

## EFFECTS OF ROADS ON POPULATIONS OF WILD GAME IN THE LUBLIN REGION

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**Summary.** The objective of the study was to compare the depletion rates of big game population caused by vehicle traffic on existing roads of the Lublin Region in recent years and to analyse the possibilities of preventing such events. Analyses of the impact of road traffic on the number of collisions and fatal accidents show that the sites of the events are not random. The animals that are most frequently killed on Polish roads are amphibians, medium-sized forest and field/forest mammals (hedgehog, marten, fox, badger, and hare) and large mammals (roe deer, wild boar, red deer). The problem seems to be downplayed despite the fact that, according to scientific statistics, the number of vehicle-large mammal collisions may be as much as four times higher than what the police statistics indicate.

**Key words:** road accidents, wild game, wildlife crossings, migration corridors

### INTRODUCTION

The expansion of the road network, including the construction of new expressways, is a key element of Poland's ongoing intensive development. The planned modernisation of Polish sections of the Trans-European Transport Network by the year 2013 includes the upgrading of about 1700 km of existing roads and the construction of 1500 km of new motorways and 2200 km of expressways. The intensity of traffic on existing roads has doubled over the last decade, and a constant and considerable increase in traffic is forecast to continue. It has to be remembered that a serious consequence of transport infrastructure development is greater animal mortality [Kurek 2007]. The objective of the study was to compare the depletion of the big game population caused by vehicle traffic on the existing roads of the Lublin Region in recent years and to analyse the possibilities of preventing such events.

## MATERIALS AND METHODS

Data concerning the number of animals killed on the roads of the Lublin Region come from the Regional Directorate of State Forests in Lublin (Annual Hunting Plans and Long-Term Hunting Farm Plans between the seasons of 2003/2004 and 2008/2009) and the Provincial Police Headquarters in Lublin. The number of animal deaths considered in the study was reduced by 15% in the case of red deer and 5% in the case of roe and fallow deer because such a percentage of deer fall prey to wolves in the Lublin Region as indicated by the statistics and observations made by the Regional Directorate of State Forests in Lublin (unpublished data).

## RESULTS

Data registered by the Provincial Police Headquarters in Lublin concern road events involving all animals, without differentiating between game and other animals. The road events involving animals were recorded in the Lublin Region between 2004 and 2008 shows Table 1.

Table 1. The road events involving animals in the Lublin Region in years 2004–2008

| Year | Accidents | Collisions | Events in total | Injured |
|------|-----------|------------|-----------------|---------|
| 2004 | 4         | 884        | 888             | 4       |
| 2005 | 8         | 848        | 856             | 10      |
| 2006 | 3         | 918        | 921             | 6       |
| 2007 | 4         | 1141       | 1145            | 6       |
| 2008 | 5         | 1341       | 1319            | 5       |

Worth noting is the fact that the police are not notified about all events because some people feel apprehensive about the consequences of the event, while others do not believe that the police will be able to help them in any way: the vehicle repair costs are not reimbursed under an insurance policy if there was a 'Beware of wild animals' sign on the roadside.

On average, 134 red deer (*Cervus elaphus*) died annually as a result of road collisions in the Lublin Region between the hunting seasons of 2003/2004 and 2008/2009 (Tab. 2). The highest mortality, 186 animals killed, occurred in the season of 2006/2007. Recently the mortality of this species has decreased as only 65 deaths were recorded in the 2008/2009 season (Fig. 1).

The number of elk (*Alces alces*) killed in road accidents has increased in recent years. The greatest number of collisions (33) was recorded in the 2008/2009 hunting season, nearly triple the number of these animals killed in the seasons of 2003/2004 and 2006/2007 (12). The number of accidents probably stems from the increasing elk population in the Lublin Region (Fig. 2) and the fragmentation of home ranges caused by the expansion and modernisation of the road network.

The lowest number of accidents was recorded for fallow deer (*Dama dama*), owing to the limited population size and small home ranges of this species in the Lublin Region. During six years, on average, 9 animals were killed annually (Table 2). The highest number of collisions was recorded in the seasons of 2005/2006 and 2006/2007: 16 and 18, respectively (Fig. 3).

