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Habitat use and selectivity by beavers (*Castor fiber*) in anthropogenic landscape

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The aim of this article was to reveal utilization peculiarities of various habitats by beavers in a relatively highly anthropogenic landscape of Lithuania. Particular attention was paid to habitat distribution and selectivity by beavers under conditions of dense population. At present, based on expert estimations, the total numbers of beaver population reach about 100 000 of individuals, with the average beaver site density of 0.41 site/km^2. The greatest part of beaver sites (36%) was situated in canals of land reclamation in 2008. Beaver sites in natural rivers have comprised about 18%, in brooks – 12%, in lakes – 17%, in swamps and peat bogs – 15%. Habitat distribution of beaver sites was found to be related to landscape type. The most attractive habitats were the forest drainage canals (indicator of selectivity, HS = 3.5 ± 3.97 (SD)), followed by rivers (HS = 2.2 ± 1.78), lakes (HS = 1.2 ± 2.49). The least attractive habitats were the field drainage canals (HS = 0.3 ± 0.35). Utilization of habitats by beavers was found to be influenced by the structure of habitats. An increase of proportion of a habitat in the habitat structure, usually leads to an increase of the beaver site proportion in this habitat. This was found to be true for all habitat types, except the field canals due to a certain avoidance of this habitat by beavers. The increase of the proportion of a habitat in the habitat structure was found negatively influencing the usage of other habitats by beavers. In this respect, rivers, brooks, forest canals, and lakes were most antagonistic to the remaining habitats.

Key words: *Castor fiber*, habitat distribution, habitat selectivity, anthropogenic landscape, Lithuania

INTRODUCTION

After a sharp decline up to extinction in many parts of the former species range, beaver populations are recovering by artificial reintroduction or by natural immigration from survival refuges (Halley, Rosell, 2002, for a review). However, the contemporary landscapes in many European countries are considerably changed by humans, and beavers have to adapt to these new environments. For beavers, as semi aquatic animals, anthropogenic transformations of the hydrographical network might be considered being of vital importance. Nevertheless, there are few studies on how the anthropogenically changed hydrographical network affects the welfare of this species in various stages of population development.

The most obvious feature of anthropogenic transformation of water bodies is the regulated river channel. In intensive agricultural areas, many small streams were transformed into the canals of land reclamation (Gailiušis et al., 2001) which have different morphological and hydrological characteristics in comparison with the former natural streams. Canals of land reclamation comprise about 83% of the hydrographical network in Lithuania (Gailiušis et al., 2001). A significant part of the meliorated land has been never used for intensive agriculture due to unsuitable soil or infrastructure conditions (Kvaraciejus, 2001). A considerable part of the drainage canals is self-destructing due to inadequate maintenance or are affected by outside agents, like beavers.

Lithuania has both, an extremely changed hydrographical network and an abundant beaver population, thus it is an appropriate model region to explore how beavers utilize anthropogenically transformed water habitats. The aim of this article was to review the existing knowledge on utilization peculiarities of various habitats by beavers in a relatively

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highly anthropogenic landscape of Lithuania. Particular attention was paid to habitat distribution and habitat selectivity of beavers under conditions of dense population.

MATERIALS AND METHODS

Study area

The total area of Lithuania is about 65 thousand km^2. The total length of hydrographical network comprises 77 thousand km with the mean density – 1.18 km/km^2. Streams ≥ 3 km make 49% and streams <3 km – 51% of the total length; drainage canals comprise about 83% and natural streams – merely 17.4% of the total length of hydrographical network (Gailiušis et al., 2001). Agricultural areas comprise about 53%, woodlands – 33%, lakes – 1.5%, bogs and other swampy areas –5% of all the territory of Lithuania (Švažas et al., 2000; http://www.stat.gov.lt/).

