Chapter 4
Bringing Large Mammals Back: Large Carnivores in Europe

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Abstract The last century has seen a dramatic reversal in the status of large carnivores in Europe. A suite of co-occurring factors has permitted a large-scale recovery of most populations. We currently recognise 10 populations of each species, most of which are transboundary in nature. The sizes of these populations vary from some tens to many thousand, with current estimates being around 17,000 bears, 10,000 wolves and 10,000 lynx in Europe (excluding Russia). As the situation moves from averting extinction to planning recovery it is logical to ask how far the recovery can go, and what our conservation goals should be, especially in light of the emerging rewilding discourse. For a variety of ecological, practical and strategic reasons, it seems unlikely that restoring "wilderness" or "natural ecological processes" (in the sense that human activity and influence are excluded) will serve as general models for large carnivore conservation on a large scale. We suggest a focus on developing a "coexistence" model that aims to create a sustainable interaction between humans and large carnivores by encouraging conservation of these species in very large areas of the European landscape, encouraging the development of a wide range of ecological processes, including predation and scavenging, while accepting that human influence on all trophic levels is pervasive, legitimate, necessary and often even desirable. This constitutes a desire to create a new form of relationship between humans and wildness that has never existed before, and therefore does not fall within the conventional meanings of the rewilding paradigm.

Keywords Large carnivores · Coexistence · Natural ecological process · Herbivory · Social tolerance · Human impact

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4.1 Introduction

Large mammals are often regarded as flagship species of wild areas and the paradigm of wilderness untouched by, or at least relatively separated from, human activities (Ray et al. 2005). This is especially true for large carnivores. This view largely stems from the historic processes of direct human persecution and indirect habitat change that gradually reduced their presence in human-dominated landscapes such that they only persisted in the residual areas with little or no human activity. As a consequence, the view of large carnivores as beasts of the wilderness became consolidated, particularly in North America (Boitani 1995). Since Europe is home to more than 500 million people and lacks extensive pristine, uninhabited land areas and large protected areas with spectacular aggregations of large mammals, it might appear to have little to offer for large carnivore conservation. However, nothing could be further from the truth. In the last few decades, changes in the socio-economic settings and people's values concerning nature and biodiversity have paved the way for new opportunities for large carnivores. As the situation develops a new conservation paradigm is slowly emerging based on the premises of coexistence instead of exclusion.

In this essay, we firstly describe the current status and trends of the large carnivores in Europe and examine the main causes of the recent increase in numbers and range. Second, we discuss the available opportunities to sustain the positive trends and the challenges in driving the process toward a new balance between carnivores and human activities. Thirdly, we use the insights coming from large carnivore conservation to offer our views on the social and ecological implications of managing the "rewilding" of Europe. In Europe, five carnivore species have been traditionally considered as "large carnivores", but in this essay we will focus on the three most important ones, the grey wolf (*Canis lupus*), the bear (*Ursus arctos*) and the Eurasian lynx (*Lynx lynx*); the other two, the Iberian lynx (*Lynx pardina*) and the wolverine (*Gulo gulo*) are restricted to small areas, respectively in southern Iberia and northern Fennoscandia, and are associated with very specific management issues.

4.2 Trends in Large Carnivores in Europe

To the Edge of Extinction

Bears, wolves and Eurasian lynx were once widespread across most of the European continent. However, intense persecution, prey extermination and habitat conversion led to their near extermination in the nineteenth and early to mid-twentieth centuries (Breitenmoser 1998; Linnell et al. 2009, 2010). As a result of the eradication efforts, all carnivore populations experienced their smallest population sizes and range contraction during early to mid-twentieth century. The declines were particularly extreme in western, central and northern Europe. Wolves were practically

exterminated and relict lynx and bear populations only persisted in parts of Sweden and Finland. In southern Europe, precariously small bear populations persisted in the Cantabrian Mountains, the Pyrenees, the Alps and central Italy. Wolves persisted in parts of the Iberian Peninsula and central Italy. In eastern and south-eastern Europe all species persisted to some extent in the Carpathian and Balkan mountains, but populations were generally very much reduced in both range and density.

