# Livestock guarding dogs

## Cultural heritage icons with a new relevance for mitigating conservation conflicts

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Cooperation and expertise for a sustainable future

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Norwegian Institute for Nature Research

European Commission

Linnell, J.D. C. & Lescureux, N. 2015. Livestock guarding dogs – cultural heritage icons with a new relevance for mitigating conservation conflicts. Norwegian Institute for Nature Research, Trondheim. 76 pp.

Trondheim, March 2015

ISBN: 978-82-426-3500-6



GRAPHIC DESIGN
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NO. PRINTED
50

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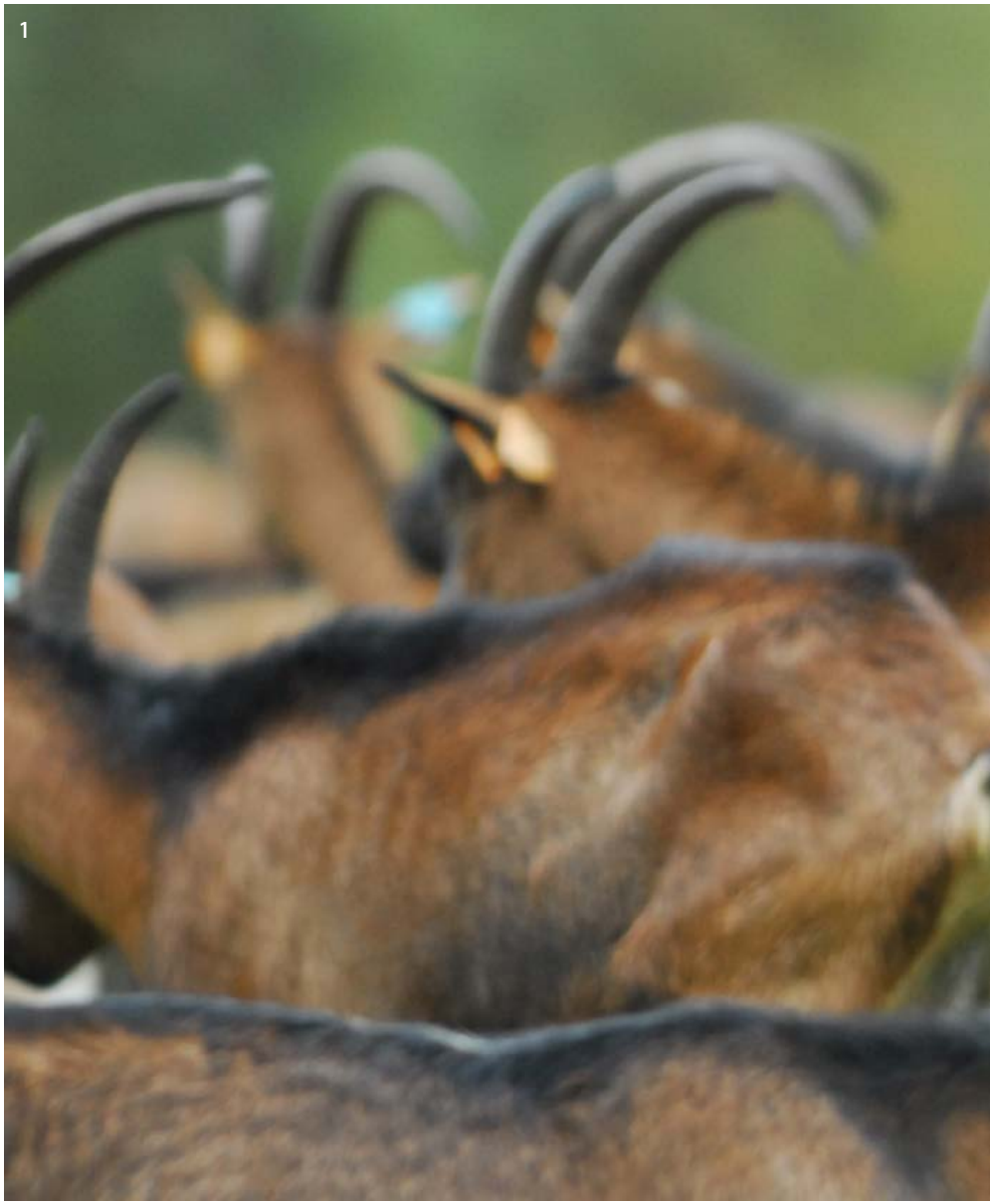
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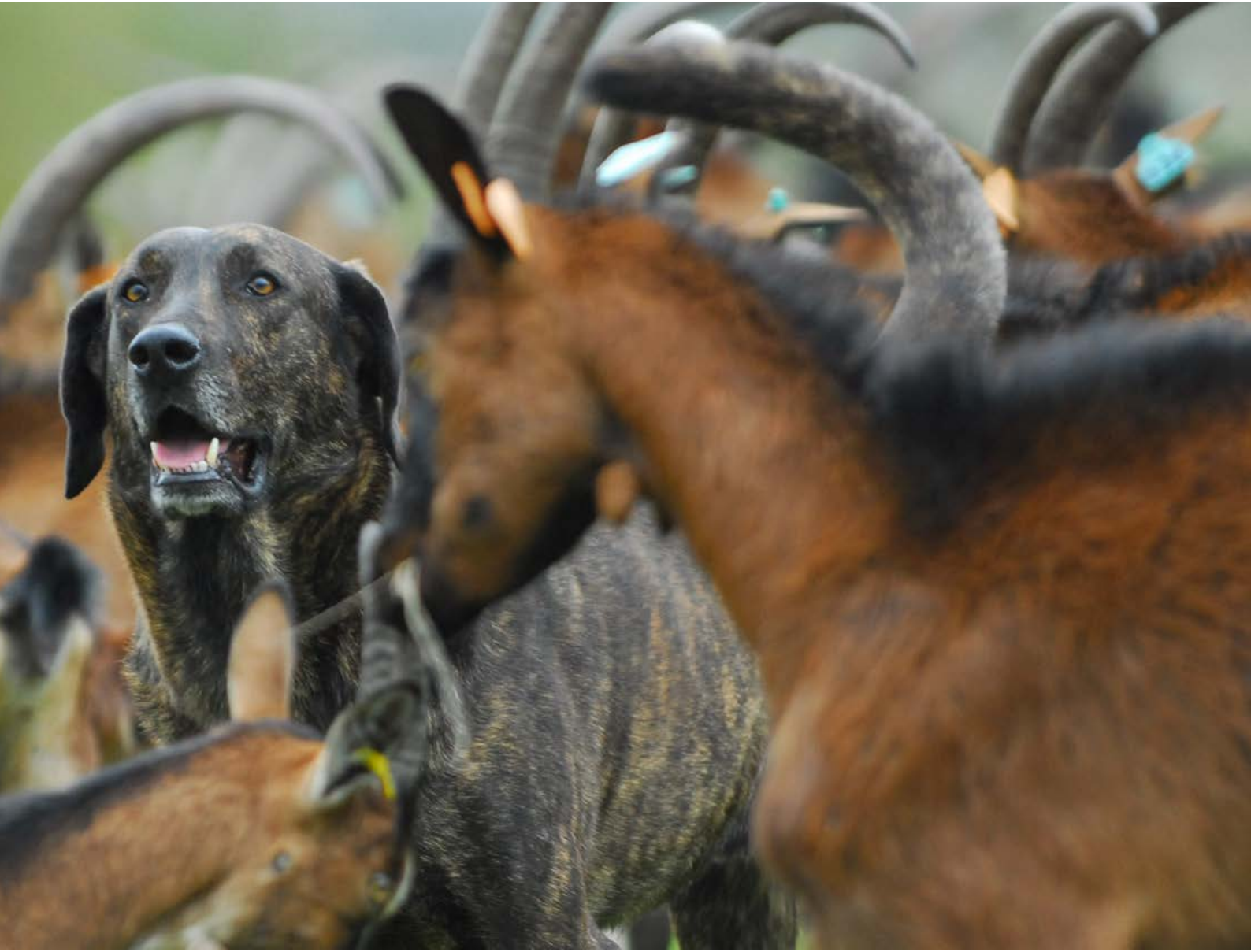