The highest draining activities in Lithuania were observed during the last 40–50 years. Commenced at the beginning of the fifties, the draining activities approached the maximum in 1971–1975. A sharp decline in draining activity was observed in 1991–1995, and later it almost stopped (Gailiušis et al., 2001). Thus, the 30-year-old and older canals prevail in the hydrographical network. Neglected canals usually overgrow by woody vegetation (Lamsodis et al., 2005), and become suitable to be inhabited by beavers. Implementation of drainage systems has raised the density of hydrographical network in Lithuania by about 20% as a lot of new canals were excavated (Gailiušis et al., 2001). This factor can be considered as positive for beavers providing more favourable conditions for animal dispersal.

Model territories, material and parameters

Official census and hunting bag data are presented by the Ministry of Environment (http://www.am.lt/VI/article.php3?article_id=9892). Expert estimations in 1996, 2004, and 2008 were performed by the Order of the Ministry of Environment and rely on extrapolation of beaver density in model territories to all the territory of Lithuania.

Habitat use of beavers and dynamics of this parameter through the last 15 years were evaluated using three data sets from many different territories of Lithuania.

In 1996, beaver sites were sampled in five administrative districts of Lithuania representing three main landscape types: Molėtai District (hilly moraine uplands), Panevėžys District (clayey plains), Plungė District (hilly moraine uplands), Vilkaviškis District (hilly moraine uplands and clayey plains), Varėna District (sandy plains). We used direct communication with local hunters, staff environmentalists, foresters to map known beaver sites at the 1:50,000 scale map. In total, 624 beaver sites were sampled and used for habitat distribution of beaver sites in 1996.

In 2004, data on beaver site (n = 8 333) habitat use were obtained from all hunting grounds of Lithuania using special questionnaires addressed to hunters. Hunters were asked to classify all beaver sites as perspective and non-perspective. The data represented ca. 75% of the country area. This set of data was used for habitat distribution of beaver sites in 2004.

In 2008, beaver sites were registered in 36 model territories throughout the entire country (Fig. 1) with the aim to estimate beaver abundance in Lithuania by extrapolating and interpolating beaver density estimates in model territories (Ulevičius, 2009). The area of model territories varied from 3 100 to 15 000 ha. The field registration of beaver sites was performed by staff ecologists of regional parks. The list and number of beaver sites prepared by staff ecologists was named the declared list and number of beaver sites. Totally, 1 310 beaver sites were registered and analyzed for habitat distribution in 2008.

The metadata on each beaver site used in this paper contain: 1) geographical co-ordinates (except the data from the hunter query in 2004) of the beaver site centre; 2) type of habitat in which the beaver site centre was located.

Part of the last data set from 2008 was used to analyze interrelations between habitat availability and habitat selectivity by beavers. For this analysis we have chosen 25 model territories from all 36 territories studied in 2008 (Fig. 1). The choice criterion was the expert evaluation of reliability of beaver site number in a model territory. Expert evaluation was performed by a careful examination of aerial photographs (http://www.maps.lt/map/default.aspx?lang=lt) for signs of beaver presence in model territories. All territories with the declared significantly lower number of beaver sites in comparison with the expert evaluation were removed from this analysis.

Quantity of habitats in a model territory was estimated using large-scale maps (1 : 50 000) by measuring the length of river, stream or canal and lake shoreline. Only linear habitats were taken into account. The plot-like habitats (swamps and other wetlands) were omitted from measurements due the methodological difficulties of objective estimation of borders of these habitats on a map.

Habitat use by beavers was estimated by counting the beaver site number in a particular type of habitats in a model territory. In the analysis, it was expressed as the proportion of beaver site number in a particular habitat type relative to the total number of beaver sites in a model territory. **Habitat selectivity** (HS) by beavers in a model territory was estimated using the habitat use-to-habitat availability ratio:

HS = habitat use / habitat availability, where **habitat availability** was defined by the proportion of a particular habitat in the habitat structure of a model territory. It should be noted that the term "habitat availability" here was used in a relative aspect, i. e. the higher proportion of a habitat did not necessarily mean a higher amount of a habitat in a model territory.

