

The level and variability of damage caused by wolves among livestock in the Subcarpathian Province in 2004-2013

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Over a ten-year assessment period an upward trend was observed in the amount of damage to livestock in the Subcarpathian Province, in terms of both quantity and the amount of compensation paid. Most of the damage occurred in three counties (Bieszczady, Sanok and Lesko), covering the Bieszczady region, due to the high density of wolf populations as well as to the tradition of free-grazing animals in these areas. As compensation for damages places such a large financial burden on the State Treasury, radical preventive measures should be taken to limit the damage or possibly to reduce the population of predators inflicting damage on livestock.

KEY WORDS: damage / livestock / responsibility for damage / wolf

Poland is one of the few European countries where large predatory mammals (bears, wolves and lynxes) are present. However, wherever these predators are present in areas used for agricultural purposes, especially livestock farming, conflicts involving significant damage to livestock populations often arise. Predation by wolves raises the most controversy, mainly due to the wide range of occurrence of this species and its high population density in some places. One such region is the Subcarpathian Province. Although the share of farmland in the total area of agricultural land is well below the national average, the share of permanent pasture, at 16.3%, is nearly double the national average of about 8.5% [11]. This means that large numbers of ruminants, mainly sheep, are grazed freely in these areas. According to Central Statistical Office (GUS) data, the sheep population in the Subcarpathian Province in recent years has been about 20,000, which in relation to the area of farmland was one of the highest in Poland, at 3.1 sheep per 100 ha [11].

At the same time, one of the largest wolf populations in the country inhabits in the same area. Despite the fact that according to various authors, both in Europe and in North America, the diet of wolves is based on wild ungulates, especially of the deer family, nevertheless in areas with intensive livestock farming and grazing wolves cause quite severe damage to their populations [1, 3, 6, 7, 8, 9, 13, 14, 16]. Because wolves in Poland are a strictly protected species, the possibility of reducing their numbers is limited, and it is often impossible. The minister of the environment may authorize the capture, relocation or culling of wolves if it is necessary to limit agricultural damage, but only in situations where there are no alternatives and such measures will not endanger the population. Thus, despite the legal possibilities for reducing the population, it is difficult to carry out in practice. Under these conditions, alternative solutions must be applied, especially in the form of precautionary measures regarding wolf predation on livestock, as well as protection programmes. However, when all preventive measures fail to produce results and damage occurs, it is the legal owner of the wild animals, i.e. the State Treasury, that is responsible for estimating the loss and paying compensation. These actions are carried out by representatives of the Regional Directorate for Environmental Protection associated with the site where the damage occurred, and in the case of national parks, by park directors [4, 5, 18]. At the same time, liability for damage caused by certain species of protected animals, according to the provisions of the legislation in force, differs from the forms of liability defined by what are known as general principles. Its range is restricted to five species of wild animals and an enumerative range of damage. It is also a form of limited liability, as it does not cover lost profits but only actual damage. In addition, this form of responsibility bears the mark of strict and not absolute liability, which entails certain limitations on its assumption [4, 10, 17].

A study was conducted to assess the magnitude of and variation in damage inflicted by wolves, taking into account the number animals killed and the amount of compensation paid in the Subcarpathian Province in the years 2004-2013. The analysis also included the spatial distribution of the damage, broken down by the individual counties of the province where the incidences of damage occurred.

Material and methods

The study was based on field procedures for assessing damage to livestock conducted by the Regional Directorate for Environmental Protection in Rzeszów. These procedures include assessment of animal losses according to species, and in particular the type of wounds inflicted by predators and the degree of consumption of the victims. These two elements are used to determine the cause of the animal's death. Because the damage assessments are carried out by same unit throughout the province, the procedures are the same in all cases.

The assessment covered the ten-year period from 2004 to 2013. The analyses included the number of animals killed each year, broken down by species, and the amounts awarded and paid out in compensation for losses suffered by farmers. In addition, the spatial distribution of damage was analysed by assigning incidences of damage to individual counties in the province.

