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Wolf numbers and distribution in Lithuania and problems of species conservation

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The abundance of wolves in Lithuania is important for the conservation of the species in the Baltic region especially for ensuring its long-term viability. On the basis of distribution maps for 2000–2005, and minimum population counts, I propose that the wolf population in the country is stable, around 200 individuals (15–20 packs). Main threats are highways and, possibly, human disturbance in fragmented forest areas, while the impact of hunting is minor. Preparation and adoption of the national species management plan and agreement on minimum viable population numbers, as well as mitigation of conflicts caused by depredation of domestic animals are the main tasks for the conservation of this species in the near future. High ecological plasticity of the wolf makes it likely that its existence in Lithuania is not threatened.

Introduction

Together with two other Baltic countries, Latvia and Estonia, Lithuania has a continuous wolf (*Canis lupus*) population and abundance in 2005 exceeded 1000 individuals (Salvatori & Linnell 2005). Despite a substantial wolf population, there have been few studies on their basic ecology (Bluzma 1999, Balčiauskas 2002). In neighboring countries, ecological studies of wolves have been underway since the mid-1980s (Reig & Jędrzejewski 1988, Leśniewicz & Perzanowski 1989) and mid-1990s (Andersone 1998, Valdmann *et al*. 1998, Ozoliņš *et al*. 2001).

Wolf depredation of livestock has been found to be the major obstacle for their acceptance in Lithuania (Balčiauskas *et al*. 2002). Until 2005, wolf hunts in Lithuania were used to manage abundance, as the country has exceptions and exemptions from all conventions and agreements bound to species protection.

The aim of this study is to present data on historic changes in wolf abundance, recent changes in distribution, and current problems confronting wolf conservation in Lithuania.

Material and methods

Data from wolf surveys conducted by hunters and foresters were the basis for the estimation of wolf abundance until 1990. This is referred to as the "official population estimation", or "official game statistics". From 1990 to 2001, data were provided by hunting clubs that might be subject to overestimation. In both periods, surveys were supposed to be carried out with snow tracking, but this requirement was not always

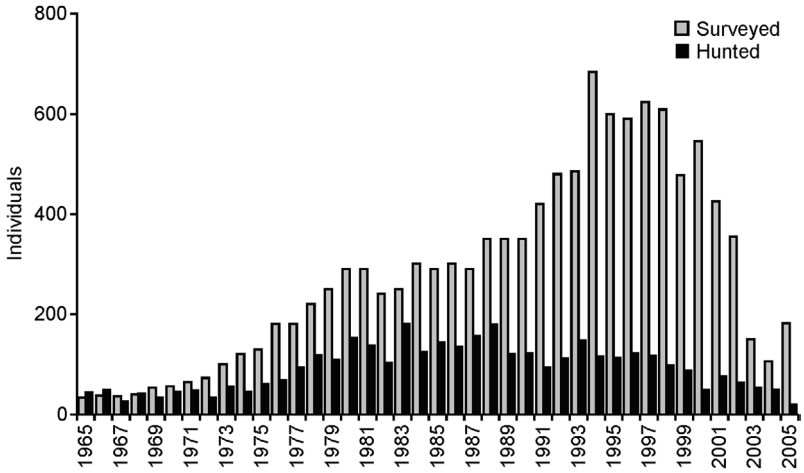

Fig. 1. Official survey numbers and hunting bag of Lithuanian wolves in 1965–2005.

met (Bluzma 1999, 2000, Balčiauskas 2002). I expected that hunting bag size was reported reliably for two reasons. First of all, hunters were eager to report valuable trophy. Secondly, there was no quota for wolf, thus, no need to hide over harvesting.

