

Science for Environment Policy

Top predators maintain regulating role in human-dominated landscapes – but human activity is greatest limiting factor on other species

Large carnivores play important roles in ecosystems by regulating populations of herbivores and other animals. Understanding how human activities affect the role of predators, particularly within human-modified systems such as [agricultural](#) landscapes, is, therefore, important. This study investigated how predator and prey populations were distributed in Transylvania, Romania, and assessed them in relation to human activities. The research highlights how relationships between large carnivores and people need to be considered as part of [biodiversity](#) conservation efforts, especially considering the successful recovery of several [large carnivore populations within the EU](#).

Top predators are a key component of ecosystem function. Large predators such as the brown bear (*Ursus arctus*) or grey wolf (*Canis lupus*) can control populations of deer and other herbivores by killing prey or changing herd behaviour. Fear of predators can cause herbivore herds to move more frequently or in smaller groups, for example, which can lead to changes in grazing patterns. Top predators may also affect the abundance of foxes and other small carnivores through competition for food and by direct killing. Human-dominated landscapes, such as agricultural land, can support top predators. Understanding the influence of humans on these predators (and their prey) has an important role to play in efforts to conserve and manage biodiversity.

In parts of Europe [large carnivores are making a comeback](#) and the reintroduction of mammal species can also be a part of conservation efforts such as ecosystem restoration or rewilding initiatives, such as [Rewilding Europe](#)¹. This study explored the relationship between humans and large carnivores in the foothills of the Carpathian Mountains in Transylvania, Romania, a traditional farming region that includes large areas of pasture and arable land as well as high [forest](#) cover and populations of large mammals.

To monitor the numbers of mammal species the researchers used camera traps in 138 locations, selected in relation to forest cover and within state-managed hunting grounds. Records of bear and wolf numbers were also used from the 35 hunting grounds within the study area. To explore the interactions between different groups of species and their habitats, the relative abundance of carnivores was then modelled in relation to surrounding land-use type, relative abundance of humans, prey (roe and red deer, *Capreolus capreolus* and *Cervus elaphus*), smaller predators such as red foxes (*Vulpes vulpes*) and large dogs used to guard livestock.

Between May and August 2013 (with individual cameras operating for between 20 and 29 days), the camera traps recorded 2 197 occurrences of roe deer, 388 of red foxes, 275 of humans, 120 of dogs, 94 of red deer, 76 of bears and 2 of wolves. As wolf and bear observations were limited, additional information on their numbers was obtained from the 35 hunting grounds and added to the analysis. Humans and top predators (dogs, wolves and bears) had a stronger influence on the occurrence of other species than did the surrounding [land use](#). As expected, the presence of humans limited all other species apart from dogs. Wolves limited the presence of red deer and this effect was three times stronger than the positive effect of the availability of pasture. Bears limited the presence of roe deer and the surrounding land use was also a key determinant for bears, which were found in areas of higher forest and lower pasture cover.

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1. [Rewilding Europe](#) defines
rewilding as follows: rewilding
ensures natural processes and
wild species play a much more
prominent role in land- and
seascapes, meaning that after
initial support, nature is allowed
to take more care of itself.

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The research shows that top predators can maintain their important role as limiters of herbivore populations in agricultural landscapes. However, as human activities limited the presence of all other mammal species in this study, humans may have a stronger influence on ecosystem processes and species densities than other top predators. For example, human effects on red deer densities were 4.6 times greater than the effect of wolves. As well as direct killing of predators and deer through hunting, humans can alter habitats and densities of wild species, e.g. by using land for agriculture, and cause changes in deer behaviour through the use of livestock guard dogs.

The researchers point out that humans do not fulfil the same ecological role as bears and wolves in controlling herbivore populations. Suppression of bear and wolf numbers could, therefore, lead to increases in herbivores with knock-on effects on ecosystems, such as overgrazing and a reduction in tree regeneration. Species protection and management programmes cannot protect their target species or ecosystems without also accounting for human effects at all levels of the food pyramid. The researchers therefore recommend that human activity be considered an influential part of the ecological system, rather than being dealt with in separate analyses. This may be particularly important in areas of Europe which are seeing the return of native wildlife, including the wolf and bear, due to the success of conservation efforts such as the [Habitats Directive](#)².



2. Habitats Directive (Council Directive 92/43/EEC): <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043>