The potential role of wolf predation in regulating wild boar population in Bieszczady, Poland

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Abstract Population densities of wild boars (Sus scrofa) and wolves (Canis lupus) for the 16 years between 1980 and 1995 in the Bieszczady Mountains, south-eastern Poland, were compared to evaluate possible effects of wolf predation on the dynamics of wild boar populations. The population trends of wolves (measured by the level of their harvest) and wild boars showed opposite trends with a significant negative relationship (r² = 0.611, p<0.001).

Key Words: wild boar, wolf, population dynamics, predator/prey relationship, Bieszczady Mountains

Introduction

Previous studies have found several factors influencing population dynamics of wild boars (Sus scrofa). Some, like food supply and climate, are of natural origin (Andrzejewski & Jeziorski, 1978; Hanai, 1983; Saez-Royula & Telleria, 1986; Lozan, 1995; Okarma, 1995). Those related to human interference include hunting (Csanyi, 1995; Eroglu, 1995), spread of diseases (Kozlo, 1975; Fruzinski, 1995), changes in land use patterns (Fruzinski, 1995; Mazzoni et al., 1995; Csanyi, 1995; Eroglu, 1995) and aging of rural populations (Nores et al., 1995). According to several authors, the species is an important item in the diet of wolves (Canis lupus) (Lesniewicz & Perzanowski, 1989; Banad & Kozlo, 1992; Hell & Duricka, 1989; Mattioli et al., 1995), yet predation has not been considered as a factor affecting population dynamics of wild boars (Okarma, 1995; Nores et al., 1995). Associations between the density of wild boars and population numbers of predators remain so far unknown.

Predation effects are difficult to analyze because there are no wolves in the majority of European forests, and where populations of both species do coexist, they are subject to intensive harvest (Okarma, 1995). The wild boar is among the most intensively hunted game in Poland. The size of the bag is planned according to official census, and consequently, fluctuations of their numbers are usually not very high (Pielowski, 1990). However, in mountains planned harvest is often unfulfilled, and population numbers change considerably.

The aim of this study was to find possible effects of wolf predation on the density of wild boars in the Bieszczady Mountains. This
is the most remote area of Poland and therefore is minimally affected by game management.

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Study Area, Materials and Methods

The Bieszczady Mountains, located in the most eastern part of the Polish Carpathians with an area of about 2,000 km², belong to the least populated regions of the country. Sixty percent of the area is covered by forests, mostly Carpathian beechwood, with two dominating species, *Fagus sylvatica* and *Abies alba*. Snow falls between November and March, and daily air temperature may drop to below -30°C. Ungulates species include the most numerous red deer (*Cervus elaphus*), as well as roe deer (*Capreolus capreolus*), wild boars, European bison (*Bison bonasus*) and a few moose (*Alces alces*). The region is inhabited by the most numerous populations of large predators in Poland, in particular wolves, brown bears (*Ursus arctos*) and lynx (*Lynx lynx*). They are all possible predators of wild boars, however lynx and brown bears seldom kill wild boars (Frackowiak & Gula, 1992; Jedrzejewski et al., 1993; Okarma et al., 1995).

Data on population numbers of game species and their annual harvest was gathered from the records of the State Forest Administration for the Krosno Province. Eight forest districts were selected for analysis (Baligrod, Brzegi Dolne, Cisna, Komancza, Lutowiska, Rymanow, Stuposiany, and Wetlina), comprising a joint area that has changed from 104,220 to 79,880 hectares between 1980 and 1986. Those districts are situated in the least populated part of the Bieszczady Mountains, with the smallest area of cultivated fields and the highest numbers of wolves and brown bears.

Results

The relative density of the wolf population (measured as the level of wolf harvest per km²) increased between 1980 and 1987, and then decreased until the beginning of the 1990’s when it apparently stabilized (Fig. 1). The density of the wild boar population showed an opposite trend; decreasing between 1980 and 1985, and then increasing until 1991. It decreased again between 1991 and 1993, and finally increased until 1995.

A significant negative relationships has been found between the relative density of wolves and the density of wild boars in Bieszczady Mountains during the period of 1980 - 1996 (r²= 0.611, p<0.001) (Fig.2).

Discussion

Population census of game species was done by the State Forest Administration once a year at the end of hunting season (late March), and was generally based on snow tracking and year-round observations. Those methods cannot provide sufficiently accurate data on population density, but may be used to analyse long term trends (Bobek et al., 1986). They are especially unsuitable to census wolves because of extremely large home ranges of wolf packs. However, hunting success, reflected by the level of annual harvest, seems to depend on the population density of that species. The majority of wolves are shot from high-seats located at permanent baiting points supplied regularly with livestock carcasses. Under this system, hunting success is rarely affected by weather
Fig. 1. A comparison of changes in wild boar density (/sq. km) and the relative density of wolves (measured as annual wolf harvest per sq. km) for the period between 1980 and 1996 in the Bieszczady Mountains.

factors, but may depend on hunters' effort. In the last 16 years, however, in most cases no planned bag was reached in Krosno Province despite the relatively stable number of issued licences. Therefore, the number of wolves actually shot every year may give a good approximation of the current population status, and consequently should allow for describing trends in the population dynamics of that species.

The density decrease of wild boar population in Bieszczady Mountains between 1991 and 1993, regardless of the stable level of wolf density, could have resulted from the apparent incidence of hog fever along the Carpathians (Forest Research Institute in Zvolen, Institute of Ecology of the Carpathians in Lvov, Veterinary Station in Krosno, personal comm.). Without the effect of the disease, the obtained correlation between the densities of wild boars and wolves could have been higher.

