Management and Conservation Article

Wolf Depredation on Domestic Animals in the Polish Carpathian Mountains

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ABSTRACT As wolves (*Canis lupus*) recover in Poland, their depredation on domestic animals is increasing, as have conflicts between wolves and farmers. From 1998 to 2004, I investigated spatial and temporal patterns of 591 verified incidents of wolf depredation in the eastern part of the Polish Carpathian Mountains. The wolf population I surveyed covered an estimated range of 4,993 km^2. Depredation occurred over 1,595 km^2 of that area. Sheep accounted for 84.8% of domestic animals killed by wolves. Depredation on sheep and number of sheep farms attacked by wolves increased between 1998 and 2004 ($r^2 = 0.61$, $P = 0.04$ and $r^2 = 0.89$, $P = 0.02$, respectively). The number of wolf attacks on sheep farms in a given year were negatively correlated to red deer (*Cervus elaphus*) population numbers ($R^2 = 0.69$, $P = 0.02$). The amount of depredation caused by each of the 4 monitored packs was best explained by farm density in their territories ($R^2 = 0.59$, $P = 0.004$). Number of attacks recorded on farms was positively correlated to distance from the farm to the pack's den and rendezvous sites ($R^2 = 0.16$, $P = 0.04$). Of depredation recorded in the 4 pack's territories I surveyed, 77% occurred in 4 farms with no or inadequate protection. I concluded that wolf depredation in the studied area is opportunistic. Wolf predation intensity is a function of decreasing abundance of red deer, the density of sheep farms, and proximity of farms to the summer activity centers of wolf packs, and it is facilitated by poor husbandry practices. These results can aid in preventing wolf depredation and provide a foundation for a wolf management plan. (JOURNAL OF WILDLIFE MANAGEMENT 72(1):283–289; 2008)

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Wolf (*Canis lupus*) populations have recovered during the last decades in many areas of their former range (Mech 1995). In most of Europe, regions where wolves may live away from humans are very limited and wolves coexist with various human activities, including farming (Boitani 2000). Depredation on livestock is one of the key factors influencing the level of wolf–human conflict. Wildlife managers must, therefore, weigh the acceptable costs of wolf conservation against the reasonable level of wolf depredation on domestic animals (Mech 1995, Boitani 2000).

Just after World War II, the general public in Poland perceived wolves as overabundant, causing threats to livestock and humans. As a result, wolves were persecuted by a state-sanctioned eradication campaign (Okarma 1993) that reduced wolf abundance and range. The Bieszczady Mountains in the eastern part of Polish Carpathian Mountains were one of the refuges where, despite persecution, wolves persisted in significant numbers (Okarma 1993). The area was depopulated after World War II for political reasons and became home to many wildlife species including brown bears (*Ursus arctos*), lynx (*Lynx lynx*), and wolves (Augustyn 2004). Settlers brought by the government in the 1950s and 1960s arrived in a region already inhabited by wolves. Although this newly established local human population considered wolves as a threat to livestock, they nonetheless accepted these predators as a part of the environment. The situation changed when wolves became legally protected in 1998. The locals suddenly claimed that the wolf population and the level of depredations had increased out of control (Krzakiewicz 2002). The region, while still relying on extensive farming, remains critically important to wolves in Poland, which provided me with a good opportunity to study the mechanisms underlying wolf depredation on livestock.

Since 1998 complaints about wolf depredation on domestic animals have been recorded and verified by state authorities within the scope of compensation program. My research began in 2000 and included data collected in the eastern part of the Polish Carpathian Mountains between 1998 and 2004. These data document wolf distribution in the region and detailed ecology of 4 wolf packs. I combined these 2 data sets to identify factors determining distribution and intensity of wolf depredation on domestic animals. I postulated that livestock density and distribution, numbers of ungulates, and husbandry practices would have an impact on frequency of wolf attacks on livestock. My research aims to provide data necessary to prevent depredations and for the management of wolves in agro-pastoral regions.

STUDY AREA

The study area covered 3 regions of the Podkarpackie Province: Beskid Niski, Bieszczady, and the Przemyśl-Dynów Foothills (48°60′–49°49′N, 21°10′–22°54′E). The region held approximately 150–230 wolves, which have been legally protected since 1998 (Gula et al. 2002, Gula 2007). All claimed losses of livestock to wolves were investigated before being compensated by the government.