Multiple Causes of Recovery

From this nadir, a number of factors have interacted to create the conditions for a continental wide recovery of the species. Many carnivore populations were protected by national and European legislations (Bern Convention of 1982, Habitats Directive of 1992) following significant changes in public opinion towards wildlife conservation, which occurred in many countries around this time. However, it is also interesting to note that much of the early recovery in northern and Eastern Europe occurred within hunting management frameworks, often while the carnivores were being harvested (Swenson et al. 1994). Much of this recovery was long before the ideals of conservation biology had been formulated. By this period there had also been a dramatic recovery of European wild herbivore populations, which had experienced a similar fate as the large carnivores during the nineteenth century. Their recovery during the early and mid-twentieth century had been greatly aided by hunting motivated translocations and the introduction of improved hunting legislation that aimed to manage ungulates for sustainable harvest (Linnell and Zachos 2011). In addition, European forest cover had begun to recover from earlier deforestation, both as a result of forest policies and due to reduced human pressure on the land following large-scale rural—urban migration. This reduced pressure led to both an increase in habitat for predators and prey, and led to a lessening of the human persecution pressure on the carnivores (see Chap. 1). Thus, many positive factors coincided to create a positive ecological and legislative environment for large carnivores to recover, although there was much regional variation in the timing and magnitude of the different processes.

Most of the recovery has been natural. Lynx have naturally recolonized much of Fennoscandia, even expanding into northern areas from where they were historically absent (Linnell et al. 2010). Wolves have naturally recolonized Scandinavia, Finland, France, Switzerland and Germany as well as expanding through much larger areas of Italy, Portugal and Spain (Kaczensky et al. 2013). Dispersing wolves are now appearing in areas like Denmark, the Netherlands, and Austria. Fennoscandian and south-eastern European bear populations have also expanded naturally, although bear expansion is slowed by the intrinsic low rates of female dispersal. Active assistance through reintroduction has played only a minor part in the process. Eurasian lynx were successfully reintroduced to the western Alps, the Jura and Vosges mountains, north-eastern Switzerland, central Germany and central Poland (Linnell et al. 2009). The translocation of bears has successfully

taken place in the Italian Alps and, less successfully, in the Pyrenees and in central Austria (Clark et al. 2002). There have been no reintroductions of wolves, although a few individuals have been translocated within Sweden in recent years as part of a genetic reinforcement program.

The Current Status of Populations

Europe's large carnivores are currently distributed among 42 nations, each with unique cultural values for biodiversity and different legal platforms for conservation. This cultural, political, and legal diversity within Europe presents major challenges for the conservation of internationally listed species, which often exist in transboundary populations that fall across several international jurisdictions. Management fragmentation is made worse by the fact that many European countries (e.g. Austria, Spain, Germany) are federal countries where responsibility for nature conservation has been decentralised to many sub-national jurisdictions. Large carnivores have all the characteristics of species that are difficult to manage at the scale of Europe's small administrative units: they live at low densities (typically less than 3/100 km^2), have home range size up to 1000 km^2 and dispersal distances of more than 1000 km (Linnell and Boitani 2012).

In an attempt to facilitate carnivore management at the appropriate scale of biologically meaningful units instead of administrative compartments, the European Commission approved a set of "Guidelines for population level management plans" (Linnell et al. 2008) and identified the main populations across the continent. The populations were identified based on several criteria such as the discontinuity in distribution, geographic features, the species' dispersal distance and the ecological and management contexts. Out of 30 populations (see below), only four occur within a single country and some span up to eight countries. Kaczensky et al. (2013) recently reviewed the conservation status of the European large carnivores in 2012 using data collected by a network of experts across Europe. The following sections are drawn from their report.

Bears

The total number of brown bears in Europe is estimated to be about 17,000 individuals. They occur in 22 countries and 10 main populations (Fig. 4.1): Scandinavian, Karelian, Baltic, Carpathian, Dinaric- Pindos, Eastern Balkan, Alpine, Central Apennine, Cantabrian, and Pyrenean. The largest population is the Carpathian population (>7000 bears), followed by the Scandinavian and Dinaric- Pindos populations (>3000 bears). The other populations are much smaller ranging from several hundred (e.g. Karelian c. 850, Baltic c. 700, Cantabrian c. 200) to less than a hundred (e.g. Central Apennine 40–70, Alps 45–50, Pyrenean 22–27). Only two