# Preface

The work described in this report constitutes a pilot action on large carnivores developed within the project Support to the European Commission's policy on large carnivores under the Habitats Directive – phase 2 (contract no. 07.0307/2013/654446/SER/B.3), financed by the European Commission via the Istituto di Ecologia Applicata, Rome, with guidance from the Large Carnivore Initiative for Europe (IUCN/SSC LCIE). It's objective was to inspire best practices and improve communication between stakeholders, specifically by developing resources about livestock guarding dogs that explore their historical use and relevance for helping reduce conflicts between livestock and large carnivores in the 21st century. The contents are based on an accumulation of experience that has come from within multiple projects, many of which have been co-funded by the EC's LIFE program. This experience has been co-developed by the work of livestock producers, agricultural specialists and environmentalists. In addition, we build on cultural historical and ethnographic research that the authors have conducted in recent years. This has involved working with and interviewing many shepherds and livestock breeders across southern, central and eastern Europe, including both those who have always worked with livestock guarding dogs and those trying to integrate these dogs into their grazing operation for the first time. On the one hand, we hope that this report will increase the level of awareness of both the heritage value and modern day usefulness of these dogs for protecting livestock from large carnivore predation. On the other hand, we are also trying to communicate a balanced view concerning the challenges and limitations of using livestock guarding dogs in a modern context. There is no magic solution to the complex challenges that large carnivores represent for livestock producers. However, livestock guarding dogs are a very valuable and versatile tool in the pastoralist's toolkit that can be used in many situations, and whose application can also be integrated with other tools, such as fencing, to create functional solutions.


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# Introduction

Human and large carnivores, like wolves and bears, have been sharing the landscapes of Eurasia for millennia, ever since the first humans colonised the continent during the Ice Age. Their early relationships were probably complex, with carnivores representing both a threat to human lives and providers of carrion that early humans could scavenge. Eventually, the relationships between humans and wolves took a dramatic turn and led to the emergence of domestic dogs. Although there is much debate about the domestication process, it is possible it began as long as between 15,000 and 12,000 years ago. These early dogs were probably used as both guardians and as hunting companions, and represented the first step in a major change in the way that early humans interacted with the wildlife that surrounded them. The next major step was the domestication of wild ungulates like sheep, goats and cattle. The need to protect these herds from wild predators promoted a dramatic change in the way humans related to large carnivores. Their previously ambiguous relationship now became one of direct competition that stimulated humans to adopt increasingly advanced ways to kill large carnivores. It also opened the way for the "domesticated wolf" to adopt a new role as guardian of the flocks against their wild ancestors! A role that they have continuously maintained until present times.

Detail of a miniature of a wolf, sneaking up on sheep from downwind (Bestiary, England, c. 1200-c. 1210, Royal MS 12 C. xix, f. 19r)

This is the story of those dogs and the wild carnivores that they were bred to defend against. We will follow the tradition down through the millennia, travelling across all of Europe and into the adjoining regions of the Middle East and Central Asia. We shall see how their fates were linked; how the historical decline of the large carnivores led to the decline of the livestock guarding dogs, and how the recovery of large carnivores is leading to a renaissance for the dogs and the pastoral systems in which they were imbedded. However, the 21st century differs dramatically from those of the past in terms of the ecology of the environments and the social, cultural and economic systems surrounding pastoralism. The central question we ask is to what extent can these symbols of our Eurasian cultural heritage continue to mitigate the impacts of the large carnivores that are returning to our modern day landscapes?

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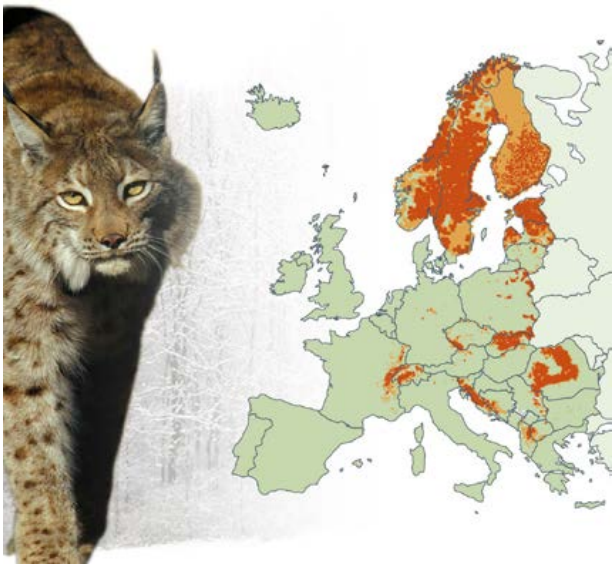
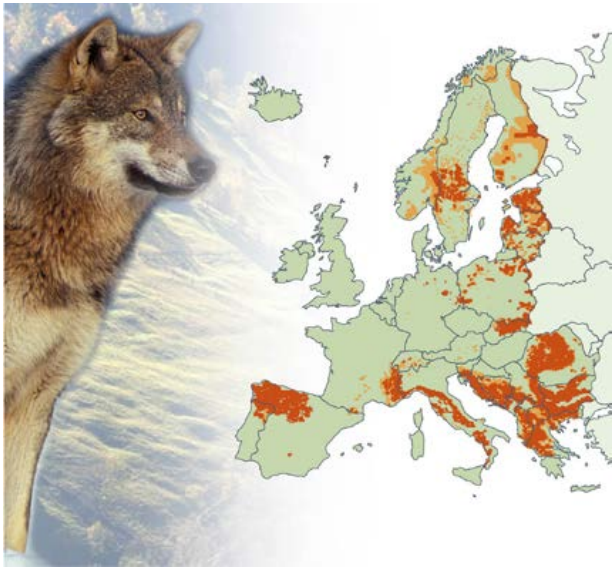
# Large carnivores in Europe and neighbouring regions

Europe and central Asia were home to a diverse guild of large carnivores at the end of Ice Age. Europe was home to lions, leopards, brown bears, wolves, Eurasian lynx, and wolverines, while the neighbouring parts of the Middle East and entral Asia also contained tigers, cheetahs, snow leopards, and hyenas. These species were all widespread at the time our story begins when human societies progressively shifted from hunting and gathering to farming and pastoralism. As soon as humans became herders of domestic livestock, they have used a great deal of effort and ingenuity to kill carnivores. As human populations grew, farmland increased to the detriment of forest, technology and tools evolved, human impact increased and large carnivore species declined. These declines reached their most extreme in the late 19th and

Distribution of Eurasian lynx, wolves and brown bears in Europe as of 2011 (www.lcie.org).





early 20th centuries. By this stage, lions and leopards were long gone from Europe (the last records come from Roman times) and wolves, bears and lynx had been effectively exterminated from most of western and central Europe. Their populations were also greatly reduced in southern and eastern Europe although small remnant populations held on in many of the mountain areas. In the Middle East and Central Asia, lions and cheetahs were reduced to tiny relict populations in India and Iran respectively, and Caspian tigers held on until the 1950's. Leopards and snow leopards have survived across wide areas in the mountains and rugged terrain that gives them refuge. Wolves were the species that retained the greatest part of their range; a testimony to their adaptability and resilience. For pastoralists wolves have probably been the single most problematic species and have become symbols for this age-old struggle between the shepherd and the predator.

The relationship between humans and predators remained largely unchanged until the post-World War 2 period when the modern day environmentalist movement began to take form. The period from the 1960's to the 1980's led to a dramatic U-turn in human attitudes towards nature which led to far-reaching changes in policy. Instead of indifference or active extermination, the goals for large carnivores in most countries switched to those of conservation and protectionism. In most populations, the carnivores responded positively to this breathing space, also availing of the dramatic improvements in forest cover and the abundance of wild herbivore prey that had begun earlier in the century. Eurasian lynx and brown bears have been given a helping hand in some areas, being reintroduced into areas like the Alps and the Pyrenees. With a few exceptions, most large carnivore populations have begun to recover, with wolves especially recolonizing many of their former haunts, including Scandinavia, Germany, France, Switzerland and even recently arriving in Denmark. At least one large carnivore species is now found across one third of the European continent. The best available data indicate that we now have as many as 17.000 brown bears, 12.000 wolves, 9.000 Eurasian lynx and 1200 wolverines in Europe . The situation of large carnivores in the Middle East and Central Asia is less clear, but even there many species are maintaining their populations or even expanding.