Bieszczady and Beskid Niski are mountain ranges with maximum elevations just >1,300 m above sea level (asl). The area was a mosaic of forested hills and open, usually inhabited valleys. The higher elevations lay across the state border with Slovakia and the Ukraine. In that region, human density was about 10 people/km^2, and forest cover reached up to 80%. Northern, ≤700-m-asl parts are more densely populated and less forested, with ≤50 people/km^2

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and 50% forest cover, the rest being either settlements or farmland.

The average annual temperature was 5.5° C. The average annual precipitation ranged between 800 mm and 1,200 mm. Snow first appeared between October and December and disappeared between February and April. Snow cover persisted for 90–140 days with a depth that did not usually exceed 40–80 cm, but that sometimes reached $\geq$150 cm at higher elevations.

Forest in the mountains was a mixture of common beech (*Fagus silvatica*), silver fir (*Abies alba*), and planted Norway spruce (*Picea abies*). Land formerly used for agriculture was overgrown with gray alder (*Alnus incana*). At lower elevations common beech, silver fir, and Norway spruce were supplemented with Scots pine (*Pinus sylvestris*), European larch (*Larix decidua*), European hornbeam (*Carpinus betulus*), silver birch (*Betula verucosa*), English oak (*Quercus robur*), sycamore maple (*Acer pseudoplatanus*), willow (*Salix* sp.), and Norway maple (*Acer platanoides*).

The most common ungulates of the region were red deer (*Cervus elaphus*) and roe deer (*Capreolus capreolus*). Red deer density varied from 1.8 individuals to 6 individuals/km^2 and was generally higher in the mountains and lower in the foothills. (I. Hołodniak, State Forest Superintendence in Krosno, unpublished data). In contrast, roe deer were more abundant in the uplands ($\leq$4.5 individuals/km^2) and quite scarce at the higher elevations (only 0.2 individual/km^2; I. Hołodniak, unpublished data). Wild boar (*Sus scrofa*) were less numerous and their density varied from 0.18 individuals to 0.84 individuals/km^2 (I. Hołodniak, unpublished data).

METHODS

The study was a part of a wider research project focused on the ecology of wolves and their relation to humans. The project originated in 2000 and was conducted by the Museum and Institute of Zoology, Polish Academy of Sciences (MIZ, PAS) and called hereafter the Bieszczady Wolf Project (BWP).

Monitoring of the Depredation

I obtained data on wolf depredation for 1998 and 1999 from files kept at the Provincial Conservation Office (PCO), which is the local government agency responsible for evaluating damages done to private property by legally protected wildlife. An officer assisted by a veterinarian checked and evaluated each case reported to the office. They attributed cause of livestock death to wolves according to the evidence of wolf presence at the killing site (foot prints, feces), presence and location of bite marks on the carcass, feeding patterns, and extent of consumption. Records included the name of the farm owner, date of occurrence, and number of animals killed or wounded. From 2000 to 2002 the personnel of BWP accompanied the conservation officer and the veterinarian to all depredations cases that farmers reported to the conservation office. Data we collected at depredation sites included the localization, date, time, number of animals killed or wounded, and information about the sheep farm and farming practice: herd size, protection measures taken against wolves, and location of the pasture.

In 2003, the local government transferred responsibility for evaluation of depredation from PCO to the State Game Guard (SGG). Since then biologists from BWP evaluated only cases reported within the home ranges of the 4 wolf packs we surveyed (Fig. 1). The SGG collected data concerning other cases and transferred it to the personnel of BWP. They gathered the same information as in 2000–2002.

Assessment of Wolf Distribution

I based estimates of wolf distribution on a snow-tracking census done in winter 2003. This census was a cooperative between the forestry administration personnel and the BWP. In February 2003 we recorded wolf tracks on a set of transects undertaken by 320 observers on foot and in vehicles. The large amount of observers enabled us to check the entire province over one day. The total length of transects was 3,236 km and we recorded tracks of 291 single wolves or wolf packs. I mapped the tracks and estimated the wolf range by plotting the 95% kernel density distribution (Worton 1989). I then disregarded the area of the range that crossed the international border to Ukraine and Slovakia.

Evaluation of the Wolf Diet

I evaluated wolf diet by analysis of feces contents. Personnel of BWP occasionally collected feces from the entire wolf range and we collected feces within territories of the 4 monitored packs, during winter snow-tracking, radiotelemetry, and other research activities (Fig. 1).