Wolf distributions up to 2000 from the "Atlas of Lithuanian Mammals, Amphibians and Reptiles" were based on various sources of data, including original fieldwork (Balčiauskas *et al*. 1999). Data on the distribution of wolves in 2000–2005 were collected from 416 forest units and strict nature reserves via standard questionnaires. At least 400 responses were obtained. For each unit, questionnaire data included (a) wolves seen during the year, (b) wolf tracks found, (c) presence of wildlife preyed upon, and (d) presence of domestic animals killed in the area, followed by an "educated guess" of a responsible person, (e) if wolves are constantly inhabiting the area, or (f) if they visit the area from the neighboring territories, or, finally, (g) if they are absent from the area. Areas where (e) was confirmed by (a) and (b) were marked on the maps as inhabited by a pack. The presence of (c) and (d) was evaluated as additional proof. Areas where (e) or (f) were confirmed by (b) only, or by (b) along with (c) and/or (d) were marked as constantly used.

On 20 and 24 February 2006, the first minimum population count was performed in the country, using similar methods and coordinated with the wolf survey performed Latvia. In each of the same 416 forest units and strict nature reserves, a 10–12-km route was walked, searching for wolf tracks. The form of the route was square or triangle, oriented to the area, where wolf presence was expected based on previous experience. A fresh wolf track found was followed until the number of animals was established. Track directions as well as remarks as to where wolves came from or where they were heading were provided. During data processing such remarks enabled avoidance of double-counting of the same animals in the neighboring territories.

Results

Changes in abundance and hunting bag

Prior to the Second World War, wolf numbers in Lithuania were not high: 112 individuals in 1934, 159 in 1935, 126 in 1937, 146 in 1938, 248 in 1939 and 280 in 1940. Non-hunting in the years of war and soon thereafter had a substantial influence: in 1943 the survey showed 564 individuals, in 1948 as many as 1723. Intensive extermination showed that in two decades the population decimated: from 1440 wolves in 1949, 980 in 1950 down to merely 320 in 1954.

In 1960–1975, wolf numbers in Lithuania achieved an all-time minimum, not exceeding 200 individuals. In the 1980s, the population started to recover, fluctuating around 300 individuals (Fig. 1). The 1990s were characterised by a wolf population burst, reaching and main-

taining 600 and more individuals.

The wolf bag in the country up to the 1990s was correlated with population numbers. In 1965–1988 the correlation was very strong ($r = 0.94$, $p < 0.001$). After 1990, the increase in wolf numbers was followed by the decrease of the hunting bag. Before 1990, hunter harvests were always over 40% of the surveyed numbers and after 1990, it was 20% or less (Fig. 1).

In 2000–2004, wolf surveys were not performed or only partially performed. The results of 2003 and 2004 did not reflect the real situation; therefore, distribution changes instead of numbers are presented for the named period.

For example in 2004, surveys were done in 53 out of 121 forests inhabited by wolves, and 111 wolf individuals were found. This number is commonly used as the official survey number. In my opinion, the extrapolated wolf population number in 2004 was about $111/53 \times 121 = 250$ animals.

The 2006 minimum population count revealed 193 wolves inhabiting mainly western and northern regions of Lithuania.

Wolf distribution

Data on the distribution of wolves before 1999 were gathered and generalized in the mammal atlas, based on 10×10 km squares (Balčiauskas *et al*. 1999). In 1992–1999, the species was distributed throughout the country, especially in northeastern, southeastern and western parts. The sparsest wolf population was in the central part of the country (Fig. 2).

In 2000–2002, wolves were observed in 163 forest units (40% from 407 answers obtained), wolf tracks were found in 301 (74%) forest units, wildlife killed by wolves was found in 120 (29%) forest units, and domestic animals killed were detected in 106 (26%) forest units. Thus, wolf distribution covered no less than 80% of the country, and about 25 wolf packs were present (Fig. 3A). Less predation of cattle occurred in the southern part of Lithuania, despite the presence of wolfs.