# History of livestock guarding dogs

Several hypotheses have been advanced concerning the origins of livestock guarding dogs (LGDs). Some trace their origin to the Tibetan mastiff; others focus on a breed of dog called Molossers given to Alexander the Great by an Indian king. Although many things have been written about the origins of LGDs there have been surprisingly few systematic investigations into their past use by either historians or archaeologists. Genetic, archaeological and behavioural studies tend to confirm that the wolf is the main ancestor of the dog and the first undisputed domestic dog remains dates back to ca. 15,000 years ago in Europe and ca. 12,000 years ago in several places including Syria, Cyprus, Iraq, northern China, and the Russian Far East. Livestock domestication events for most other species (cattle, sheep, goats, pigs) all occurred in the Near East at around the same period between 8,500 and 11,000 years ago. Despite the probable co-occurrence of livestock and dogs in some regions, the most ancient association between dogs and sheep in archaeological records only dates back to ca. 5,600 BP, without any information on what function these dogs had.

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The co-occurrence of sheep (or goats) and dogs is a necessary but not sufficient condition for the emergence of LGDs. There are some historical preconditions for the presence of LGDs . The first one was the practice of large-scale extensive sheep-farming. It is probable that families owning a few sheep and practicing mixed farming did not need (and maybe couldn't even sustain) such large (and hungry) dogs. LGDs are therefore linked with large flocks grazing in open landscapes like mountain pastures and steppe areas. In fact, it is noticeable that the original location of LGD breeds corresponds quite well with places of transhumant and/or nomadic shepherding. The second precondition is of course the necessity to protect the flocks from predators, which is confirmed by the absence of LGDs in places with no large carnivores as well as their disappearance from places where large carnivores became extinct. As Johanes Caius already wrote in 1570 about English dogs: "*Our shepherdes dogge is not huge, vaste, and bigge, but of an indifferent stature and growth, because it has not to deale*

*with the bloudthyrsty wolf, sythence there be none in England"* (following their extinction in the late Middle Ages). The last condition for the presence of LGDs is the possibility for livestock owners to feed them, and notably to provide them with proteins. Meat was certainly not an option in the past when a lot of people couldn't even afford it for themselves. Therefore, whey, as a by-product of cheese making, was probably a cheap way to provide proteins to such huge and hungry dogs, but it then implied that pastoralists were producing dairy products, either from their sheep or cows. Nowadays, whey is still used to feed LGDs, notably in the Balkans, mixed with some flour or old bread.

The oldest unambiguous written mention of dogs dedicated to guarding livestock appears in Aristotle's History of Animals, dated from 2356 years ago.

*"Of the Molossian breed of dogs, such as are employed in the chase are pretty much the same as those elsewhere; but sheep-dogs of this breed are superior to the others in size, and in the courage with which they face the attacks of wild animals. Dogs that are born of a mixed breed between these two kinds are remarkable for courage and endurance of hard labour."*

The Jennings Dog is a Roman sculpture of a dog identified at the British Museum as a Molossian guard dog. It is a 2nd century AD Roman copy of a Hellenistic bronze original. © Trustees of the British Museum.

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Then, livestock guarding dogs are described in great detail, as well as the way to raise and use them, in the writings from the Roman writer Varro's Rerum rusticarum libri III, dated from ca. 2100 years ago .

*"There remains …….. only the topic of dogs; but it is of great interest to those of us who keep fleece-bearing flocks, the dog being the guardian of the flock, which needs such a champion to defend it."*

According to Varro, these dogs were used to guard sheep and goats against wolves, since other livestock are able to defend themselves:

*"Under this head come especially sheep but also goats, as these are the common prey of the wolf, and we use dogs to protect them."*

Varro also provided numerous details on how to choose and use a dog for guarding livestock, to the point that for the most part his text would certainly be still relevant today:

*"In the first place, they should be procured of the proper age as puppies, and dogs over age are of no value for guarding either themselves or sheep, and sometimes fall a prey to wild beasts.[. . .] It is better, therefore, to buy from a shepherd a bitch which has been trained to follow sheep, or one that has had no training at all; for a dog forms a habit for anything very easily. [. . .] The food of dogs is more like that of man than that of sheep: they eat scraps of meat and bones, not grass and leaves. Great care must be taken for their supply of food; for hunger will drive them to hunt for food, if it is not provided, and take them away from the flock [. . .] You should also feed them barley bread, but not without soaking it in milk; for when they have become accustomed to eating that kind of food*

*they will not stray from the flock. They are not allowed to feed on the flesh of a dead sheep, for fear that the taste will make them less inclined to protect the flock".*

*"In the matter of rearing after birth, if the litter is large you should at once pick those that you wish to keep and dispose of the others. The fewer you leave the better they will grow, because of the abundance of milk [. . .]. Some people castrate them, because they think that by this means they are less likely to leave the flock; others do not, because they think this makes them less keen".*

*"To protect them from being wounded by wild beasts, collars are placed on them — the so called melium, that is, a belt around the neck made of stout leather with nails having heads; under the nail heads there is sown a piece of soft leather, to prevent the hard iron from injuring the neck. The reason for this is that if a wolf or other beast has been wounded by these nails, this makes the other dogs which do not have the collar, safe".*


The vigilant eye. Illustration by French artist Jacques Callot (1592-1635) from the book Lux Claustri (the light of the monastery) showing a flock protected by a net and a guarding dog.

*"The number of dogs is usually determined by the size of the flock; it is thought to be about right for one dog to follow each shepherd. But the number varies with the circumstances; thus in countries where wild beasts are plentiful there should be more, as is usually the case with those who escort the flocks to summer and winter pastures through remote woodland trails. On the other hand, for a flock feeding near to the farm two dogs are sufficient. These should be a male and a female, for in this case they are more watchful, as one makes the other more keen, and if one of the two is sick that the flock may not be without a dog."*

Even if the first known mentions of LGDs are from ancient Greece and the Roman Empire, this doesn't mean LGDs were first used in these place and at these times. The origins of LGDs and the chronology of their introduction remain uncertain. More research is needed to assess the presence of LGDs, either in archaeological remains or in ancient texts from other places.

Indeed, to our knowledge no historical study of LGDs has been conducted. A few scattered accounts can be found but the place of LGDs in pastoral systems in Eurasia from Roman times to the beginning of 20th century remains poorly studied Nevertheless, a quick investigation of iconography reveals that LGDs were present and used throughout this period.

One example is the Triptych of the Burning Bush, painted by Nicolas Froment between 1475 and 1476 and displayed in Aix cathedral. On the central panel, accompanying a mixed flock of sheep and goats lies a white dog with cut ears and a spiked

Central panel from Nicolas Froment's Triptych Le Buisson ardent (the burning bush) (1475-1476, Cathedral of Aix-en-Provence), showing a mixed flock of sheep and goat guarded by a dog with a spiked collar.

collar. It is highly probable that this is a representation of a guarding dog. Another good example is shown in the emblem book "lux claustri" written in the mid-seventeenth century and illustrated by Jacques Callot. One of the engravings, "the vigilant eye", shows a flock inside a net protected by a dog wearing a spiked collar. Once again, the role of the dog is obvious. Later on, in the mid-nineteenth century, several painters illustrated the daily life in the Pyrenees and in a few pictures LGDs appear, looking quite similar to modern ones. Despite these very interesting representations, we lack information on the distribution and use of LGDs during historical time, even though it appears they were probably widespread.

Illustration from Le Kalendrier des Bergiers (the shepherds' calendar) published in 1508, showing a flock attacked by a wolf in the background and a shepherd accompanied by two guarding dogs wearing spiked collars in the foreground.

M.-A. Alophe (1812-1883) drawing of a mountain dweller from the Spanish Pyrenees showing a shepherd with his guarding dog.