We dried feces and soaked them in water, and we separated the macro components by washing through sieves. To identify the eaten prey we further identified macro components (mostly hairs) by comparing them with our reference collection and a hair identification key (Teerink 1991). I then calculated frequency of occurrence of each prey species in wolf feces (Ciucci et al. 1996).

Monitoring of 4 Wolf Packs

The detailed survey covered 4 wolf packs named Paniszczew, Stebnik, Łodyna, and Piątkowa (Fig. 1). I evaluated home ranges of Stebnik and Piątkowa as a minimum convex polygon plotted over multiyear radiotelemetry localizations of 2 collared animals (Theuerkauf et al. 2007). From 2002 to 2005, we radiotracked a female from Stebnik pack. We identified Piątkowa pack via a male caught in 2003 and radiotracked until the end of 2005. We localized radiotracked animals by ground triangulation: 1) conducted in 24-hour continuous sessions once per month, or 2) sessions of one to a few hours undertaken at least once every 10 days (Theuerkauf et al. 2007). We collected 9,800 locations, and discovered dens of radiotracked packs by searching in areas of summer activity centers of tracked animals.

I evaluated home ranges of Paniszczew and Łodyna as a MCP plotted from snow-tracking routes of wolves trailed in

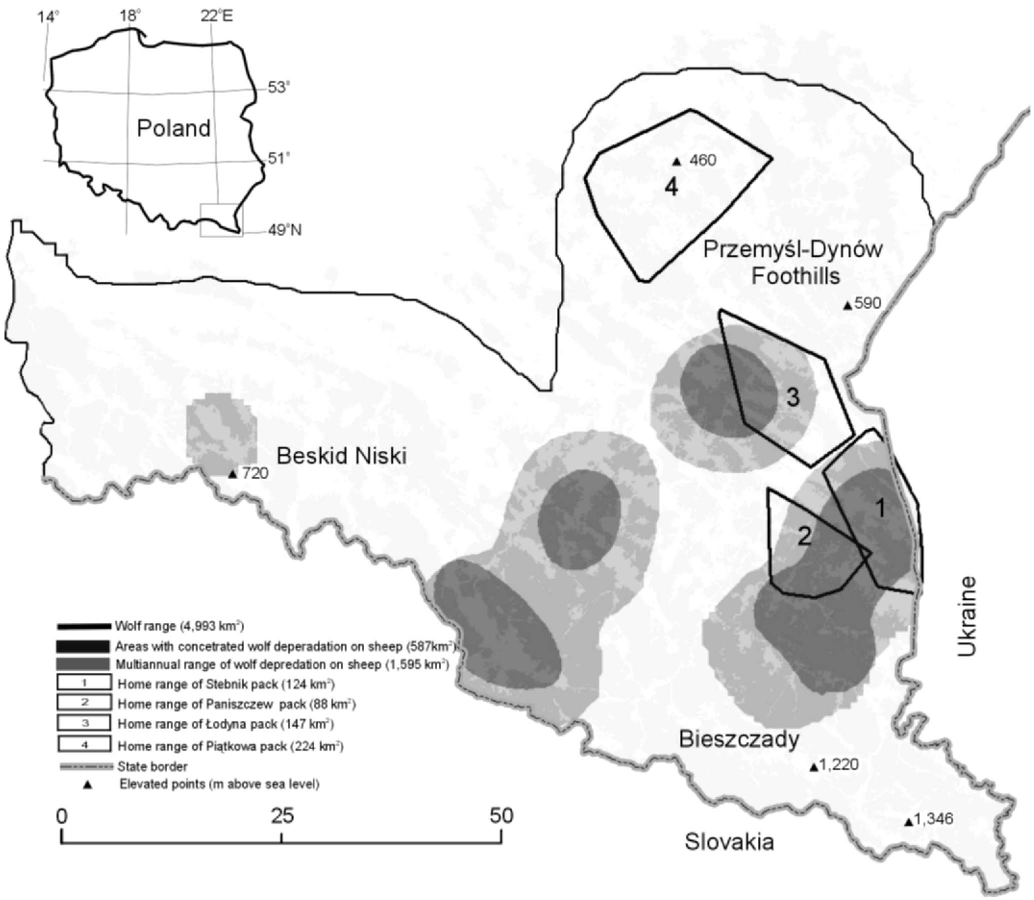

Figure 1. Wolf range, distribution of wolf depredations on sheep and territories of 4 monitored wolf packs in the eastern part of Polish Carpathian Mountains, 1998–2004. Scale bar is in kilometers.