In 2003, wolves were observed in 126 forest units (31%), wolf tracks were found in 249 (61%), and wildlife killed in 67 (21%) forest

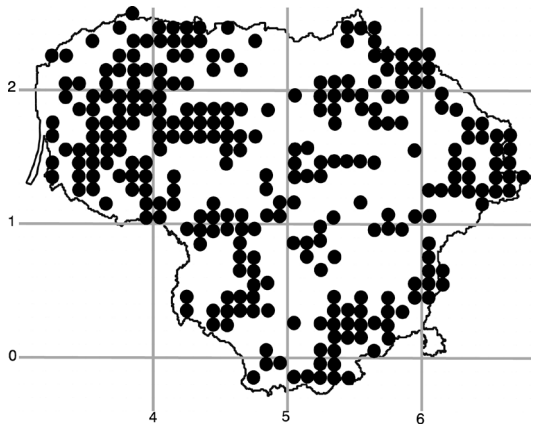

Fig. 2. Wolf distribution in Lithuania in 1993–1999 (Balčiauskas *et al.* 1999).

units. Domestic animals were killed by wolves in 54 (13%) forest units. Thus, wolf distribution covered about 70% of the country, inhabited by about 20 packs (Fig. 3B). The "educated guess" of foresters showed 74 forest units (18%) constantly inhabited.

In 2004, changes in the distribution of wolves in the country were registered (Fig. 3C). The "educated guess" of foresters showed 57 forest units (14%) constantly inhabited, though factual observations did not confirm such data. Wolves were observed in 108 (27%) forest units, wolf tracks were found in 280 (69%), and wildlife killed — in 100 (25%) forest units. Depredation of domestic animals by wolves was registered in the territory of 56 forest units (14% of 405 answers). Again, we presume wolf distribution covered ca. 60% of the country.

During the winter of 2005, wolves were observed in 71 (18%) forest units, and tracks were found in 231 (58%) forest units. The "educated guess" showed 48 (12%) forest units constantly inhabited (Fig. 3D). The decrease was not statistically significant; moreover, the data were from the winter season only.

In February of 2006, the minimum population count revealed 79 forest units, where wolves were observed (19% from 409 units) forming no less than 15–20 packs (Fig. 4). The biggest areas were occupied in the north, north-west and west of the country, four packs — in the south of the country, and one pack — in the very east. The central part of Lithuania was inhabited very

