income of the yak herders was estimated by obtaining baseline values of sales and expenditure per livestock head through field measurement of dairy products and interviews with a sample of herders. As yet, the average annual damage does not appear to have adversely affected fundamental livelihoods in households with an average herd size (36.6 head). However, in the worst scenario of livestock depredation, households with medium or small-sized herds (<40 head) might risk their living conditions becoming unsustainable or having to withdraw from yak pastoralism. A supplementary interview showed that the majority of the herders, except those who took completely neutral attitudes towards the regional conservation and development programme, had negative views of the snow leopard conservation policy. For the snow leopard conservation programme in the KCA to be a success, there must be a system to compensate the herders' households for livestock damage.

Woodroffe, R., Thirgood, S. and Rabinowitz, R. 2005. People and Wildlife, Conflict or Co-existence? *Conservation Biology* No. 9.

Human-wildlife conflict is a major issue in conservation. As people encroach into natural habitats, and as conservation efforts restore wildlife to areas where they may have been absent for generations, contact between people and wild animals is growing. Some species, even the beautiful and endangered, can have

serious impacts on human lives and livelihoods. Tigers kill people, elephants destroy crops and African wild dogs devastate sheep herds left unattended. Historically, people have responded to these threats by killing wildlife wherever possible, and this has led to the endangerment of many species that are difficult neighbours. The urgent need to conserve such species, however, demands coexistence of people and endangered wildlife. This book presents a variety of solutions to human-wildlife conflicts, including novel and traditional farming practices, offsetting the costs of wildlife damage through hunting and tourism, and the development of local and national policies.

- Covers a major, and emerging, conservation issue
- Applies equally to conservation in developed and developing countries
- Multi-disciplinary approach, involving ecologists, social scientists, managers and policymakers

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10. Zoning as a means of mitigating conflicts with

- large carnivores: principles and reality. *John D. C. Linnell, Erlend Birkeland Nilsen, Unni Stobet Lande, Ivar Herfindal, John Odden, Ketil Skogen, Reidar Andersen and Urs Breitenmoser*;
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 19. Searching for the coexistence recipe: a case study of conflicts between people and tigers in the Russian far east. *Dale Miquelle, Igor Nikolaev, John Goodrich, Boris Litvinov, Evgeny Smirnov and Evgeny Suvorov*;
 20. A tale of two countries: large carnivore depredations and compensation schemes in Sweden and Norway. *Jon E. Swenson and Henrik Andren*;
 21. Managing wolf-human conflict in the northwestern United States. *Edward E. Bangs, Joseph A. Fontaine, Michael D. Jimenez, Thomas J. Meier, Elizabeth H. Bradley, Carter C. Niemeyer, Douglas W. Smith, Curt M. Mack, Val Asher and John K. Oakleaf*;
 22. Policies for reducing human-wildlife conflict: a Kenya case study. *David Western and John Waithaka*;
 23. An ecology-based policy framework for human-tiger coexistence in India. *K. Ullas Karanth and Rajesh Gopal*;
 24. The future of coexistence: resolving human-wildlife conflicts in a changing world. *Rosie Woodroffe, Simon Thirgood and Alan Rabinowitz*.
- The Sheep & Goat Research Journal No 19** has dedicated a special edition on predation. The following articles are online available on <http://www.sheepusa.org/>
- Predation and Livestock Production Perspective and Overview. Author: *Maurice Shelton*
- Economic Impact of Sheep Predation in the United States. Author: *Keithly Jones*
- The History of Federal and Cooperative Animal Damage Control. Author: *Donald W. Hawthorne*
- Status and Management of Coyote Depredations in the Eastern United States. Author: *J. M. Houben*
- The Coyote in the Edwards Plateau of Texas — an Update. Author: *Gary Nunley*
- Coyote Predation Management: An Economic Analysis of Increased Antelope Recruitment and Cattle Production in South Central Wyoming. Author: *Stephanie A. Shwiff and Rod J. Merrell*
- Feral Swine Impacts on Agriculture and the Environment. Author: *Nathan W. Seward, Kurt C. VerCauteren, Gary W. Witmer, and Richard M. Engeman*
- Managing Wolf Depredation in the United States: Past, Present, and Future. Author: *Stewart Breck and Tom Meier*
- Compensation Programs in Wyoming for Livestock Depredation by Large Carnivores. Author: *M. T. Bruscano and T. L. Cleveland*
- Direct, Spillover, and Intangible Benefits of Predation Management. Author: *Stephanie A. Shwiff and Mike J. Bodenchuk*
- Indirect Effects of Carnivores on Livestock Foraging Behavior and Production. Author: *Larry D. Howery and Thomas J. DeLiberto*
- Livestock Depredations by Black Vultures. Author: *M. L. Avery and J. L. Cummings*
- Non-lethal Alternatives for Predation Management. Author: *John A. Shivik*
- Use of Livestock Guarding Animals to Reduce Predation on Livestock. Author: *W. F. Andelt*
- Predacides for Canid Predation Management. Author: *K. A. Fagerstone, J. J. Johnston, and P. J. Savarie*
- Selective Targeting of Alpha Coyotes to Stop Sheep Depredation. Author: *M.M. Jaeger*
- Using Genetic Analyses to Identify Predators. Author: *C. L. Williams and J. J. Johnston*
- Economic Impact of Protected Large Carnivores on Sheep Farming in Norway. Author: *Leif Jarle Asheim and Ivar Mysterud*
- Review of Canid Management in Australia for the Protection of Livestock and Wildlife - Potential