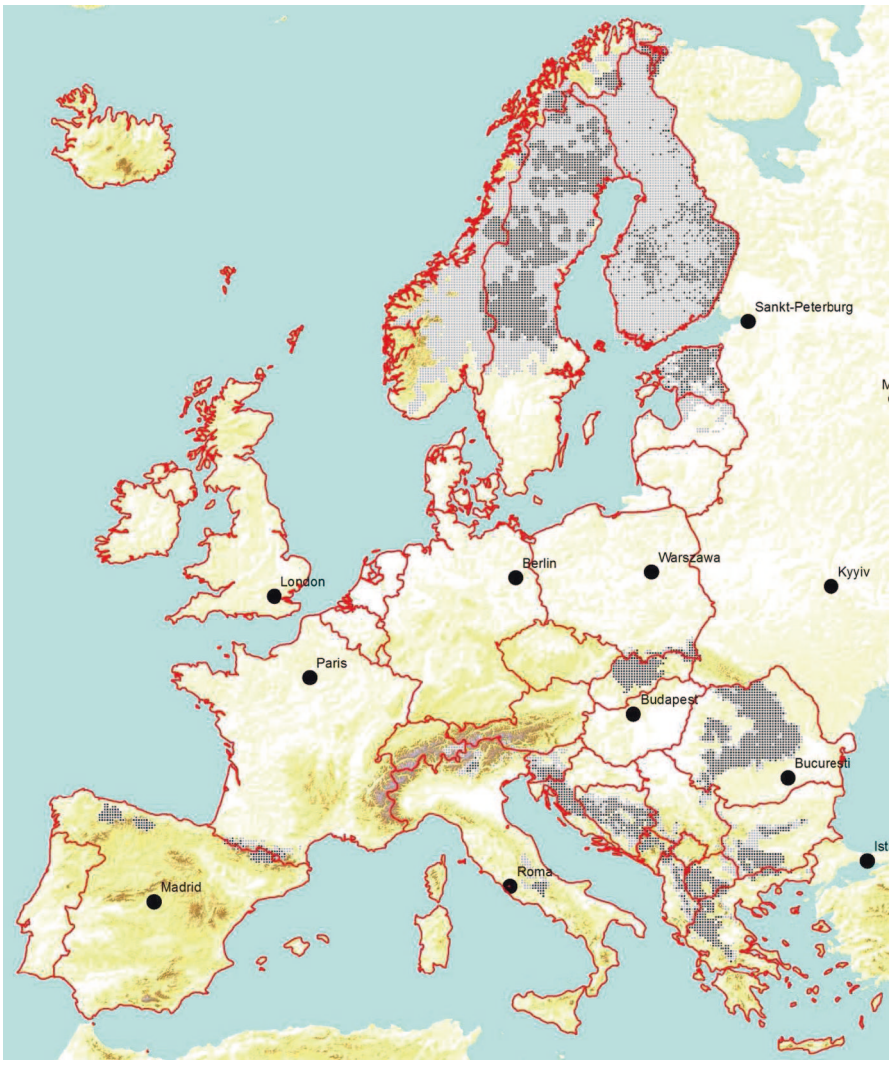

Fig. 4.1 Distribution of bears and their populations in Europe in 2012. *Dark cells* permanent occurrence, *Grey cells* sporadic occurrence. (From Kaczensky et al 2013)

small populations (Alpine and Pyrenean) have been reinforced with animals translocated from Slovenia.

Trends in number and range expansion are generally positive: all populations are either stable in number or show an increase (Scandinavian, Karelian, Dinaric-Pindos, Baltic, Cantabrian, and Pyrenean); their range is also stable or slightly expanding. With the exception of the small populations of the Cantabrian, Central Apennine and Pyrenees, no populations are threatened and most of them are well

protected by effective legislation that severely limits human-induced mortality. The Habitats Directive provides full protection for all bears in the European Union under Annex IV, although moderate culling is allowed under article 16 derogations in Sweden, Finland, Romania, Estonia, Bulgaria, Slovenia and Slovakia. Overall, the level of conflict with human activity is surprisingly low for such an opportunistic species that feeds on a large variety of items. With the notable exception of Norway, Spain and Slovenia, all other countries pay small amounts in compensation for bear damages to livestock and other agricultural products. The overall cost of compensation in Europe is in the order of 3 million € per year (Kaczensky et al. 2013). In spite of their size and potential for being dangerous to human lives, bears in Europe are not a significant threat to humans and injuries or lethal attacks are limited to a few occasional cases.