Table 2. Average number of different species of game killed in road accidents in the Lublin Region

| Species     | Number of animals per year |
|-------------|----------------------------|
| Red deer    | 134                        |
| Elk         | 18                         |
| Fallow deer | 9                          |
| Roe deer    | 836                        |
| Wild boar   | 113                        |

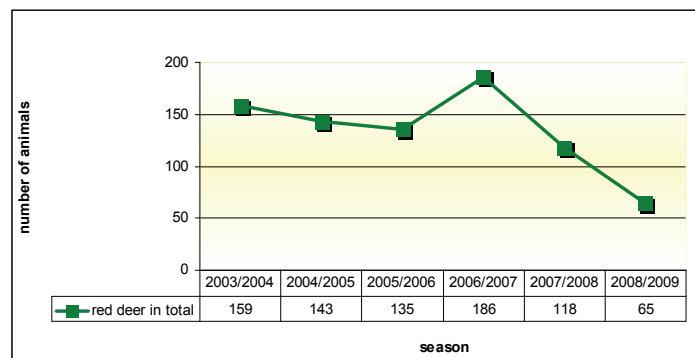


Fig. 1. Number of red deer (*Cervus elaphus*) killed in road traffic collisions between the seasons of 2003/2004 and 2008/2009 in the Lublin Region

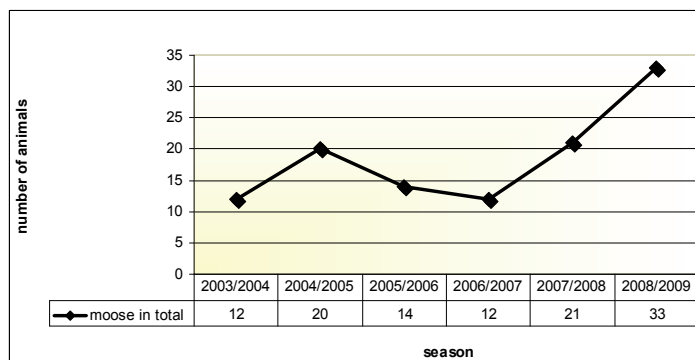


Fig. 2. Number of moose (*Alces alces*) killed in road traffic collisions between the seasons of 2003/2004 and 2008/2009 in the Lublin Region

Roe deer (*Capreolus capreolus*), the smallest among deer species in Poland, was another population considered in the study. Since this population is quite numerous in the Lublin Region, the number of collisions involving this species was the highest compared to other populations studied (Fig. 4). An average of 836 animals died annually (Tab. 2).

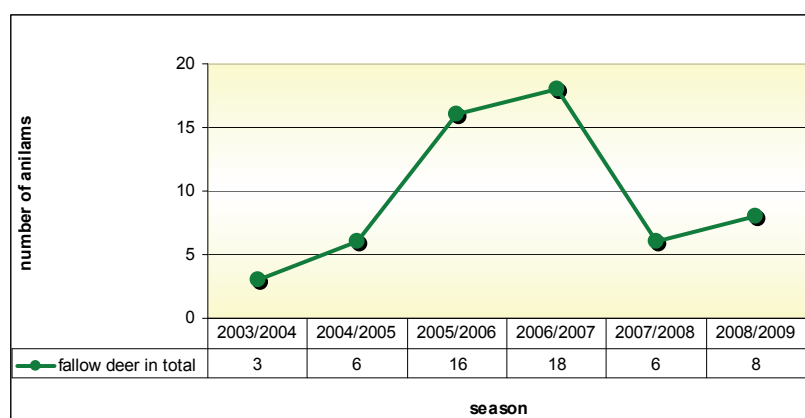


Fig. 3. Number of fallow deer (*Dama dama*) killed in road traffic collisions between the seasons of 2003/2004 and 2008/2009 in the Lublin Region

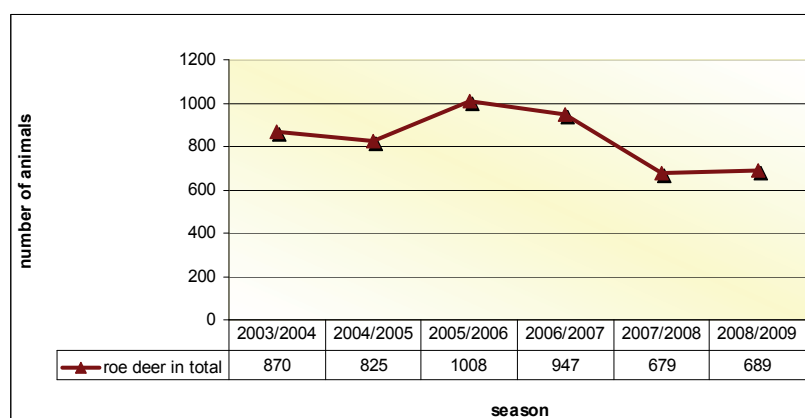


Fig. 4. Number of roe deer (*Capreolus capreolus*) killed in road traffic collisions between the seasons of 2003/2004 and 2008/2009 in the Lublin Region

