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Beaver management in Lithuania

Key words: Beaver, *Castor fiber*, management, classification of beaver sites, Lithuania

History and origin of beavers in Lithuania

The current population of beavers in Lithuania was restored mainly due the reintroduction works in the 1940's–1950's. Totally, 108 individuals were released at five locations inside the country and Kaliningrad Region (Russia) near the Lithuanian border from 1947 to 1959 (PRŪSAITĖ 1988). Origin of the reintroducents was basically belarussian (Gomel Region); eight beavers were brought from Voronezh Region, Russia. In southern Lithuania, beavers have naturally immigrated from Belarussia (Grodno Region). Totally, at least six geographically or temporally isolated centres of spread have influenced the formation of the present beaver population. The expansion stage has finished in the 1970's. Morphological and genetical characteristics of the newly formed 'hybrid' population show higher variabilities of Lithuanian beavers in comparison with the maternal populations in Russia and Belarussia (LAVROV 1981; ULEVIČIUS, PAULASKAS 2003).

Hybrid origin of beaver population in complementation with good environment conditions and low regulation press has led to high beaver densities during last decades. In 2008, estimated density of beaver sites was 4.12 sites/1000 ha of the country territory (ULEVIČIUS, unpubl.). Maximum densities in some areas of hilly land-

scapes can reach up to 17.8 beaver sites/1000 ha rising the level of cumulative impact of beavers on a landscape up to 11 % of the whole territory (SAMAS 2016). Such an extremely high impact of beavers really challenges management of this population.

Goals of beaver management

Beaver management in Lithuania rests on three basic concepts: 1. beaver is a key stone species in a landscape ecosystem; 2. beaver is valuable economical resource; 3. beaver is damaging factor.

As ecosystem engineers, beavers are transforming and creating wetland habitats and their infrastructure which is important to many other species (MÜLLER-SCHWARZE, SUN 2003; ROSELL et al. 2005; ULEVIČIUS et al. 2009; LAMSOUDIS, ULEVIČIUS 2012; SAMAS 2016). Beaver itself is valuable economical resource in terms of pelt industry and meat. In Lithuania, every year up to 20 thous beavers are taken from the wild by hunters and are used for pelt and meat. On the other hand, in conditions of dense population of beavers many conflict situations occur in agriculture, forestry and man-made infrastructures. Destroying of drainage systems and road dykes, flooding of arable land or meadows, flooding of productive forest stands are among

the most common damage cases caused by beavers in Lithuania.

The main goal of beaver management in Lithuania is to maintain the ecologically and economically reasonable abundance of this species. Ecologically reasonable abundance is thought to be lower than ecological carrying capacity (prevention from intraspecific competition and overuse of environmental resources), but high enough to ensure positive impacts of beaver to other species (habitats). Some indicators, such as low percent of the newly colonized beaver sites (mainly recolonized), colonization of pure habitats in terms of food and space, indicate beaver population in Lithuania has reached (or at least approaching) its ecological carrying capacity. Monitoring of beaver population dynamics should provide basic knowledge on abundance and habitat distribution tendencies needed for adaptive management.

Economically reasonable abundance suggests a balance between value of beaver as an economical resource (pelt, meat, recreation, ecosystem services) and losses from beaver damage. This balance is difficult to assess practically. Many interested stakeholders usually do not take into account recreation values or ecosystem services provided by beavers. Thus, declared losses from beaver damage largely overcome the benefits from pelt and meat, and as a result, economically reasonable abundance of beavers relies on question: what level of beaver damage could society tolerate? This forces to elaborate a system of quantification of beaver damage, which should be as simple as possible to be easily applied in practice.

Main tools of beaver management

Two main tools of beaver management are applied in Lithuania – 1) harvesting, 2) classification of beaver sites. These tools are tightly interconnected because harvesting relies on classification, i.e. different strategies of harvesting should be applied to different classes of beaver sites.

Beaver harvesting was the primary tool of beaver management in Lithuania since 1975 when hunting on this reintroduced species was allowed. However, harvesting alone did not solve

many problems of beaver damage. Usually, beavers were harvested in sites irrespective to beaver impacts.

Harvesting motivation is important factor to regulate beaver population. Since 2000, the hunting bag was rising and currently reached approximately 20 thous individuals yearly. Reasons of this tendency might be rather multiple. Lithuania has relatively well developed fur industry with barkery network and high quality skin development (very urgent for beaver skins). Approximate maximum prices of raw beaver skins might compensate part of hunting expences.