Wolves

There are probably more than 10,000 wolves in Europe. They occur in all countries except the island states (Ireland, Iceland, United Kingdom, Cyprus and Malta) and the Benelux countries. At least 10 main wolf populations can be identified: north-western Iberian, Sierra Morena (southern Spain), Alpine, Italian Peninsula, Carpathian, Dinaric-Balkan, Baltic, Karelian, Scandinavian and Central European Lowlands (Fig. 4.2). The largest populations are in southern and Eastern Europe such as the Carpathian and the Dinaric- Balkan populations (>3000 wolves each), followed by the north-western Iberian (~2500 wolves) and the Baltic (>1000 wolves). Other populations are an order of magnitude smaller (numbering in the low hundreds with the Italian Peninsula population being somewhat larger, in the range of 600–800 wolves) and the Sierra Morena population in southern Spain now reduced to just one pack detected in 2012. No wolf reintroductions (i.e. release of individuals where the species had been exterminated in historical times) have ever been carried out in Europe, although most recently there have been a few translocations of individuals within wolf range inside Sweden.

Trends in numbers and range size are generally positive since the last estimates in 2005. With the exception of Sierra Morena population, all populations are either stable or increasing and there is good evidence of large dispersal movements potentially re-connecting populations, such as the Alpine and Dinaric or the Scandinavian and Karelian. However, some countries have seen their national estimates decreasing such as Albania, Finland, Macedonia, and Portugal for the subpopulation south of the Douro River, where the social, ecological and political conditions for wolf acceptance have significantly deteriorated recently.

Most European wolves are covered by the full protection offered (with derogations possible under article 16) by Annexes II (requires establishment of Natura 2000 sites) and IV (strict protection) of the Habitats Directive although there are several exceptions of countries that have their wolf populations (or just part of it) in Annex V (which permits regulated harvest): for example, the Baltic countries,

Fig. 4.2 Distribution of wolves and their populations in Europe in 2012. *Dark cells* permanent occurrence, *Grey cells* sporadic occurrence. (From Kaczensky et al 2013)

Bulgaria, Poland, Slovakia, parts of Greece and parts of Finland. Depredation by wolves on livestock is one of the most ancient conflicts that humans have sustained against wildlife and it is still widespread across Europe. The total economic loss is estimated to be in the range of 8 million € and about 20,000 domestic animals, mostly sheep, are killed annually with huge variations between countries. The costs of adopting damage prevention measures can also be significant, and in some countries is far greater than the cost of damage prevention. In addition to the economic and material costs of livestock depredation, many hunters perceive wolves as com-

petitors for shared game. Moreover, wolves have generated a wide range of, often intense, social and political conflicts in western and northern Europe, as they have become political symbols for many social issues including urban vs. rural and modern vs. traditional tensions. Although historical evidence indicates that wolf attacks on humans were widespread in the past, there have only been a handful of exceptional cases detected during the last century (Linnell et al. 2002).

Eurasian Lynx

The total number of lynx in Europe is estimated to be 9000-10,000 individuals. They occur in 23 countries divided into 10 main populations (Fig. 4.3): five of these ten populations are autochthonous (Scandinavian, Karelian, Baltic, Carpathian and Balkan), the other populations stem from reintroductions in the 1970s and 1980s (Dinaric, Alpine, Jura, Vosges-Palatinian and Bohemian- Bavarian) (Linnell et al. 2009). Of the autochthonous populations, only the Balkan one is of conservation concern, having been reduced to about 40–50 individuals and showing no signs of significant recovery. The reintroduced populations are all small in the range of 20 individuals in the Vosges-Palatinian to about 150 in the Alpine population. In addition, lynx roam the Harz Mountains of central Germany because of recent reintroductions.

The general trend in numbers is stable or slightly increasing, although there is some concern for the long-term viability of the reintroduced populations due to small population effects and the risk of inbreeding. Most of the lynx populations are strictly protected and derogations under article 16 of the Habitats Directive are used to harvest the populations in Sweden, Latvia and Finland. Estonia is unique within the EU having the lynx on annex V, which permits regulated harvest as a game species. Large conflicts with livestock owners are limited to the northern populations. The only country with a major conflict with sheep is Norway, where about 7000–10,000 sheep are compensated annually. In addition, thousands of semi-domestic reindeer deaths are attributed to lynx depredation annually in Norway, Sweden and Finland. Elsewhere the level of livestock depredation is very small. However, the level of conflict with hunters is widespread across Europe who perceive lynx as a competitor for wild ungulates, especially roe deer (Breitenmoser et al. 2010).

