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## **Ecological, social and economic justification of wolf population management in the Baltic region**

Key words: wolves, population, conservation, hunting

### **1. Introduction**

The wolves *Canis lupus* in the three Baltic countries belong to the population which is relatively big and probably one of the most viable in Europe due to their continuous range, stretched across the Baltics and includes European Russia, Belarus, NE-Polish lowlands and North Ukraine (LINNELL et al. 2008). A common characteristic describing conditions of wolves in the Baltics over the last ten years is a favourable status of population and their habitats. Abundance of food (prey populations) and shelter (woodlands) has even increased over the last decade. However, the management policy of large carnivores includes not only ecological aspects but also a so called human dimension that largely depends on the social and economic situation, i.e. wide scope of interests (NIE 2003). Thus, management approaches in each of the countries that share the Baltic wolf population are vastly different, ranging from strict protection in Poland to intensive exploitation in Russia, without gradual transitions or buffer zones between closely located distinct management units. This management diversity and its impact on the population, namely its viability

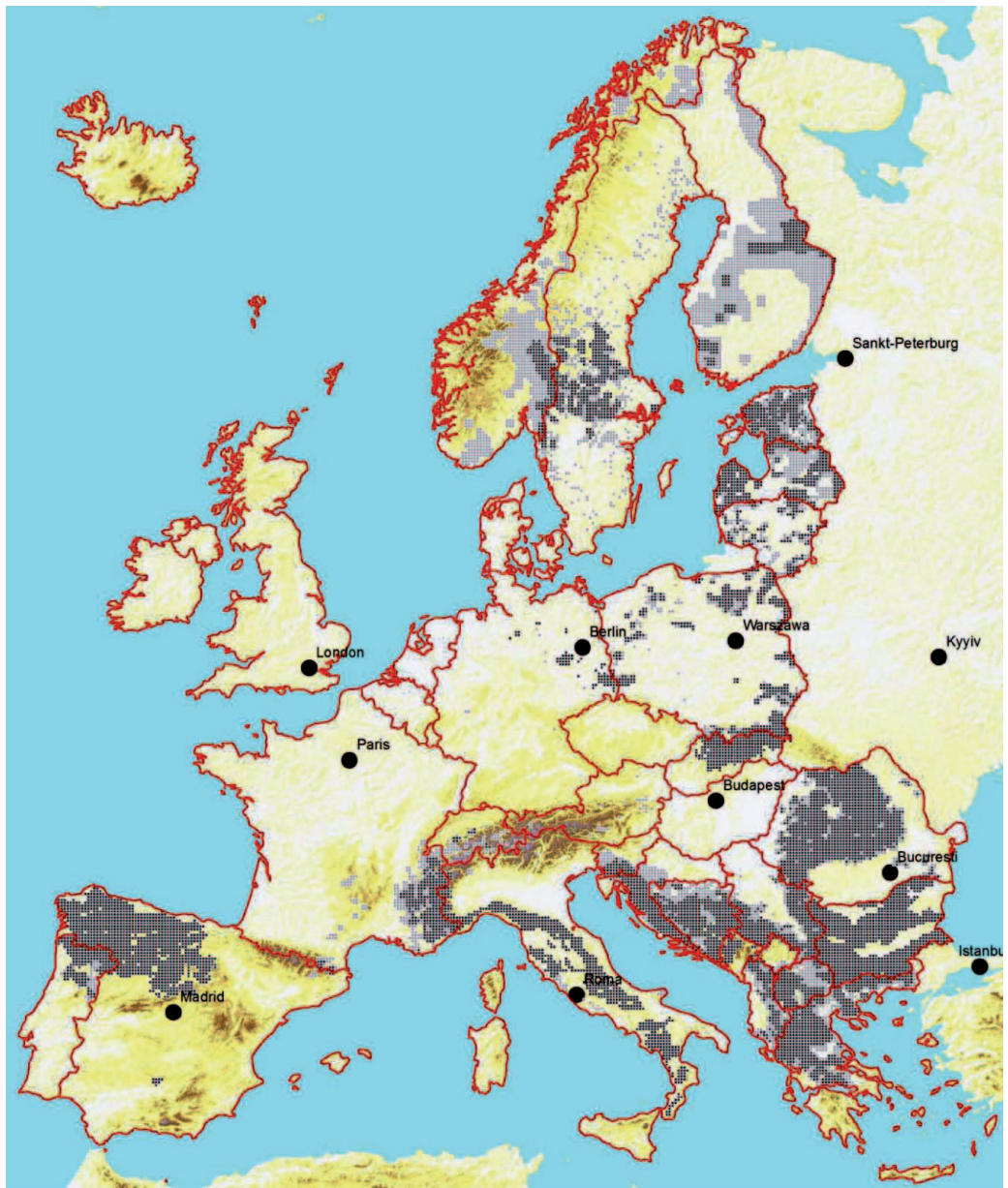
at large scale, needs to be documented and analysed.

