

Understanding the Lynx



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Telemetry studies of the lynx population in Białowieża Forest are providing valuable information on the species

Once hunted as pests and for their beautiful pelts, today they are carefully studied and protected. The Eurasian lynx is the largest feline predator in Europe. It has a distinctive body shape, characterized by a relatively short body, long limbs, a short, bobbed tail, and long tufts of hair on the tips of its ears. The species inhabits large parts of Eurasia, from Scandinavia, the Baltic States, Poland, and Slovakia all the way to the Far East. Centuries ago, it roamed the extensive forests covering much of Europe; however, as forest environments became smaller and the lynx were increasingly hunted, the species survived in the more remote eastern and northern parts of the continent. In Poland, on the western boundary of the species' natural reach (not including regions where it has been reintroduced), the lynx can be found in the Carpathian Mountains and a few large forest complexes, isolated from one another, in the north-eastern reaches of the country (Białowieża, Knyszyn, and Augustów Primeval Forests).

Studies of lynx populations in their largely fragmented environment have been conducted by the PAS Mammal Research Institute in Białowieża as part of a long-term, wide-ranging program covering various aspects of the species' biology and ecology. Research using state-of-the-art methods such as telemetry and DNA studies focuses on discovering the role played by the lynx in the ecosystem and factors affecting the density, survival and endurance of its populations.

Counting the lynx

Pioneering radio telemetry studies in the lynx's natural environment in Białowieża Forest have provided unique data on the size of the populations' home ranges and spatial structures, as well as the potential of exchange of individuals between populations. The studies have noted the predator's very significant territory requirements, with the average range for an individual reaching 200-300 km². They have also shown that young, migrating individuals frequently take long journeys (over 100 km). The results have shown the difficulties faced by the species as a result of the fragmentation of their natural environment. They have also brought forward a thesis that a continuity of forest environments is essential for the continuing survival of the species, maintenance of a sufficient number of individuals, and strong genetic diversity.

Perilous fragmentation

In order to find out whether the current distribution of lynx populations in a highly fragmented environment near the boundaries of the species' reach has a significant effect on its genetic diversity, the PAS Mammal Research Institute has conducted microsatellite and mitochondrial DNA analysis in a population occurring in northern and eastern Europe.

The studies have revealed a significant genetic diversity between lynx populations



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ranging from northern Scandinavia to the Carpathian Mountains. Geographically distant groups have shown particularly significant diversity. However, researchers also noted that groups inhabiting neighboring but isolated forest environments, such as the Białowieża and Knyszyn Forests, also exhibit high genetic diversity. They found that lynxes from the Scandinavian Peninsula and the Carpathian Mountains show no diversity in their mitochondrial DNA, with animals from the Białowieża Forest also showing relatively low diversity. Considering that lynxes are able to undertake long-distance journeys, the results show that a fragmented environment has a powerful effect on gene

flow in lynx populations, which is far more significant than random migrations.

While a relatively large part of Poland is still covered with forests, their distribution (fragmentation and lack of continuity) is undoubtedly one of the most important factors that limit free gene exchange and the ability of individuals to colonize new territories. A project coordinated by the PAS Mammal Research Institute since 2000, counting and monitoring of large predators on a national scale, has estimated the number of individual lynxes in Poland at 200. It has shown that despite the species being protected, its numbers are not increasing, and the animals are unable to rebuild their populations

The lynx has a relatively short body, long limbs, a short, bobbed tail, and tufts on the end of its ears

Endangered predators



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The diet of the lynx is dominated by roe and red deer; unfortunately these species are also popular among human hunters. Human hunting reduces prey numbers, depriving the lynx of suitable amounts of food

in areas they once inhabited. This confirms that a lack of continuity of forest environments has a direct impact on the size of the lynx population, and may also influence its endurance.

Important forest structures

The relationship between environmental fragmentation, genetic diversity of lynx populations, and their chances of survival closely depends on the animals' specific environmental requirements. Telemetric studies in Białowieża Forest have shown that lynxes rarely leave the dense forest environment. The internal structure of the forest plays an important role in the biology of these animals. During their hunts, the predators select locations with forest floors of high complexity, comprising elements such as root hollows, tree stumps, shrubs, undergrowth, and so on. The cats' hunting style requires good ground cover to allow them to stalk their prey and make a successful kill. A good environment for lynxes is one with dense vegetation such as bracken,

saplings, and other growth reducing visibility and accessibility, as well as providing suitable conditions for rest. Overgrowing clearings and fallen tree trunks are also key, as they provide feeding ground for red deer and roe deer – the main prey of the lynx. As such, the basic environmental structure characterizing many forest environments in Poland is one of the reasons preventing lynxes from distributing and colonizing new territories.

