ISAH 2005 - Warsaw, Poland
Vol 2

RABIES OCCURRENCE AMONG RED FOXES *VULPES VULPES* IN WESTERN POLAND IN RELATION TO THE DENSITY OF THE SPECIES AND LANDSCAPE COMPOSITION

Robert Kamieniarz[1], Andrzej Krynski[2], Marek Panek[1]

[1)] Polish Hunting Association, Research Station, Czempin, Poland,
[2)] Warsaw Agricultural University, Division of Animal and Environment Hygiene, Poland.

Key words: rabies, red fox, *Vulpes vulpes,* density, landscape composition.

Introduction

At the end of the XX century red fox was the main source of rabies in Poland. Between 1983 and 2000, foxes constituted 67% of the 32 thousand cases of infected wild and farm animals (Smreczak 2003). The action of fighting the disease started in 1993 in the area near the western border of the country. Soon the number of the epidemic concentration spots in western Poland was restricted (Mizak 1997). However, in the end of 1990s, the amount of infected animals, including foxes, began to increase again in some places.

The aim of the research was to look for the factors conducive to the rabies occurrence in the areas where the immunization took place. The relationship between the spatial variation of the rabies occurrence in the population of foxes, and the species density and landscape composition (the proportion of forests, the density of towns and villages), has been analyzed.

Study area and material

The research has been conducted in Wielkopolska province located in the center of the western part of Poland. The region lies on the surface of 30 thousand km^2 and is divided into 31 districts. Vaccinations of foxes against rabies have been carried out here since 1995. Oral baits with vaccines were scattered from the planes twice a year, in spring and autumn. At the beginning, 16-20 baits with vaccines per 1 km^2 were scattered (bigger doses were given in the border areas of the province, or the districts with a high number of rabies concentration spots). Since 2002 the biggest possible dose was given in the whole Wielkopolska province (Local Veterinary Inspection - not published data).

The information about rabies occurrence among foxes from specific districts came from The Local Veterinary Inspection, which registered the cases of rabies occurrence during examinations of: found animal carcasses, animals killed as being suspected of rabies, shot foxes examined within the action of vaccination monitoring. The data concerning the fox density came from the reports of hunters being at the disposal of Polish Hunting Association. The parameters characteristic for the landscape structure in the districts such as the proportion

of forests (forest surface / total surface) and the density of towns, villages and other settlements (their number / total surface) was taken from the statistical office.

Results

In the years 1999-2000 the number of rabies-infected foxes was relatively low (Fig. 1) and most cases (41%) came from Gniezno district. The explosion of the epidemic took place in the year 2001. At that time the epidemic spread almost in the whole province (Fig. 2). Since 2003, it began to subside.

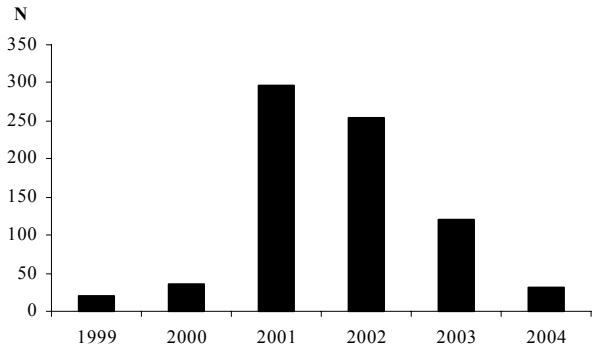

Fig.1. The changes in numbers of rabies cases among red foxes in Wielkopolska province, western Poland, in the years 1999-2004.

Fig.2. Rabies occurrence (the number of cases per 100 km^2) among red foxes in specific districts of Wielkopolska province in the year 2001.

The density of infected foxes cases in the specific districts of Wielkopolska province in 2001 did not correlate with either the fox density or the landscape structure. However, a significant correlation with the distance from Gniezno district was observed in this year ($r_{29} = -0.664$, $p < 0.001$). In 2002 rabies occurrence correlated with both fox density

(r_{28} = 0.415, p = 0.02) and the proportion of forests (r_{28} = –0.531, p = 0.003), whereas, in 2003, only with the proportion of forests (r_{28} = –0.393, p = 0.03), while the factor of density was not significant (r_{28} = 0.224, p = 0.2). The density of towns and villages did not influence the rabies occurrence significantly in any year, although the density of such places turned out to be lower in districts with higher proportion of forests (r_{29} = –0.812, p < 0.001).

Discussion

In the middle of the 1990s the number of foxes was considerably increasing, especially in the western regions of Poland (Bresinski and Panek 2000), which were the first regions where vaccinations against rabies took place. At that time the spring fox density reached the level of 1 ind./km^2 (Bresinski and Panek 2000, Panek and Bresinski 2002), which is the level conducive to spreading the disease. According to World Health Organization (in Mizak 1997) fox rabies spreads easily when their density increases above 0.3 ind./km^2. As in 2001 such density was recorded in the whole analyzed region, observed differences in density of rabies occurrence turned out to depend mainly on the distance from the first, main source of the epidemic which was Gniezno region. However, in 2002 the importance of the fox density became visible.

The negative dependence between rabies occurrence and the forest cover means that the danger of the disease was bigger in districts where farmland dominated. In the end of the 1990s in Wielkopolska province foxes penetrated fields irrespectively of the distance from the forest. Although the number of breeding sites situated in fields increased, still the forest remained the habitat preferred by foxes during breeding periods (Pielowski 1976, Panek and Bresinski 2002). Therefore, the most significant seems to be the fact that in regions where farmland prevailed, the density of towns and villages is higher than in forest-dominated areas. Towns and other inhabited places are omitted by planes scattering the baits with vaccines. That is why their placement in farmland is less even than in forest areas. Moreover, in fields some of the baits can be eaten by cats and dogs regularly penetrating the surroundings of human settlements. As a result, the chance of taking the vaccine by foxes is smaller.

The above-mentioned problem occurs mainly during autumn immunization. The amount of baits per surface unit remains the same as in spring, but the fox density is doubled because of the presence of the young animals. For the young foxes the autumn immunization is the only chance of developing the immunity against rabies in their first year of life.

The return of the disease to the regions where immunization was carried out, especially in districts where farmland prevailed and the degree of urbanization was higher, resulted probably from high fox density, especially in autumn season. Omitting the towns,

villages and other settlements, which are also penetrated or even settled by foxes, was important as well.

Acknowledgements

The State Committee for Scientific Research provided financial support for this research in the years 2004-2005 within the project No 2 P06L 048 26.

References

1. *Bresinski W. Panek M. 2000. Sytuacja populacji lisa w Polsce w koncu lat dziewiecdziesiatych. W: Mat. z symp. „Zwierzyna drobna jako elementy bioroznorodnosci srodowiska", Wloclawek-1999 (S.Kubiak red.). Oficyna Wydawnicza „Lega", Wloclawek, 163-171.*
2. *Mizak Z. 1997. Szczepienia doustne przeciw wsciekliznie lisow wolno zyjacych. Low.pol. 7, 24.*
3. *Panek M. Bresinski W. 2002. Red fox Vulpes vulpes density and habitat use in a rural area of western Poland in the end of 1990s, compared with the turn of 1970s. Acta Theriologica 47(4), 433-442.*
4. *Pielowski Z (1976) The role of foxes in reduction of the European hare population. In: Pielowski Z, Pucek Z (eds.)"Ecology and management of European hare populations", PWRiL, Warszawa: pp. 135-148.*
5. *Smreczak M. 2003. Wscieklizna zwierzat w Polsce w latach 1983-2000. Medycyna Wet. 59(6), 474-477.*