The aim of this article is to summarize implemented actions and results of wolf population management in Estonia, Latvia and Lithuania within the last 10 years (2004–2013).

### **2. Material and methods**

The article is based on three main sources of information: review of the legal acts reflecting conservation policies, official statistics gathered by the competent authorities and the case studies.

The territory examined in our study is not homogeneous. A comparative description of the Baltic region (Fig. 1) is given in Table 1. It embraces geographical data and some relevant statistics on game management, especially the factors affecting wolf population. Assuming the hunting bags as mirror of species abundance, Estonia is distinguished by its elk *Alces alces* population, Lithuania holds the largest wild boar *Sus scrofa* population while Latvia is notable for its red deer *Cervus elaphus* and beaver *Castor fiber* populations.



*Fig. 1 Wolf distribution (black rasters – breeding range, grey rasters – sporadic occurrence) in Europe and the three Baltic countries after materials prepared with the assistance of Istituto di Ecologia Applicata and with the contributions of the IUCN/SSC Large Carnivore Initiative for Europe (Boitani et al. 2014)*

Table 1 Characteristics of the study area related to wolf habitats and management

Characteristic	Estonia	Latvia	Lithuania
Area (km <sup>2</sup> )	45 215*	64 589	65 300
Forest cover (%)	51	50	30.3
Bogs and marshes (%)	10	10	2.4
Highest point (m a.s.l.)	318	312	294
Human population (x 1000)	1 340	1 900	3 500
Number of hunters per 1000 capita	10	12	9
Continuous snow cover (days per year)	75–135	75–115	70–110
Abundance of wolf prey (in terms of the hunting bags in season 2011/2012)	-	-	-
Elk	4730	3190	269
Red deer	693	5606	1602
Roe deer	1211	4600	14178
Wild boar	18159	26332	33922
Beaver	6210	26402	20591
* Estonian mainland only			

### 3. Results and discussion

The wolf is the least protected large carnivore in the Baltic countries since the species conservation specialists had not identified any actual threat to population and all three countries got a geographic exemption concerning requirements of the Habitat Directive (**Council Directive 92/43/EEC**), namely it is added to Annex V species which can be hunted using methods not banned by this Directive.

Looking back in history, the wolf population in the Baltics has been subjected to for centuries lasting persecution and intense control as in whole Europe.

However, after World War II, the population was truly high again and an anti-wolf campaign was picked up in the whole territory of the former USSR. Consequently, the wolf population reached its' lowest in the 1960s. The next period was very unique for the Baltic region. Game management both at professional and amateur level was widely supported by the soviet politicians. Fur and meat harvested in the wild supplemented the soviet economy considerably and Republics of the Baltics appeared

outstanding within this economy branch. According to data published by the former soviet leading hunter magazin 'Ochota' (STACHROVSKY 1986), the average income from hunting in 1984 was 32.9 soviet rubles per 1000 ha in terms of fur value and 9.2 kg/1000 ha in terms of venison. Meanwhile, the Baltic region contributed with 76.8 soviet rubles/1000 ha and 120.0 kg/1000 ha respectively. Representing only 0.8 % of the soviet territory, the Baltic hunter associations sold venison composing 10.2 % of the total Soviet Union's state purchase. These impressive results were achieved by a comparatively efficient game management system including permanent predator control. Particularly large numbers of wolves were killed annually in the 1980s and 1990s, even after gaining political independence in 1991 (Fig. 2). There were especially notable wolf hunting records in Latvia (Fig. 3). On the other hand, abundant game ensured good foraging conditions for large carnivores and the wolf population recovered well and fast after the harvest. Therefore, nature conservation and management authorities disregarded concerns about wolves until the mid-1990s. At that time,

