

Large Carnivore Conservation

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Situation in the Alps and the Carpathians

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National Park Low Tatras, Slovakia © ALP/PC/NP Low Tatras, Petr POJOCKÝ

1- Importance of the presence of large carnivores (in human inhabited areas such as the Alps and the Carpathians)

1.1 The Alps and the Carpathians

The Alps are a biogeographical region extending over approximately 190,000 km² in the centre of Europe and comprising territory of 8 countries: Austria, Germany, France, Italy, Liechtenstein, Monaco, Slovenia and Switzerland. They are extremely varied in terms of biology, landscape, language and culture.

They display an impressive variety of habitat and climatic conditions on reduced spatial scales, reflecting a complex physical history, and have a long history of human presence and exploitation: the mountain range is a centre of biodiversity, or hot spot, for the whole of Europe, hosting 39% of all European plant species (about 4,500 plant species, almost 400 plants endemic to the Alps) and around 30,000 animal species (Chemini et al., 2003). According to the IUCN (Temple et al., 2009) the Alps, together with the Pyrenees, the Apennines and the Carpathians, host the greatest European richness of mammalian species in the Mediterranean area.

The Alps are also home to around 14 million inhabitants, but population density varies hugely from one region to the next: there is a clear distinction between the built-up valley floors and the rural areas, which tend to be more isolated or at higher altitudes. What is clear is that human activity has deeply modified the landscape and biodiversity of the Alps: part of present-day Alpine living is therefore linked to artificial or semi-natural environments, as well as to traditional land-use. The mountain range is the world's number one tourist region, with over 500 million overnight stays per year and a local population of just 14 million (www.alparc.org).

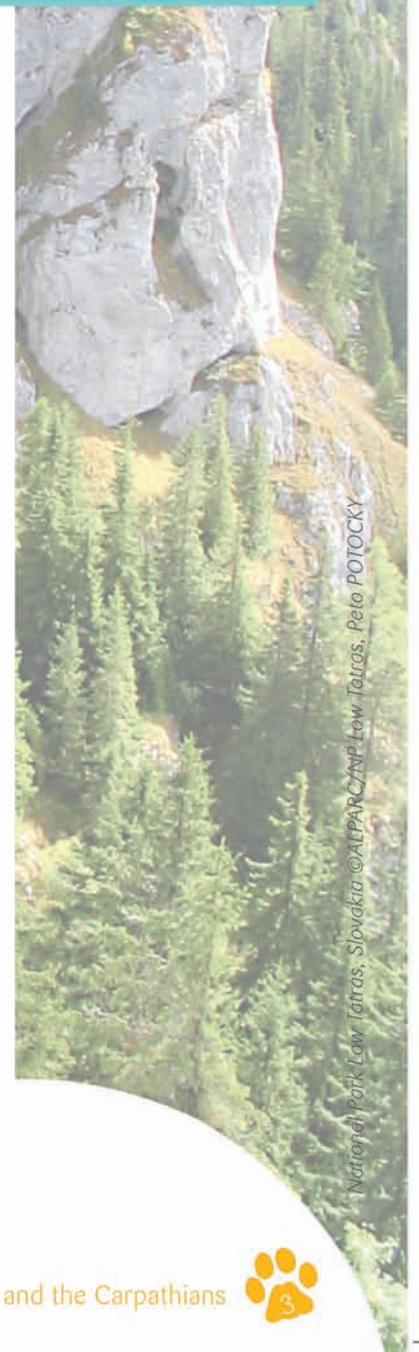
The consequence of these two partly contrasting aspects is that, apart from worldwide phenomena such as desertification and climate change, the Alps are subject to many pressures linked to transport (especially road transport), increasing urbanisation, urban sprawl, abandoned farmland and a gradual rural exodus, the winter sports industry, mass tourism and intensive farming in the valleys.

The entire range of the Carpathians covers an area of 209,256 km² and extends over eight countries (Romania, Slovakia, Ukraine, Poland, Hungary, Czech Republic, Serbia and Austria). They cover an area of about 1,500 km in length and up to 350 km in width (Webster et al., 2001). In geological terms, these mountains are relatively young (the same age as the Alps and the Himalayas) and support diverse natural habitats where a third of the vascular plants of Europe can be found, 481 of which are endemic species. Over 50% of the area is covered by extensively managed semi-natural forest combined with old growth forest and several hundred thousand hectares of pristine forest (in the following description Austria will be not taken in to consideration).

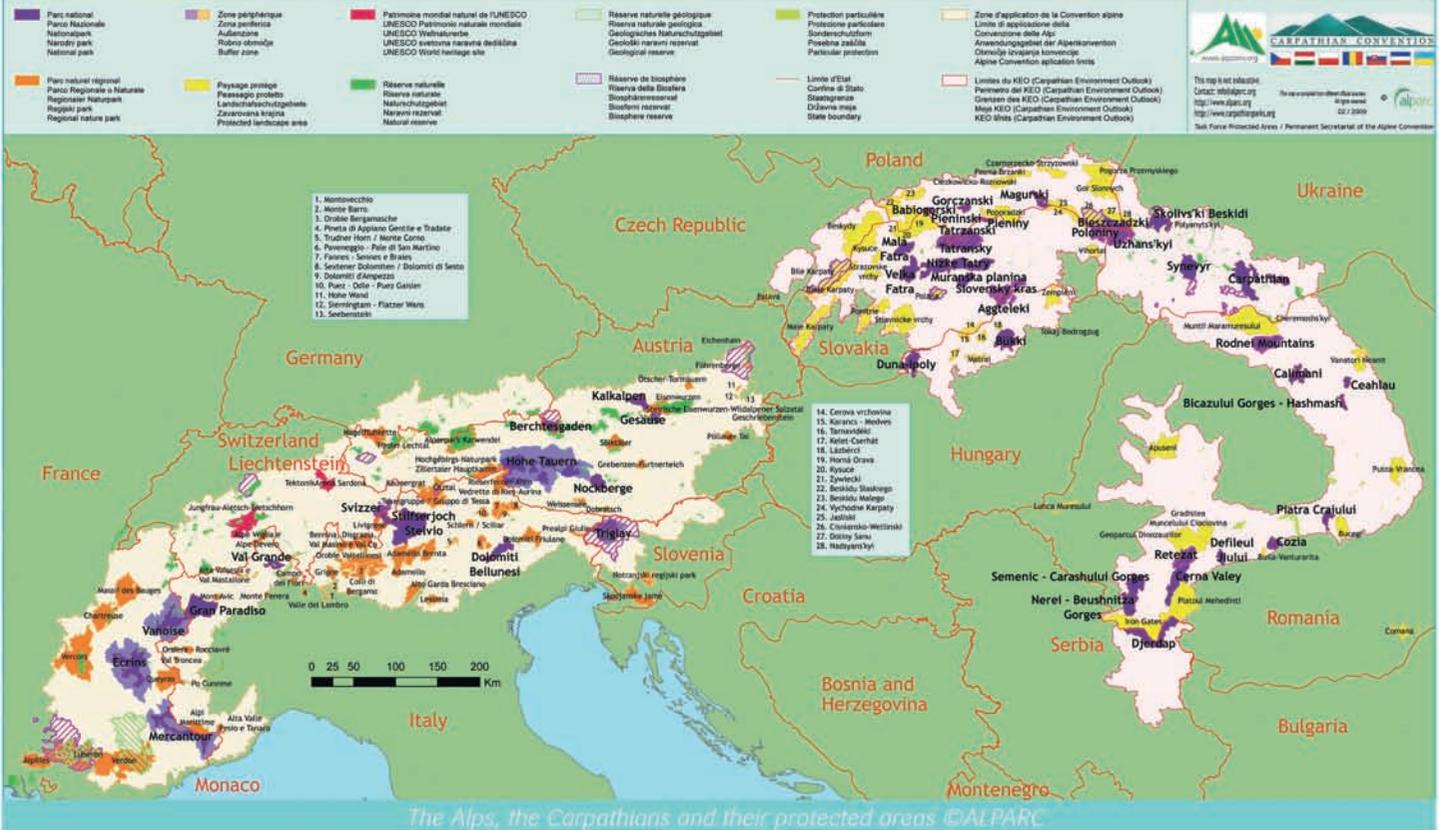
Up to now the traditional extensive land use system influenced by the social and political evolution of the area has maintained a great biodiversity and, to a certain degree, functional ecosystems and ecological networks. These provide clean water and air and timber, as well as non-timber and grassland products for organic markets.



Sheep in Mercantour ©Parc national du Mercantour, F. LE BOUTEILLER



National Park Low Tatras, Slovakia ©ALPARC/NP Low Tatras, Peter POTOCKY



1.2. Ecosystemic role of large carnivores in the Carpathians and the Alps

The Carpathians are one of the strongholds of the large carnivore population in Europe where the density of bears, wolves and lynx is one of the highest in the world. What is even more amazing is the coexistence of these large carnivore populations with people in the same area.

Under these conditions they are an important reservoir of large carnivores for Europe (Breitenmoser et al., 2000) and they have great biological, cultural, educational and ecotourism potential.

Large carnivores are the key stone to maintaining wilderness and biodiversity conservation in the area.



©R. Skilienka

In order to exist, they need large natural forests and meadows, good density of prey populations and, even more importantly, human tolerance.

The ecosystemic role of large carnivores is particularly evidenced in the comparative studies related to the damage caused by the same density of ungulates in young forest regeneration in areas with and without large carnivores.

Large carnivores in the Carpathians are protected species which deserve the utmost care and attention and which undeniably have the right to exist. In this respect, they are some of the most valuable elements of biodiversity and play an important role in biodiversity maintenance. When compared to other animal species, they are at the top of the food web and are directly threatened only by humans and their activities.

Implementation of the measures for the conservation and protection of biological and ecological balance in the natural habitats of large carnivores, enabling the coexistence of large carnivores and humans, has to be developed on the basis of modern ecological knowledge with a general agreement on the key issues between the different interest groups. For similar reasons, in the Alps large carnivores also have outstanding importance in ecological terms.