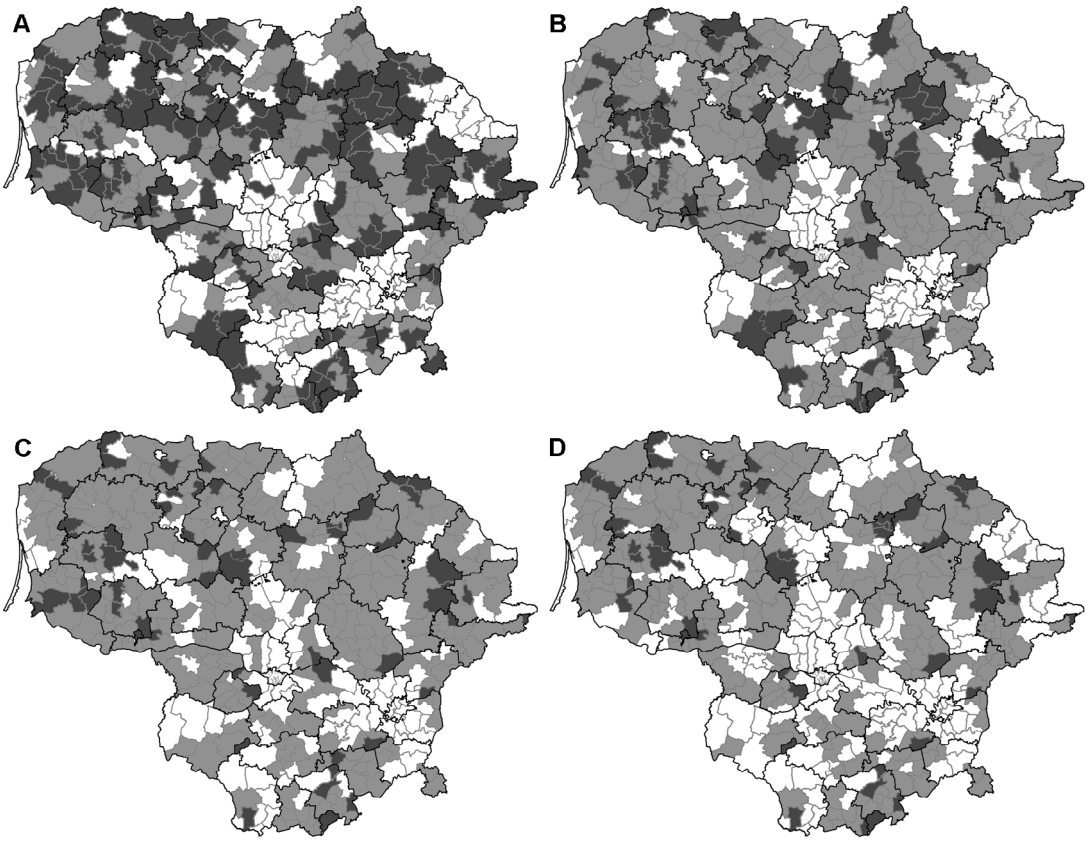

Fig. 3. Wolf distribution in Lithuania in (**A**) 2000–2002, (**B**) 2003, (**C**) 2004 and (**D**) winter 2005 (dark grey = inhabited, light grey = constantly used by wolves).

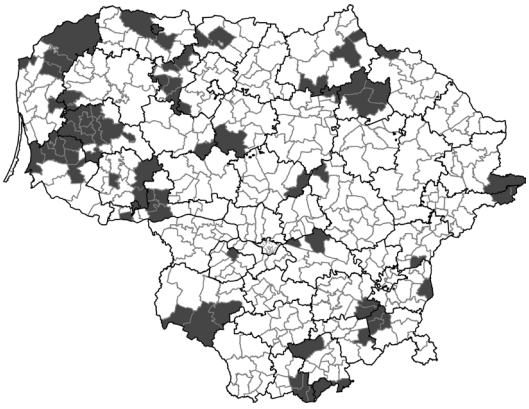

Fig. 4. Wolf pack distribution in Lithuania in February 2006 (based on the minimum population count).

sparsely. Migrations to Latvia from the northwest of Lithuania, to Latvia and Belarus from the east, and to Belarus from the south were registered.

Discussion

The wolf is known as an opportunistic species, thriving during the periods of political instability (Jedrzejewska *et al*. 1996). In Lithuania, several population peaks were known — after the rebellion in 1883, after the First World War, then after the Second World War. The rise of wolf numbers in the mid-2000s is characteristic not only of Lithuania, but all Baltic countries (Ozoliņš & Andersone 2000, Lõhmus 2001, Ozoliņš *et al*. 2001, Balčiauskas 2002).

Exact reasons for the wolf population increase in Lithuania are not known (Balčiauskas 2002). In my opinion, one of the reasons is high ecological plasticity of wolves. They are able to settle down in various habitats — former military territories, abandoned fish pond systems, rehabilitated peatlands, and, as the highest form of adaptation, even in unused agricultural areas. Two hundred hectares of an abandoned

field, re-grown by thick willow and reed-bed layer, were inhabited by a pack of wolves in western Lithuania (near Jokūbavas, ca. 55°49´N, 21°20´E) in 1995–1997. As reported in the local press, damage caused by this pack to neighboring farms was considerable.

The second possible reason for the wolf expansion is the increase in livestock that occurred with the land restitution process and cattle husbandry. Small farmers often have their land away from their house, which results in leaving cattle in the field overnight; in 90% of the cases herd is unattended (Balčiauskas *et al*. 2002). In 1995–2000, wolf caused damage to approximated 1000 heads of domestic animals per year (Bluzma 1999, Balčiauskas *et al*. 2002).