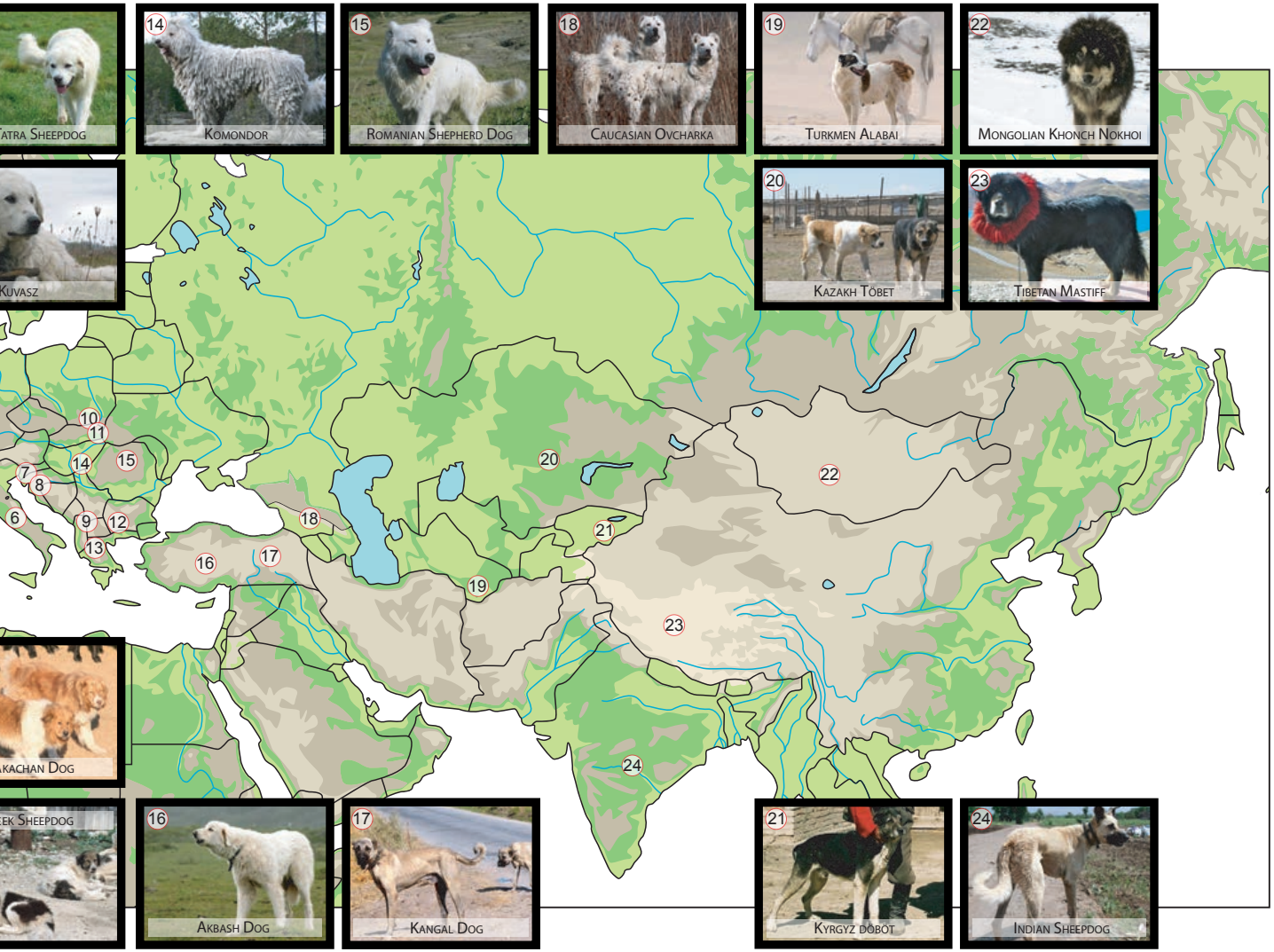
# Livestock guarding dogs as cultural heritage

## Diversity of breeds and their local identity

Nowadays, it is possible to recognize approximately 50 breeds of LGD. Many of them are recognized both by the American Kennel Club (AKC) and the Fédération Cynologique Internationale (FCI) with their respective standards. However, it is highly probable that all these breeds are recent creations with the standards almost certainly being set in an environment isolated from that in which the dogs were actually used. In addition, the establishment of breeds recognized either by the FCI or the AKC is leading to the standardization of LGD breeds mainly based on morphological characteristics whereas the origin and use of LGDs was mainly based on their ability to protect the flocks.

Some breeds are not recognized by these international organizations and alternatively one breed can have several local names. Thus, some breeds will be associated with one country, even though very similar dogs are present in the neighbouring countries on the same mountain range where the traditional transhumance patterns used to cut across these countries' borders. Therefore, the exact number of LGD breeds remains unclear, varies according to authors, and the splitting between dogs appears quite arbitrary.

In several places it appears that dog breeds hold substantial political and identity values which have biased the separation between different breeds and the construction of their history, giving birth to unsupported assertions about the origins of breeds. It is probable that this strong identity value associated with a particular breed is mainly an issue for kennel club members. Indeed, even if they have their own criteria according to which they select their dogs, active LGD users are far more concerned about the working abilities of their dogs. The extent to which a breed traditionally had a name simply reflects that they were local dogs, with most breed


Tatra Sheepdog
14
Komondor
15
Romanian Shepherd Dog
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Caucasian Ovcharka
19
Turkmen Alabai
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Mongolian Khonch Nokhoi
Kuvasz
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Kazakh Tobet
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Tibetan Mastiff
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Akachan Dog
ek Sheepdog
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Akbash Dog
17
Kangal Dog
21
Kyrgyz dobot
24
Indian Sheepdog

names meaning "the dog from this region". The Great Pyrenees comes from the Pyrenees, the Mareema comes from Mareema, and so on.

With few exceptions, the most striking aspect of these dogs is actually their similarity rather than their differences. It is possible to speculate about the degree to which shepherd cultures established contact and exchange practices, and dogs, across the wide sweep of Eurasia. These similarities are even more evident when looking at the wider pastoral system within which these dogs have been used.


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## Livestock production systems as age old bio-cultural adaptations

Since its origins in the Near East livestock breeding has spread across most of the world and, combined with agriculture, has dramatically shaped many of our landscapes. Nowadays, extensive pastoral production systems cover about 25% of the Earth's terrestrial surface. Throughout the world, 100 to 200 million people depend on pastoralism, which is of both economic and cultural value. Pastoral systems are very diverse throughout the world, but they are generally characterized by high mobility and dynamism, low population densities, and a high reliance on local and traditional knowledge that has accumulated through the ages. The pastoralism systems show greater similarity to the patterns of grazing used by wild ungulates than those of more stationary livestock production systems. In addition, pastoralists often use locally adapted livestock breeds and actively help to preserve them, thus maintaining livestock genetic diversity. Pastoralists also contribute to biodiversity conservation through their knowledge of various species and their management of the landscape which helps to maintain these species as well as their interactions with other elements of the ecosystem through herbivory, host-parasite cycles and nutrient cycling. However, the densities of livestock kept are often much higher than those of wild ungulates and the grazing regimes often induce higher grazing pressures on the vegetation.

Extensive livestock grazing, often combined with human activities such as burning, mowing and intensive use of firewood, has transformed landscapes and created new habitat types. The suppression of shrubs, bushes and trees as well as trampling by livestock and the net removal of nutrients has favoured the emergence of a vegetation community dominated by grasses, and where species that have poor competitive ability thrive. These new habitat types are often very rich in fungal, floral and invertebrate diversity and help to maintain a greater degree of habitat diversity than would otherwise have occurred. These habitats also provide good grazing conditions. As such, the system can be viewed as a bio-cultural system where livestock practices and the associated biotic communities have developed a high degree of interdependence. Compared to many other agricultural practices, pastoralism can clearly increase plant and landscape diversity. Finally, in addition to favouring biodiverse


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landscapes, pastoralism has enhanced the cultural richness of the landscape through numerous buildings, tracks, rock carvings, droving roads, stone walls, livestock pens, etc. which can be viewed as living monuments to an ancient heritage. They would quickly fade away if pastoralism and transhumance systems were to disappear.

## LGDs as a component of the pastoral system

Considering the ecological and social context in history, we can hypothesize that it would have been almost impossible for herders to exploit the grazing resources of these wilder landscapes at greater distance from settled areas without the presence of livestock guarding dogs to help protect the flocks from the predators that have always occurred in these areas. As such, the dogs can be viewed as essential ingredients in the development of this bio-cultural system. The dogs, however, did not work alone. Throughout Eurasia, they have been integrated into a system that combines the constant presence of shepherds following the flocks during the day and the night-time gathering of flocks into enclosures. Since nomadic or transhumant grazing does not lend itself to having permanent structures, simple netting enclosures were often used which require that shepherds also slept in proximity to the flocks so they could respond to the alarm raised by the dogs. The ability to defend their flocks against predators using both reactive and proactive culling of carnivores, to remove livestock killers and maintain shyness among the predators, has probably always been a part of most pastoral systems.