Conserving these species is difficult at European level, but it becomes a real challenge in landscapes which are as crowded and modified as the Alps. The main challenge derives from their most fundamental characteristic: as top predators, these species need, in fact, a lot of space (home range sizes of individual large carnivores between 100 and 1,000 km²; low densities from 0, 1 to 3/100 km²; movements over hundreds of kilometres during the juvenile dispersal phase. Linnell et al., 2008). Despite their capacity to adapt to various habitats and tolerate human activities, this means that they need large territories, beyond the limits of protected areas: maintaining their presence means conserving forest cover and abundant high quality food sources (in particular wild ungulate prey for wolves and lynx) (LCIE, 2007).

In simple words, brown bear, wolf and lynx can be considered to be umbrella species, whose protection can foster the conservation of the whole Alpine ecosystem. This is stated also by national laws in Alpine countries, but above all by international legislation. According to the Bern Convention, large carnivores are protected (Eurasian lynx: appendix III) or strictly protected (wolf and bear: appendix II) species. According to the Habitats Directive (valid for all the Alpine countries except Switzerland), large carnivores are covered by annex II and thus their presence requires Natura 2000 sites. They are also listed in annex IV (strictly protected) of the same Directive.

1.3. Large carnivores as an element of educational and cultural interest



Habituated bears ©Bucegi Nature Park, H. IUNCU

As long as humans were living as hunters and gatherers, they got along well with wolves in the Carpathians and many ancient cultures deeply respected and even worshipped the wolf. The legend of the founding of the Roman Empire, the name of the ancient people who inhabited the territory from the Tatra Mountains (SK) to the Black Sea (“Daci” comes from “daois” – the wolf-like warriors) or the flag (with the wolf’s head), show respect for this species.

However, when humans settled down and started to domesticate animals for food, wolves, bears and lynx became competitors. Cattle, sheep or goats became more vulnerable to predation than their wild ancestors and concentrations of livestock attracted wolves and bears. As a matter of their own survival, large carnivores always sought easy prey and so conflicts arose wherever livestock breeding, human cultures and bears and wolves shared the same environment. Due to traditional guarding methods (the use of guard dogs), damage caused by lynx was very limited.



Wolf (*Canis lupus*) ©ICAS Brasov

Especially during the Middle Ages, when wolves and bears were still abundant and livestock had become an essential part of a family’s economy, large carnivores became a pest for peasants: if a pack of wolves or a bear broke into the barn of a farmhouse and killed a cow, a sheep or pigs, it often meant famine for the family. Indirectly, large carnivores could thus become life-threatening and this reflected badly on them. Even the Church picked up on the bad image of wolves and used them as a symbol of Satan. In the same period the situation was completely different in a different culture: in Japan, for instance, religion did not allow the eating of mammal meat and the main enemies of the peasants were the deer and wild boars which destroyed the crops. There temples were built to venerate the wolf as it was the only species which protected the crops and was able to kill these other animals.

Few animals are as integral a part of Alpine cultural traditions as the bear, wolf and lynx. Down the centuries, sharing the same territory with man, large carnivores have aroused contrasting emotions in the collective imagination. Attitudes changed with social and cultural developments. Once reviled as dangerous species, enemies and even a threat to man’s supremacy over nature, they subsequently became symbols of the Alpine ecosystem, the hallmark of uncontaminated nature. Today they are emblematic of man’s renewed rapport with the natural environment (Zibordi, 2009). Whatever the reason for this “love-hate” relationship, old prejudices remain, however, undermining any



objective, reasoned approach to the three species. Still today awareness is based more on myth and legend than on biological and environmental understanding.

Yet despite their scant knowledge, the general public is nonetheless keenly interested in large carnivores. Their presence rarely goes unnoticed. Indeed, bears, wolves and lynx have become “symbol species”, the ideal testimonials to nature-safeguard campaigns.

2- Conservation status of large carnivores in the Alps and the Carpathians

Wolves, bears and lynx were once scattered over the whole northern hemisphere. They inhabited landscapes as diverse as the arctic tundra, the Pacific rain forest, the European lowland, mountain forests, the steppes of Asia, or the semi-deserts of the Arabian Peninsula. For these reasons in ancient times they were widespread throughout almost all the European territory. Being vulnerable to habitat loss and directly persecuted by men, they vanished during the 18th and 19th century from all regions of high human activity in Europe. They remained confined only in the rural areas, whence they have started, in recent times, a gradual re-colonization of their ancient territories

2.1. Historical presence of large carnivores

• Historical presence in the Carpathians

Large carnivores have never disappeared from the Carpathians. People have learned to live and work in the presence of the large carnivores.

How far from the forest to grow the corn, wheat or oats, how to defend and where to put the beehives, where to go with the animals for grazing, these were permanent questions which had to be answered in the mountains. Shepherds and guard dogs were part of the protective solution and no livestock breeding in the mountains was possible without them.

With the demographic and socio - economic development of the area more and more pressure was put on resources. Predators as competitors were seen as an enemy of human welfare. In the Austrian Empire during the 18th century there were bounties on bears and wolves. In the Carpathian basin a total war

broke out against large carnivores: poison, traps, and hooks with bait to catch the jumping wolves, baits that would penetrate the wolf's stomach, the killing of pups in dens - no measures were too cruel to be put into practice. It did not take long before the wolf had disappeared from many parts of its former range. This negative trend continued until the early 1970s, when no more wolves occurred in the Czech Republic and Hungary (Okarma, 2000). After this, rural exodus and a more balanced understanding of natural systems helped the wolves to slowly recover.

The distribution area of wolves in the Carpathian area had been much larger in the past, but it decreased until the Second World War, increasing during the war and immediately after when people were hunting people and not wolves. Hunting pressures on ungulates after the Second World War, correlated with a relatively large number of wolves, reduced the food base for large carnivores and increased conflicts with livestock. Even if there are differences between the Carpathian countries, as a rule in the late '50s and beginning of the '60s the war against wolves resumed.

The wolf population decreased, both in number and in the occupied area, till the



Skalko Reserve - typical brown bear habitat in Nizke Tatry
©ALPARC/Skalko Reserve, M. JASIK

'70s when, as a result of the much greater increase in the natural prey (ungulates) they slowly started to recover. The GIS studies done by ICAS Wildlife Unit (a Pin MATRA financed project) have shown that the distribution of wolves in the Carpathians is constant or has increased slightly during the last decades.

Little is known about the historical situation of the bear in the Carpathians. Up to the Second World War this species was heavily hunted and after the war fewer than 1500 individuals were left. In the early '50s the Romanian bear population reached its lowest with an estimated number of 860 animals. In the '60s the management of this species changed in most of the countries in the Carpathian basin. In Romania Ceausescu was a passionate bear hunter. During his regime bears were strictly protected. Until the late '70s hunting was still carried out by foreign hunters, but during the '80s the latter were no longer allowed to hunt.

Many of the hunting licences were revoked because the political leaders wanted to limit the number of people carrying weapons. The use of poison and traps was also forbidden. Bears were artificially



Brown bear (*Ursus arctos*)
©ALPARC, Guido PLASSMANN

fed in Ceausescu's favourite hunting areas. In addition, in one area in Arges (Tarcul Rausor) an intensive captive breeding and introduction programme was carried out. In seven years 216 two-year-old bear cubs were released from this enclosure into the hunting grounds of Arges. Due to these measures the Romanian bear population grew extremely fast, reaching a peak of almost 8,000 individuals in 1988.

Ideas about the need to protect the species came from some hunters and biologists aware of the importance of fauna conservation after World War 1. Unfortunately, the preservation of the species was not stipulated by law, primarily because, for political reasons, most of the animal breeders were not interested in protecting the species.

The lynx was the first species to retreat from the areas where the forest was reduced or had disappeared and human activity had intensified. The only places where the species found shelter, even if the density of its main prey in the area was lower, were the Carpathian Mountains.

Among the large carnivores the lynx was the first protected species in the area. During the campaign against wolves, when poison was used, lynx suffered a great deal. And even if they were protected in some countries, their number decreased considerably.



Wolf (*Canis lupus*)
© R. Siklienka

Lynx density started to increase when not only the protective status was enforced but also the number of deer and chamois increased and poison was no longer used in the area. Conventions regarding wildlife conservation were initiated by the Western European countries, so they do not really reflect the situation in the east. Lynx for example, have a lower protected status in the Bern Convention or in the Habitats Directive compared with bears and wolves.

The situation in the Carpathians is different. Here, efforts have been concentrated more on lynx.

• Historical presence in the Alps

Present in historical times in large areas throughout Southern Europe, during the last centuries large carnivores suffered a great reduction in distribution, being confined to mountain ranges. This trend was also experienced in the Alpine countries. Although the process took place more rapidly in some places than in others and for one species than for the others, the process was similar and between the 19th and the beginning of the 20th century, lynx, wolf and bear had disappeared - with few exceptions - from their original Alpine range.

Until the 17th century bears were still abundant and widely distributed over most of the Alps in all the valleys and mountains presenting adequate wood cover. After the 18th century, distribution of the species decreased in the valleys, in relation to the development of timber and agricultural activities. In this period, in fact, the species started to be mentioned as rare in some areas. After 1800, the bear's range decreased and became increasingly fragmented. In Italy, the bear disappeared from the Alpine valleys of Piedmont between the first half of the 1700s (Alpine Valleys of Turin province) and the first years of the 1800s (Val Vigezzo, Valle Anzasca - Verbano-Cusio-Ossola province), and greatly decreased in Lombardy in the first half of the 19th century.

By the end of that century the species had definitely disappeared from all the Central-Western Alps.

The gradual extinction continued in the Central-Eastern Alps during the following decades, with bears disappearing from the Veneto region (the last records of killed bears: 1830 for the Ampezzano, 1860 in Cadore, 1870 in the Cansiglio forest - Belluno province), eastern Trentino (1856: last killed bear in Valsugana) and north-eastern Lombardy (1850: Alto-Garda - Brescia province) (Jonozovic et al., 2003).

During the first decades of the 20th century, before the bear's complete disappearance, the species was still present in the Grigioni Canton (Switzerland) and transient individuals sporadically wandered in the province of Brescia, all coming from the last residual population of the western Trentino (Italy). There also, in any case, active legal persecution pushed the local population beyond the threshold of viability (e.g. between 1700 and 1971, 550 bears were killed in Trentino alone). At the end of the Second World War, bears had become extinct in the whole Alpine Arc, with low numbers persisting only in the upper valleys surrounding the Adamello-Brenta Mountains.