the winters of 2000–2004 (Paniszczew) and 2002–2004 (Łodyna). When conditions were suitable for snow-tracking, BWP personnel patrolled the target areas by motor vehicles to find fresh wolf tracks. Whenever we found fresh tracks, we followed the tracks as far as possible on foot. We were equipped with Global Positioning System (GPS) data loggers and recorded track routes and wolf numbers. We uploaded the track logs to a Geographic Information System software (ArcGIS 8.3). We collected 154 km and 129 km of snow-tracking data for the Paniszczew and Łodyna packs, respectively. I assumed that trails belonged to the same pack when they overlapped each other. During the summer, BWP personnel searched for dens and rendezvous sites. We found dens of the Łodyna pack in 2003 and 2004. We found rendezvous sites of Paniszczew pack in 2002 and 2003.

I estimated the annual pack size as the maximum number of individuals observed directly or recorded over one trail during snow-tracking. We obtained the distribution of sheep herds within home ranges and in their vicinity by field inventories. We digitized their actual locations in the field with GPS. We collected data on herd sizes and husbandry practice by interviewing herd owners. From 2000 onward, BWP personnel inspected all depredation cases which took place within the territories of the 4 monitored packs.

Analysis

I plotted the 95% and 75% kernel probability zones of the distribution for all depredations attributable to wolves during 1998–2004. I then used the following habitat parameters to describe each of the kernel zones and the entire wolf range: 1) percentage of forest, 2) forest fragmentation index (Jeager 2000), 3) human density, 4) sheep farm density, and 5) sheep density.

A linear regression analysis enabled me to determine trends in annual depredation. I used a multiple step-wise linear regression to determine a potential relationship between ungulate numbers and depredation rates, to evaluate factors that influence depredation rates by particular packs, and factors that determine exposure of particular farms to wolf depredation.

RESULTS

Domestic Animals in the Wolf Diet

Wolves predominantly fed on wild ungulates. The frequency of occurrence of red deer, roe deer, and wild boar remains in scats was 83.2% (n = 719), whereas the frequency of livestock and pets was only 7.8%. Dogs (4.5%) were the most frequent domestic animal remains in wolf scats, followed in declining order by sheep (1.1%), cattle (0.8%), cats (0.7%), and horses (0.4%). Livestock grazed in fields from May to October and, during that period, the

Table 1. Number of wolf attacks on domestic animals in the eastern part of Polish Carpathian Mountains, 1998–2004.

Species taken	Total for 1998–2004	Annual mean	SD
Cattle			
No. of verified attacks	20	3.0	3.44
No. of animals killed	19	2.8	1.83
Dogs			
No. of verified attacks	19	4.7	3.76
No. of animals killed	21	5.2	4.38
Goats			
No. of verified attacks	41	5.3	2.56
No. of animals killed	39	6.5	3.40
Horses			
No. of verified attacks	10	1.4	1.29
No. of animals killed	8	1.1	0.83
Sheep			
No. of verified attacks	501	71.6	24.08
No. of animals killed	1,110	158.6	59.02
No. of farms affected	92	31.3	8.16
Range of depredations[a] (km^2)	1,595	1,799.3	590.44

[a] I calculated depredation range as 95% kernel probability distribution.

frequency of occurrence of ungulate remains in scats was similar to its annual frequency (83.5%, $n = 194$). However, in that same period, livestock and pets were encountered nearly twice (14.4%) as often as during the rest of the year. Dogs (8.8%) also were the domestic species most frequently encountered in scats found during the grazing season, followed in decreasing order by sheep (2.1%), cattle (1.5%), horses (1.0%), and cats (1.0%).

Attacks reported under the compensation program concerned principally sheep (84.8%; Table 1). Attacks on goats were the second most common (6.9%) cause of complaint as farmers quite often keep goats with the bigger sheep herds and these were, therefore, attacked at the same time as sheep. Attacks on bigger livestock (i.e., cattle and horses) were sporadic (5.1%), with the exception of 2004, when wolves attacked cattle on 13 occasions, killing 11 and wounding 6 animals. Reports of wolves killing dogs were limited to 2001–2003 when losses of dogs taken by wolves were compensated by the State Administration. Another case was reported in 2004 but was not covered by the compensation program.