Results and discussion

Number and breakdown of animals killed

In the ten-year period, a total of 4,831 cases of livestock animals killed by wolves were recorded in the Subcarpathian Province (Fig. 1), on average 483 animals killed each year. During the evaluation period there were fluctuations in the number of animals killed. An upward trend was observed between 2004 and 2010, but a significant decrease during the last three years of the assessment period. Thus, although the trend line equation for the entire assessment period ($y = 7.9212x + 439.53$) indicates a slight increase in damage, it cannot be definitively concluded that there is a continuing upward trend in the number of farm animals killed in the area under evaluation.

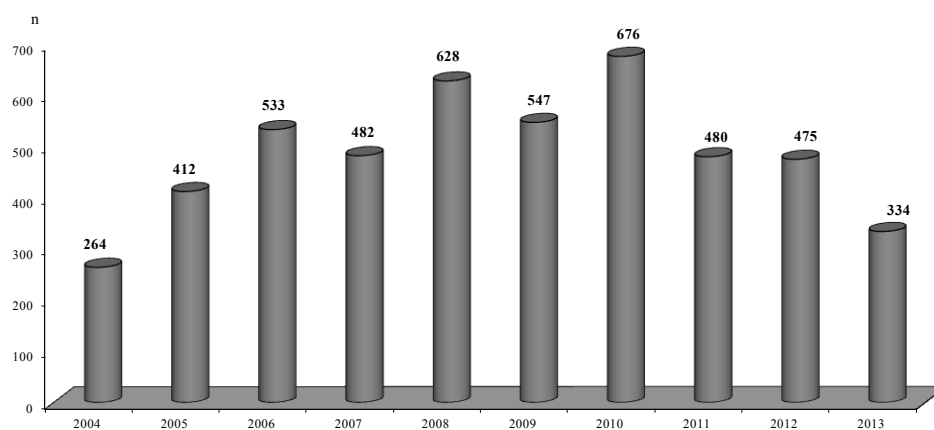


Fig. 1. Number of livestock killed by wolves in the Subcarpathian Province in 2004-2013

The vast majority of animals killed were sheep (Tab.). In the first two years of the evaluation period, the proportion of sheep was 88%, and in the next six years it was over 90%. This percentage reached a peak in 2008, when sheep accounted for 95.4% of the total number of farm animals killed. In the last two years, the share of sheep

among killed livestock decreased, ranging from 83% to 89%. The other species killed, in descending order, were cattle – on average slightly over 4%, goats – slightly over 3%, and horses – about 1.5%. In addition, in 2004 the wolves killed two dogs, and in 2011-2013 fallow deer and sika deer that had been fenced in as farm animals.

Table

Species structure (%) of livestock killed by wolves in the Subcarpathian Province in 2004-2013

Species	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sheep	87.9	88.1	94.9	90.2	95.4	92.9	91.6	93.1	83.4	88.9
Cattle	6.4	4.9	1.7	7.1	1.4	3.1	1.9	0.8	8.2	5.1
Goats	3.8	6.5	1.9	2.7	2.6	2.0	4.4	2.7	2.7	2.1
Horses	1.1	0.5	1.5	–	0.6	2.0	2.1	2.1	3.4	0.9
Dogs	0.8	–	–	–	–	–	–	–	–	–
Fallow deer	–	–	–	–	–	–	–	0.2	0.2	–
Sika deer	–	–	–	–	–	–	–	1.1	2.1	3.0
Total	100	100	100	100	100	100	100	100	100	100

Amount of compensation

In the ten-year evaluation period, the total compensation paid for livestock losses due to predation by wolves in the Subcarpathian Province was 2,253,056 PLN. In the years 2004-2008, an annual increase in the amount of damages was observed (Fig. 2). After a slight reduction in annual compensation claims in 2009, a year later they again increased. In 2011 the amount of compensation decreased considerably, to a value of 210,000 PLN, and a year later rose to the highest level of the entire evaluation period – slightly over 300,000 PLN. In the final year of the assessment period, the amount of compensation paid approached the level of the first year, at 152,000 PLN. The analysis of the 10-year period of damage caused by wolves in livestock showed fluctuating trends, as in the case of the number of animals killed every year. Although the value of the trend line equation $y = 6943.8x + 187115$ indicates an upward trend in the amount of compensation paid for damages, the lack of significance of the linear regression does not justify this type of inference.