Due to the fact that bears had not been not completely extirpated from present Slovenia (30 to 40 individuals



Wolf (*Canis lupus*) ©ALPARC, Guido PLASSMANN

A continuous wolf population existed in Europe until the 19th century. Then, this population started to fragment and single, more vulnerable, nuclei were gradually extirpated one by one or greatly reduced.

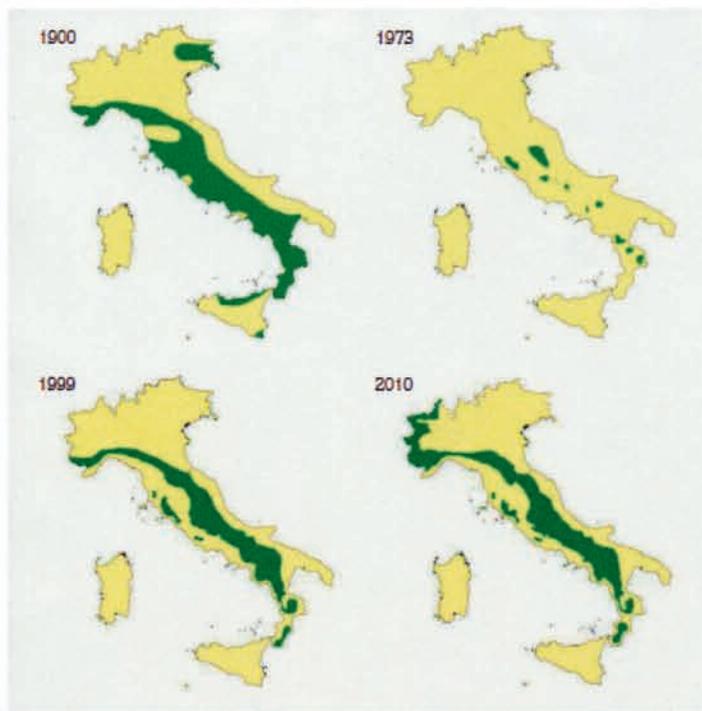
The wolf had disappeared from the Northern Alps by the middle of the 19th century and from the Southern Alps by the 1920s (Breitenmoser, 1998). Historical documents testify, for example, that in the Venosta Valley (Bolzano province - Italy), 50 wolves were killed in less than 20 years (1833-1852): the last wolf in Alto Adige was shot in Funes Valley in 1896 (Righetti et al., 2011).

However, owing to its great adaptability, the species was able to survive in the mountainous areas of the Italian peninsula. At the beginning of the 1970s, the Italian population probably fell to its lowest point, with only one hundred individuals surviving in the most remote areas of the Central-Southern Apennines. Thanks to various factors (above all the abandonment of the mountains and the growth of wild ungulates) the tendency was then reversed and the wolf population started to grow in number. This resulted in the re-colonization of almost the entire Apennine range, starting from Tuscany and reaching the extreme southern edge of Italy (southern Calabria) and Liguria, where wolves were able to cross to the Alps in the late 1980s-early 1990s.

On the other side of the Alps, the Dinaric-Balkan population has not shrunk to this extent, but in Croatia and Slovenia the wolf population has recovered significantly following the active management started in the 1990s and leading to the westward movement of some individuals.

Present almost everywhere in Europe, except for the Atlantic islands, the lynx almost completely disappeared from the continent in the 20th century, when its presence was testified to only in the Carpathians, in Scandinavia and small nuclei in Albania and the Pyrenees.

The felid first became extinct mostly in populated areas of Europe: at the beginning of the 19th century,



Evolution of the area of the wolf in Italy (in green)
©From Righetti et al., 2011

resisted there at the beginning of the 20th century, as a north-western segment of the bear population of the Dinaric-Balkan Mountains). Some dispersing individuals (5 young males) were shot in the Slovenian Alps on the extreme eastern edge of the Alps between 1900 and 1940, along the borders with Austria and Italy (Adamic, 2003).



the species remained only in the major mountain ranges (Breitenmoser, 1998). The Alps were the last refuge in Western Europe but the lynx soon became extinct there also.

The disappearance of the Alpine lynx population took place between 1800 and 1900. Between 1800 and 1850 it disappeared from the Eastern Alps (Austria, Italy and Switzerland), remaining in small numbers only in the Western Alps.

The last evidence of the species dates from 1909 for Valais (south-western Switzerland). In the Western Italian Alps and French Alps, on the other hand, lynx survived some decades longer: historical documentation testifies to the last captures in Valdieri (Cuneo) in 1909, but sightings are recorded up to 1930s in Valtellina.

2.2. Analysis of the causes which have led to the present status of large carnivores

• In the Carpathians

In order to see the causes which have led to the present status of large carnivores in the Carpathians, the social and economic development of each country of the area has to be considered as well as the natural conditions, the habitat, which offers shelter and food. In some countries the social system was inefficient and the destruction of the predators was not possible as long as they had large, inaccessible areas as a refuge. Road density was reduced and shepherds were not allowed to carry guns. This area had and still has the lowest number of hunters in proportion to the surface area and total number of people.

For example: motivated by the alarming decrease in the bear population, the hunting of this species was restricted in Romania by the no. 76/7.02.1953 Decree regarding the hunting economy.

On the one hand, restriction was made by establishing a legal shooting season from March 1st to January 15th and a year-round ban on hunting female bears with cubs, as well as prohibiting the shooting of bears in their dens, and, on the other hand, by establishing a harvest level and making private shooting licences compulsory. Due to the 76/1953 decree, the bear population in Romania increased constantly until 1969, when it reached a maximum of about 4,700 bears. Starting from 1969, because of the pressure of hunting, the bear populations began to decrease, falling to about 3,700 in 1974. From that year forward, as a result of the protection measures and the limited number of bears hunted, the population of these animals started to show significant increases.

The year 1976 marked the beginning of a new period in the management of bear populations in Romania, following the introduction of the 26/5 November 1976 Law regarding the economy of hunting and the hunt itself. The law acted to restrict bear hunting and took special management measures to increase the density of the population.

The law stipulated that the period of bear hunting be reduced to six months, these being divided into two periods: 15 March – 15 May and 1 September – 31 December. In a special paragraph, the law allowed for the possibility of shooting bears that attacked domestic animals and of those who became dangerous for people all year round, but only with the special



Habituated bears ©ICAS Brasov

and anticipated approval of the specialized central public authority.

Besides the protection achieved by the restriction of the legal period for hunting and the regulation of the hunt, due to the stipulations of the 26/1976 Law, the forestry department introduced special units for game management. The system of administration of these units was regulated through special forestry and hunting planning which led to the increase of bear populations, particularly due to higher amounts of daily food and the increasing of feeding periods (Micu , 1998).

The result of these protection measures was a significant increase in the number of bears. Starting from 1978, these populations exceeded the number considered as the economic and ecological optimum in research work. Simultaneously, the area of dispersal of the species increased to 65,000 km².

The density/100 km² of proper habitat increased constantly: 6 bears in the '50s, 7 bears in the '60s, 8 bears in the '70s and more than 10 in the '80s.

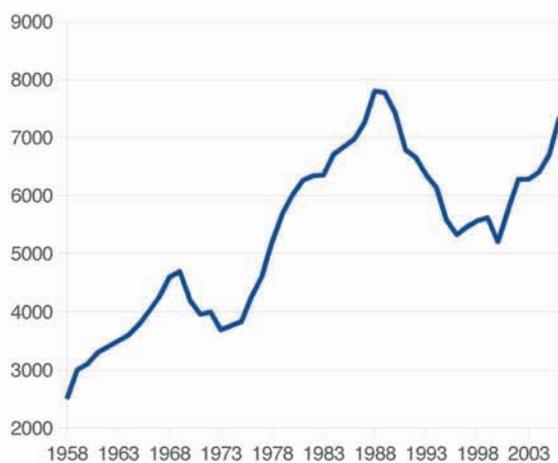
The bear, which until 1953 had been hunted unrestrictedly with guns, all kinds of traps and even by strychnine poisoning used to kill other carnivorous animals, remained less negatively affected by human activities after this year. In the environmental conditions in the Carpathian natural forests, the bear

was for a long period almost exclusively affected by hunters.

Starting in 1954 the annual brown bear populations in Romania showed a significant increase. The curve of the increase in bear populations reveals an absolute maximum in 1989 and a peak in 1969.

The number of bears decreased substantially from 1989 to 1996 due to poaching, the illegal use of poison and a high legal harvest. The existing conflicts were the cause of a hostile attitude towards bears on the part of the local population which resulted in the illegal using of poison, snares, traps and illegal shooting. Poisoning has decreased substantially since then, but still occurs from time to time, although it was officially forbidden by the 13/1993 Law and the poison is no longer on the market.

• (causes of extinction) in the Alps



Trend of the brown bear population in Romania in the last 50 years

Large carnivores disappeared from the Alps as a consequence of the reduction (or loss) of their habitat but above all because of the direct persecution perpetrated by humans. To describe the decrease of bear, wolf and lynx populations in the region, we can distinguish two periods: an earlier one (which started in the 17th century) and a later one (which for bears started in 1850 and ended in the first half of the 20th century; for the other two species the process started before and was more rapid).

In the earlier period, a significant reduction of habitats suitable for large carnivores was caused by wood cutting, mostly with the aim of creating pastures for livestock, and to the increase in the exploitation of the Alpine areas. This process was caused by profound developments in human society which caused a conflict in land use between man and the three species: at that time, it is possible that wild

animals were seen simply to be prey or a nuisance. The result was similar, although some species were affected more than others: in this period, for instance, the Alpine bear population still remained healthy while lynx started to decrease irremediably.

In the following period, a more intensive direct persecution started, adding its effects to the increasing habitat fragmentation due also to the exploitation of high altitude areas by people. Rewards were paid throughout the whole Alpine Arc for the killing of bears, lynx and wolves and hunters specialized in “pest” killing were highly regarded and considered almost as heroes.

The sum of these two effects resulted in a dramatic decrease in the populations of the three species: by the end of the 19th century some of them were so rare that proposals were made to remove the reward for killing them to avoid causing the total extinction of the species (Jonozovic et al., 2003). A new conception of nature was probably appearing, preparing the change of mentality that was to become reality in the next century, but the future of the large carnivores had been marked.