Wolf Depredation on Sheep

A simple linear regression analyzed for the 7-year period indicated a positive trend in number of wolf attacks on sheep farms ($r^2 = 0.61$, $P = 0.04$). The number of farms affected ($r^2 = 0.89$, $P = 0.02$) also increased. The annual variation in number of wolf attacks on sheep farms was negatively related to red deer numbers estimated annually by forestry personnel ($R^2 = 0.69$, $P = 0.02$).

The estimated wolf range in the area of Beskid Niski, Bieszczady, and the Przemyśl-Dynów Foothills covered 4,993 km^2 (Fig. 1). Wolf depredation on sheep was distributed (95% kernel) over 1,595 km^2 in 4 areas (Fig. 1). Wolf attacks were concentrated (75% kernel) in 4 areas that covered 589 km^2 (Fig. 1). The amount of forest cover

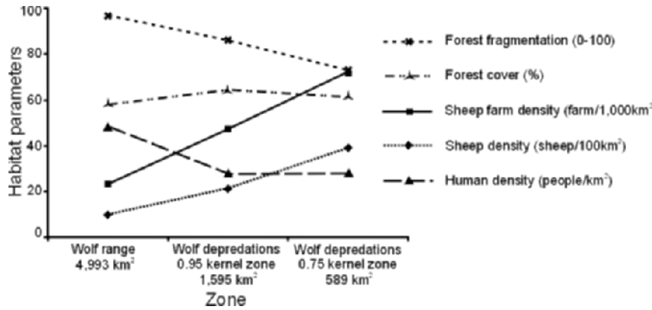

Figure 2. Percentage of forest cover, forest fragmentation, sheep density, sheep farm density and human density over the entire wolf range in relation to the area with wolf depredation on sheep (95% kernel probability distribution) and area with concentrated wolf depredation on sheep (75% kernel probability distribution) in the eastern part of Polish Carpathian Mountains, 1998–2004. I calculated forest fragmentation index according to Jeager (2000).

was similar in 3 areas (58.3%, 59.7%, and 62.0%). However, the forest fragmentation index was greatest in the wolf range (97) and least in the area where the depredation was concentrated (73), whilst the depredation range (82) fell in between those 2 values. The area where wolf attacks on sheep occurred was nearly 50% less populated than the entire wolf range (27.2 vs. 48.2 people/km^2). There were 47 sheep farms per 1,000 km^2 and 21 sheep per 10 km^2 in that area, which was greater than twice as much as values for the entire wolf range (23 farms/1,000 km^2 and 10 sheep/10 km^2). Areas with the highest rates of wolf depredation on sheep had a similar human density to the entire wolf range (28.2/100 km^2 vs. 27.2/100 km^2) but almost twice as many sheep farms (72/1,000 km^2 vs. 47/1,000 km^2) and sheep (39/10 km^2 vs. 21/10 km^2; Fig. 2).

Wolves attacked sheep during the grazing season, which usually began in May and ended in October–November (Fig. 3). Weather conditions in some years encouraged farmers to put sheep out to pasture as early as April and to prolong grazing to late November or even the beginning of December. A limited number of attacks occurred in January–March ($n = 6$) and late December ($n = 8$) when farmers took sheep out of their stables during snow-free periods of warm weather. The number of attacks rose from April to September with the exception of June, when it was lower than in May (Fig. 3). Wolves attacked sheep more frequently than the grazing season monthly multiannual weighted average (11.6) from July through to October.

Depredation by 4 Studied Packs

Multi-annual home ranges of the 4 studied wolf packs varied between 88 km^2 and 224 km^2. Packs consisted of 2–7 individuals with an average density of 4.6 wolves per 100 km^2 (SD = 2.1; Table 2). The number of wolf attacks on sheep by packs in a given year was best explained by density of farms in the pack's territory ($R^2 = 0.59$, $P = 0.004$).