Wild boar (*Sus scrofa*) was the last of the species under study. During six years, on average, 113 animals were killed annually (Tab. 2). However, a particularly marked increase in accidents involving wild boar was recorded in the season of 2005/2006 (137) and the mortality rate has remained on that level until

the present. It results from the high reproduction following mild winters and, in consequence, a growing wild boar population: it increased by 160% between 1991 and 2008 (Fig. 5).

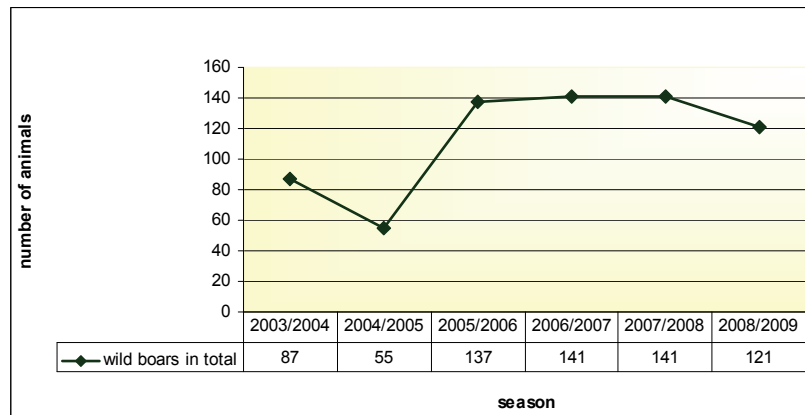


Fig. 5. Number of wild boars (*Sus scrofa*) killed in road traffic collisions between the seasons of 2003/2004 and 2008/2009 in the Lublin Region

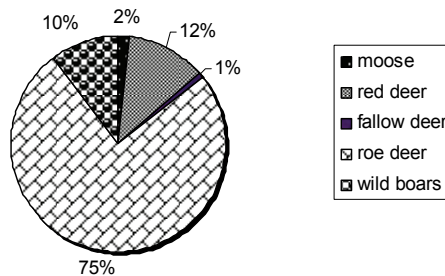


Fig. 6. Percentage of different types of wild game involved in road accidents in the Lublin Region

Increase in the number of vehicle-animal collisions in the seasons of 2005/2006 and 2006/2007 was probably caused by low mortality of animals during the mild winters, which resulted in high reproduction levels in 2006/2007 [Kamieniarz 2008]. In the winter, deer are characterised by cluster-like distribution as they stay close to feeding grounds thanks to which they are less vulnerable to road mortality. Mild winters with a limited or no snow cover at all may also result in greater dispersal of animals throughout their home ranges.

Recorded data from the Annual Farm Hunting Plans regarding the animals killed indicate that the greatest depletion affects the roe deer population whose annual mortality rate of 836 animals represents 75% of accidents involving game

in the Lublin Region. The share of collisions involving red deer and wild boar is much smaller (12 and 10%, respectively). Elk and fallow deer show the lowest mortality rate (2 and 1%, respectively) (Fig. 6).

## CONCLUSIONS

Originally, forests were the dominant group of land ecosystems in terms of area covered, hence the reduction in acreage and fragmentation of ecosystems is most conspicuous in the case of forests. Wetlands, bogs and river valleys represented another important kind of habitat. They all have been affected by considerable fragmentation and their continuity is now disrupted by built-up areas, roads and railways. Until recently people did not realise that numerous ecological processes occur on a very large spatial scale. The disruption of habitat continuity has resulted in a seriously reduced range of many animal species [Jędrzejewski 2009].

Species characterised by high mobility, large territorial requirements and large movement ranges are the most vulnerable to the destructive effect of ecological barriers created by roads. Species considered in this study, i.e. elk, red deer and wild boar, as well as wolf, lynx, bear and bison, are particularly vulnerable owing to their demanding living space requirements and large movement ranges. The species studied are intimately associated with forest environment and any restrictions on their movements between forest complexes pose a significant threat to them [Kurek 2007].

