

Institutional Science for Policy Report on the damages produced by and the conservation status of wolves in Europe

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In an EU press release on September 4th, the European Commission invited local communities, scientists and interested parties to submit up-to-date data by September 22nd on wolf populations and their impacts. The Estación Biológica de Doñana CSIC has been working on large carnivore management and conservation and on the management of wildlife damages for decades, in collaboration with multiple international research bodies. In this Science for Policy Report we provide, together with collaborating scientists from other institutions, evidenced-based scientific information related to the petition expressed by the EC. This response also includes an evaluation of the suggested changes in management policies raised in the EC press release, which are of particular concern for the conservation of wolf populations. Those changes could compromise human-wolf coexistence in Europe and eventually downgrade coexistence targets in the management of other predators in Europe and worldwide.

Wolves are pivotal to functioning ecosystems

Scientific evidence is biased towards documenting and studying the costs of living alongside wolves and other predators as opposed to the benefits arising from coexistence (Lozano et al., 2019). However, several positive impacts arise from the presence of predators, including benefits from tourism and commercial activities, benefits from ungulate population control, benefits to regional and product marketing, cultural heritage and identity, recreation, educational and research benefits, and even social cohesion (Rode et al., 2021, Giergiczny et al. 2022). To base any species management solely on their negative impacts without considering the diverse benefits species provide to ecosystems and people is misguided and is likely to result in unintended consequences (O'Bryan et al., 2018; Ripple et al., 2014).

Wolves are an integral part of European landscapes, playing a fundamental role in ecosystem functioning and regulation, providing important ecosystem services (Ripple et al., 2014). Wolves reduce the prevalence of diseases in prey populations (Tanner et al 2019), buffer the effects of climate change on ecosystems (Wilmers & Getz 2005), support biodiversity by providing food subsidies to a wide range of species (Selva et al. 2005, Wilmers et al. 2003), shape the landscape and stream morphology (Beschta & Ripple 2012, Dobson 2014) and may even save human lives by reducing traffic collisions, as shown for other large carnivore species (Gilbert et al. 2016).

The European Council has recognized this vital role and proposed the further recovery of missing keystone species like the wolf. The aim is to restore ecosystems that have been lost or degraded in Europe and boost

their resilience to climate change (recommendation 145, 2010). The EU Biodiversity Strategy 2030 also aims to restore the habitat of species of Community interest and increase their resilience. In Europe, the Natura 2000 network and other protected areas are generally too small to support interconnected and self-sufficient large carnivore populations within their limits (Santini et al., 2016). In spite of this, coexistence between wolves and humans is nowadays possible across European landscapes and administrative borders (Cretois et al., 2021), which has been exemplified by the expansion of wolves across Europe in the last decades. This expansion is a successful example of the effectiveness of species protection and reduction of lethal control (Chapron et al., 2014).

However, in some human-dominated ecosystems, local communities oppose the presence of wolves as well as restructuring free-ranging livestock husbandry practices to minimize depredation. Almost 70% of the compensation for damages caused by large carnivores in Europe is for free-ranging livestock (Bautista et al. 2019). The number of wolves in 2022 in the 27 EU member states has been estimated at about 19,000, based on the best available data (Boitani et al. 2022). However, regardless of how widespread the assumption might be, the number of damages by large carnivores is not directly related to the number of individuals. Actually, damage occurrence is mostly driven by multiple socio-economic factors, including inefficient implementation of damage mitigation programs (Bautista et al 2017, 2019).

As apex predators, wolves have slow life histories and naturally low densities (Wallach et al., 2015), characteristics that make its populations vulnerable to lethal management. For instance, wolves may be unable to offset extra mortality via recruitment (Cardillo 2003). Indeed, most mortality comes from human persecution—the total mortality in wolves shows strong correlation with human offtake (Creel & Rotella 2010). Human persecution in the form of hunting, poisoning and culling has historically reduced wolf distribution and population size in Europe to a minimum reached during the second half of the 20th century (Wabakken et al., 2001; Lucchini et al., 2004; Clavero et al., 2022). The protection of the species under the Habitats Directive, together with conservation measures in many European member states (including a drastic reduction of lethal control) have been crucial in reversing this trend (Chapron et al. 2014, Ripple et al., 2014).

Wolves are not a danger for humans

In the press release accompanying the EC petition, the President of the European Commission, President Ursula Von der Leyen, states that “*The concentration of wolf packs in some European regions has become a real danger for livestock and potentially also for humans. I urge local and national authorities to take action where necessary*”. The assertion that wolves pose a danger to humans is fallacious. There have been no fatal attacks on humans reported in Europe in the 21st century (“[Facts about wolves in Europe](#)”, compiled by WWF) and the risk to humans from wolves is substantially less than that posed by other wild or domestic species, or by many sporting or leisure activities, including hunting. The case, widely covered by the media, about a British tourist found dead in Greece, was a fatal dog attack, not a wolf attack (Iliopoulos et al. 2022). Just in 2016, 45 persons were killed by dogs in Europe (Sarenbo and Sevnesson, 2021), and an average of more than 3 die annually for this reason in England and Wales (Tullock et al., 2023).

Lethal control does not reduce conflict

Livestock predation is the most common cause of conflict with carnivores (Thirgood et al., 2005). A thorough review of this issue showed that non-lethal methods were more effective than lethal methods at reducing livestock damages. Furthermore, several studies showing effectiveness of lethal methods had sufficiently serious design flaws as to call into question their inferences (Treves et al., 2016). Lethal control programmes for large carnivores are often ineffective at preventing livestock losses (van Eeden et al., 2018). Some lethal control may even be counterproductive, resulting in an increase in damage proportional to the number of wolves culled the previous season (Fernández-Gil et al. 2016). Human-caused mortality has detrimental effects on pack stability, reproduction and dispersal success (Cassidy et al., 2023; Morales-González et al., 2022); which in turn may increase the risk of livestock depredation (Imbert et al., 2016; Wielgus & Peebles 2014). Lethal control has also favored hybridization with dogs, especially in small, isolated or 'edge' wolf populations (e.g., Andersone et al., 2002, Gómez-Sánchez et al., 2018).