4.3 How Far Can We Take the Recovery Process?

Although the status of large carnivores across Europe is heterogeneous and dynamic there are grounds for increasing (though still cautious) optimism concerning their future status. Apart from a few small populations that are clearly still threatened (such as bears in central Italy and the Pyrenees), the main task for the future is more one of sustaining their recovery than of saving them from extinction (Swenson et al.

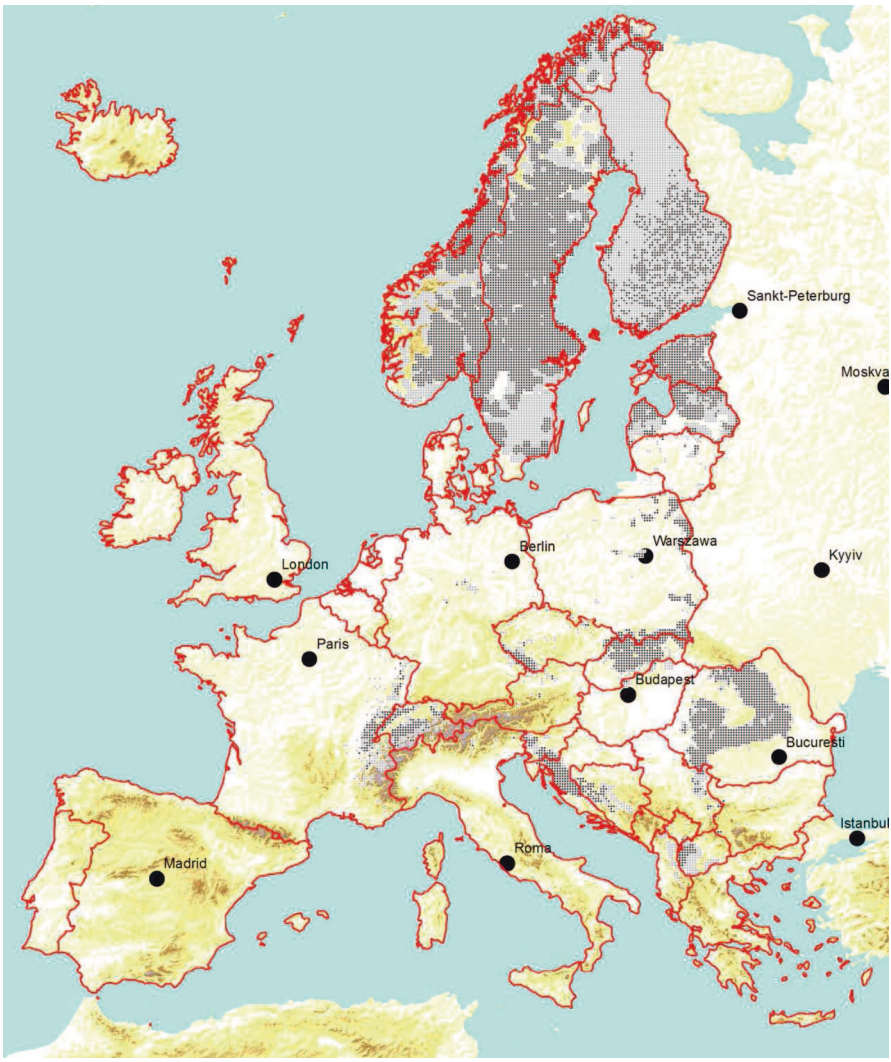

Fig. 4.3 Distribution of lynx and their populations in Europe in 2012. *Dark cells* permanent occurrence, *Grey cells* sporadic occurrence. (From Kaczensky et al 2013)

1998). This leads to asking how far the recovery may go. In other words, what level of conservation ambition should we hope for (Linnell et al. 2005)? While the short-term recovery goals have always been about achieving "population viability" to safeguard against population and species extinctions, the present conservation discourse is now increasingly moving to one of "ecological functionality". Although the rewilding movement offers many diverse points of view (Donlan et al. 2006; see Chaps. 1 and 9), it has been placing a lot of emphasis on the restoration of "natural processes" with the often stated understanding that this excludes human activity.

So far these ideas have been mainly directed towards restoring herbivory, although they have met with considerable debate (Hodder et al. 2005; Kirby 2009). There is an increasing trend to also extend them to predation and we feel it is also important to raise some questions concerning whether it is possible, or even desirable, to restore "natural predation processes" (Andersen et al. 2006). It is important to ask what this term means, and even ask if it should be the benchmark goal for large carnivore conservation strategies from strategic and value based points of view.

What are the Characteristics of "Natural Predation Processes"?