In this paper a beaver site is defined as an area occupied by a single beaver, or by a pair of beavers, or by a family of beavers (adults with offspring) (Djakov, 1975). Usually it delineates a territory in which beaver signs are found. Under conditions of a dense beaver population, the neighbouring beaver sites may significantly overlay, thus, making the beaver site count problematic. This is why we have used beaver site centre conception to sample beaver sites. Beaver site centre was defined as the main lodge, or burrow, or beaver dam, or the densest cluster of beaver activity signs (mainly trails) on a river/lake bank (Ulevičius, 2009). This methodical concept was implemented among the staff ecologists during the field training in 2007.

The model territories (2008) were classified into landscape groups to find out the differences in beaver site habitat distribution among landscapes. A model territory was attributed to a landscape type if at least 2/3 of the area of this model territory was characteristic of this landscape. Four model territories were assigned to hilly moraine uplands, four – to clayey plains, and two model territories – to sandy plains. The rest of model territories could not to be assigned to a landscape type. Finally, 10 model territories, representing three dominating landscapes of Lithuania were chosen for this analysis (Fig. 1).

The following types of beaver habitats were distinguished:

1) Rivers – natural streams with water yield more than 0.5 m^3/s;

2) Brooks – small natural streams with water yield equal and less than 0.5 m^3/s;

3) Field drainage canals – artificial channels in open areas (free of forest);

4) Forest and outskirts canals – artificial channels inside or outside forest;

5) Lakes;

6) Swamps and other wetlands;

7) Other habitats relatively not abundant in the hydrographical network of Lithuania (reservoirs, ponds).

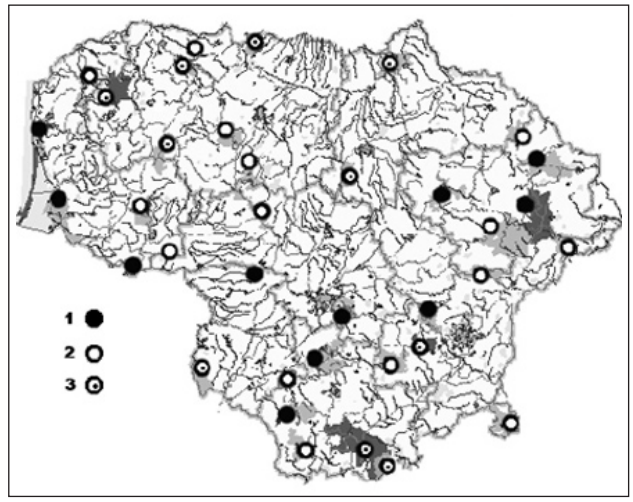

Fig. 1. Location of the model territories in Lithuania in 2008. *1, 2, 3* – all 36 model territories; *2, 3* – the chosen 25 model territories to analyze interrelations between habitat availability and habitat selectivity of beavers; *3* – ten model territories representing landscape types

RESULTS AND DISCUSSION

Beaver numbers

Having naturally immigrated at the beginning of the 1940s and reintroduced in 1947–1959, beavers have spread rapidly and by the 1970s were common in all the country (Ulevičius, 1997). The basic source of information on beaver numbers in Lithuania was the official data of beaver census. Being hardly reliable for various conjuncture reasons (reviewed by Bluzma, 1990) these data show at least some general tendencies of beaver numbers in Lithuania (Fig. 2).