# Livestock guarding dogs in the 21st century

Having looked at the history of LGDs through more than two thousand years the question remains concerning their place in the 21st century. To answer this we have to look at two very different contexts. In those parts of Europe where large carnivores persisted, such as the Carpathian mountains, the Balkans, central Italy and the Iberian peninsula (and the mountains of the Middle East and much of Central Asia), LGDs were retained as integral parts of the livestock production system. In the countries from the former Eastern Bloc, the upheaval associated with the Soviet era and the post-communist transition to a market economy has left its scars on the traditional systems, and it is probable that the quality of the LGDs declined in many areas. However, in general it has been impossible for shepherds to herd sheep without these guardians who work round the clock to protect the flocks and alert the shepherds to approaching predators. As a result, LGDs remained an integral part of these traditional pastoral systems with extensive grazing, wide-ranging movements of the flocks (transhumance), night-time gathering, and constant presence of shepherds. The relevance of LGDs has not diminished with time.

In these pastoral systems, the major present day threat is coming from external factors that threaten the whole system. The collapse of state agriculture support through veterinary care and the infrastructure to buy livestock and livestock products, the general decrease in lamb meat consumption due to impoverishment, the

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privatization of pastures and other factors have led to a major collapse in sheep production. Thus in Eastern Europe, the number of sheep and goats decreased from c. 169 million in 1991 to c. 31 million in 2001. Despite the presence of LGDs, many herders in these regions also increasingly complain about the changing behaviour and increasing number of predators following the end of state sponsored predator-control. A final issue concerns social forces that are making it harder to recruit a new generation to the difficult and poorly paid life of the shepherd.

The other situation concerns the areas of western and northern Europe where large carnivores are returning to areas from which they have been absent for decades or centuries. Released from the pressures of carnivore presence herding systems rapidly shed the burden of these large hungry dogs and night penning which is often detrimental to sheep growth, health and wool quality. Following the widespread recovery of large carnivores in recent decades, the herding systems that had developed in the absence of predators are suddenly being confronted with attacks that are viewed as intolerable. The impacts are felt by shepherds on many levels. Although state compensation systems can buffer against some of the economic losses, the extra workload and the social and psychological impact of losing animals is often unbearable. Beyond this obvious social impact on livestock breeders and shepherds, these situations often generate conflicts that can quickly grow and lead to illegal retaliatory killing of large carnivores, demonstrations, and heated conflicts between different groups in society.

In addition, reduction in grazing pressure leads to the encroachment of shrubs and reforestation that begins to lead to the loss of the grazing dependent landscapes. This leads to a loss of landscape diversity and many associated species. These grazing dependent landscapes often have a very high aesthetic value for the modern public. In addition, they have a strong cultural value in many regions that value the landscape as living cultural heritage with all the associated traditions, paths, buildings, and walls. In many cases, the existing conservation legislation has also recognised the biotic value of these landscapes and calls for their conservation, which requires a continuity of use of traditional grazing practices.

In these contexts, the reintroduction of LGDs is being widely proposed as a suitable protection measure to allow grazing to continue; often in combination with other measures like electric fences and night-time gathering. LGDs are thus acquiring a new status. They are becoming a tool in the modern conservation toolbox to protect both large carnivores and grazing dependent landscapes indirectly through their role as a livestock protection measure. The hope is that reducing damages on livestock will increase the tolerance of livestock producers for the presence of large carnivores.

However, the ease with which LGDs can be reintegrated into western European pastoral systems varies greatly, reflecting the diversity of European landscapes, cultures and pastoral practices.


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# Opportunities

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As a consequence of the political and economic changes of recent decades, the European continent is undergoing dramatic environmental changes. These changes vary regionally, but in many part of Europe there has been a general trend for the "lowlands" to see an intensification of agriculture and increase in human populations and the "highlands" (and other marginal areas designated as Less Favoured Areas by the Rural Development Funds) to see both a reduction in agriculture and a decrease in their rural human population.

Together with protective legislation and active conservation measures, the reduced human pressure on habitats has contributed to the recovery of large carnivores. It is also leading to shrub encroachment and the reforestation of the landscape. These changes are creating a wide range of challenges for rural populations including socio-economic difficulties and the loss of tradition and identity in the face of global change.

In some contexts, LGDs allow the maintenance of sheep grazing in places where it would be too risky to graze without dogs, i.e. in specific habitats and regions where the risk of depredation is high. To some extent, and being cautious about the diversity of contexts, LGDs can potentially slow down the vicious cycle of land abandonment leading to loss of grazing pastures and increased difficulties of maintaining livestock breeding activities. In many parts of Europe a range of conservation projects and government schemes have been encouraging herders to adopt LGDs and learn how to use them under modern conditions.

In other contexts, LGDs allow livestock breeding activities to resume even under quite challenging situations. For example, in the eastern Polish Carpathians, people are resuming sheep breeding activities on meadows surrounded by forest where wolves are present. Breeders are adopting some of the traditional husbandry methods which

are still in use in the Tatra Mountains (a mountain range in the western Carpathians on the Polish/Slovakian border), but are also adapting them to the context of village meadows close to the forest, combining LGDs and electric fences. Thus, they can maintain the presence of sheep in meadow enclaves within the forest in the absence of shepherds.

Thus, in some contexts LGDs are used to maintain borders between the "domestic" flock – and the "wild" wolf, preventing the later from coming into the domestic area. LGDs are also sometimes used to cross the border in the other direction, helping herders to graze their sheep in "wilder" places like forest or shrubby areas where reforestation is occurring.


In summary, LGDs provide the following opportunities;

- Protecting livestock from large carnivores and decreasing damages to livestock.
- Maintaining the use of traditional pastoral practice in countries where LGDs have always been in use.
- Renewing a forgotten traditional practice when favourable conditions are present in countries where LGDs disappeared and where large carnivores are returning.
- Maintaining grazing in shrubby areas where it would be even more difficult to protect flocks without LGDs.
- Maintaining the diversity of LGD breeds which are highly symbolic of many rural cultures.
- Maintaining a population of working LGD breeds based on their working abilities rather than external appearances.
- Maintaining the ancient heritage of this complex human – animal relationship implying multiple domestic species working together.
- Favouring the coexistence of livestock breeding activities and the presence of diverse large mammals, including large carnivores, when favourable conditions are present.

# Limitations and difficult issues

## Requirements

Even when LGDs are bred and trained to defend flocks from predators and intruders, their use cannot be isolated from a complex herding system in which they have to be integrated. As a part of transhumant pastoral systems, LGDs have been traditionally used in combination with shepherds and quite often with night-time enclosures, as shown by numerous ancient dry stone sheepfolds that can be found across Eurasia. When confronted by a threat, LGDs will bark and alert shepherds who will encourage their dogs and also help them to prevent predators from coming close to the flock. LGDs can obviously work best when the flocks that they are defending are concentrated. Different sheep breeds show different flocking behaviour, but the work of shepherds and herding dogs, as well as night-time enclosure is also instrumental in helping the dogs in their task.

However, herding systems vary across Europe and they have been changing through time. Notably, in many places the modern market economy has been leading to an increase in the size of flocks and a decrease in the number of shepherds. In some cases, pluri-activity farm economies prevent livestock breeders from being able to permanently guard their flocks.

In some systems, notably when sheep are not free ranging but are moved between fenced meadows, LGDs can be put with sheep inside a fence (electric or not) and then do not require the presence of a shepherd. In that case, electric fences combined with LGDs appear to be efficient against predators. The situation is more complicated if flocks are left to free-range without supervision. In such cases the LGDs may develop a tendency to wander, leaving the sheep unguarded, and also potentially harassing wildlife and people.

In addition, night-time enclosure and fencing of meadows – which favour the efficiency of LGDs – are not always possible in some herding systems, notably when there is a need for nocturnal grazing or when the grazing resources are scarce and sheep have to travel relatively long daily distances. In some cases, going back to the sheep barn each night would cause erosion through trampling.