Large predatory mammals rank among species with the greatest territorial requirements in Poland. The territory of a wolf pack covers approx. 250 km<sup>2</sup>, while a lynx needs a territory of 100 to 200 km<sup>2</sup>. Hoofed mammals are also demanding in this respect, e.g. a bison needs 90 km<sup>2</sup>, roe deer 10 to 30 km<sup>2</sup>, wild boar 10 to 20 km<sup>2</sup>. Younger wild boars live within a much larger area of approx. 100 km<sup>2</sup> [Spitz 1992, Oliver *et al.* 1993]. When studying the seasonal changes in the size of home ranges, Massei *et al.* [1997] observed changes between 313 and 247 ha for females in two consecutive years in Maremma Park in Italy [Fisher *et al.* 2004]. Home ranges of small- and mid-sized mammals (roe deer, fox, hare, and badger) do not exceed a few square km. The stable and steady movement of a species relies on the freedom of individual animals to move freely. The movement of animals is linked with the satisfaction of their basic life needs, i.e. getting food, finding shelter, reproduction. Animals with the largest territorial requirements (home range and movement distance) are at the highest risk from the development of the road network. The greater the area used by a given species, the more vulnerable it is to the negative effect of roads, as confirmed by the number of wild game killed by traffic.

The presence of species with large territorial requirements and their free movement in a fragmented environment is only possible thanks to ecological

corridors (wildlife migration corridors) that are usually formed by woody, bushy or waterlogged areas having natural linear vegetation and located between habitat patches. The corridors provide the right conditions for the movement of animals, i.e. availability of protection and access to food, and are particularly important for animals that inhabit forest areas and avoid open spaces. Such animals can only migrate through areas with a sufficiently dense forest cover [Massei *et al.* 1997].

The building of road crossing structures is currently the most important and commonly used method of mitigating the impact of roads on wildlife. Given the enormous ecological significance and high costs of building wildlife crossings, decisions on their location should be preceded by a complex procedure that addresses both the environmental as well as the technological aspects. Crossings should be aligned with migration corridors and local migration routes of key species. They should be situated in habitat areas, in places with the highest concentration of animals and places with landscape attributes most favourable to the movement of animals [Kurek 2007].

Co-operation with hydraulic engineers, foresters, authorities, local governments, etc. is required to build public acceptance of ecological corridors [Jankowski 2001].

Relatively unrestricted a few decades ago, nowadays the migration of animals is hindered by uncontrolled building development. The continuing lack of spatial development plans results in architectural confusion where houses, housing estates or service centres „are allowed” to obstruct animal migration routes. Animal migration is also inhibited by the rapid construction of expressways and motorways [Bożek 2009].

It is essential that spatial development plans at the province and commune level specify the adequate location of ecological corridors. The PAN (Polish Academy of Sciences) Mammal Research Institute at Białowieża, in collaboration with natural environment experts, has designed a model of a nationwide system of ecological corridors linking Natura 2000 areas. The majority of these migration corridors are forest areas and river valleys [Spitz 1992].

The Spatial Planning Office in Lublin develops a map of ecological corridors in the Lublin Region, elaborating on the model designed by the Mammal Research Institute. Its objective is to rule out investment projects that would inhibit animal migration [Lenart 2007].

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#### WPLYW DRÓG NA POPULACJE ZWIERZYNY ŁOWNEJ W WOJEWÓDZTWIE LUBELSKIM

**Streszczenie.** Celem pracy było porównanie wielkości ubytków w populacji zwierząt łownych (zwierzyna gruba) spowodowanych ruchem pojazdów po drogach województwa lubelskiego w przeciągu ostatnich lat i możliwości zapobiegania tym zdarzeniom. Analizy wpływu ruchu drogowego na liczbę kolizji i wypadków śmiertelnych pokazują, że miejsca tych zdarzeń nie są przypadkowe. Na polskich drogach najczęściej giną płazy, średniej wielkości ssaki leśne i polno-leśne (jeż, kuna, lis, borsuk, zając) oraz duże ssaki (sarna, dzik, jeleń). Problem zdaje się być marginalizowany, mimo że według statystyk naukowych kolizje z dużymi ssakami mogą stanowić aż 4-krotność tego, co podają statystyki policyjne.

**Słowa kluczowe:** wypadki drogowe, zwierzyna łowna, przejścia dla zwierząt, korytarze migracyjne