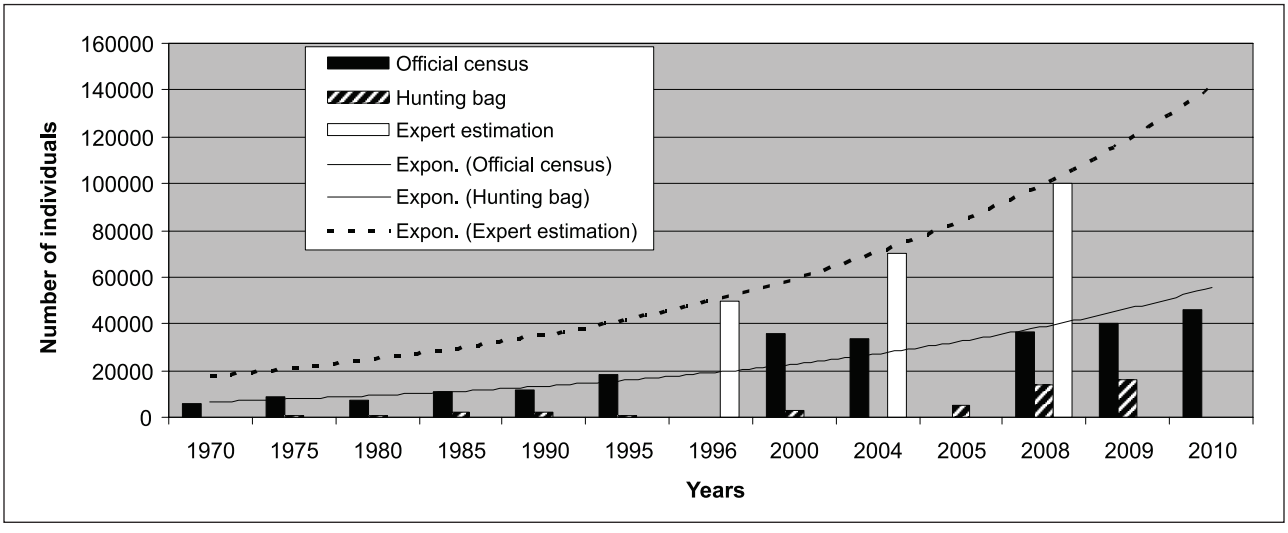

Fig. 2. Beaver numbers and hunting bag in Lithuania in 1970–2010

Special investigations on model plots and water bodies allowed extrapolation of beaver densities to the whole territory of the country. The mean density of the beaver population in Lithuania was estimated to be 0.2 beaver site/km^2 in 1996 (Ulevičius, 1997), thus, making about 13 000 of beaver sites and about 52 000 of individuals in total. These numbers have exceeded the official ones approximately three times.

In 2004, hunter clubs have declared about 8 300 beaver sites (more than 33 000 beavers with an average density of 0.18 sites/km^2) in 76% of the whole territory of Lithuania. Expert evaluation has resulted in about 70 000 beavers in Lithuania in that year.

Investigations in 36 model territories showed different estimates of beaver density in 2008: average beaver site density has reached 0.41 sites/km^2. This value resulted in total beaver abundance estimates in Lithuania reaching approximately 100 000 individuals.

Despite the existing discrepancies between official and expert estimates, both sources suggest tendencies of further growth of the beaver population in Lithuania. Signs of stabilization of beaver abundance indices were found in larger rivers (Ulevičius, Balčiauskas, 2002). Since 1996, beaver densities have remained quite stable in medium and large rivers, and have generally increased in the peripheral parts of river catchments and watersheds (Ulevičius, 2001).

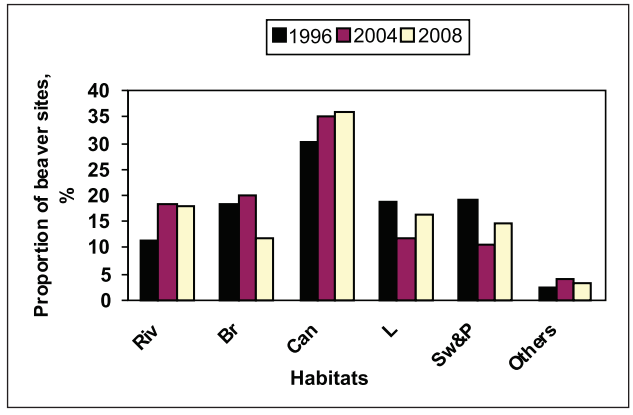

Fig. 3. Habitat distribution of beaver sites in Lithuania in 1996 (n = 624), 2004 (n = 8333) and 2008 (n = 1030). Riv – natural rivers, Br – brooks, Can – canals of land reclamation (both types of canals pooled together), L – lakes, Sw – swamps, P – peat bogs