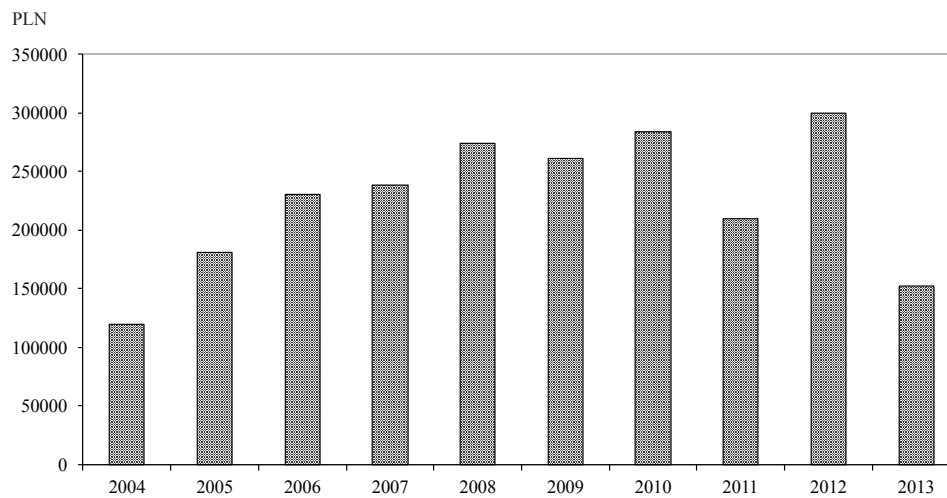


Fig. 2. The amount of compensation (PLN) for livestock killed by wolves in the Subcarpathian Province in 2004-2013

Spatial distribution of damage

In the evaluation period, wolves caused damage in 11 counties (*powiats*) of the Subcarpathian Province. In terms of the number of animals killed, Bieszczady County had the largest share of the damage, with more than 40% over the 10-year period. The amount of compensation paid in this county was also the highest, accounting for 44.16% of the total amount (Fig. 3). The next counties, in terms of both the number of animals killed and the amount of compensation paid, were Sanok and Lesko Counties. Compensation paid in Sanok County accounted for 24.37% of the total amount paid in the 10-year period, and compensation in Lesko County for 17.08%. In Krosno and Przemyśl Counties, the amount of compensation paid was similar and did not exceed 6% of the total. In Jasło County, the share of compensation was 2.3%, while the remaining five counties had only isolated instances of damage and their share of compensation paid ranged from 0.04% to 0.25% of the total amount.

The distribution of livestock killed by wolves with respect to the area of individual counties, i.e. animals killed per km², is almost identical to the distribution of the number of killed animals. The highest rate of damage was recorded in three counties, Bieszczady, Lesko and Sanok, at 1.7, 1.2 and 0.99 animals per km², respectively. In Krosno and Przemyśl, the level of damage per unit area was slightly lower, at 0.25 animals per km². In other counties where damage occurred, its density was low, not exceeding 0.09 animals per km².