A decrease in the number of kills occurred in a period which varied for the three species, but was probably mostly due to the fact that the populations were in a critical condition. Legal protection arrived too late and, in any case, poaching continued to affect the populations, bringing them below a critical threshold.

In conclusion, historical data indicate that direct persecution by humans, originating from economical and psychological considerations, was the main factor of the dramatic decrease in Alpine large carnivore populations: the decline was so impressive that, when the social-economic and environmental conditions changed, the populations failed to recover naturally.

2.3. Current status of large carnivores

• In the Carpathians

Currently, the Romanian bear population consists of about 6,000 bears, which represents about 30-35% of the European population west of Russia. This number exceeds the estimated optimum number of bears that is to say around 4,000, which the natural habitat would sustain under natural conditions, minimizing socio-economic impact. This high density of bears is due to abundant food sources provided by humans: in some areas bears congregate to feed on garbage. Also livestock, beehives and fruit plantations are still intensively used as food sources by these animals (Mertens et al., 2001).





Brown bear (*Ursus arctos*) ©ALPARC, Guido PLASSMANN

In addition, in the periods before and during the hunting seasons (April-May, September-November) bears are artificially fed at feeding places in the forest. This especially, coupled with the fact that they feed on fruits in fruit plantations, probably provides a good food source for fattening for the winter.

The Romanian bear population is distributed all over the forested range of the Romanian Carpathians. 93% are located mainly in the mountains and the remaining 7% live in the hills (Ionescu et al., 1999). A smaller population of 250-300 bears is present in the Apuseni Mountains. Although the data reported from hunting areas suggested a gap between the population in the Apuseni Mountains and the main Carpathian population, there was little doubt that these two populations are still connected.

The brown bear population in Romania occupies a surface of around 69,000 km², which represents about 30% of the surface of Romania. This means a density of 9 bears/100 km². The highest densities can be found in the north-eastern and central part of the Carpathians, in the counties of Harghita, Covasna, Bistrița, Brașov, Buzău, Mureș and Neam. Particularly high densities of bears can be found in autumn in concentration areas, where bears gather in huge numbers to feed on fruit plantations. The two most outstanding cases are: Dealul Negru – Bistrița, where each year around 70-75 bears can gather to feed on a fruit plantation of 650 ha and Domnești – Argeș, where up to 80 bears have been counted entering the fruit plantation of about 300 ha.

Except for Ukraine and Serbia, all the other counties of the Carpathian Mountains are members of the European Union and bears, wolves and lynx are strictly protected. However, the situation is still very different from one country to another. Romania and Slovakia administrate large areas of the Carpathians and large populations of large carnivores. They are generally commonly found in the mountains and their management is generally speaking similar. Large carnivores are hunted under Art.16 of the Habitats Directive in order to prevent or to reduce conflicts. Poland and Ukraine administer similar areas of the Carpathians but the legal status of large carnivores differs considerably from country to country. In Poland they are strictly protected, in Ukraine the bear is a game species. Even if it is a game species in Ukraine, there are very few licences issued by the Ministry in case of extensive damage. The wolf is a game species which can be hunted with a licence all year around. The lynx is totally protected. The Czech Republic and Hungary have very small areas with large carnivores. Their populations greatly depend on the populations of the other countries of the region.

Country	Official number in 2010	Expert judgment of the accuracy of official number in 2010	Population trend in 2000- 2010
Czech Republic	Sporadic occurrence	< 5	Stable
Hungary	Only sporadic occurrence	Accurate	~
Poland	~100	Accurate	Stable
Romania	5500 - 6500	Accurate (hunters' clubs estimation is over 8000)	Decrease, until the middle of '90s followed by a slow increase up to the present
Slovakia	1000 - 1200	Overestimated, probably about 700-800 individuals	Increase
Ukraine	~ 400	Accurate	Decrease, in some areas increase

Table1. Official and expert assessment of **bear numbers**, and population trends in various Countries of the Carpathian region (Okarma et al., 2000 revised).

Country	Official number in 2010	Expert judgment of the accuracy of official number in 2010	Population trend in 2000- 2010
Czech Republic	No official number	5-10	Increasing
Hungary	No official data	<5	~
Poland	550	Considerably overestimated, probably about 250 individuals	Increasing
Romania	2400 - 2600	Accurate (hunters estimation: > 4500)	Stable
Slovakia	800 - 1000	Overestimated, probably about 300-450 individuals	Slight decrease
Ukraine	350 - 400	Underestimated	Stable
Total	3300 - 3700	Official estimations based only on hunting clubs reports are greatly overestimated	Total stable with slight increase in areas where it is a relative newcomer

Table 2. Official and expert assessment of **wolf numbers** and population trends in various Countries of the Carpathian region (Okarma et al., 2000 revised).

Country	Official number in 2010	Expert judgment of the accuracy of official number in 2010	Population trend in 2000- 2010
Czech Republic	No official number	10-15	Increasing
Hungary	No official data	5-10	Heavy fluctuations
Poland	250	Considerably overestimated, probably about 150 individuals	decreasing
Romania	1000 - 1400	Accurate (hunters' estimation: > 2250)	Stable
Slovakia	~800	Heavily overestimated, probably about 300-450 individuals	Slight decrease
Ukraine	350	Underestimated	Stable
Total	7000 - 8200	Accurate (if the estimation is made by hunters it results in result in an overestimation, if it is made by conservation biologists it is underestimated)	Generally stable in the last decade, with a slow increase in Slovakia and Romania and a slow decrease in Ukraine

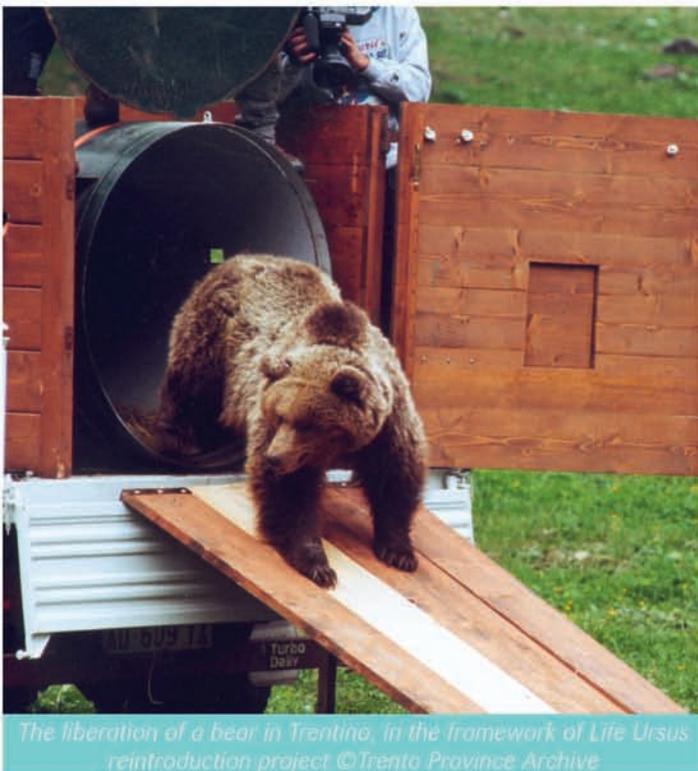
Table 3. Official and expert assessment of **lynx numbers** and population trends in various Countries of the Carpathian region (Okarma et al., 2000 revised).

Predators are well represented in the Carpathians but if we compare the distribution and densities of wolves, bears and lynx we will see that the species most sensitive to human activities is the species with the lowest density and distribution: the lynx. Even if on the list of conflicts the lynx takes the last place, it is the species which is suffering most from human activities. Bears and wolves are much more adaptable.

• (Current status) in the Alps

Present brown bear distribution on the Alps consists of one growing population in the Central range, which has not fully recovered from the risk of extinction but raises good hopes, plus some individuals (or a small nucleus) deriving from the Slovenian source population. This population, consisting of around 500 bears, is part of the healthy Dinaric - Balkan population but its core area is not in the Alpine range of the country: natural dispersion westwards occurs but has not been relevant, until now, on a population scale as it has not allowed the creation of stable nuclei and small populations.

The spontaneous arrival in Styria (Austria) of an individual from Slovenia (1972: "Ötscherbär") favoured the translocation of 3 bears between 1989 and 1993. Notwithstanding the birth of 31 cubs, the derived nucleus has been experiencing a constant negative trend since 2002: today it consists of only 2 males (genetic monitoring, 2009: KORA, 2010) and can thus be considered as nearly extinct.



The liberation of a bear in Trentino, in the framework of Life Ursus reintroduction project ©Trento Province Archive

Natural wandering from Slovenia is the cause of the constant presence of some individuals in the Tarvisio area (North-Eastern Friuli Venezia-Giulia), on the border between Austria, Italy and Slovenia. This nucleus, first established in the 1970s, is of fundamental importance for the re-colonization of the Eastern Italian Alps and Austria, but is characterized by high turnover and mortality and was estimated in 2009 at around 12-15 individuals, all males (experts estimate around 10 bears at present; KORA, 2010).



Brown bear (*Ursus arctos*) ©ALPARC, Guido PLASSMANN

The most important population is thus the one centred in Trentino (Central Italian Alps), the only area in the Italian Alps where the brown bear has never disappeared. Extinct everywhere else, a small nucleus (2-3 autochthonous bears in the late 1990s) has in fact managed to survive in the mountain range of Adamello-Presanella and the Brenta Dolomites, which for this reason were instituted as a protected area with the name of Adamello Brenta Nature Park in 1988.

In 1996, in order to recover this remnant brown bear population, (which was by then considered biologically extinct), the Adamello Brenta Park, together with Trento Province and the Italian Wildlife Institute, promoted a project which foresaw the translocation of 9 bears to the area of the last bear presence in order to try to reconstruct, in a mid-long term, a minimum vital population (40-60 individuals) in the Central Alps. This initiative, named "Project Ursus - Brenta Brown Bear Conservation Plan", was implemented also thanks to LIFE funding of the European Community and based on a specific Feasibility Study which determined the achievability of the initiative and set the guidelines for its implementation.

Between 1999 and 2002, 10 bears (7 females and 3 males) coming from Slovenia were released in Trentino, as established in the preliminary phase of the project (one bear more than expected was translocated to substitute an individual which had died of natural causes a few months after the release) (Ufficio Faunistico del Parco Naturale Adamello Brenta, 2010).