Habitat use and selectivity of habitats by beavers

In 1996 investigations showed that under conditions of a dense beaver population a considerable part of beaver sites in Lithuania was located in small tributary catchments (Ulevičius, 1997), i. e. mainly in the small peripheral components (like brooks, drainage canals, swamps and peat bogs) of larger hydrographical systems. According to the type of habitat, the greatest part, about one third of beaver sites, was located in canals of land reclamation (Fig. 3). Generally, the situation has not considerably changed in the two successive periods of time. Analysis in 2004 and 2008 showed that beavers repeatedly most often inhabited canals of land reclamation (36%), then natural streams, rivers, lakes and swamps (Fig. 3). Moreover, a certain tendency of increase of the beaver population in canals of land reclamation from 1996 to 2008 can be noted.

This is not an unexpected outcome, keeping in mind the lack of maintenance of the drainage canals and their overgrowing with shrubs (Lamsodis, Poškus, 2006). Canals of land reclamation seem to be among the most important "reserve habitats" that could increase the ecological carrying capacity of beavers in an agricultural landscape (Lamsodis, 2001). Many other natural habitats show certain signs of beaver overpopulation, and increase of beaver abundance here was not a characteristic feature (Ulevičius, Balčiauskas, 2002).

Habitat use of beaver sites was found to be related to landscape type (Table 1). Differences in beaver site frequencies in different habitat types among three landscape types were statistically significant: 3 × 6 contingency table; $\chi^2 = 289.8$; df = 10; $p < 0.0001$. Among landscapes, the most obvious differences were pronounced in use of lakes and swamps. Hilly moraine uplands contain plenty of these habitats, whereas especially in clayey plains, swamps and lakes they are exceptionally rare (Basalykas, 1977) or absent at all (Table 1). Hence, the observed patterns of beaver site distribution among habitats were caused rather by the availability of the mentioned habitats among landscapes.

Landscape differences in beaver site distribution were also observed in rivers ($\chi^2 = 166.86$; df = 2; $p < 0.0001$), field canals ($\chi^2 = 6.62$; df = 2; $p = 0.0365$), and closely to the appropriate significance level in forest and outskirts canals ($\chi^2 = 5.36$; df = 2; $p = 0.0685$) (Table 1). Beavers have relatively rarely utilized canals of both types in sandy plains, whereas more often they were found in clayey plains and hilly moraine uplands. The observed patterns of different habitat distribution of beaver sites among landscapes can be influenced by uneven availability of habitats. In clayey plains and sandy plains, beavers are comparatively more restricted in the habitat choice than in the uplands. However, in sandy plains canals of land reclamation were found to be of less preference by beavers, probably due to higher availability of natural rivers and brooks in this landscape. Natural streams (rivers and brooks) are the most important habitats for beavers in sandy plains and clayey plains.

Selectivity of habitats by beavers was found to be different among habitat types (Kruskal-Wallis test: $H = 30.01$; $p < 0.0001$) (Table 2). The most attractive habitats were forest drainage canals; however, their selectivity was the most variable among model territories. This might indicate

Table 1. **Habitat use (number of beaver sites in a habitat; numerator) and habitat availability (length of a habitat in km; denominator) in model territories representing landscapes of different types in 2008**