## Limitations

Most scientific studies of LGD efficiency come from areas such as North America or southern Africa where they have been recently introduced. There are comparatively few studies that document their efficiency from Eurasia. However, considering the long history of LGDs' use, it is highly likely that the practice would have been abandoned in most places if it didn't show at least some effect, considering there is a cost in maintaining it. In many places in Europe where large carnivores are present, it would certainly have been impossible to develop large scale extensive grazing without LGDs.

Although LGDs are large and powerful dogs, they are not super-dogs. They will not prevent all damages, especially when facing adaptable predators like wolves. Like all other means of livestock protection, there can be ecological and climatic conditions, which will favour large carnivore attacks (steep terrain, shrubs, rain, fog). LGDs can also be killed by wolves and there are also cases where they have bred with wolves, which is certainly not compatible with the defence of the flocks.

## Difficult issues

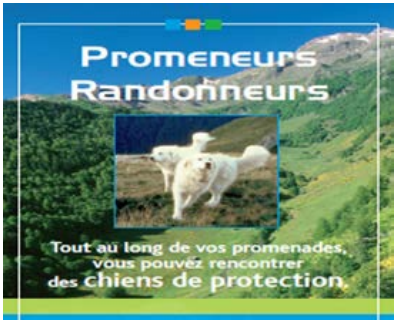
In places where dogs are traditionally used, livestock breeders accept that there is a cost to maintain several LGDs with their flock but they readily pay this cost because they value the presence of the dogs, even in situations where they may not strictly be needed.

However, in places where LGDs are being introduced or reintroduced, they mean additional costs and work for livestock herders and shepherds. Notably, they are not

easy to manage if they are used as an emergency reactive solution when predators are already back and if adult dogs are directly introduced. Indeed, the lack of knowledge and know-how about training and management among livestock breeders and shepherds recently confronted with large carnivores is very challenging and comes in addition to the stress caused by depredation. Inter-individual differences between dogs can be quite important and problematic individuals (aggressive dogs, dogs that harass sheep, dogs leaving the flocks) have to be rapidly detected. In transhumant systems where sheep spend winter inside or in areas with no threats, LGDs have to be cared for and fed, even when they are not "at work" anymore, which can give the impression of an unnecessary investment.

It is generally advised to have several dogs in order to be able to defend the flock, meaning even more work for the shepherd and requiring major changes to well-established practices and habits. In addition, there can be a pack effect when several LGDs are present and this can become problematic for other landscape users.

One of the main problems with LGDs appears in areas of intensive summer tourism. There are numerous cases of LGDs threatening hikers and of hikers being obliged to find alternative trails because they can't pass through a pack of LGDs. Even a few events of this type can generate controversy and conflicts in places where LGDs have been recently introduced. The potential for conflicts is even higher when hikers are accompanied by their own pet dogs.




Various reasons have been invoked to explain such cases: inappropriate dog behaviour (e.g. problematic individual, poorly trained LGDs, bad previous experience with humans, etc.), the absence of a shepherd with the dogs and flocks, and inappropriate behaviour by the hikers. Rather than trying to attribute blame, it is important to admit that it is challenging to reconcile tourist activities like hiking and mountain biking with numerous flocks defended by LGDs. Nonetheless, this cohabitation between rather intensive touristic activities and the presence of LGDs exists in some places and there's hope that appropriate solutions could emerge.

Another conflict can arise when hunting dogs come close to the flocks and are considered as a threat by LGDs who can attack or even kill them. In some countries, this has led to hunters killing LGDs in retaliation, generating conflicts between livestock breeders and hunters.

Last but not least, the question of potential LGDs' impact on wildlife has to be seriously taken into account, notably in places where marmots and wild ungulates are present.


H. de Montaut's (1825-1890) drawing of a shepherd trying to prevent his guarding dog from attacking a hiker in the Pyrenees (Eaux-Bonnes, Ossau valley), thus showing that problems of coexistence between tourism and livestock guarding dogs already existed in the 19th century.

# Conclusions

LGDs are very potent symbols of an extensive pastoral system that has existed across the mountains and plains of Eurasia for millennia. The near ubiquity of their presence across the continent – from the Atlantic seaboard of Portugal in the west to the Mongolian deserts in the east – is testimony to their central role in enabling herders to graze their flocks in rangelands where predators occur. In the 21st century LGDs are regaining relevance in the face of large carnivore conservation policies. They do not represent a panacea to all the problems that predators cause for livestock herders and are not a one-size-fits-all solution. However, they certainly represent a key component of the toolkit that is going to be needed to face the challenging co-occurrence of extensive livestock grazing and of large carnivore populations in a rapidly changing European landscape.

# Photo gallery

The followingpages consist of a series of photographs depicting livestock guarding dogs, pastoralists and pastoral landscapes from across Eurasia, from Portugal in the west to Mongolia in the east. Organised by country, the objective is to illustrate the diversity of contexts where livestock guarding dogs are used today.

# ALBANIA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# BULGARIA

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# ESTONIA

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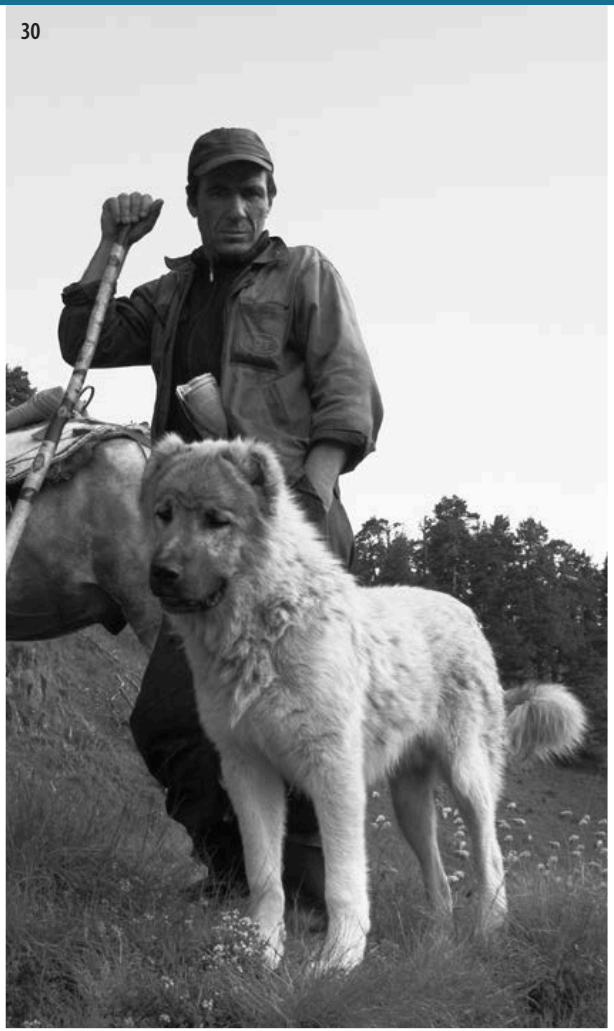
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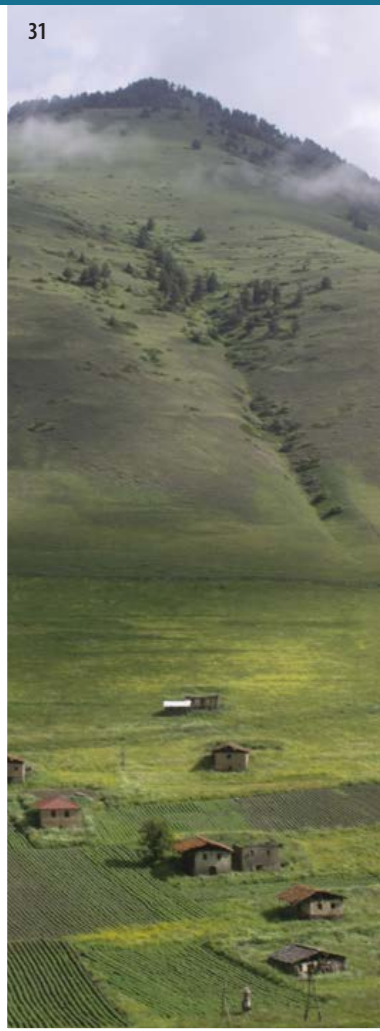
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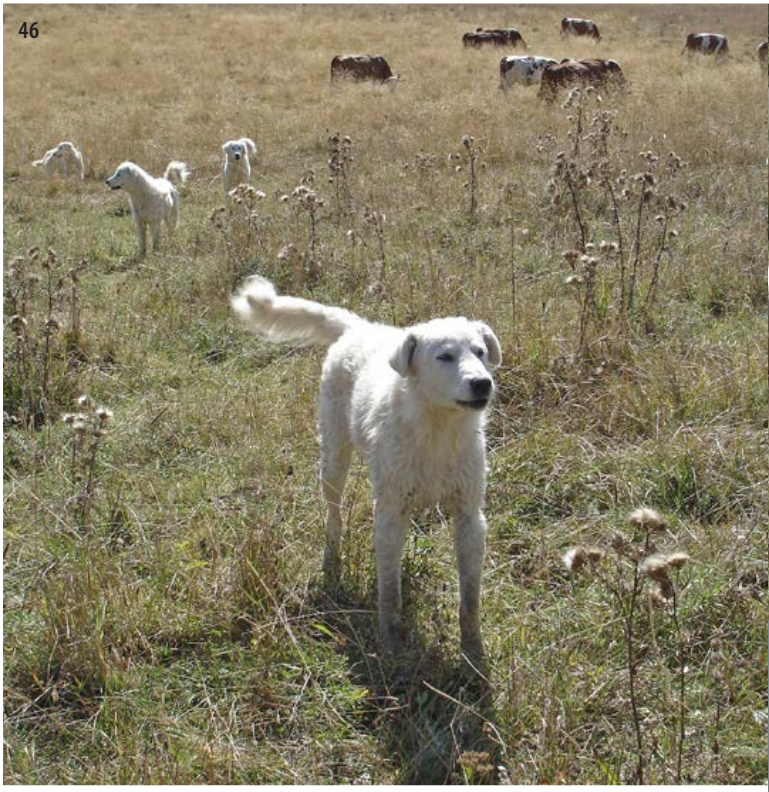
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# Former Yugoslav Republic of MACEDONIA