The reintroduction projects have reached the expected goals as the majority of released bears have adapted well to the new territory. Today the local population is around 30 bears (Groff et al., 2011), with an area of stable presence of females estimated at 1,450/km², fully contained in Trento Province (average bear density 1,7 bears/km²). The overall area where the species is present is, however, quite large (around 15,000 km²) and includes neighbouring regions (Alto Adige, Lombardy, Veneto) and countries (Switzerland, Austria, Germany).

After a long while, reproduction has occurred, (21 between 2002 and 2010, for a total of 44 cubs born) and the population is today close to the minimum viable threshold of 40-60 individuals. The bear population of the Central Alps has thus not yet been recovered, but high hopes also come from transient individuals, naturally moving from and to Slovenia: although no reproduction with the Trentino population has yet occurred, in the last years at least a couple of bears have moved from Slovenia to Eastern Trentino and vice versa, confirming the concrete possibility of connections between the Austrian, Slovenian and Italian populations.

Synthesis: a total of around 45 bears can be considered a reasonable estimation for the whole Alpine Arc.

Situation	2010
Central Alps (core area in Western Trentino)	28-31 bears
SLO-A-I Triangle	~10 bears (high turnover)
Austria (Styria)	2 males?
Slovenian population	~500 bears (not in the Alpine range)
Alps	40-45 bears

Table4. Estimation deriving from available data of bear numbers in the Alps.

In the last 20 years, wolves have naturally re-colonized the South-Western Alps of Italy and France through dispersal from source populations in Central Italy, where the population started expanding in the 1960s.

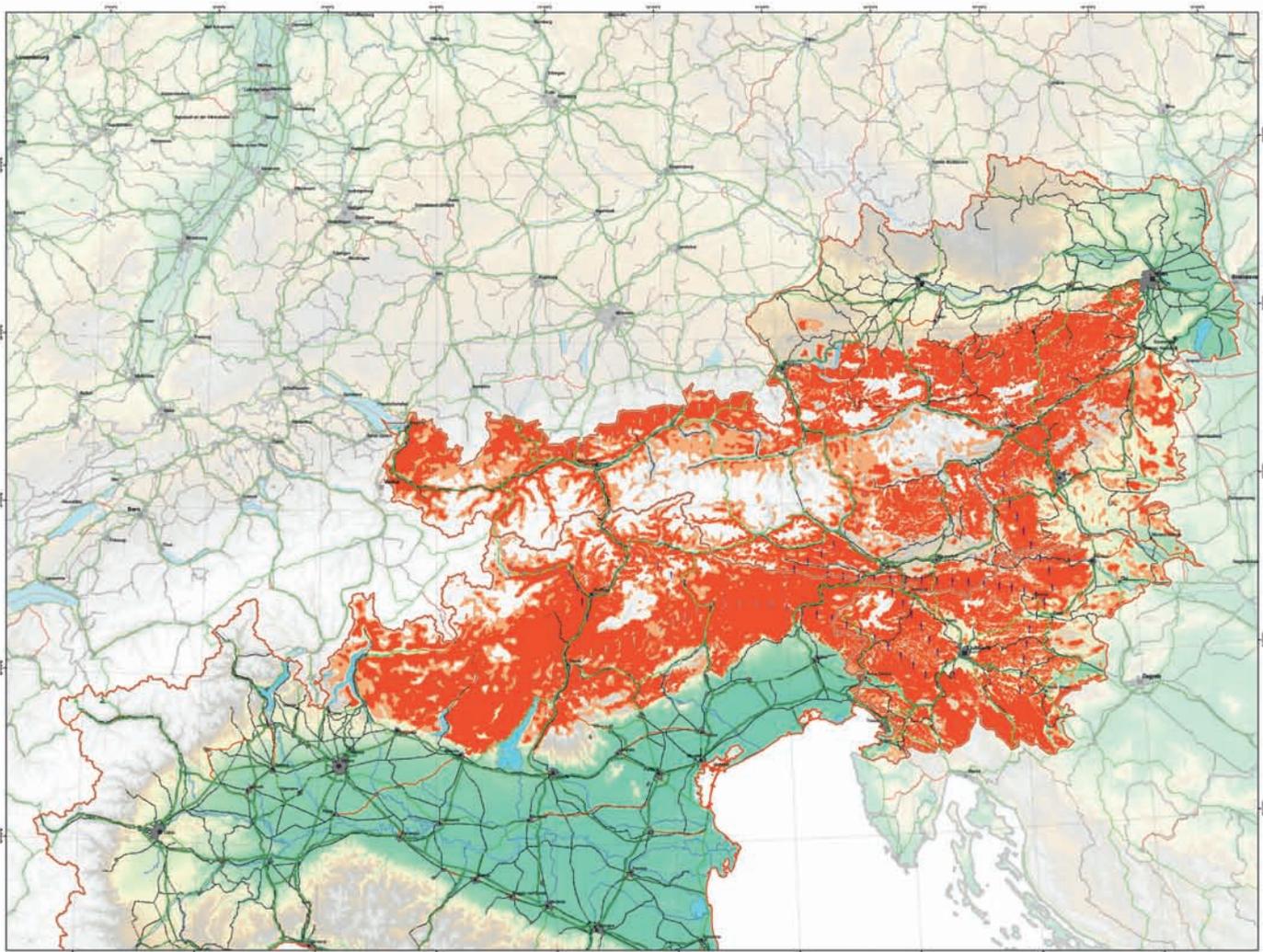


Table4. Estimation deriving from available data of bear numbers in the Alps.



Attaching collar with GPS-transmitter ©ICAS Brasov

This re-colonization process through natural dispersal has been documented from the early 1990s: genetic analysis conducted on wolf scat and tissue samples has proved that a total of 8-16 founders have crossed the northern Apennines and reached the Alps (Marucco, 2010).

In short, the return of the wolf to the Alps can be summarized in these steps:

- 1987: first signs of presence on the Italian-French border (Valico di Col della Tenda)
- early 1990s: first confirmed observations in Italian Alpine territory (Valle Pesio, Stura, Cuneo province)
- 1992: first attested presence of a pack in Mercantour National Park
- 1997: first attested reproduction in Piedmont, in Gran Bosco di Salbertrand Park.

Last available data (deriving from Progetto Lupo Piemonte) confirm the presence of 55-59 wolves in Piedmont in 2009, with 14 packs in the Alpine area of the Region.

Other parts of the Alps are concerned by the dispersal of single individuals that move from west (South-western Alps of Italy and France) to east (Switzerland, Lombardy, Trentino and Alto Adige) and, in a minor way, from east (Slovenia and Czech Republic) to west (Austria and Germany, Friuli Venezia Giulia and Trentino). Notwithstanding regular dispersal of individuals (in particular into Switzerland), such presence is to be considered unstable as until now wolves have failed to establish permanent groups (Wolf Online Information System for Europe, <http://www.kora.ch/sp-ois/wolf-ois/index.htm>).

More particularly, the main corridor of migration from the Western Alps is Switzerland: several individuals (usually young males that disperse in new territories, with a consequent high mortality rate) have reached southern Germany, Western Austria and, more recently, also Trentino and Alto Adige. On the opposite side, a minor flux is perceivable in the Eastern range of the Alps due to movement of wolves from the east: a wolf from the Slovenian-Croatian population reached Eastern Trentino in 2007/2008 and a Mittel-European

wolf reached Voralberg – Austria in 2010 (Righetti et al., 2011).

Synthesis: KORA and Wolf Online Information System for Europe estimation for the whole Alpine range can be a useful reference (KORA, 2010; <http://www.kora.ch/sp-ois>):

Situation in 2004/05	in 2008/09
France: 120-140 wolves in 25 packs	~33 packs
Italy: ~50 wolves in 14 packs	
Switzerland: ~3 wolves	~15-20 wolves
Alps:	114-183 wolves

Table 5. Estimation deriving from available data of wolf numbers in the Alps.

The Alpine lynx metapopulation became extinct during the 19th century and in the 1970s and 1980s, lynx from the Slovak Carpathians were released in the Swiss, Austrian and Italian Alps, as well as in the neighboring Jura Mountains (Switzerland), Vosges (France), Dinaric range (southern Slovenia) and Bavarian-Bohemian Forest (Czech Republic). These reintroduction projects resulted in several local populations and isolated occurrences. Today Alpine lynx are thus all derived from these pioneer conservation initiatives that took place in Slovenia and Switzerland.

While lynx populations in the Jura and Dinaric Mountains, the Alps and the Bohemian-Bavarian Forest initially expanded very fast, 20-40 years after the reintroductions there the process of expansion appears to be stagnating, although suitable habitats are available (AAVV, 2010). Some individuals spontaneously reached the Italian and Austrian Alps from Southern Slovenia but such expansion has not yet been sufficient to create a stable population there, nor does it seem likely that it will happen - without human intervention - in the near future.

Following the Swiss Lynx Management Concept 2000, a reintroduction project named LUNO was promoted in order to enlarge the area of presence of the species to North-Eastern Switzerland. Between 2001 and 2003, 9 individuals were thus captured in Western Switzerland and released in the north-eastern part of the country. The monitoring confirmed only one reproducing pair of lynx (in the region of Tösstock): the development of a population capable of surviving in the northeast of Switzerland is thus to be rated as critical (Ryser et al., 2006). From this pair, however, a young male was born in 2006 in North-Eastern Switzerland. B132 (the name it received) moved first to the Swiss National Park and then to Adamello Brenta Park (Trentino -

Italy): in both cases it was fitted with a GPS/GSM radio collar. Its dispersal was the furthest ever documented for a Eurasian lynx outside Scandinavia and confirms the existence of corridors for potential movements of the species.

Parallel to official projects, an unknown number of lynx was also illegally released in various parts of the Alps, giving birth to a short-lived nucleus and probably increasing illegal shooting.

The Alpine lynx population presently consists of 5 more or less isolated subpopulations or occurrences (in grey in Figure 21). The main lynx occurrences in the Alps are confined to the North-Western Alps (Switzerland, extending into France) and the South-Eastern Alps (Italy, Slovenia and Austria). All other lynx occurrences consist of few individuals only without reported reproduction. Almost 40 years after the first reintroduction, less than 20% of the Alps are re-colonised (Molinari-Jobin, 2009).