Model territory	Habitat						Total number of beaver sites
	Rivers	Brooks	Field canals	Forest and outskirts canals	Lakes	Swamps*	
Hilly moraine uplands (HMU)							
Žemaitija National Park	10 / 4.5	10 / 7.8	2 / 28.5	8 / 12.4	17 / 7.6	96	143
Vištytis Regional Park	0 / 0	1 / 41.2	2 / 19.2	11 / 5.7	2 / 5.0	29	45
Varniai Regional Park	3 / 5.7	9 / 13.6	7 / 72.6	22 / 30.9	6 / 26.5	11	58
Trakai Historical National Park	0 / 0	4 / 6.2	1 / 2.9	8 / 3.7	12 / 27.1	6	31
Totally for HMU**:	13 / 10.2	24 / 68.8	12 / 123.2	49 / 52.7	37 / 66.2	142	277
	4.7	8.7	4.3	17.7	13.3	51.3	100.0
Clayey plains (CP)							
Biržai RP	12 / 8.0	1 / 4.0	0 / 29.0	5 / 17.0	0 / 0	1	19
Krekenava RP	22 / 19.9	1 / 5.2	7 / 25.1	10 / 58.8	0 / 0	0	40
Žagarė RP	9 / 6.5	0 / 0.7	3 / 53.3	13 / 24.5	0 / 0	0	25
Venta RP	70 / 35.2	28 / 34.7	7 / 35.2	24 / 27.5	0 / 0	0	129
Totally for CP**:	113 / 69.6	30 / 44.6	17 / 142.6	52 / 127.8	0 / 0	1	213
	53.1	14.1	8.0	24.4	0	0.4	100.0
Sandy plains (SP)							
Dzūkija NP	13 / 29.9	9 / 16.8	0 / 2.0	3 / 5.0	0 / 2.0	0	25
Čepkeliai Strict Reserve	21 / 26.2	0 / 0	0 / 0	4 / 10.3	1 / 12.9	4	30
Totally for SP**:	34 / 56.1	9 / 16.8	0 / 2.0	7 / 15.5	1 / 14.9	4	55
	61.8	16.4	0	12.7	1.8	7.3	100.0
Test of differences in beaver site frequency among landscapes (χ^2; df; p)	166.86; 2; <0.0001	4.84; 2; 0.0889	6.62; 2; 0.0365	5.36; 2; 0.0685	Not tested***	Not tested***	–

* Availability of swamps was not estimated (see Materials and Methods);

** Upper numbers – total number of sites / total length of a habitat; lower number – percentage of beaver sites in a habitat;

*** Not tested due to the very different availability of these habitat types (for swamps – based on the empirical observations and literature data) among landscapes

a different value of forest canals for beavers among model territories, e. g. higher availability of natural habitats could influence lower usage of canals. Uneven persecution of beavers by man in canals of land reclamation could also impact lower usage of these habitats in some model territories.

Also, rivers were highly selected by beavers, but significantly lower selectivity, though close to the figure of one, was characteristic for brooks – small natural streams. This type of water bodies has particularly suffered from land reclamation activities and usually only remnant fragments of small brooks have survived after the implementation of drainage projects (Gailiušis et al., 2001). High fragmentation and low availability of this habitat could bias the selectivity indicator. Another reason for lower usage of this habitat by beavers can be the unfavourable hydrological conditions of small streams, especially in dry years when the majority of brooks with prevailing surface-water supply gets fully dry. In drought conditions, the shallow and relatively large beaver ponds in small brooks are likely prone to get dry faster than the deeper and relatively smaller beaver ponds in canals of land reclamation. Moreover, sometimes the persecution of beavers by man in brooks can be even more intense than in drainage canals due to extensive overflowing of land property.

The lowest selectivity was found in the field drainage canals (Table 2). The hydrological characteristics of the field canals do not significantly differ from the forest canals, but the basic factor, reducing the attractiveness of this habitat for beavers, is the lack of woody vegetation – the main winter food resource for beavers. However, as it was discussed above, the field canals would be more important for beavers in the nearest future due to overgrowth with woody vegetation (Lamsodis, Poškus, 2006).

Table 2. **Selectivity of habitats by beavers in 25 model territories in Lithuania. Habitat selectivity is expressed by proportion of beaver sites in a habitat divided by availability of this habitat in a model territory**

Habitats	n*	Mean habitat selectivity ± SD
Rivers	14	2.2 ± 1.78
Brooks	24	0.8 ± 0.74
Field drainage canals	24	0.3 ± 0.35
Forest drainage canals	25	3.5 ± 3.97
Lakes	24	1.2 ± 2.49

* number of model territories containing a particular habitat

We made analysis on how the usage of habitats by beavers might be influenced by the structure of habitats. Our results show (Table 3) that increase of the proportion of a habitat in the habitat structure usually leads to increase of the proportion of beaver sites in this habitat. This is true for all habitat types, except field canals, and this can be explained by certain avoidance of this habitat by beavers. Despite the statistical insignificance, some tendency of increase of beaver site proportion in field canals, together with relative availability of these habitats, can be noted. As it was shown in Fig. 2, the canals of land reclamation are the only habitats showing the increasing usage by beavers with time.