Describing the nature of predator—prey dynamics for large carnivores and large herbivores has been an ongoing theme in ecological research for the last 60–70 years at least. From the early writings of Aldo Leopold through to the on-going long-term predator-prey studies of wolf—moose relationships on Isle Royale and other parts of North America and Africa, there has been much speculation about the relative importance of top-down and bottom-up factors in regulating densities of predators and prey (e.g. Skogland 1991; Mech and Peterson 2003). The discussion has also spilled over into discussions in modern conservation biology about the pervasiveness of trophic cascades and the role of predators as ecological keystones (Ray et al. 2005; Terborgh and Estes 2010). Reviewing this vast literature is beyond the scope of this chapter, but it is possible to extract some findings relevant for our discussion. Firstly, predators have been shown to have a diversity of behavioural and demographic effects on their prey and on other aspects of ecosystem function through trophic cascades. However, the strength of these impacts varies considerably across space (Melis et al. 2009, 2010) and time (Mech and Peterson 2003) and with the behaviour of the predator and the anti-predator strategy of the prey. Secondly, the impact of predators on prey is very much dependent on the numerical response of predator density as well on the functional responses of kill rates to changes in prey density (Andersen et al. 2006). Moreover, large carnivore populations operate at very large scales, with home ranges spreading across hundreds of square kilometres (Nilsen et al. 2005) and dispersal distances covering hundreds of kilometres (Samelius et al. 2012). This implies that spatial dynamics of large carnivores can only be measured on such large scales, making it hard to predict impacts at local scales. Additionally, many fine-scaled factors such as variation in habitat structure or snow depth can introduce micro-level modifications to the larger scale processes (Gorini et al. 2012), which introduce uncertainties in predicting larger scale dynamics. Furthermore, both large carnivores and large herbivores are influenced by external factors such as climate and disease that have the potential to induce dramatic changes in population sizes and predator prey relationships. Finally the empirical data underpinning our understanding of predator-prey systems is very limited, especially for systems with multiple predators and multiple prey, and time series are almost entirely rather short.

The present state of knowledge is sufficient to have a good qualitative idea of the impacts of predation and the types of predator-prey dynamics that can occur. However, it is very hard to predict in a quantitative way what will occur in any given location. This is especially true for Europe, where there have been very few long-term predator-prey studies. Therefore, it is rather difficult to speculate about what "natural predation processes" will actually be in any given location.

The Pervasive Impact of Humans

Despite the existence of many large protected areas where human impacts are minimised, just about all predator-prey systems on earth are impacted by humans in various ways. The most obvious and immediate effect is through human induced mortality of both predators and prey. While some of the planet's largest protected areas may insulate some large herbivores from human exploitation, there is still pervasive human impact through poaching and legal harvest within protected areas or on the herbivores that seasonally migrate outside the borders. For large carnivores, the situation is even worse as their wide-ranging movements more often carry them beyond protected area borders (Woodroffe and Ginsberg 1998). In a European context, where protected areas are often small, there are probably very few large predator individuals, let alone populations, that live their lives entirely inside protected areas (Linnell et al. 2001).

In addition to the deliberate targeting of these species, there are many other sources of mortality which humans induce, such as through vehicle collisions (Langbein et al. 2011) and cases where disease is transferred from domestic to wild species. Furthermore, humans have very strong impacts on herbivores through their manipulation of habitats (see Chap. 8). Forestry and agricultural practices have dramatic impacts on vegetation structure and productivity that can have both positive and negative impacts on herbivore and carnivore populations (e.g. Gill et al. 1996; Torres et al. 2011). In general, small scale forestry and agriculture lead to situations that increase productivity and benefit many herbivores. The winter feeding of wild herbivores is a widespread activity across most of northern, eastern and central Europe which has the potential to greatly influence herbivore distribution and density (Putman et al. 2011). Long-term deposition of nitrogen and climate change can also have dramatic impacts on the productivity of vegetation (Holland et al. 2005). Another impact comes from competition between domestic and wild species. Domestic herbivore densities tend to exceed those of wild herbivores and can have dramatic impacts on habitat structure and the productivity of vegetation, as well as providing potential prey items for predators. In many areas, animals of domestic origin have been, and still are, critical prey for large carnivores (Mattisson et al. 2011; Peterson and Ciucci 2003). Even predators of domestic origin (domestic cats and dogs) can compete with wild predators. A final impact occurs through the behavioural disturbance that human presence and activity can induce in both predators and prey (Moen et al. 2012). Given the mobility of both large carnivores and large

herbivores, the spatial impacts of these diverse perturbations are likely to influence the structure and functions of populations on scales of at least tens and hundreds of kilometres. Across Europe, there is a very high degree of diversity in the ways habitats, herbivores and carnivores are managed, such that actions in neighbouring countries could well have dramatic impacts on predator-prey dynamics even beyond their own borders (Putman et al. 2011; Kaczensky et al. 2013; Linnell and Boitani 2012).