Application to Coyote Management. Author: *L. R. Allen and P.J.S. Fleming*

Meetings of interest

3-6 March 2006

22nd Vertebrate Pest Conference

Location: Berkeley, California

Information: <http://www.vpconference.org/>

23-27 August 2006

1st European Congress of Conservation Biology

Location: Eger, Hungary

Information: <http://www.eccb2006.org/>

2-6 October

17th International Conference on Bear Research and Management

Karuizawa Town, Nagano, Japan

Information: <http://www.japanbear.org/iba2006.html>

Please send Information on Meetings to:

cdpnews@kora.ch

Coming topics

The next issue of the CDPNews will be all around “dealing with problem bears”. If you are running a project dealing with bears or if you are dealing with problem bears in your daily work, please don’t hesitate to contact us for writing an article for the CDPNews.

You can find authors guidelines for the article on our website on www.kora.unibe.ch.

The next issue will be opened for any other topics as well. Please contact us on cdpnews@kora.ch before writing your article for better coordination.

Thanks

the Editors

Special thanks to Stephanie Rathier who perused some of the articles and gave us a lot of input to improve the quality of the articles at hand.

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We welcome the translation and further distribution of articles published in the CDP News under citation of the source.

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LCIE card



The Large Carnivore Initiative for Europe aims

"To maintain and restore, in coexistence with people, viable populations of large carnivores as an integral part of ecosystems and landscapes across Europe".

According to this mission statement, the LCIE defines four important fields of activity:

1. conservation of large carnivore populations and their habitats;
2. integration of large carnivore conservation into local development of rural areas;
3. support for large carnivores through appropriate legislation, policies and economic instruments;
4. the human dimension (information and public awareness with the aim of obtaining the acceptance of large carnivores by all sectors of society).

To solve the conflict arising from the predation of large carnivores on livestock, the prevention of damages is of high priority. For more information on the LCIE please visit the LCIE website (www.large-carnivores-lcie.org) or contact the LCIE coordinator, Agnieszka Olszanska (agnieszka.olszanska@coe.int)

Contributions desired

Dear subscribers,

The CDP News will only thrive with your active participation. Articles should be as „down to the earth“ as possible. Please send us any contribution on the following topics (please see article guidelines on our website):

- Prevention measures
- Prevention measures that did not work
- Statistics on damage
- Compensation systems
- Technical articles
- Problem animal management
- Opinion and forum papers