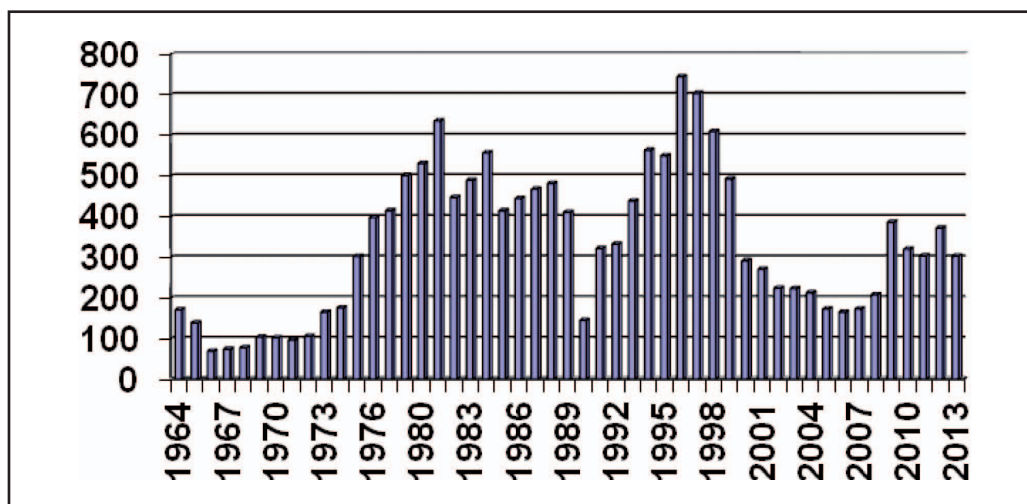


Fig. 2 Wolf harvest (total number of the shot individuals per year) in the three Baltic countries within last 50 years.

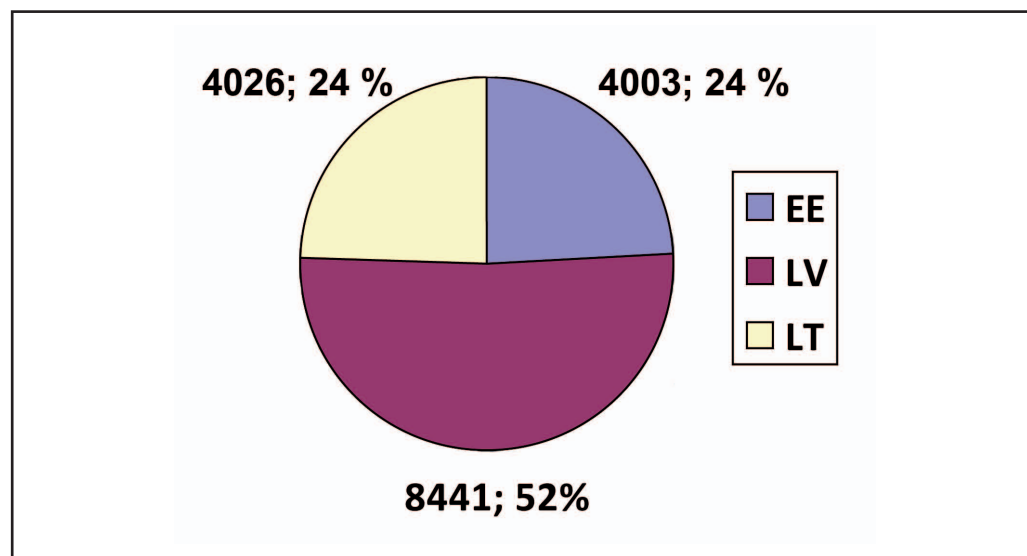


Fig. 3 Share of the each country in total wolf harvest within last 50 years (numbers and percentage)

the discrepant status of wolves motivated zoologists in all three Baltic countries to develop researches.

First of all, the studies were conducted on population status embracing distribution data, numbers, hunting bags and habitat description. Despite different methods applied for population assessment in Estonia (VALDMANN 2000), Latvia (OZOLIŅŠ et al. 2001) and Lithuania

(BLUZMA 1999), results enabled description of the region in a joint review (JEDRZEJEWSKI et al. 2010). A regional wolf distribution map was drawn as well (Fig. 1). Furthermore, several case studies were done on morphometric characteristics (ANDERSONE, OZOLIŅŠ 2000a, 2000b) and diets (ANDERSONE 1998, 1999; WALDMANN et al. 1998, 2005; ANDERSONE & OZOLIŅŠ 2004a, ŽUNNA et al. 2009).