So far few authors have attempted to evaluate the effect of wolf predation on population dynamics of wild boars. Nores et al. (1995) analyzed the changes in distribution of wolves and wild boars in Spain at intervals of 50 years, but did not report any mutual relationship. However, alterations of local habitat and its use by human during the 19th and 20th centuries undoubtedly affected those species, and human impact may obscure true relations between both populations.

Okarma et al. (1995) have studied the cause of death of wild boars retrieved during winter in the Bialowieza Primeval Forest (north-eastern Poland) and attempted to evaluate the percentage of total natural mortality in the wild boar population, including wolf predation. According to that study, wild boars suffered mostly from diseases and starvation; wolves did not affect their population dynamics. Such a conclusion could however result from involuntary bias in the estimation of wolf predation effects. Collection of boar carcasses
was done only in winter when wild boars are preyed upon to lesser extent than in other seasons (Jedrzejewski et al., 1992; Okarma, 1995). At that time the chances for increased mortality due to starvation are higher, because of snow accumulation and frozen soil which prevents wild boar rooting activity. In addition, wolves kill mostly piglets which are usually completely consumed (Jedrzejewski et al., 1992). Hunting pressure in the Bialowieza Forest concentrates mostly on adult individuals (Milkowski & Wojcik, 1984), therefore the population consists mostly of young animals which are more susceptible (3 - 3.5 times) to diseases and parasites compared to adult animals (Kozlo, 1970).

Many authors compared proportions of particular species in the community of ungulates and in wolf diet, concluding that wolves avoid wild boar as a prey (see review, Okarma, 1995). That could have been a side effect of methodology, as well as unknown mutual changes in population density of both species, which may affect prey selection by wolves. For example, in the Bieszczady Mountains the percentage of wild boar in the winter diet of wolves was 10.9% in 1986/87 and 1987/88 (Lesniewicz & Perzanowski, 1989) when wild boar density was low and the relative wolf density high (Fig. 1). However, between 1989 and 1992, when the density of wild boars increased and wolves were less numerous, the species constituted 40.3% of wolf diet (Smietana & Klimek, 1993). This indicates a

Relative density of wolf population (/sq. km)

Fig. 2. The relationship between the density of the wild boar population (/sq. km) and the relative density of wolves (measured as annual wolf harvest per sq. km) estimated for the period between 1980 and 1996 in the Bieszczady Mountains.
higher importance of the wild boar as a prey species than is commonly assumed, even if the dynamics of the wolf population is mostly dependent on availability of red deer. Thus, although wild boar does not belong to preferred prey of wolves, the pressure exerted by the predator may still alter its population dynamics.

In the Bieszczady Mountains, effects of wolf predation on wild boars can be much stronger than in the lowlands. In Europe, the breeding season of wild boars is mostly year round (Durio et al., 1992, 1995; Boitani et al., 1995; Moretti, 1995). In case of miscarriage or the loss of suckling piglets in spring, a sow can again enter estrus, and reproduce in autumn (Mauget, 1982). Obtaining food by rooting activity is very important to wild boars in winter (Genov, 1981; Dardaillon, 1987; Gallo Orsi et al., 1995). In Bieszczady, however, snow accumulates to a depth of 40 - 80 cm, and ambient temperature sometimes drops to below -20°C, even in April, maintaining deeply frozen soil (Zarzycki & Glowacinski, 1986) which effectively prevents rooting. Late born piglets hardly can survive such winters, thus sows in Bieszczady cannot compensate for young killed by wolves in spring.

The pressure of predators can be diminished if the habitat provides an effective hiding cover for wild boars. Good refuge, making wolf attacks more difficult, are dense coniferous thickets (Kudaktin, 1982). In the natural forests of the Bieszczady Mountains (Fagetum Carpinetum) such habitats do not exist, and are limited only to artificially planted spruce plantations.

Moreover, in this area wolf predation may be accelerated by the competition with scavenging species (ravens and brown bears), which deprive wolves of a considerable part of their prey (Promberger, 1991).

Some authors suggest that predation may regulate prey populations if they remain at low densities (Messier & Crete, 1985; Bergerud et al., 1983; Messier 1994). Population density of wild boar in the Bieszczady Mountains is generally much lower than in other Polish forests (Puzek et al., 1975), which additionally supports our hypothesis.

It seems then that apart from other important factors influencing wild boar population, i.e., food supply, climate and diseases, the predation by wolves may also affect the population dynamics of that species. Because severe climatic and habitat conditions of Bieszczady Mountains reduce the survival rate of young and prevent successful raising of a second litter, the mortality of piglets, the preferred age class by wolves, can be the most important limitation for wild boar population growth. Therefore, in natural mountain ecosystems where the population density of wild boars is relatively low, access to food remains mostly limited to strongly fluctuating natural resources, and when numbers of large predators are high, the effects of predation on population dynamics of wild boars are much more pronounced than in lowland ecosystems.

References


ボーランド、ピエスチャディー地域におけるオオカミの捕食がイノシの個体群動態に与える影響

オオカミの捕食がイノシの個体群動態に与える影響を検討するために、ボーランド南部ピエスチャディ地域において16年間のオオカミ、イノシの個体数変動を比較した。オオカミの相対密度（単位面積当たりの捕獲数）とイノシの密度変化は反対の傾向を示した。両パラメーターの間に有意な負の相関

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関係 \( (r^2=0.611, p<0.001) \) がみられた。

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