Synthesis. KORA estimation for the whole Alpine range can be a useful reference (KORA, 2010):

Despite the differences evidenced above between the two mountain ranges, large carnivores are vulnerable both in the Alps and in the Carpathians.

Due to the biology of the three species, to the fragmentation and loss of habitat which characterises both mountain ranges and to the relationship that large carnivores have with man in both contexts, the threats to present populations of large carnivores have common features in the Alps and in the Carpathians.

Estimated resident lynx (2005-2007)	
France	15
Italy	10-15
Switzerland	50-80
Liechtenstein	0-1
Austria	05-10
Slovenia	04-8
Alps:	114-183 wolves

Table 6. Estimation deriving from available data of lynx numbers in the Alps.

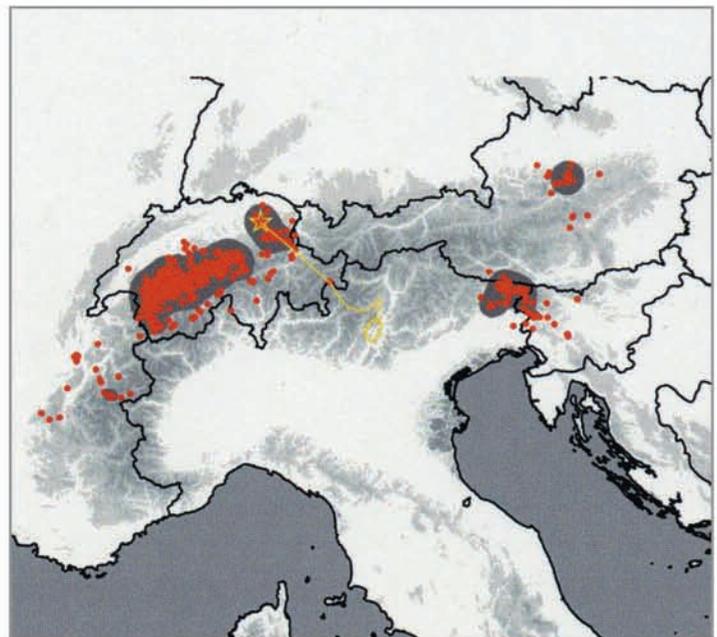


Figure 21: Confirmed lynx signs of presence in the Alps (red dots). Each dot buffered with a radius of 5km). In grey 95% Kernel estimate. In yellow the dispersal movement of a lynx in 2009/2010 (from AAVV, 2010).



Lynx (Lynx lynx) ©ALPARC, Guido PLASSMANN

3 - Leading factors for the present and future of large carnivore populations in the Alps and in the Carpathians

3-1 Main leading factors

Living in human dominated landscapes, wolf, bear and lynx presence is strictly dependent on human presence, which influences in various ways the current status of the three species.

Large carnivores are, first of all, exposed to direct human-caused mortality. Legal and illegal killings, which are in majority dependent on the attitude of local human populations, can have a serious impact on the species as they live at low densities and do not have a high reproductive rate.

This problem appears crucial, in particular, for those nuclei which are reduced in number: this is the case for all three species in the Alpine range. Killings have an even more remarkable impact where populations are below the threshold of minimum viability: in such cases the subtraction of a single individual (e.g.: a damage-causing wolf poached or a problem bear removed by local authorities) can have dramatic effects, pushing the whole population to extinction. For this reason, in the Alps, taking into account also that poaching exists but is hard to quantify and harder to control, the removal of individuals which are responsible for damage will have to be carefully assessed according to population level: the human social context could in fact lead to choices which are useful in the short term but unfavourable to the conservation of the nuclei in the long term.

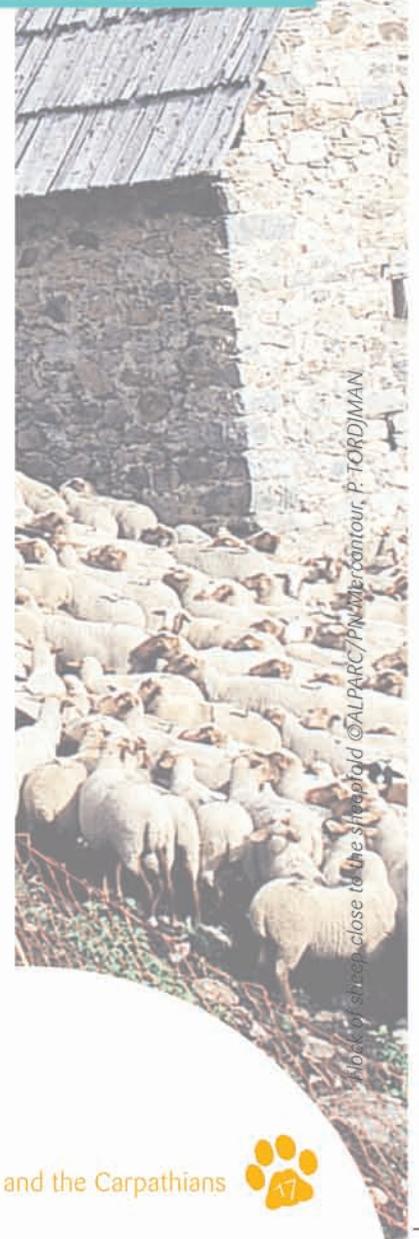
On the contrary, considering that hunting based on accurate population estimation and knowledge of the demographic parameters for viable large carnivore populations appears not to be a problem (Swenson, 1999), there is no evidence that legal hunting is reducing the size of the large carnivore populations in any country of the Carpathian Chain. As all the Carpathian countries except Ukraine and Serbia are members of the European Union, the legal killing of problem carnivores is allowed “in the absence of other satisfactory solutions”.

Contrary to legal hunting, poaching may be a threat for large carnivores in the Carpathian area, as it is in the Alpine area. Poaching is not directly dependent on the population size or on the density of large carnivores in an area: it is indiscriminate of sex or age and it is more correlated with economic development, social acceptance and damage caused by a certain individual or with personal benefits gained by poaching. For the Carpathian range, Ukraine seems to be more affected by poaching than the other countries in the region even if the restrictions created by the Habitats Directive for the local hunters in EU countries create resentment both against EU and against large carnivores.

Killings can have an influence at population level as they can reduce demographic and genetic viability. As already mentioned, this is a key problem for the Alpine populations of the three species which are composed of a low number of individuals, in most cases isolated one from the other: for them the risk of inbreeding depression (decrease in fitness and vigour of the population as a result of continued breeding of closely related individuals) is to be carefully considered. The future of the species in the Alps is thus strongly dependent on the possibility of the development of metapopulations which allow the interaction (reciprocal exchanges of individuals) among disjoint nuclei and contribute to genetic variability and the common gene pool.



Flock of sheep in Piatra Craiului
©ALPARC/Piatra Craiului, Mircea VERGHELET



Flock of sheep close to the sheepfold ©ALPARC/Piatra Craiului, P. TORDJIMAN



The Carpathian populations of large carnivores are, however, large enough not to have problems with demographic viability. In the first half of the 20th century, all the large carnivore populations of Europe outside of Russia were passing through a bottleneck but the Carpathian populations were big enough to insure good genetic variability: the heterozygosity found in the bear population of the Carpathians, for example, is similar to that of the Alaska brown bear population.

An indirect cause behind the presence of large carnivores in the Alps and in the Carpathians is habitat availability. Large carnivores, in fact, require wide areas of high quality habitat to survive: such conditions are hardly present in Europe, where natural habitat is scarce, fragmented and patches often isolated from one another.

In the Carpathians, land use was under centralised state administration till 1989: privatization then started and development followed western patterns. In the Alps the situation appears very different from one region to another: in some places the abandonment of mountain villages led to an increase in habitat suitability for wildlife, which in some cases favoured the return of large carnivores; in other places, intense use of valley bottoms (e.g.: for the construction of new industries, new houses, new roads) and access to previously undisturbed areas (e.g. for tourism purposes) took away from large carnivores areas of critical importance or isolated one area from another.

The consequence is that wolf, bear and lynx are forced to share their home range with men and their activities, giving rise to a conflict over land use which, in turn, generates little acceptance on the part of humans, killings and policies not in favour of (or even against) the conservation of large carnivores.



Habituated bears ©ICAS Brasov

Land use conflict can also be translated as a disturbance for the three species which are affected by human activities and presence. The result is an increase in mortality (e.g. road deaths) or a reduction in their fitness.



Brown bear (*Ursus arctos*) ©ALPARC, Guido PLASSMANN

The present distribution of large carnivores in the Carpathians is the result of the loss of mountain habitat correlated with human population changes and a former policy of extermination. In the last 20 years urban expansion, especially for recreational purposes, has caused the greatest loss of habitat in the area: due to the lack of restrictions, holiday homes have appeared even in the natural and semi-natural areas, and these constructions create problems for lynx and more conflicts with bears and wolves.

Forestry and forest management have, on the other hand, different direct and indirect influences on large carnivores. Logging, for example in oak and beech forest, decreases the production of acorns and beech nuts if there are clear cuts, but selective cuttings increase tree fruit production as well as berry production. As long as the forest cycle is long enough to enable the trees to have good fruit production, and the natural composition of the forest is respected, large carnivores are not endangered by intensive forestry. Greater disturbance is caused by humans cutting trees, building new forest roads and transporting logs.

Tourism is developing more and more intensively in the Carpathians. In the last years, snowmobiles, motorbikes and ATVs have been multiplying in the mountains, even in the areas where their presence is forbidden. This increase of human access to large carnivore habitat results in disturbance for wildlife in general and for large carnivores in particular.

Synthesis: although bear, wolf and lynx have different sensibilities to disturbance, degradation of habitat quality appears as a major cause of risk for the three species both in the Alps and in the Carpathians.

All above mentioned problems are increased by the lack of knowledge about the three species. Their biology, ecology, distribution, etc. are not investigated enough either in the Alps or in the Carpathians, with the consequence that appropriate solutions to local problems cannot be found. Hence this ignorance leads to improper management among politicians and to negative effects on the status of large carnivores.

Moreover, as stated above, large carnivores have big home ranges which cover significant areas, often crossing international boundaries: it thus frequently happens that, during their roaming, one bear or one wolf is faced with different regulations and management practices, which in some cases derive from an ill-prepared context.