Despite the pervasive impacts of humans, the recent history of large carnivore and large herbivore recovery in Europe has shown that these species have a remarkable ability to persist and thrive in human-modified landscapes. There are clear species-specific differences in this tolerance, with wolves and roe deer for example being especially tolerant of modified landscapes, and species such as bears and wild reindeer being least tolerant. Certainly there are limits to tolerance. Extreme habitat modification for intensive agriculture and high rates of disturbance can make many areas unliveable for many species (e.g. Schadt et al. 2002; Güthlin et al. 2011; Jedrzejewski et al. 2008). A lot of transport infrastructure has the potential to create barriers (Kaczensky et al. 2003). However, in general none of these species require areas free of human intervention, and most will in fact benefit to some extent from many low-intensity human activities (Basille et al 2009; Torres et al. 2011).

The Social Tolerance of Humans for Large Carnivores and Large Herbivores

Despite the potential for carnivores and herbivores to persist and even achieve very high density in human modified landscapes, the major limit to the densities they achieve is likely to be set by human tolerance for their presence. Herbivores create a diversity of conflicts with humans, ranging from damage to crops and forestry, the transfer of disease to domestic animals, and vehicle collisions (Gordon 2009). Regardless of the real level of conflict, large carnivores are associated with conflicts such as depredation on livestock, destruction of beehives, and competition with hunters for shared game. The level of social and political conflict that results from efforts to conserve species such as wolves and bears can be intense in some areas, especially in places where they return after long absences (Benhammou and Mermet 2003; Skogen et al. 2006). The effect of these conflicts is largely to reduce human tolerance for the presence of these species, which tends to result in efforts to limit the density or distribution of these species through lethal means.

The Problem of Natural Processes as a Goal

Based on the arguments presented above there are clearly some problems with having a “return to natural processes” as an ecological objective for large carnivores and large herbivores in Europe. Firstly, we do not exactly know what these

processes look like; making it hard to recognise the state even if we could reach it. Historical analysis represents very little help seeing as humans have been severely affecting all trophic levels in Europe for many millennia. Secondly, the impacts of humans on habitats, herbivores and carnivores is so pervasive that there simply are no areas large enough in Europe for these processes to occur without there being a major impact of human activity on all trophic levels. Thirdly, because of the conflicts that both herbivores and carnivores can induce with human activities there is likely to be little acceptance for allowing their populations to develop without some form of intervention and control (both in terms of reinforcement and reduction of populations under varying contexts)—which in turn is likely to impact the dynamics between predators and prey.

In other words, it is hard to know what these natural processes look like, it will be hard to achieve them in practice, and the process of trying to achieve them may be associated with significant levels of material and social conflict. Combined, these arguments represent severe technical and strategic obstacles for any effort to pursue "natural ecological processes" (in the sense that they are free from human interference) within a wilderness setting as a conservation goal for a large herbivore-large carnivore predator prey system in a European context. Another fundamental issue concerns the implicit assumption of these "natural process" goals that humans are not part of nature, and that their interactions with nature are not natural. This assumption has been instrumental in the construction of the "wilderness" ideal (Cronon 1995; Marris 2011; see Chap. 2). This dualistic worldview has been heavily rejected in recent years by anthropologists and nature philosophers in favour of a much more integrated view that firmly places humans as integral and interactive parts of nature (Descola and Pålsson 1996). Following this emerging line of argument, the interactions between humans and nature should be as much a legitimate target of conservation as the interactions between non-human parts of nature.