The third reason for wolf population increases in Lithuania was the chaotic reorganization of the hunters' society that started in 1990. Now there are only a few hunters that specialize in wolf hunting across the country. This kind of hunting is expensive and unrewarding, thus it is hardly surprising that even in the regions with high damage wolf populations cannot be reduced by hunting for several years. Obviously, the last peak in wolf population numbers was also due to a low hunting effort.

Reasons for the decline in the wolf population since the mid-2000s are not known. They may be related to disturbance, forest fragmentation, or demographic stochasticity. It is unlikely the decline was caused by hunting or poaching pressure.

It is known that 30%–40% population losses can be tolerated by a wolf population (Ballard *et al*. 1987), but 40%–50% losses lead to population collapse (Fuller 1989, Smietana & Wajda 1997). For several decades these figures were exceeded in Lithuania (Fig. 1), but still accompanied by population growth. After the years of the wolf number peak, the hunting bag in Lithuania was stable or decreasing, thus, not influencing recent population dynamics. There are no reasons to assume that the numbers of hunted wolves were given incorrectly, as no limits in quota or season were established until 2005–2006. According to the traditions of Lithuanian hunters, wolves are a highly valued trophy. For the seasons 2005/2006 and 2006/2007, a quota of 20 animals was set for the wolf bag.

Changes in the extent of the wolf distribution in Lithuania in 2000–2005 were not statistically significant. The spatial dispersion of inhabited territories is changing every year. Two causes — stronger hunting pressure in territories with wolf damage, and disturbance — are involved. From the maps (Figs. 3 and 4) it is also clear that wolves are rarely registered along highways and main roads (Vilnius–Kaunas–Klaipėda, Via Baltica and Vilnius–Zarasai). This finding fully corresponds to the situation in Poland, where motorways and forest fragmentation are negatively influencing wolf distribution (Jędrzejewski *et al*. 2004, 2005).

Disturbance is created by high forest fragmentation in Lithuania, in line with forest management activities. Segregation of wolves from humans, avoiding not only direct disturbing factors, but also arable land and forest edges, is known from the Białowieża forest (Theuerkauf *et al*. 2003). The forest area in Lithuania is expanding due to afforestation measures, but this will not lessen forest fragmentation. The main natural and semi-natural areas are situated in the eastern and western parts of the country, roughly similar to the distribution of wolves. The central part of Lithuania, characterized by high agricultural activities, has lower human densities. Luckily, distances between forest patches are not exceeding those of wolf migrations.

Wolf conservation perspectives in Lithuania are based on the following issues:

1. Convention on the Conservation of European Wildlife and Natural Habitats, or Bern Convention (ratified with exceptions for wolf and beaver).
2. Habitat Directive (Lithuania negotiated a geographical exemption for wolf population management).
3. Natura 2000 (no special territories for wolves are established, but wolves are inhabiting territories designated for other species).
4. Current system of protected territories (strict nature reserves and several reserves, where hunting is totally prohibited, serve as refuges for several wolf packs).
5. Hunting limitations (period shortened, quota established in 2005; in the future, the quota should be based of survey results and reflect population trends).

6. NGO initiative — "Joint council for the protection of wolves".
7. Private initiative — persons keeping wolves in enclosures (a threat to release wolf-dog hybrids).

Along with the minimum population count established in 2006, and wolf monitoring re-established in 2007, sustainability of the species is safeguarded for the near future. The preparation and adoption of the national species management plan and agreement on minimum viable population numbers, as well as mitigation of conflicts caused by depredation of domestic animals are the main tasks for the nearest future. On these premises, the ecological plasticity of the wolf makes it likely that its existence in Lithuania is not threatened by human disturbance, forest fragmentation, and harvest.

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