3.2 Social acceptance

The factor that most limits the expansion of large carnivores in the Alps and that poses a risk to their future conservation in the Carpathians is probably social acceptance.



Bear damages on the beehives ©ICAS Brasov

In human populations living in areas of large carnivore presence, fear of bears and wolves as well as the threat that the three species pose to human interests, still influences current attitudes towards them. These aspects of coexistence with carnivores the size of humans seem to depend more on the emotional perception of the conflict than on the real danger for people and economic loss (which, by the way, can be prevented and refunded by appropriate measures). The negative attitude towards large carnivores has its roots in the attacks on humans and/or in the damage which in the past had, in a socio-economic context different from today, a real incidence, but which has now taken on features that go well beyond the biology

and ecology of the species (AAVV, 2004).

Large carnivores are mostly known from legends and prejudices: as a result the importance of their presence is difficult to instil permanently in public opinion and, today, management and / or conservation objectives are difficult to achieve without the support of the local people and main actors in the field.

Bath and Buchanan (1989) found that human attitudes towards large carnivores changed from negative to positive according to the distance from the areas where the carnivores were. There is, therefore, a spatial dimension in the human attitude toward large carnivores, whereby people who are in direct contact with the consequences of carnivore presence are sometimes unable to adapt to it.

As mentioned above, the attitude of the human populations that live in areas where large carnivores are present is deeply influenced by damage caused (especially by bear and wolf) to zootechny, agriculture and beehives. Moreover, the presence of particularly confident/habituated individuals, especially in the case of the bear, can play a major role in the rapid change in the degree of acceptance towards the species.

Conflicts with human activities - especially if not managed properly - but also insufficient information about the species, can give rise to fear and emotional responses which, in turn, easily become a matter for propaganda by political parties: such a vicious circle can kindle illegal killing, which probably represents (no data are available) a major limit to large carnivore expansion and/or stabilization in our mountain ranges.

In any case, the result of such a vicious circle is in most cases the lack of long term political support for such a "delicate issue" as large carnivore conservation: this leads to the implementation of incorrect conservation programmes, to the interruption of projects and to limited funds for their safeguard.

3.3 Dispersal and barriers

Today radio telemetry and the genetic monitoring of large carnivores give us more data about the dispersal possibilities of bear, wolf and lynx.

A male lynx, named B132 and radio-collared in Engadin (CH) in 2008, moved southwards for more than 200 km as the crow flies, reaching in few days Trentino. A 5 year old male bear, second generation of the Slovenian founders released in the framework of the Italian reintroduction project, roamed in the Central and Eastern Alps, arriving in Carinthia: its genetic samples were found in the same summer (2010) 400 km apart. A wolf named M15 - Ligabue, run over by

a car near the city of Parma, in the Apennines, in February 2004, wandered for 560 km as the crow flies until reaching the Alps (Cuneo province and France): the SMS it sent every 12 hours allowed the reconstruction of movement of more than 1100 km in less than 12 months (Groff, 2011; Marucco, 2010; Provincia di Parma, 2010).

Those are the most recent records for the Alps but, more in general, a newly-established population of wolves in Germany and nuclei arriving in the Western Alps from the Apennines, bears travelling from Croatia and Slovenia to Austria and Italy or from Italy to Germany and Switzerland, show us the possibility of dispersal of large carnivores in a human dominated landscape. Although there are differences among the three species - with lynx being, usually, less mobile than wolf and bear - such movements can reach hundreds of kilometers as the crow flies.

Large carnivore dispersal creates the basis of genetic variability in large carnivore population: the movement of the individuals favours gene flux and increases genetic variability, avoiding inbreeding depression.

Young males are usually the protagonists of great movements. In Trentino, for instance, all the 14 bears which roamed outside the core area between 2005 and 2010 were young males: most of them returned to Trentino, others were killed or disappeared during their roaming (Groff, 2010). Females normally establish their territories near the territories of their mothers: as a general rule, they are generally less erratic than males.

In the Carpathians, dispersal is a reality and creates the basis of the great variability in the above mentioned large carnivore populations.

In the Alps, on the other hand, up to now dispersal has been a key factor only for wolf re-colonization of the Western and Eastern Alpine range (and hopefully it will be so for possible further expansion). For biological reasons, it is not probable that lynx will spontaneously expand as far as to join present populations of Slovenia and Switzerland, especially considering the distances between existing nuclei. With regard to bears, as mentioned in the previous paragraph, a flux has existed for decades from Slovenia westwards (and one bear has recently travelled in the opposite direction), but it has not yet succeeded in mixing gene pools from different populations.

On the other hand, movements of single individuals are of great importance from a social point of view. Roaming animals arriving in places where the presence of the species is not stable can be considered as ambassadors (good or bad, depending on their behaviour and other factors) of their species: they

attract public opinion and political attention and can help the preparation of a measure of coexistence with man.

In highly anthropic areas, movements are difficult because the animals meet barriers. Barriers can be defined as obstacles which fragment species habitat, preventing them from moving freely from one area to another.



Examination of a captured wolf
©Austrian Ministry of Environment, H. DUNGLER

Large carnivores need large territories to survive and within them they frequently meet barriers which, in most cases, act like filters, more or less permeable to their passage. This means, for instance, that some categories of animals (young males) cross them more frequently than others, and that a percentage of them get killed.

The numbers of cars and the traffic on the roads have increased a lot in recent years in the Carpathian Region. The building of new houses in the habitat of large carnivores along the roads in the mountains makes it even more difficult for large carnivores to cross these barriers.



Highway construction can also create permanent barriers for large carnivores. A recent study case conducted by the Forest Research Institute - Wildlife Department with the administrations of the Piatra Craiului National Park and Bucegi Natural Park in order to determine the connectivity between these protected areas and the effect of the road and the building of new holiday homes showed, for example, two radio collared bears waiting respectively 11 and 23 hours in order to be able to cross a road and a lynx giving up after 3 days. The project, which was carried out by fitting large carnivores with radio transmitters and through a winter monitoring of tracks and intensive snow tracking, evidenced areas where the development of infrastructures is not recommended in order to maintain connectivity.

The same occurs in the Alps which, because of their position of linkage between the north and south of Europe, are crossed by an increasing network of connections. At present road deaths, for instance, are identified as a major cause of mortality for Piedmont wolves (Marucco, 2010).

In the last years some specific projects have undertaken actions that have directly or indirectly helped to enhance functional connectivity for large carnivores such as: restoring crucial habitats and food sources and increasing genetic flow between tiny and fragmented populations by constructing 'green bridges' (Pedro Silva et al., 2010). However, those are specific and limited actions, which can possibly help to solve isolated problems. Habitat connectivity, for large carnivores but also for wildlife in general, has to be considered in the wider context of territorial planning, in a transboundary framework.

If improper studies are done and habitat connectivity is not ensured, fragmentation of the populations is more than sure.



4 - Possible management measures for favouring the future of large carnivores in the Alps and in the Carpathians

With reference to the above mentioned threats, here we outline the measures necessary for maintaining already existing viable populations of large carnivores (i.e. in the Carpathians) and for creating a favourable status for wolf, bear and lynx where it does not exist today (i.e. in the Alps). For the purposes of this report, it appears advisable to identify 4 major fields of actions, which are to be pursued in the two contexts we are dealing with. Possible differences in the initiatives which have to be undertaken in the two mountain ranges are evidenced when necessary.

4.1 Habitat preservation/restoration

Even if large carnivores are highly flexible in their choice of habitat, a few factors are important in determining their density and mobility in the territory, and therefore they should be considered carefully, for example when designing/reviewing the Natura 2000 network. More generally, in any area of presence (stable or sporadic) or potential presence of bear, wolf and/or lynx, the conservation of all habitats suitable for them should be taken in consideration in the framework of any territorial planning.

In fact, any activity that can harm directly the health of large carnivores, or cause detectable changes in their behaviour (including alteration of home ranges, diel activity patterns, use of habitat, food habits, distribution, abundance, reproduction, and survivorship) should be avoided, especially if such a source of disturbance has negative effects on areas or periods of primary importance for the biology of the species (e.g. areas used for hibernation, reproduction, alimentation) (Parco Adamello Brenta, in press).





Retezat national park landscape
©ALPARC/Piatra Craiului, Mircea VERGHELET

Great attention to land management has to be sought, especially when carrying out any work or activity that can subtract permanently habitat suitable for large carnivores or cause its fragmentation. The priority objective is to maintain areas used as refuges and those that are used for movements from one area to another.

The stable and sustainable presence of large carnivores cannot be planned in an area if all the ecological needs of the species are not met. This means, for instance, adequate food sources and wood structure which can be searched for actively, for instance favouring the recovery of ungulates (wolf and lynx preys) or carrying out environmental restorations.

In short, forest management of areas where large carnivores are present has to take in consideration the possibility of improving the carrying capacity for ungulates and food sources for bears.

In this context, it has to be underlined that a good quality habitat usually has the effect of keeping (the majority of) large carnivores away from (the majority of the) conflicts with human activities.

4.2 Habitat connectivity maintenance/creation

Many ecologists believe that the effects of fragmentation can be reduced by the maintenance or provision of landscape linkages among sub-populations. Much recent literature in conservation biology supports the concept of providing “corridors” of suitable habitat between population centres. Corridors provide travel lanes to accommodate daily, seasonal, and dispersal movements from one large habitat block to another. In theory, corridors greatly reduce the possibilities of inbreeding and chance environmental catastrophes by providing opportunity for the introgression of new genetic materials and exchange between individuals

from source populations. Persistence times for populations that inhabit fragmented landscapes are thought to be greater where connectivity (between habitats e.g. via corridors) enhances the exchange of individuals. The practical challenge is to delineate wildlife corridors given current understanding, knowledge and socio-economic context.

In the Alps, the territorial expansion of the large carnivores and thus the achievement of Alpine metapopulations appear essential for the future of the species. For this reason, it is vital to improve landscape permeability by providing species with functioning stepping stones (like green bridges) to overcome barriers more easily. Urgent action is also needed in human-dominated Alpine valleys, with their transport infrastructures and urban settlements and, more generally it is imperative to take into account the needs of species in the various future planning processes. Such exigencies can be met only taking by into account species needs in the various future planning processes and thus preserving large tracts of interconnected and permeable lands (ECONNECT, 2011).