There was only one sheep farm with >10 sheep within the territory of the Piątkowa pack, and wolves never killed sheep in that area (Table 2). The Piątkowa pack also was never

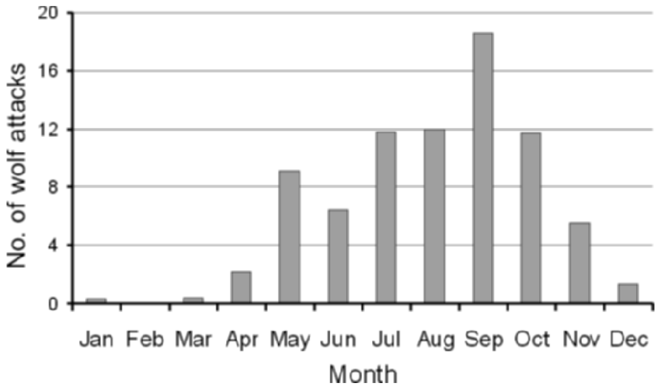

Figure 3. Monthly mean number of wolf attacks on sheep in the eastern part of Polish Carpathian Mountains, 1998–2004.

confirmed as attacking cattle, even though there were many unguarded cattle grazing near villages situated within the pack's territory.

There were 10 sheep farms on the territory of the Łodyna pack. These farms held an average of 528 sheep annually (Table 2). The number of depredation incidents by this pack steadily increased from 2 cases in 2001 to 8 in 2004, but the number of wolves observed in the winter dropped from 6 in 2003 to 4 in 2004 (Table 2). This pack also was not known to attack cattle, despite their relative abundance within the pack's territory.

Most depredation incidents took place in the Stebnik pack territory, which included 13 sheep farms (Table 2). In 2003 the number of attacks rose from 7 to 27 cases, and remained high (31 cases) in 2004. In 2003, the Stebnik pack attacked foals on 3 occasions; in 2004 this pack attacked horses twice and cattle on 5 occasions. The substantial increase in attacks was associated with an increase of pack size from 5 individuals to 7 individuals (Table 2).

The territory of the Paniszczew pack was the most densely forested and included 3 sheep farms, which were attacked only sporadically (Table 2). The pack attacked horses only once and never attacked cattle, even though 2 virtually free-ranging herds of horses and cattle roamed the southern part of the pack's territory.

The number of attacks perpetrated by wolves on particular farms situated in the territories of 4 monitored packs averaged 4.0 (SD = 6.87, range = 0–32). Only 7 farms out of 27 experienced no depredation during 4 years. Sixteen farms recorded <5 cases and the remaining 4 farms >10 cases. The number of attacks recorded on farms was best explained by distance from the farm to the den and rendezvous sites of particular packs ($R^2 = 0.16$, $P = 0.04$). Of the 4 farms that were frequently attacked by wolves, 3 were situated in the territory of the Stebnik pack. The distance of the farms to den sites of the Stebnik pack varied from 2.3 km to 4.6 km, but pastures of all 3 farms were located on the edge of a continuous forest patch in which dens of the Stebnik pack were located in 2002–2004. Therefore, wolves were able to access farms concealed by the forest and did not have to cross roads or enter villages. The farm with the greatest numbers of attacks (32) did not have guard dogs or shepherds; its sheep roamed freely between a small enclosure situated near the house of the owner and an unenclosed pasture located next to the forest, 3.5 km from the Stebnik pack den site. On 2 other farms in the Stebnik territory the owners had sheep dogs and the pastures were partially fenced. However, in both cases sheep dogs were not properly trained and most of the time did not stay in the pasture with the sheep. The fourth farm with a history of frequent depredation was situated in the Łodyna pack territory, 6.7 km from the den site identified in 2004. The only protection measure on this farm was 1.2-m-high wooden fence, which was more effective in keeping sheep inside the enclosure than in keeping wolves out.

Table 2. Forest cover, sheep number, sheep farm number, and number of wolf attacks on sheep within home ranges of 4 monitored wolf packs in the eastern part of Polish Carpathian Mountains, 2001–2004.

Variable	Pack			
	Stebnik	Paniszczew	Łodyna	Piątkowa
Home range size (min. convex polygon, km^2)	124[a]	88[b]	147[b]	224[a]
Pack size				
2001	5	5		
2002	5	7		
2003	5	7	6	2
2004	7	6	4	5
% of forest cover in the home range	61	75	58	64
Forest fragmentation index (0–100)	16	6	38	72
No. of sheep farms within the home range	13	3	10	1
Mean annual no. sheep within the home range	545	101	528	13
No. wolf attacks on sheep				
2001	9	0	2	0
2002	7	2	5	0
2003	27	1	8	0
2004	31	6	8	0

[a] Estimated by radiotelemetry.
[b] Estimated by snow-tracking.