More importantly, predator removal may compromise the long-term viability of the predator's population (e.g. Lennox et al., 2018) and so might be contrary to conservation needs (Haber 1996). Altogether, the available literature clearly points to non-lethal methods as better mechanisms to reduce losses (van Eeden et al., 2018).

For decades, the main non-lethal action directed to manage conflicts arising from livestock depredation are damage compensation programs (Boitani & Linnell 2015). However, these programs alone have little capacity to reduce losses and yet a great potential to perpetuate low tolerance and negative attitudes towards wolves (Bautista et al., 2019). Attacks to livestock can be effectively reduced using well-established non-lethal methods such as livestock husbandry and guardian dogs (e.g. Petridou et al., 2023). For instance, electric fences and electrified fladry are shown to be 100% effective in reducing livestock losses (Miller et al., 2016). Guarding livestock with shepherds and dogs can reduce the risk of wolf attack by 80% and visual and auditory deterrents can decrease the same risk to zero (Eklund et al., 2017). In contrast, the effectiveness of lethal management as a method for reducing carnivores' attacks on livestock remains unclear (Moreira-Arce et al., 2018; van Eeden et al., 2018).

Conservation of Iberian wolves

The Iberian wolf population remains isolated from the rest of continental Europe. Despite the Iberian wolf population maintaining the largest population size in the EU through the late 20th century, its conservation status is currently assessed as Unfavorable - Inadequate in Spain and in Portugal (ETCBD 2019). A favorable status requires functional dispersal, which, especially in the Iberian context, could alleviate the genetic consequences of past bottlenecks (Vilà et al., 2003). Historical human persecution caused a severe decline of Iberian wolves, to the extent that the current Spanish wolf distribution represents only one third of the 19th century distribution (Clavero et al., 2022). Despite an expansion in recent decades, this population still shows small effective population size (Sastre et al., 2011), loss of genetic diversity (Salado et al., 2023), isolation from other European wolves (Hindrikson et al. 2017), and relatively small average pack size (Fernández-Gil et al., 2020). The southernmost wolf population in Sierra Morena has gone extinct in recent

decades (Boitani et al. 2022), causing the loss of unique genetic diversity (Salado et al., 2023). The current wolf range occupies only 35% of high quality areas predicted by the distribution range models for the Iberian Peninsula, showing that there is a large amount of suitable habitat unoccupied by wolves in both Spain and Portugal (Grilo et al., 2018). Nowadays, lethal management appears to be the primary cause hindering the Iberian wolf population recovery (Quevedo et al., 2019).

We found evidence that culling wolves does not decrease livestock losses. By analyzing official data on compensated damages and culled wolves in Asturias region (northern Spain) during 8 years, we found that wolf culling was followed by an increase in the number of compensated damages. Our studies show that culling of the wolf population failed in its goal of reducing damages, and suggest that management decisions are at least partly influenced by press coverage (Fernández-Gil et al., 2016). The culling intensity needed to dampen depredations is probably behind the legal mandates in the EC, that is, the lethal control intensity required to reduce livestock predation rates would be so high (Bradley et al., 2015) that would be incompatible with the EU conservation objectives for the species.

Concluding remarks

The statement by the Commission President that wolves have become a real danger for livestock is incoherent with the EC request for information about the impacts by making an *a priori* diagnosis without supporting data. As detailed above, there is substantial scientific knowledge on the negative impact of lethal management and the not favorable conservation status of wolves in Europe.

In order to translate scientific knowledge into policy, better transparency of the data collected by public administrations on the distribution, population size and conflicts are required. In spite of the EU mandate for transparent public data, the administrations often fail in providing the data they use in the characterization of the problem, and, when provided, it is in an aggregated way, with no explicit methodology, precluding the objective evaluation of the actual status of wolf populations and the extent of the predation problem. Additionally, the lack of standardized public information complicates comparing data from the different member states and their administrative divisions often affecting the same wolf population (Bautista et al. 2019).

Too often, the current existential crisis of traditional extensive farming is attributed to the presence of wolves and other predators. However, this serious socioeconomic problem affects all traditional farmers across Europe, whether they share the land with large predators or not. Diverting attention from the actual causal factors (i.e., the unfair competition with industrial farming and associated changes in consumers' preferences), will not help traditional farming practices to survive in the future. Instead of unfoundedly signaling predators, the EC should undertake a serious stance in designing sustainable agricultural policies that allows traditional farming to compete with the all-new, less sustainable and environmentally damaging industrial livestock raising.

Societal tolerance towards wolves is crucial to achieving successful coexistence. However, this will be hardly achieved with ineffective policies that perpetuate a negative perception of wolves and undermine the lowest

cost and highest success mitigation tools at our disposal. Instead, promoting tangible and intangible benefits of coexistence with wolves, may, to a greater extent, increase tolerance towards wolves (Kansky et al., 2016, Marino et al., 2020) and improve both the wolf's conservation status and human well-being.

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***Note:** *The Estación Biológica de Doñana is a public research institute belonging to the Spanish National Research Council CSIC, Spanish Ministry of Science and Innovation. Its research focuses on the conservation of biodiversity, including multiple research projects on large carnivores' population ecology and conservation and the management of wildlife damages.*