In order to achieve the indispensable linkage between nuclei the need for connection at governmental level among the Alpine and Carpathian nations involved becomes evident. Through their competent Ministries, the Governments should in fact search for the most effective strategy for the large-scale conservation of the species.

4.3 Reaching/obtaining a positive social attitude towards large carnivores



Shepherd's dog ©ALPARC/PN Mercontou, J.M. CEVASCO

The presence of large carnivores needs a positive social and political “habitat”, which means a favourable attitude of resident human populations that, in turns, generates a positive stance on the part of politicians.

Such acceptance towards large carnivores can be reached through adequate measures which help to



solve the conflicts which inevitably, in various ways, arise with lynx, bear and wolf.

Promoting preventive measures and best practice examples, as well as setting up an efficient compensation framework to make up for damage as well as a correct strategy of garbage disposal, are essential to coexist with large carnivores. In this sense, an overall strategy for the management of the species, which foresees also a plan of intervention for problem animals and includes the possibility of removal of certain individuals, has to be prepared. In such a context, considering the low demographic and genetic viability of the Alpine populations of large carnivores, the possibility of compensating the removal of a problem wolf or bear, by translocating another individual (as a “substitute”) also needs to be considered .

The above mentioned management strategy, whose importance varies according to the local situation and to the species (measures for dealing with lynx are obviously different from those which are needed for wolf and for bear), has to be ready before the arrival of the species, considering that a fundamental rule for the conservation of large carnivores is “to leave as little room as possible for improvisation” (AAVV, 2004).

Within the strategy, a key role is played by communication initiatives. The carrying out of divulgation or sensitization activities appears, in fact, of great importance for improving public awareness and involvement both in areas of stable presence and in territories of possible future expansion. The involvement of the public in wildlife management has become a basic requirement for developing successful programmes. Public involvement can take many forms but is essentially about redistributing power from the technicians to the people involved.

With reference to this issue, a communication plan, which foresees a periodic monitoring of the level of social acceptance by residents, has to be set up through the collaboration of large carnivore experts and communicators. Such a strategic communication plan has to be based on a specific analysis of the situation (general context, acceptance of the species, target groups and needs of the interest groups, available funds, etc.) and has to make clear the objectives which are to be reached and the means to reach them. This plan should foresee a set of short- and long-term actions to be carried out in different stages and situations of bear management (AAVV, 2004). In this sense, depending on the actual situation, it can be considered not only as highlighting the (ecological, cultural, etc.) importance of large carnivores but also the value of the species as a common resource and

an example of beauty, which can be stressed using the same methods of advertising (i.e. promotion campaign).

A correct and successful communication strategy is a basic requirement to promote social acceptance, and thus to safeguard stable populations and to favour expanding / exploring by single individuals. It is nevertheless frequently not enough to prevent the instrumental use of large carnivores by political parties who exploit conflicts created by bear, wolf (and in a minor way) lynx to attack opponents.



Wolf (*Canis lupus*) ©ALPARC, Guido PLASSMANN

Wherever and only if sufficient social and political acceptance is present, reintroduction or restocking can be considered if needed.

In the end, particular care must be dedicated to the training of all the staff involved that are called upon to apply the above mentioned activities. Wildlife managers and rangers, but also communicators and intervention teams - in a word: all the people working within the large carnivores conservation institutions - should be adequately prepared about the species and good at handling and solving conflicts with people.

4.4 Increasing knowledge about large carnivores

In order to achieve an efficient management of large carnivore populations it is necessary to possess a detailed and constant evaluation of their status. Data on consistency, structure, distribution, damages by lynx, wolf and bear populations in the Alps and in the Carpathians are fundamental for the adoption of correct strategies of conservation. Such knowledge must be acquired through the setting up of a monitoring system adequate to the different species and to the context (stable presence/occasional presence/potential areas of expansion/etc.). As they both have big distribution areas for large carnivores, such monitoring has to be shared throughout the

Alps and the Carpathians, allowing the sharing of methods and data between all the administrations and organizations which operate in the two mountain ranges.

In fact, in areas of possible expansion, it is advisable to set up a monitoring system which informs in a reasonable time of the arrival of a species. Similarly, in areas of stable presence, the objective should be a long term monitoring of large carnivore populations which can keep a constant check on the consistency and distribution trends of the species, so as to be prepared to intervene rapidly in case of need with the most suitable management strategy.



Bucegi nature park's information campaign
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Together with having their status monitored, large carnivores should be the object of applied scientific research. Such research, which should be carried out in close cooperation between all the actors involved in the different countries, also with the aim of optimizing the often scarce resources, should be focused on acquiring knowledge about the biology and ecology of the species at local level, as well as about their relationship with men (the phenomenon of damage, behaviour during encounters, etc.). Its role is thus evidently fundamental in searching for new strategies for correct management and favouring coexistence with man.

Last but not least, scientific research about the species based on a structured collection

and analysis of data could be useful to give proper content, reliability and prestige to the communication activities. First hand data, collected in the areas of bear, wolf and lynx presence, should then constitute the essence of all the communication activities described above.

5 - Conclusions: What are the perspectives for large carnivores in the Alps and in the Carpathians

Large carnivores are species of undoubted value, both from an ecological and from a cultural point of view. Their presence is to be considered of strategic importance at European level and the Carpathians and the Alps both represent key areas for their large-scale preservation, being among the last strongholds of the species.

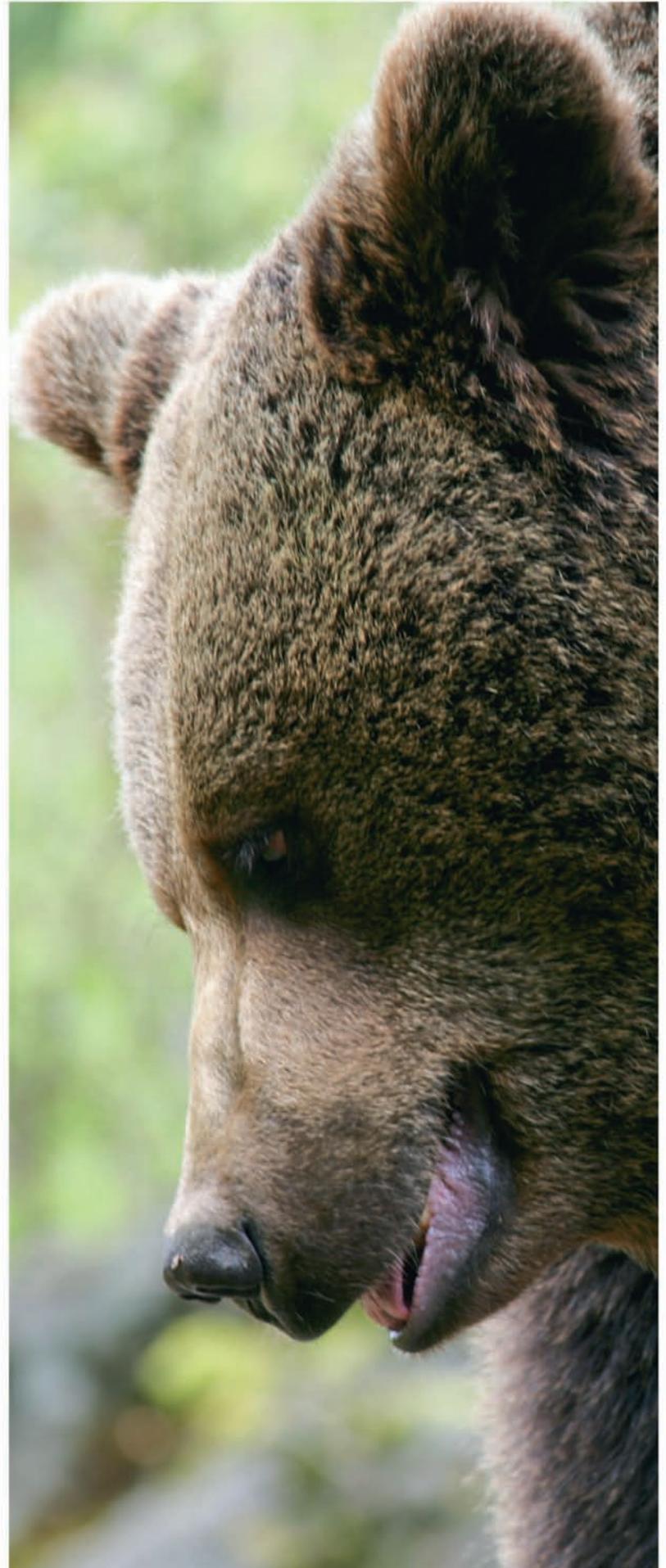
Coexistence between man and large carnivores, however, always raises problems and acceptance by local people is difficult to achieve, especially where large carnivores return after a long absence (i.e. in the Alps). Similar difficulties are faced where rapid economic development takes place (i.e. in the Carpathians), as the exigencies of large carnivores are often felt to be in conflict with the justified demands of local people.

However, the economic growth of an area does not need to be stopped by large carnivores whose presence can, on the contrary, coexist with human activities.

The great needs of large carnivores, together with the extraordinary role they play in human culture and society, can (or must) find, instead, a synthesis in a development which encompasses economic development and nature conservation, allowing movement of people and of large carnivores, allowing tourism but ensuring viable populations of bears, wolves and lynx capable of dispersing and re-colonizing new areas, in coexistence with man.

Protected areas and the Natura 2000 network represent a good step in this direction, but obviously they cannot be the only response to large carnivore conservation as they are neither big nor connected enough to satisfy the species' needs. Nevertheless, if virtually interpreted and managed, they represent centres for promotion and examples beyond their legal boundaries, as well as strategic elements in the geographic context of the Alps and of the Carpathians. Their role in the future of large carnivores could thus be central as "local accomplishees" of all the preparatory actions which are needed in order to manage well the presence or to welcome the return of large carnivores.

However, if a connection inside and between Alps and Carpathians is the long term goal at European level, then pan-Alpine and pan-Carpathian intergovernmental institutions, and among them the European Union, must play a major role, setting up the necessary international cooperation which is essential to unify management strategies in accordance with the best practices already experimented. ■



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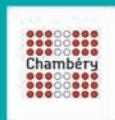
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