We found that wild boar and beavers were comparatively frequent prey of wolves in the Baltics. In theory, the wolf could be perceived as the main predator adjusting the beaver population to a lower density. However, under the circumstances when hunting, habitat improvements and supplementary feeding of wild boar and red deer impact both the wolves and their prey, the predators can hardly control prey populations. Indeed, game statistics show that after Year 2000 almost all game species including wolves increased in numbers (ANDERSONE-LILLEY & OZOLINS 2005, KAWATA et al. 2008) (Fig. 4). This trend was confirmed by research on population demography. Most material was gained from Latvia (OZOLIŅŠ et al. 2001, 2011) and smaller samples were examined for sex and age in Estonia (MÄNNIL 2012) and Lithuania (BAĖKAITIENĖ 2012), also. In Latvia for instance, within a period from 1998 to 2005 a total of 1164 wolves were shot. Surveying this bag, 331 (28.4 %) wolves were examined for age and reproductive status. The obtained pattern of the sex-age structure resembled that of a growing population. Average fecundity of matured female wolves ( $n = 32$ ) was rather high according to the average number of placental scars – 6.4 (min 4; max 10;  $SD = 1.5$ ). Later investigations revealed even higher fecundity

– e.g. 12 traces of fetuses in uterus (Fig. 5). On average, 72.6 % of the shot matured females exposed fresh signs of reproduction. The share of the juveniles in the population amounts to 42.3 %, that is less than expected (68.2 %) from females' share in the examined sample and their fecundity. Thus, these results from Latvia confirm successful recruitment in a harvested population.

Baltic wolves have been studied for genetic diversity, structure and phylogenetic formation



Fig. 5 Dark traces of 12 fetuses (placental scars) in uterus of a female wolf from Latvia

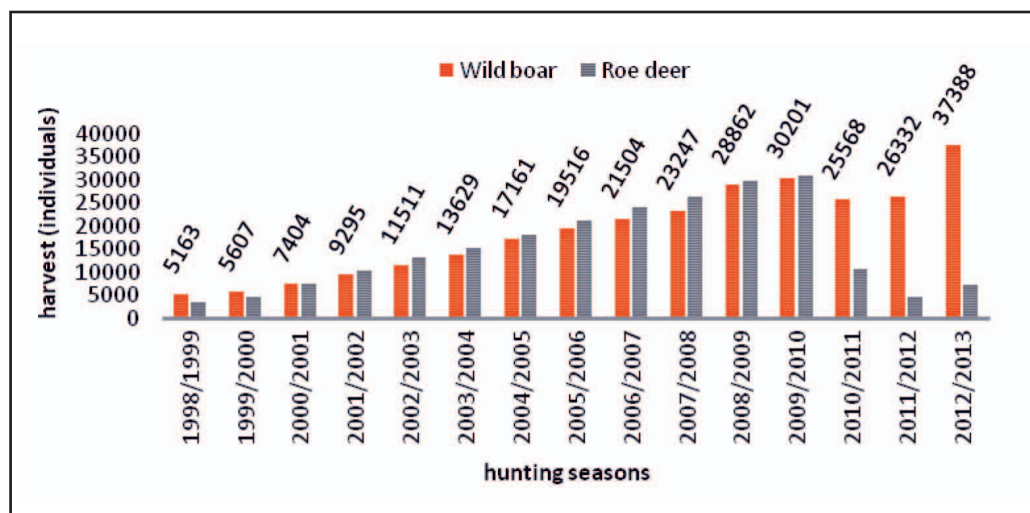


Fig. 4 Growing of wildboar and roe deer abundance in Latvia according annual hunting bags (number of shot wild boar indicated above the bars)

(HINDRIKSON et al. 2013, STRONEN et al. 2013) and the results did not reveal any threat to the recent population. However, a few DNA examinations of phenotypically suspicious individuals verified occurrence of the wolf-dog hybrids in the wild. Hybridization with stray dogs is one of the least manageable threats since available data indicated that wolf-dog hybrids are associated with weakened wolf packs and the presence of feral or free ranging domestic dogs. Hybridization has been confirmed by DNA analyses in one pack from Estonia and two packs from Latvia (ANDERSONE et al. 2002; HINDRIKSON et al. 2012) while some other packs were phenotypically suspected to be hybrids (Fig. 6) and genetic analyses are still in process. In Lithuania, genetically confirmed hybrids so far have not been identified (BALTRUNAITE et al. 2013). Noticeably, all putative hybrid packs have been

located in west Estonia and north-eastern Latvia, i.e. in areas with comparatively low wolf abundance.