DISCUSSION

I found that wolves mostly preyed on wild ungulates and attacks on domestic animals were essentially opportunistic. Wolves usually prefer to prey on wild ungulates even when livestock is easily available (Fritts et al. 1992, Mack et al. 1992, Bangs et al. 1998, Traves et al. 2002). The prevalence of livestock in wolf diets is observed only in areas where the natural prey base is substantially degraded, as in some parts of India, Mongolia, the Middle East, and Portugal (summarized in Fritts et al. 2003). The entire wolf range I studied covered almost 5,000 km^2, but in 2003 and 2004 the Stebnik pack alone (5–7 wolves in a territory of 124 km^2) was responsible for about one-third of all depredations. Yet, livestock constituted only 1.2% of the biomass consumed by this pack, the rest being wild prey (Mayer 2003). So however relatively frequent, even depredation by the Stebnik pack does not qualify as specialization on livestock.

Bobek et al. (1995) found, as I did, a high prevalence of sheep among livestock killed by wolves. Cattle are, however, 10 times more numerous than sheep in the Podkarpackie Province (Statistical Office in Rzeszów 2004). Wolf preference for killing sheep in areas with numerous cattle occurs also in Finland (Pulliainen 1965), Minnesota, USA, and Alberta and British Columbia, Canada (Mack et al. 1992). Wolves, therefore, seem to select sheep rather than kill livestock randomly, probably because sheep are easier to kill.

Surprisingly, wolves ate dogs even more frequently than sheep, possibly because dogs wander freely around villages the whole year, whereas sheep are only out during the grazing season. Dogs might even be attracted to wolf prey, and be killed while scavenging. I observed free-ranging dogs near most villages in the study area. Wolves also frequently killed dogs in Minnesota and Wisconsin, USA, and Croatia, Finland, Italy, Russia, and Slovakia (Huber et al. 1993, Traves et al. 2002, Fritts et al. 2003).

The increased depredation observed since 1998 parallels a decrease in the red deer population. Since 1990 red deer have been culled because of forestry management policy aimed at reducing deer numbers to limit damages to the forest stands (Krzakiewicz 2002). Red deer is the main wolf prey in the Bieszczady (Gula 2004) and it is likely that lowering red deer numbers may increase wolf depredation on sheep. However, Krzakiewicz (2002) suggested that the wolf population had increased as a result of protection, thus causing deer numbers to drop and depredation to increase. Although higher wolf numbers can increase depredation (Traves et al. 2002) there is no clear evidence of a wolf population increase in the study area since 1998. Although difficult to quantify, there is some poaching of wolves in the region, which probably also accounts for the fairly stable wolf population (Gula 2007).

If wolves kill livestock wherever it is available, logically, if sheep and wolves coexist depredation is to be expected (Boitani 2000). However, although sheep farms occur over the entire wolf range, depredations occurred only on about one third of that area. Wolves seem to kill livestock in areas with less anthropogenic habitat but where there are, nonetheless, a substantial number of farms which, in areas of high depredation, can be twice as common as in other regions. Territories of 4 packs included valleys settled by people and used for farming. Wolves could, therefore, easily and quickly raid sheep farms. Although wolves fed mostly on wild ungulates, the number of depredations correlated positively with farm density, which reflects the opportunistic nature of wolf attacks on domestic animals. Attacks were more common on farms that were close to the packs' dens and rendezvous sites as also observed in Montana and Idaho, USA (Bradley and Pletscher 2005). During summer, wolves gravitate around dens and rendezvous sites (summarized in Mech and Boitani 2003) so again depredations in those areas are probably opportunistic. Most depredations occurred on 4 farms where poor husbandry and forested routes that linked the packs home sites to the farms probably increased vulnerability and exposure to attacks.

MANAGEMENT IMPLICATIONS

To effectively reduce depredation, management actions should target first the areas of high depredations (here about 600 km^2). In these areas, red deer harvest quotas should be lowered so that red deer densities stabilize. Husbandry practices of farms that suffer from chronic depredation must be improved with adequate preventive measures such as trained sheep dogs and electric fencing. Because wolf depredation on sheep is opportunistic, the state program of promoting sheep farming in areas occupied by wolves should be reconsidered, especially because livestock losses are compensated by the state. These management measures should be included in a (yet to be compiled) wolf management strategy and action plan.

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