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# MONGOLIA


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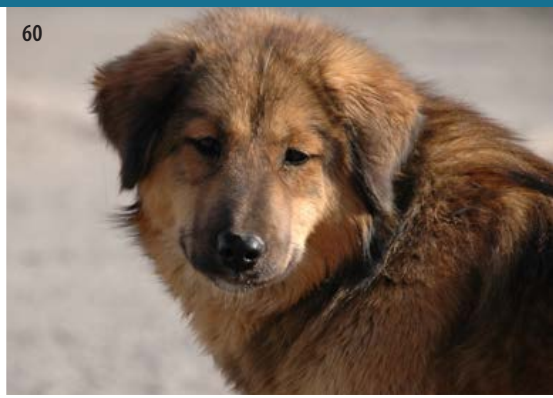
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# POLAND

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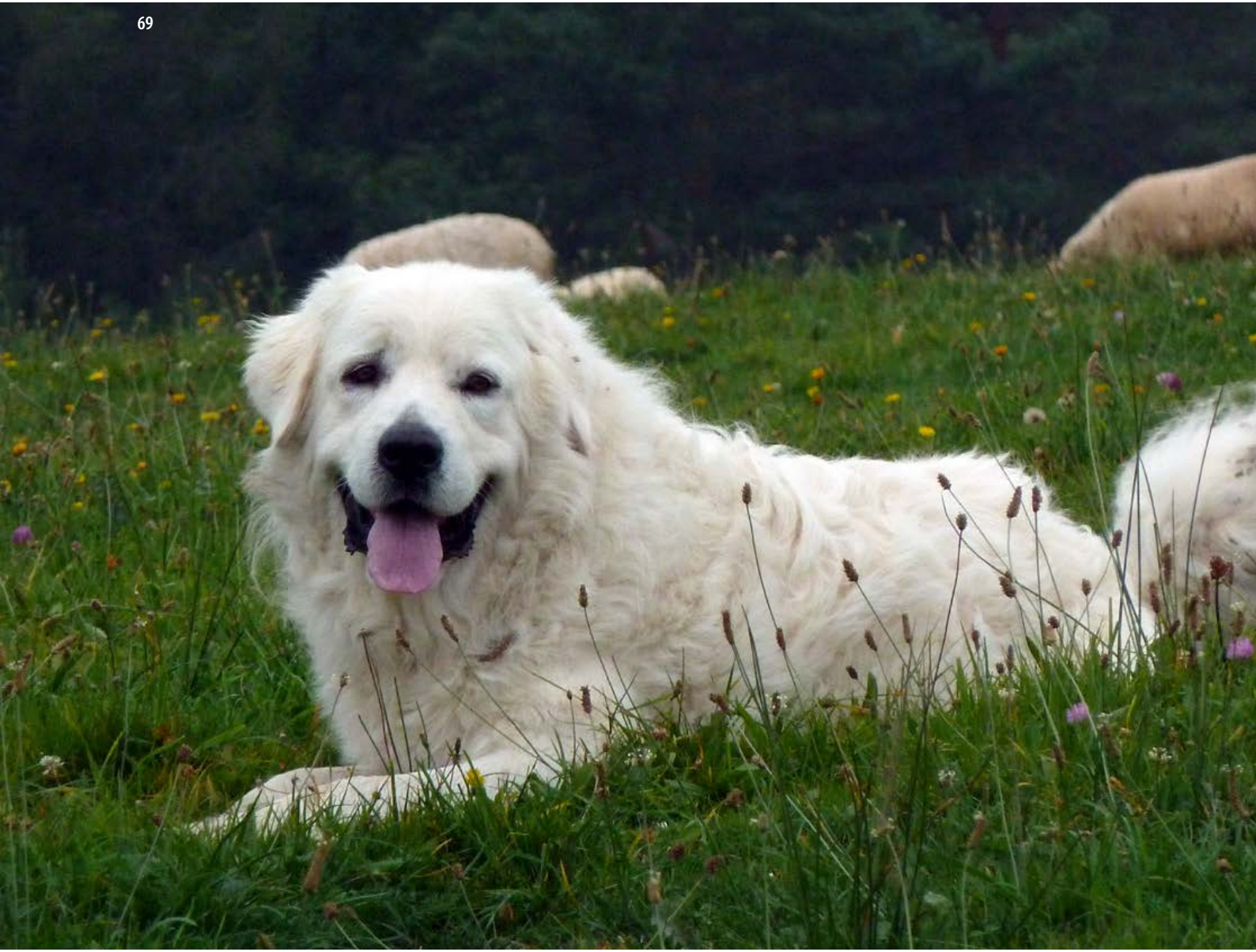

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# PORTUGAL


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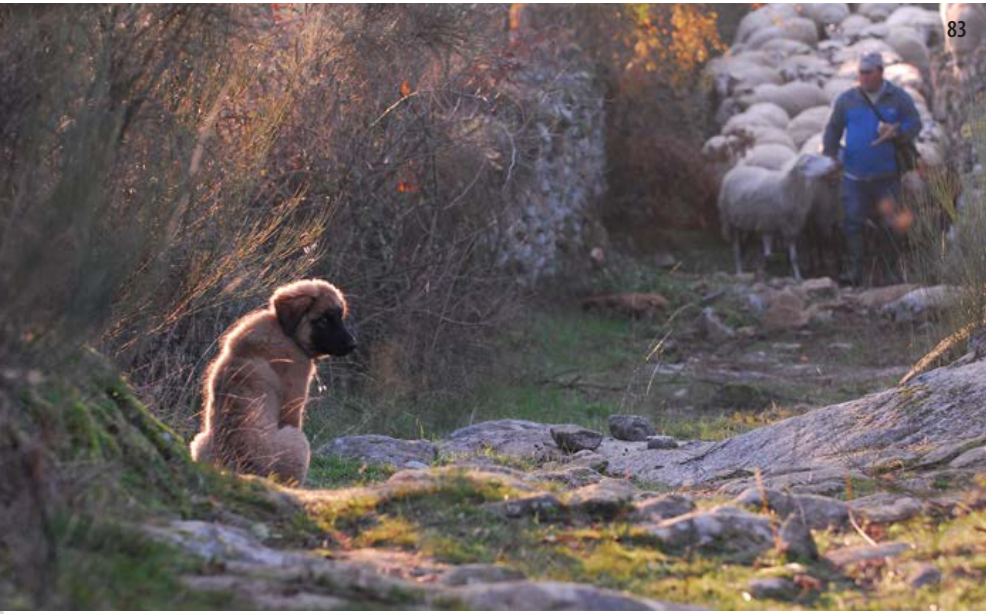
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# ROMANIA