And last but not least, public attitudes towards wolves were studied in all Baltic countries. First inquiries were arranged in Latvia (ANDERSONE & OZOLIŅŠ 2004b), Estonia (RANDVEER 2001) and Lithuania (BALČIAUSKAS 2001) by enthusiastic national experts. Later surveys were methodologically coordinated equally across the whole region as a part of the international project “Large Carnivores in the Northern Landscapes: an Inter-Disciplinary Approach to Their Regional Conservation” financed by the Research Council of Norway and NINA (BALČIAUSKAS et al. 2005, BALČIAUSKAS & KAZLAUSKAS 2008). In general, in this study the Lithuanian society demonstrated the least tolerance towards wolves while public in Estonia best accepted coexistence with large carnivores. The above mentioned case studies formed a robust justification of wolf status enabling authorities to make decisions on further management. Consequently, by EU Habitat Directive 92/43/EEC “On conservation of natural habitats and wild fauna and flora” where the wolf is listed under Annex II (its habitats should be made specially protected areas) and Annex IV (exploitation ban), Baltic countries have got a geographic exemption. It means, in the whole of the Baltics the wolf is added to Annex V species which means that it can be hunted using methods not banned by the Directive. There is population monitoring, yet there is no need to designate specially protected areas for wolf conservation.

Implementation of obtained knowledge from researches into management practices was not easy. Idea about wolf conservation actually required a revolution in human perception, however recently it has started to be accepted step by step. In the past, the wolf control was mostly motivated by “game conservation”. For instance, in Latvia less than 20 years ago – between 1995 and the first half of 1997 – the total sum paid by the State Forest Service to the hunters for killing 276 wolves was 18,238.96 LVL (= ca. 29,900 EUR). Since 1<sup>st</sup> January 2000 awarding a bonus was cancelled but wolf control continued to be financially supported by some municipalities and private persons.



Fig. 6 Two wolf-dog hybrids confirmed by DNA analysis (HINDRIKSON et al. 2012) (upper photo) and suspected hybrid shot in 2014 from NE-Latvia (lower photo)

By regained political independence and information freedom, the wolf, namely researchers and conservationists dealing with it, came into a controversy over interests and opinions. Nevertheless, there was one important peculiarity of human dimensions likely specific for entire Baltics and not detectable by standard inquiries – seeing a parallel between wolf control and a big impact of former soviet politicians in game management. Accepting the wolf as a flagship for nature conservation, some interest groups could demonstrate their protest to the past rather than understand ecological sense of this top predator. Though the so-called anti-hunting movement was not pronounced, there were people strongly voicing in press, especially in Lithuania, that wolf hunting should be either stopped completely or reduced to the cases of attacks to livestock. Recent wolf management policy seems quite united throughout the region from the point of view of external legal liability while some differences originated and persist on a national level. In the accession process to the European Union, annual shooting quotas were introduced and closed seasons in wolf hunting affirmed in all three countries. Basically, all national systems of management are adaptive, i.e. harvest quotas are predicted in line with the changes in species abundance while the main goal is to preserve the population at a favourable conservation status. The differences between countries are in techniques of status assessment, conceptions of target populations, durations of open seasons as well as decision making procedures (Tab. 2) However, these differences do not affect common status of Baltic carnivores considerably.

Cooperation among the states sharing the Baltic carnivore populations takes place at the level of individual experts and decision makers rather than within a regularly acting framework. A step towards calibration of conservation and management approaches was done in 2011 by organizing the 8<sup>th</sup> Baltic Theriology Conference in Lithuania. The program of this meeting was devoted to various studies of large carnivores. A workshop on wolf management in three Baltic countries was attended by representatives from scientists, relevant state authorities and NGOs. The basic principles of carnivore conservation at the population level are included in all op-

erative carnivore conservation plans as well as those elaborated for protected areas. The most recent co-operation on the wolf conservation policy was achieved by elaborating the “Key actions for Large Carnivore populations in Europe” (BOITANI et al. 2014) where a trans-boundary approach to population management was brought in front of all activities.