An increase of relative availability of natural streams (rivers and brooks) has led to negative tendencies of use by beavers of drainage canals and even lakes, and vice versa, high relative availability of forest canals and lakes was related to lesser usage of the remaining habitats. These findings show that the structure of habitats can be among the important factors of habitat selectivity by beavers.

The results of our investigation show that beavers have very successfully adapted to anthropogenic landscape of Lithuania. This is shown not only by high numbers of beaver population but also by utilization range of water body types by this semi aquatic mammal including highly artificial canals of land reclamation.

For the most part, namely the abundance of land reclamation canals reflects the degree of anthropogenic transformation of beaver habitats. Historically, beavers started to inhabit the canals of land reclamation only when population abundance has reached a certain level, i. e. somewhere in 1965 with population number of about 3 000 individuals. Later the proportion of beaver sites in drainage canals constantly grew making 14.7% in 1986 with a beaver number of about 13 000 individuals, and 30.3% at the beaver abundance level of approximately 30 000 individuals in 1997 (Lamsodis, 2000).

This dynamics shows that canals were not an attractive habitat for beavers to settle, at least initially at the stage of expansive growth of population while other natural habitats were not yet limited. A pattern of some avoidance in the drainage canal occupation by beavers was also discovered in a newly expanding beaver population in Russia (Zav'yalov et al., 2005). It was shown that despite high availability of drainage canals, the proportion of beaver sites in this habitat was rather low (17.3%) compared with natural streams and rivers (39%). Very similar tendencies of canal occupation by beavers were described in Estonia where in 1986 only 16% of beaver groups inhabited canals, but later this proportion rose up with an approximate rate of 10% per ten years, and in 1996 it was estimated to be 28% (Laanetu, 2001).

Nowadays, under conditions of dense beaver population, the land reclamation canals became one of the most important beaver habitats in an anthropogenic landscape. Especially in case of forest and outskirts canals. Their selectivity by beavers seems to be dependent on beaver population abundance status, availability of other alternative habitats, and the state of a canal itself. The results of our study show increasing tendencies of canal utilization by beavers; thus, it should be taken into account in implementation of landscape planning projects.

CONCLUSIONS

1. After the immigration and the reintroduction in the 1940s and 1950s, beavers have successfully colonized the agricultural landscape of Lithuania. In the last 2–3 decades, beaver population became very abundant reaching total numbers of about 100 000 individuals, with the average beaver site density of 0.41 site/km^2. Under conditions of dense population, beavers have utilized a variety of water body types, including highly artificial canals of land reclamation.

2. The greatest part of beaver sites (36%) was situated in canals of land reclamation in 2008. Beaver sites in natural rivers comprised about 18%, in brooks – about 12%,

Table 3. **Matrix of Pearson correlations between habitat type proportion (relative availability) and beaver site proportion (relative use) among habitats in 25 model areas in Lithuania. Upper number – coefficient of correlation, lower number – significance level of correlation, p; significant correlations – in bold**

Habitat, correlation of which relative availability upon relative use of habitat was tested	Rivers	Brooks	Field canals	Forest canals	Lakes
Rivers	**0.68**	0.31	–0.23	–0.29	**–0.43**
	0.0002	0.1265	0.2695	0.1569	0.0339
Brooks	–0.27	**0.67**	–0.36	–0.27	0.10
	0.1857	0.0003	0.0786	0.1914	0.6396
Field canals	0.31	–0.25	0.32	0.19	–0.38
	0.1353	0.2331	0.1130	0.3513	0.0634
Forest canals	0.12	–0.37	–0.03	**0.66**	**–0.44**
	0.5530	0.0691	0.8886	0.0003	0.0287
Lakes	**–0.45**	–0.16	0.19	**–0.42**	**0.82**
	0.0243	0.4491	0.3661	0.0364	0.0000

in lakes – about 17%, in swamps and peat bogs – 15%. The tendency of slight increase of beaver population in canals of land reclamation was observed from 1996 to 2008.