From Wilderness and Natural Processes to a Future Orientated Coexistence

Our arguments so far have caused us to raise serious questions about the extent to which "natural ecological processes" or "wilderness" are either potentially achievable or even desirable goals for the general conservation of large carnivores and large herbivores. Therefore, the question remains: what we should replace it with? The recent history of carnivore and herbivore conservation in Europe and their current status show that we have an incredible opportunity to integrate these species into very large areas of the European landscape. In many areas we may well be able to restore the full assemblage of species that have been found on the continent for the last few millennia. In some few areas this may occur in areas where there has been little human modification of habitat and where there is minimal direct influence by humans on the species. However, these areas will be the exception. As we have seen most of these species are tolerant to many forms of human activity. In

principle there are very few parts of the continent where at least some of the large herbivores and carnivores will not be able to live. This implies that wolves, bears, lynx, bison, moose, red deer, roe deer, ibex, chamois, wild boar and other species can look forward to rather wide distributions in the coming decades. The fact that this conservation will be occurring in multi-use landscapes implies that all trophic levels and interactions will be, to some extent, influenced by humans, often in radical ways. Despite this modification there is a huge potential for a diversity of ecological processes to resume, including predation and scavenging, albeit in modified ways.

In other words, even if "wilderness" is unattainable there is a huge scope for increasing the amount of "wild" in most parts of the European landscape. This conservation view is best termed the "coexistence" approach as it seeks to integrate wildlife and humans in a shared landscape. Its focus on achievable "wildness", rather than unobtainable "wilderness", allows for a much more optimistic view of conservation, where every small recovery can be viewed as a success, rather than lamenting how much it falls short of some ideal (Kirby 2009; Marris 2011). A wolf raising pups in a Spanish agricultural plain is a triumph for coexistence as it shows the dramatic return of a degree of wildness to an otherwise heavily domesticated landscape, even if the functionality of the system is as far from wilderness as you could ever imagine. Having wild animals back in more parts of the landscape will also secure a far greater degree of long term viability (for example by increasing connectivity) than would be achieved from having some few very special wilderness areas, even if they could be obtained. Conserving large carnivores only in some small "wilderness" areas is simply impossible (i.e. in a land sparing approach sensu Phalan et al. 2011) because of their spatial needs (Linnell and Boitani 2012).

The coexistence approach represents many challenges as it does increase the area of interface between humans and wildlife, which potentially opens for more conflicts (Gordon 2009; Linnell 2013). However, the approach also opens for humans to enter into mindful and interactive relationships with the wildlife and allows them to mitigate or react to these issues, and find some form of dynamic and active relationship with the species that share their landscapes. For many cases this relationship may require re-adopting some traditional practices (for example shepherding methods), but it will also require adopting many new and innovative practices such as electric fences and green bridges. While the coexistence approach is in many ways trying to take advantage of changing situations in Europe (see Chap. 1) it has nothing retrospective about it, which makes it stand out from many interpretations of "rewilding" (where the "re" suffix implicitly suggests a retrospective component). Rather it is a future orientated approach that seeks to build a sustainable relationship with wildlife in shared landscapes. This has rarely been achieved before in our history, and certainly has not been attempted on a continental scale in modern times, with all the pressures that our modern society is placing on the land. It will be an essentially hands on approach, requiring a lot of adaptive management as it seeks to find a way forward that can adjust to the ecological and societal dynamics of the human and non-human actors that are trying to share the same landscapes.

4.4 Conclusions

The last 40–50 years have seen a dramatic reversal in fortune for many large carnivore and large herbivore species. When the focus moves beyond saving them from extinction it is logical to begin exploring long-term conservation goals. It may be possible to create some areas with full species assemblages and a minimum of direct human interference on the species and their habitat (see Chap. 9). Such areas are clearly of a high degree of conservation and scientific interest. However, the spatial scales at which the dynamics of large carnivores and large herbivores occur and the huge human pressure on space and resources in Europe will inevitably lead to a range of subtle human influences on these areas, and will prevent these approaches from having general value at large scales. Therefore, we believe that defining goals in terms of "wilderness" and "natural ecological processes" (in ways that exclude humans and human activities) has very little relevance as a general model for large carnivore conservation in Europe. In contrast, because all these species have shown a high degree of tolerance for many human activities it is possible to imagine a future based on "coexistence" where they are integrated into a very large proportion of the wider multi-use landscape. This will permit a large degree of wildness to appear in many areas. The challenge will not be to minimise human impacts on them, but to find ways for these interactions to occur in a sustainable manner. This future will have fallen outside many of the conventional "rewilding" philosophies, which often have retrospective and hands-off connotations. It is a state that has rarely been achieved before and will require constant management and intervention. Within this framework, there is enormous scope for creating a "new-wild" which is built on such key ideas as diversity, interaction, tolerance, sustainability, and coexistence.

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