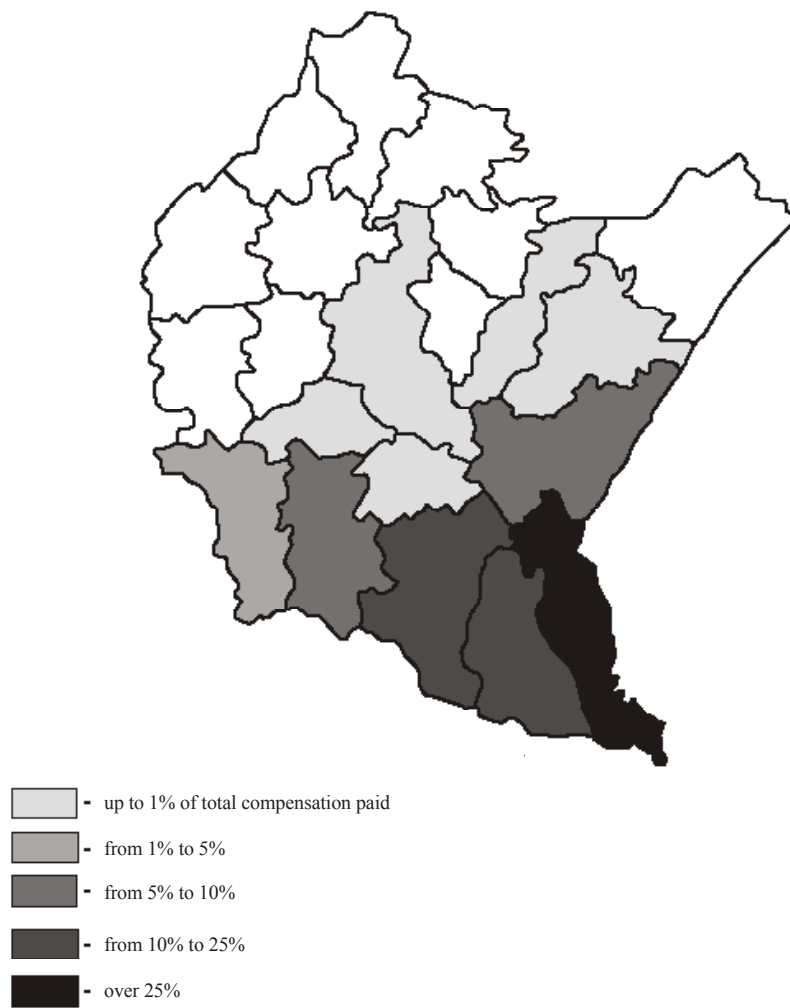


Fig. 3. Spatial distribution of damage caused by wolves in terms of the amount of compensation paid in the Subcarpathian Province in 2004-2013

The problem of increased damage to livestock inflicted by large predators, especially wolves, appears in many countries where the population of these predators is stable and has high densities in some areas. As a rule, the costs associated with the protecting wolf populations, mainly in terms of preventive measures taken and the amount of compensation paid, are quite high, and what is more, they do not compensate fully for

the losses suffered by livestock farmers [1, 2, 12, 15]. According to Cozza et al. [2], in areas with high densities of wolves, each farmer records at least one attack on livestock a year, while a third of farmers note an average of two wolf attacks a year.

It should also be noted that wolf predation on farm animals has two types of negative consequences. The first of these is undoubtedly direct costs in the form of compensation for killed animals, and the other is indirect consequences in the form of losses in the foundation stock of young animals, which are generally easier prey, as well as losses of livestock with high performance. According to Steele et al. [12], the indirect effects of wolf predation can be two to three times higher than the direct consequences assessed on the basis of the amount of compensation paid.

Under current environmental conditions, multi-faceted attempts are being made to mitigate economic and social conflicts through the use of various types of protection programmes and preventive methods for protecting livestock. The measures taken mainly involve the use of specially trained dogs, primarily sheepdogs, for the round-the-clock protection of flocks of sheep and goats in their grazing areas [14, 16]. If these measures are not effective, there are legal instruments in some countries, including Poland, making it possible to reduce the number of wolves in areas where it is high and the damage they inflict is severe [18].

The analyses revealed considerable variation in the amount of damage caused by wolves among livestock in the Subcarpathian Province during the evaluation period, both in terms of numbers of animals killed and the amount of compensation paid. Despite a slight upward trend, statistical analysis does not allow us to infer that there has been a clear increase in damage. Nevertheless, the current state of liability of the State Treasury for compensation paid should be considered high. The highest share of losses during the entire assessment period was noted in three counties, Bieszczady, Sanok, and Lesko, which cover most of the Bieszczady Region. This is due to the high densities of wolves in this region, as well as to the tradition of free grazing in these areas, especially sheep.

The results presented show only the direct effects of the killing of livestock by wolves, without capturing the indirect effects (loss of young animals and those with breeding certificates), which are not subject to assessment under current legislation, but may even be several times higher.

In view of to the amount of compensation paid every year, preventive measures to protect livestock from predation by wolves should be stepped up, or radical measures should be considered in some cases to reduce the number of predators in the most severely affected areas, and in particular to remove individual wolves that specialize in hunting farm animals. This type of measure is allowed by legal instruments in the country.

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