3. Habitat distribution of beaver sites was found to be related to the type of landscape. The most obvious differences among landscapes were pronounced in use of lakes, swamps, and canals of land reclamation. In hilly moraine uplands, beavers utilized significantly more lakes and swamps, whereas in clayey plains – rivers and forest canals, in sandy plains – rivers and brooks. The observed specificities of beaver site distribution among landscapes were probably caused by the availability and attractiveness of habitats.

4. Selectivity of habitats by beavers was found to be different among habitat types. The most attractive habitats were the forest drainage canals (an indicator of habitat selectivity = 3.5 ± 3.97 (SD)), followed by rivers (2.2 ± 1.78), lakes (1.2 ± 2.49), brooks (0.8 ± 0.74), and field drainage canals (0.3 ± 0.35). The lowest selectivity of the field drainage canals was explained by the lack of woody vegetation – the main winter food resource and building material for beavers. Field drainage canals would be more important for beavers in the near future due to overgrowth with woody vegetation.

5. Utilization of habitats by beavers can be influenced by structure of habitats. An increase of the proportion of a habitat in the habitat structure usually leads to an increase of the beaver site proportion in this habitat. This was found to be true for all habitat types, except field canals, and this can be explained by certain avoidance of this habitat by beavers. Moreover, the increase of the proportion of a habitat in the habitat structure was found to be negatively influencing the usage of other habitats by beavers. In this respect, rivers, brooks, forest canals, and lakes were the most antagonistic to the rest of habitats.

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BEBRŲ (*CASTOR FIBER*) BIOTOPŲ PANAUDOJIMAS IR BIOTOPINIS SELEKTYVUMAS ANTROPOGENINIAME KRAŠTOVAIZDYJE

S a n t r a u k a

Straipsnio tikslas – atskleisti bebrų naudojimosi įvairių tipų biotopais ypatumus santykinai stipriai antropogenizuotame Lietuvos kraštovaizdyje. Daug dėmesio skirtas biotopiniam bebrų pasiskirstymui ir biotopų selektyvumui esant gausiai bebrų populiacijai. Remiantis ekspertiniais vertinimais, šiuo metu bendrą bebrų populiaciją Lietuvoje sudaro apie 100 000 individų, vidutinis tankumas – 0,41 bebravietė/km^2. Daugiausia bebraviečių (36 %) 2008 m. buvo melioracijos kanaluose, mažiau upėse – apie 18 %, upeliuose – apie 12 %, ežeruose – apie 17 %, pelkėse ir durpynuose – apie 15 %. Bebraviečių biotopinis pasiskirstymas yra susijęs su kraštovaizdžio tipu. Patraukliausi bebrams buvo miško melioracijos kanalai (selektyvumo rodiklis = 3,5 ± 3,97(SD)), toliau ėjo upės (2,2 ± 1,78), ežerai (1,2 ± 2,49), mažiausiai patrauklūs – laukų melioracijos kanalai (0,3 ± 0,35). Bebrų naudojimąsi biotopais lėmė biotopų struktūra. Paprastai tam tikro tipo biotopo proporcijos didėjimas bendroje biotopų struktūroje didino ir bebraviečių proporciją tame biotope, išskyrus laukų melioracijos kanalus. Tai galima paaiškinti tuo, kad bebrai vengia apsigyventi šio tipo biotopuose. Nustatyta, kad tam tikro tipo biotopo proporcijos didėjimas bendroje biotopų struktūroje negatyviai veikia kitų biotopų panaudojimą. Šiuo požiūriu upės, upeliai, miško kanalai ir ežerai buvo labiausiai antagonistiški likusių biotopų atžvilgiu.

Raktažodžiai: *Castor fiber*, biotopų panaudojimas, biotopinis selektyvumas, antropogeninis kraštovaizdis, Lietuva