Additionally, utilization of beaver meat in the kitchen gets more and more popular. Beaver is the only game object in March and early April, so, wait hunting on beavers appears to be quite attractive this time. Finally, harvesting is practically the only effective tool to eliminate damage because hunters must compensate the officially declared damage.

Beaver site classification was implemented since 2003. The main reason was to differentiate harvesting strategies among beaver sites with respect of their ecological and economical impacts. Two types of beaver sites were distinguished: 1) non-perspective (“bad”) sites – those causing significant economical damage and/or containing limited resources for beavers (51.5 % of all beaver sites); 2) perspective (“good”) sites – those being valuable for biodiversity/habitats, no damage or damage is negligible, important as recreation places (48.5 %). Especially valuable beaver sites for biodiversity/habitats making 20 % of all beaver sites can be distinguished. Hunting clubs are responsible for classification of beaver sites on their hunting ground units.

Analysis of practical application of beaver site classification was done in 2004 (Table 1). Method – questionnaires to all hunting ground units. Totally, 8333 beaver sites were described. Approximately half of sites were regarded as non-perspective, and the rest as perspective. Especially valuable sites comprised one fifth of all sites. The only reason to classify beaver sites as non-perspective was beaver damage in forestry and agriculture. Destroyed drainage systems and flooded forests were the mostly fixed types of beaver damage (Table 2).

The most often arguments to classify beaver sites as perspective were as follows: 1. beavers do not cause damage, 2. beaver site is valuable as recreation site, 3. beaver site is important for biodiversity/habitat. The two last groups of sites make about 20 % of all described sites.

Different harvesting and management strategies

Results of this analysis suggest that approximately half of the present beaver population in Lithuania should be kept under increased har-

vest press to relief conflict situations and optimize social capacity for this species. Harvesting and management strategy diversification among beaver site groups was applied (Table 3). The main difference is that the non-perspective beaver sites should be removed at all if possible, whereas perspective beaver sites should be harvested minimally to be persistent for long time. In especially valuable sites some biotechnical means (e.g. improvement of feeding habitat by planting *Salix* species) are recommended. The main goal is to keep beavers in these sites as long as possible. Long occupation by beavers allow to restore and maintain valuable wetlands

Table 1 Results of beaver site classification in Lithuania in 2004

Class of beaver sites	Number of beaver sites	% of beaver sites
Non-perspective ("bad") sites	4292	51.5
Perspective ("good") sites	2374	28.5
Especially valuable sites ("good") sites	1667	20.0
Total:	8333	100.0

Table 2 Distribution of the non-perspective beaver sites by character of beaver damage in the forestry and agriculture in Lithuania in 2004.

Character of beaver damage	Number of beaver sites	% of beaver sites (from all described sites, n = 8333)
Flooded forest	1191	14.3
Destroyed valuable trees	394	4.7
Not specified damage for the forest	591	7.1
Destroyed drainage systems	1417	17.0
Flooded meadows & arable fields	699	8.4
Total:	4292	51.5

Table 3 Different harvesting and management strategies in two beaver site classes in Lithuania.

Class of beaver sites	Harvesting and management means
Non-perspective ("bad") beaver sites	• Should be harvested at first; • Taking up to 100 % of animals if possible; • All legal harvesting methods allowed (including specially trained dogs); • Removal of beaver dams (destroying of beaver dams is allowed for private landowners around the year).
Perspective ("good") beaver sites	• Taking not more than 10–20 % of animals (1–2 individuals/site); • Only wait hunting and Conibear traps allowed.

that attract many related species (amphibians, birds, mammals, etc.). Formation of local ecological communities in beaver wetlands needs time.

Perspective beaver sites usually occupy large areas and number of animals living in a site is often much greater than the statistical average of 4 animals/site (ULEVIČIUS 1999). In 2008, about 26 % of beaver sites were occupied by large beaver families (average 7 animals/site) (ULEVIČIUS, unpubl.). One of reasons of enlargement of beaver families could be limited spread possibility for subadult (2 years old) beavers in conditions of dense population. They may stay in parental sites for a time, thus, increasing number of animals in a site. It is reasonable to harvest these animals because they don't reproduce until they set new pairs at new sites.