The largest recent distinction of wolf management in the region is dealing with damages to the livestock owners. In Latvia, damage to livestock is minor and localised, and a compensation system has not been implemented. At the same time, sheep farming is a new and growing way of land use, especially in remote areas. Conflict with wild predators becomes obvious because in this case sheep are brought into a semi-natural environment, not because carnivores have returned into rural landscapes as in some other countries, e.g. Germany, France or Sweden. The farmers do not realize that wolves can kill unprotected domestic animals regardless of abundance of wild prey, particularly at night time. Therefore, an unsolved task is to convince the farmers that they must enforce widely known preventive measures to minimize the loss from wolf depredation. Similar problems are reported from Lithuania. There is neither a livestock depredation compensation scheme nor funding available for adopting mitigation measures. Furthermore in the Baltics, both wolves, feral and stray domestic dogs are believed to be predators on sheep, goat, and cattle (usually calves).

Since 2007 the compensations for livestock damages are paid by the state in Estonia with the responsible body being the Environmental Board and the funding source being the Environmental Investment Centre. All cases are inspected by trained experts of the Environmental Board and if confirmed 100 % of the market value is paid. At the same time, wolf is more hunted in agricultural areas of Estonia thus giving more protection to packs living in the forest habitats (MÄNNIL & KONT 2012).

Concluding we stress the need for permanent monitoring and transboundary co-operation of experts and competent authorities as main pre-conditions to ensure our conservation goal – sustainable and harmonized game management of the wolf population at a favourable status.

*Table 2 Switch from pest control to conservation approach in wolf management of Baltic countries*

Key points of management	Estonia	Latvia	Lithuania
Duration of recent management system (years)	13	10	9
Use of the species before recent system	Non-restricted hunting promoted by bounties	Non-restricted hunting promoted by bounties	Non-restricted hunting, however, limited by season
Formal reason for implementing quota system	Decision to stop further population degradation	External legal liability	External legal liability, NGO pressure
Average capacity of quota filling (%)	80	95	100
Main index for reducing quota	Decrease of reproductive packs	Unfavourable changes in demographic structure of hunted individuals	None (should be reduction in number while really – NGO pressure)
Main index for rising quota	Increase of reproductive packs/ increase of damages	Favourable demographic structure of hunted individuals/ increase of damages	Damages, public unacceptance, rising numbers
Management goal	Reached target population size	Public acceptance of conservation status	Favourable population status. Public acceptance of numbers and damage done
Target population size	100–200	–	150–250
Estimated long term trend in population after system's implementation	Increasing	Stable	Increasing
Changes in environmental carrying capacity	Increase (till 2009) and decrease (since 2009) due to prey populations	Increase due to prey populations	Increase due to prey populations
Other management actions apart from harvest (e.g. habitat protection/ improvement measures)	Damage compensations since 2007	None	Locally

## Summary

The article summarizes history, recently implemented actions and results of the wolf population management in Estonia, Latvia and Lithuania within the last 10 years. Authors refer to legal acts, official statistics and relevant case studies. Baltic wolves have been studied in Baltic countries for population dynamics, distribution, age-sex structure, foraging ecology, genetic diversity and reproduction to various extent while human attitudes were surveyed according to comparable methodology across the whole region. Comparatively good knowledge of favourable population status enabled all three countries to arrange geographic exemption regarding the wolf position within the annexes of EU Habitat Directive 92/43/EEC. Namely, the wolf is added to Annex V species which means that it can be hunted using methods not banned by the Directive, there is population monitoring, yet there is no need to designate specially protected areas for wolf conservation. Recent national systems of wolf management are adaptive, i.e. harvest quotas are predicted in line with the changes in species abundance. The main goal is certainly to preserve the population at favourable conservation status. Differences are in techniques of status assessment, conception of target populations, duration of open seasons as well as decision making process. Improvement of cooperation among states sharing the Baltic wolf populations is an important task for the future.

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