Human hunters: bad news for lynxes

The most important factor governing the density of the animals' population, environmental and reproductive capacity, and mortality, which all contribute to population growth, is availability of food. The lynx is a typical carnivore; it feeds on various species, although its diet is dominated by large hoofed animals, such as red deer and roe deer. Despite its compact body size (adult males weigh up to approx. 25kg), the lynx can bring down prey up to four times larger. Studies conducted in Białowieża Forest con-

firm that roe deer constituted over 60% of the lynxes' diet, with red deer contributing over 20%. Precise observations of telemetrically-tagged animals confirm that a single lynx kills new prey on average every 5.4 days. This was extrapolated to calculate that during an average year, a lynx kills and consumes between 50 and 60 large mammals, or up to approximately 26% of their populations. As such, the predator has a significant effect on the population levels of its prey, and can have a serious effect preventing the increase in numbers of roe deer.

At the same time, both roe and red deer are popular among human hunters. If human hunting significantly reduces the number of deer, it may have a negative effect on lynx populations, which rely on deer for survival. Long-term research conducted in Białowieża Forest into the dynamics of deer populations and the numbers and spatial structure of lynx populations between 1991-2006 has made it possible to follow the predators' response to temporary fluctuations in the numbers of deer resulting from intensive bursts of hunting activity. They show a significant correlation between deer population density and the size of the lynxes' home ranges. Since the lynx is a territorial animal, an increase in a given individual's home range leads to a reduced territory available to other individuals, and in turn to a reduction in the size of the overall population. Decreased deer availability also has an effect on survival of lynx cubs, since adult females must consume three times the usual amount while they are rearing their young. In effect, the estimated number of lynxes in the Białowieża Forest fell by approximately 30-40% during the period.

Active conservation

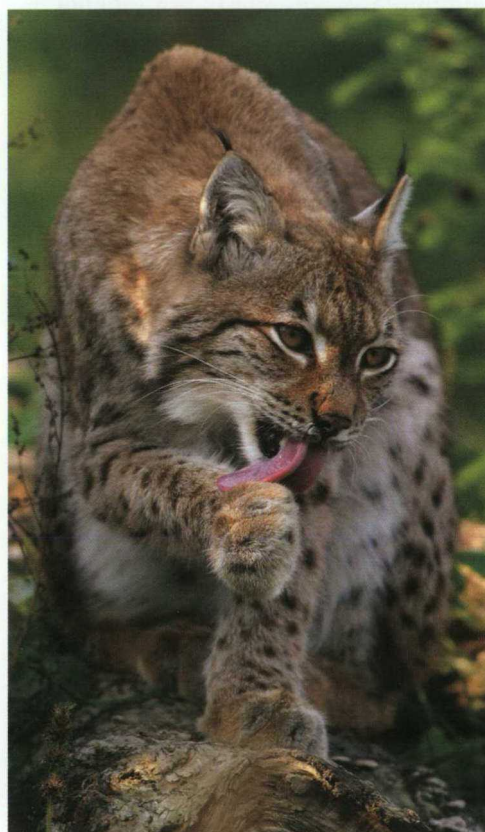
Although the lynx is not endangered on the global scale, on the boundaries of its reach it is subject to numerous factors that can have a negative effect on its population levels. In areas where its reach is continuous and the forest environment is dense, such as in Russia, Latvia, and Estonia, the numbers of individuals continue to grow despite intensive hunting activities in the region, whereas in Poland, Lithuania, and Belarus, where the lynx is strictly protected, its populations have remained at low levels

for many years, and may even experience local dips. The results of studies conducted by the PAS Mammal Research Institute portray the lynx as a predator extremely sensitive to any environmental changes. Reducing its free migration by environmental fragmentation results in a lowered ability to exchange genes and a reduced genetic diversity of populations, while poor forest structures and excessive deer hunting contribute to a lowered environmental capacity for the species by making it difficult to catch prey and rear young. As such, successful conservation of this species requires efforts to strive to reconstruct the continuity of forest environments (ecological corridors), increase the diversity of forest structures, and secure management of deer populations taking into consideration the need of large predators. ■

Further reading:

Schmidt K, Ratkiewicz M, Konopiński MK. (2011). The importance of genetic variability and population differentiation in the Eurasian lynx *Lynx lynx* for conservation, in the context of habitat and climate change. *Mammal Review* 41: 112-124

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Successful conservation of the lynx requires human efforts, such as reinstating the continuity of forest environments