Beaver damage mitigation tools such as installation of beaver pipes to reduce the water level, fencing of areas, road culverts, are widely implemented in North America, but not practically used in Lithuania. One of possible reasons – these tools are expensive and practically there is no experience on their use. They could be effective when installed professionally and

properly maintained. Infrastructure is needed for proper maintenance. It is hardly expected to be promoted by the private business, at least in the nearest future.

Does the management system work?

The harvesting of beavers in Lithuania started since 1975, however beaver site classification tool was implemented since 2003. The hunting bag raised up during the last ten years and approached 20 thousands of hunted animals. This comprises almost 50 % of beaver abundance estimated by official census. However, expert estimations of beaver abundance provide as much as twice higher beaver numbers in Lithuania. Thus, real hunting load on population might comprise about 20–25 %. Nevertheless, this harvesting level could cause additive mortality in beaver population of Lithuania and abundance started to decline since 2014 (Fig. 1). It is difficult to say whether this tendency was the result of implementation of beaver site classification tool, however, after this implementation hunters have to evaluate each beaver site more carefully than before.

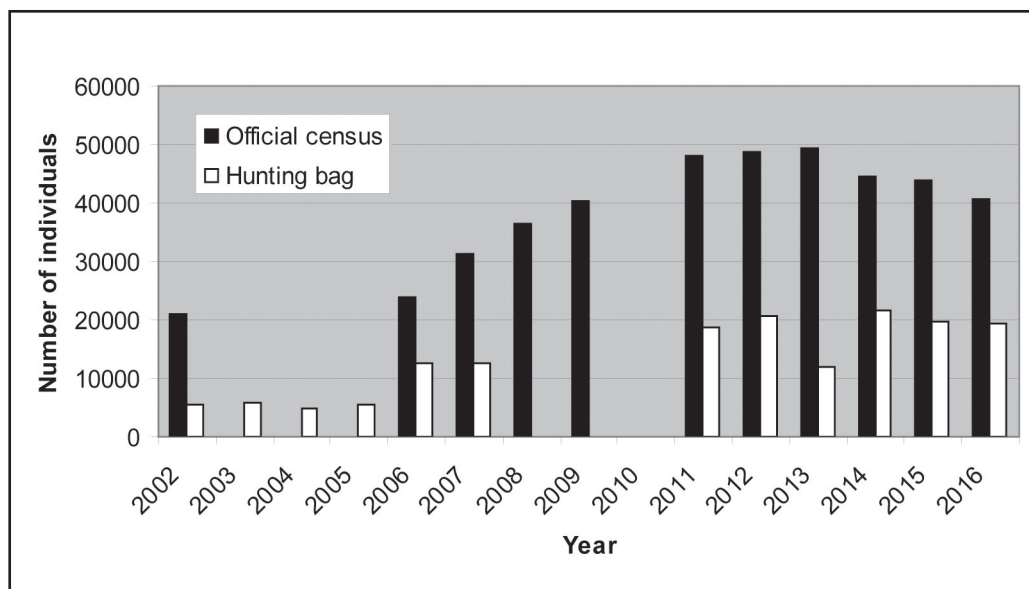


Fig. 1 Official census and hunting bag of beavers in Lithuania in 2002–2016. Data by the Ministry of Environment of Lithuania. Data are absent in some years.

Summary

High densities and impacts of beavers do challenge management of this species in Lithuania. Two main tools of beaver management were applied: harvesting and classification of beaver sites. Two classes of beaver sites were distinguished: 1) non-perspectivite (“bad”) sites – those causing significant economical damage and/or containing limited resources for beavers (51.5 % of all beaver sites); 2) perspective (“good”) sites – those being valuable for biodiversity/habitats, no damage or damage is negligible, important as recreation places (48.5 %). Especially valuable beaver sites for biodiversity/habitats (20 % of all beaver sites) can be distinguished. Hunting clubs are responsible for classification of beaver sites on their hunting ground units. The main difference between two classes of beaver sites is that the non-perspective beaver sites should be totally removed if possible, whereas perspective beaver sites should be harvested minimally to be persistent for long time. After the implementation of beaver site classification tool in 2003, the hunting bag raised up and approached 20 thousands of hunted animals yearly during the last ten years. This comprises almost 50 % of beaver abundance estimated by official census and 20–25 % by expert estimation. Slight decline of beaver population is observed in the last three years.

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Zeitschrift/Journal: [Beiträge zur Jagd- und Wildforschung](#)

Jahr/Year: 2017

Band/Volume: [42](#)

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Artikel/Article: [Beaver management in Lithuania 197-201](#)