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# SLOVENIA

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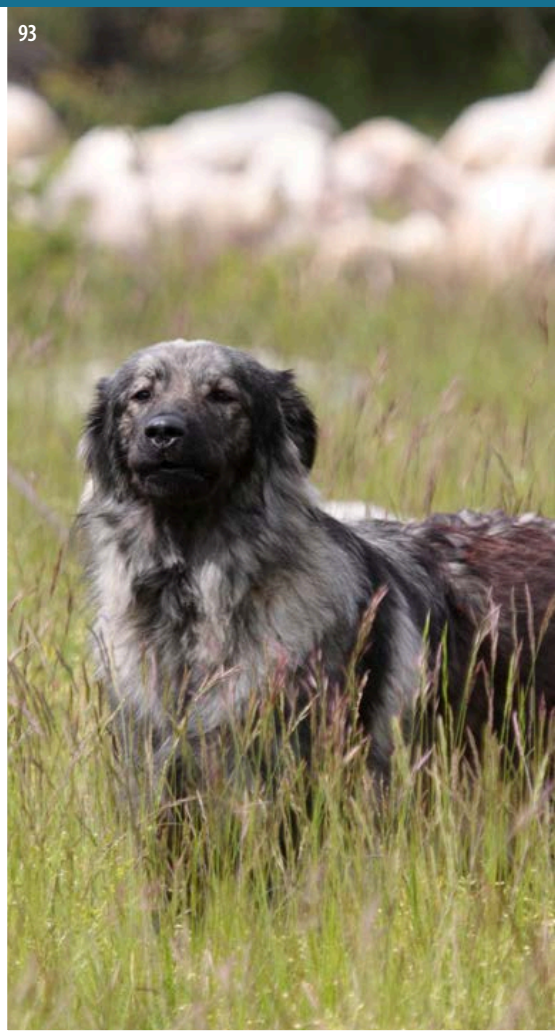

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# SPAIN


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# SWITZERLAND


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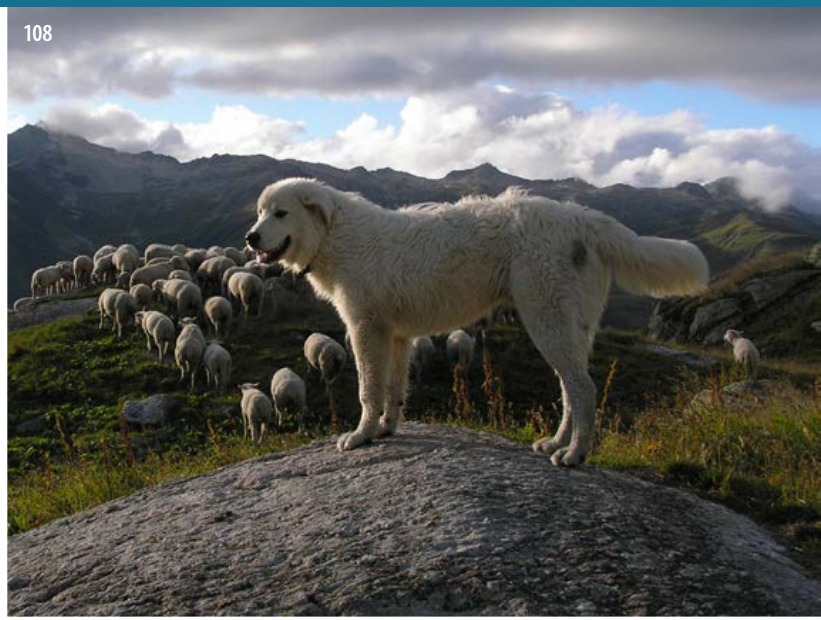
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# TURKMENISTAN

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# Further reading and resources

Many resources about livestock guarding dogs, pastoralism, and conflict mitigation can be found online on the homepage of the Large Carnivore Initiative for Europe at www.lcie.org
Search the publications database under "themes" for either "Livestock guarding dogs" or "Livestock protection". There are resources here in multiple European languages that describe in much greater detail how to use livestock guarding dogs in practice. The pages of the newsletter Carnivore Damage Prevention News in particular contain much information on livestock protection.

The European Commission also has many resources on large carnivores on their home pages; http://ec.europa.eu/environment/nature/conservation/species/carnivores/index_en.htm

A series of projects co-funded by the LIFE program have accumulated much experience on the use of livestock guarding dogs. These projects have resources online in many languages.

| **Source** | **Languages** |
|---|---|
| LIFE Arctos " Brown Bear Conservation: Coordinated Actions in the Alpine and Apennine Range " [ http://www.life-arctos.it/home.html ] | EN, IT |
| LIFE Medwolf " Best practice actions for wolf conservation in Mediterranean-type areas " [ http://www.medwolf.eu/ ] | EN, IT, PT |
| LIFE WOLFNET [ http://www.lifewolf.net/it/component/content/ ] | |
| LIFE Extra "Improving the conditions for large carnivore conservation: a transfer of best practice" [ http://www.lifextra.it/ ] | EN, IT, BG, RO, GR |
| LIFE Co-Ex "Improving coexistence of large carnivores and agriculture in southern Europe "[ http://www.life-coex.net/ ] | EN, FR, HR, IT, ES, PT |
| LIFE SLOWOLF " Conservation and surveillance of the conservation status of the wolf (*Canis lupus*) population in Slovenia " [ http://www.volkovi.si/ ] | EN, SL |
| LIFE CRO-WOLF "Protection and Management of Wolf Populations in Croatia" [ http://www.life-vuk.hr/vuk/ ] | HR |

| | |
|---|---|
| LIFE WOLF-ALPS "Wolf in the alps: implementation of coordinated wolf conservation actions in core areas and beyond" [ http://www.lifewolfalps.eu/ ] | I |
| Sweden's Wildlife Damage Centre [ http://www.viltskadecenter.se/ ] | SE |
| Norway's Wildlife Damage Centre [ http://www.bioforsk.no/ikbViewer/page/prosjekt/hovedtema?p_dimension_id=19579&p_menu_id=19593&p_sub_id=19578&p_dim2=19580 ] | NO |
| AGRIDEA – Swiss Livestock Protection Information [ http://www.herdenschutzschweiz.ch/ ] | FR, DE, IT |

There is a vast popular and scientific literature on livestock guarding dogs. Some key introductory references include;

Breber, P. (2008) The Sheep-Guarding Dog of Abruzzo. Pensoft, Sofia

Caetano, P., S. Ribeiro, and J. P. Ferreira. (2010) Cães de Gado. Bizancio, Lisboa.

Cummins, B. and P. Lore. (2006) Pyrenean partners: herding and guarding dogs in the French Pyrenees. Detselig Enterprises Ltd., Calgary.

Coppinger, R. and L. Coppinger. (2001) Dogs. A startling new understanding of canine origin, behavior and evolution. Scribner, New York.

Landry, J.-M. (2004) Synthèse de la littérature sur les chiens de protection. Institut pour la Promotion et la Recherche sur les Animaux de Protection, Corgémont (CH).

Rigg, R. (2001) Livestock guarding dogs: their current use world wide. IUCN/SCC Canid Specialist Group Occasional Paper 1, 1-133.

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The authors are grateful to all the photographers that freely contributed their images for this publication.

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| Grupo Lobo: | 75, 77, 80, 81, 82, 83, 84, 85, 86 |
| Jasna Jeremić: | 20, 21, 24, 25, 26 |
| Joaquim Pedro Ferreira: | 1, 76, 78, 79 |
| John Linnell: | 2, 4, 5, 7, 8, 9, 11, 12, 13, 34, 35, 36, 38, 43, 44, 46, 48, 49, 52, 55, 57, 70, 71, 72, 73, 74, 87, 88, 92, 96, 99, 101, 112, 113, 114, 115, 116, 117, 118, 119 |
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Coverphotos:
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ISBN 978-82-426-3500-6

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