

USE OF SHORELINE VEGETATION BY THE EUROPEAN BEAVER (*CASTOR FIBER L.*)

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Abstract. The aim of the present study was to describe and characterize the use of shoreline vegetation by beavers for dam building as well as to determine their food preferences with regard to particular shrub and tree species. It was found that the selection of dam building materials by beavers was related to the occurrence and availability of certain tree and shrub species in the strip of shoreline vegetation. Tree branches to 6.0 in diameter and 0.5 to 3.0 m in length were used most often as construction material for dams. The analysis of food stored in winter caches revealed that beavers showed strong preferences for particular plant species.

Key words: European beaver, shoreline vegetation, food preferences

INTRODUCTION

Beavers are typical herbivores, so they feed on a variety of plant species [Żurowski 1989], usually found within 10 to 15 m from the edge of a water body. However, sometimes they may travel in search of food for a distance of 35 m from their habitat [Szczepański and Janiszewski 1997, Czech 2002, Żurowski and Kasperczyk 1986], and in exceptional cases even for a distance of between 60 and 100 m [Brzuski and Kulczycka 1999].

The beaver's diet shows seasonal variations. In the spring and summer beavers feed almost exclusively on herbs, grasses and aquatic plants. In the summer they also willingly consume bark and leaves of young willow trees as well as aspen and trembling poplar sprouts [Dzięciołowski 1996]. In October they start to gnaw shrubs and trees for food. Apart from their preferences for certain plant species, beavers are also known for tree-size selection [Dzięciołowski 1996]. Their favourite foods are aspen and willow trees, but they also gnaw the bark of hazel, birch, alder, oak or ash trees [Łoziński 1997].

Szczepański and Janiszewski [1997] reported that beavers would most often cut down small-diameter trees, considered most valuable. Such trees have soft bark, a high

percentage of bast (phloem tissue) and a low percentage of wood. When leaving the shore and travelling on land, beavers would choose younger and thinner trees [Bartmańska and Gryszkiewicz 1999]. Kubacki and Wajdzik [2002] demonstrated that beavers most frequently cut down small trees (to 4 cm in diameter) growing within 35 m from a body of water.

In the autumn beavers store branches and twigs in underwater piles near their lodges, to be used during the winter months [Brzuski and Kulczycka 1999]. They can easily get to them even when the pond is frozen over: they dive down, swim underneath the ice, retrieve some sticks placed at the bottom of the pile and transport them to the shelter [Szpaczyński 2003].

The aim of the present study was to describe and characterize the use of shoreline vegetation by beavers for dam building as well as to determine their food preferences with regard to particular shrub and tree species.

MATERIALS AND METHODS

The study was performed at two beaver sites located in the Province of Warmia and Mazury, Administrative District of Gołdap. The observations were carried out twice in 2005, in mid-June and at the end of October. Site no. 1 was a drainage ditch with a network of lateral channels, surrounded by a meadow (15 ha) bordering on a field under cultivation on the one side, and by a deciduous forest (about 26 ha) on the other. The dominant tree species were birch and black alder (72% and 26% respectively), the remaining 2% being mostly Scotch pine, Norway spruce, willow and single trembling poplars. Within 20 m from the site, shoreline vegetation was dominated by shrubs, including willow (90%), alder buckthorn and bird cherry (10%). Site no. 2 was a drainage ditch in a ravine, in an area classified as wasteland. Along the shoreline there were only small trees, reaching several meters in height, with the domination of willow and alder whose cut-down trucks sprouted new branches, as well as willow shrubs and wetland plants. The entire vegetation utilized by beavers could be found within 20 m from the dam, since the site is surrounded by hills visible at a distance.

Tree and shrub species were recognized based on two guides: Broda and Mowszowski [1971] and Mowszowski [1983].

The main phase of research comprised the determination and description of vegetation used by beavers for dam building. The same method was employed at both sites. The dams were partly destroyed in order to measure the length and diameter of branches and twigs used as construction material (at the point they had been gnawed through). The plant species was determined for each branch. It was also analysed whether bark had been stripped off and eaten. The percentage of braches of various tree species used for dam building was determined. The branches were allocated to three size groups, according to their diameter, i.e. the thinnest (to 3.5 cm), medium-sized (3.6 to 6.5 cm) and the thickest (above 6.6 cm).

Winter food caches were investigated in the autumn, and the species composition (%) of food supplies was determined.

RESULTS AND DISCUSSION

The data presented in Table 1 show that the materials used most often for dam building at site 1 were alder branches (35% in June, 30% in October), followed by birch branches (25% and 30% respectively) and willow branches (20% and 10%). Alder buckthorn made up 2% of the construction materials, while twigs of other tree species (bird cherry, trembling poplar and oak) accounted for 3% and 5% in the spring and fall respectively. The dam at site 2 was built using primarily alder branches (52% in the spring, 48% in the autumn). Twigs of alder buckthorn and other tree species constituted 10% in the spring, and 11% and 12% respectively in the autumn. Birch and willow branches were used in trace quantities only. Beavers used also some pine boughs to strengthen the structure of the dam.

Table 1. Construction materials used for dam building
Tabela 1. Udział materiałów używanych do budowy tam bobrowych

Construction material Rodzaj budulca	Dam – Tama							
	1				2			
	spring wiosna		autumn jesień		spring wiosna		autumn jesień	
	n	%	n	%	n	%	n	%
Willow – Wierzba	40	20	20	10	8	6	10	8
Alder – Olcha	70	35	60	30	65	52	60	48
Birch – Brzoza	50	25	60	30	2	2	1	1
Alder buckthorn – Kruszyna	4	2	10	5	13	10	14	11
Other species – Inne gatunki	6	3	10	5	12	10	15	12
Total – Suma	170	85	160	80	100	80	100	80
Unrecognized species Gatunki niez rozpoznane	–	15	–	20	–	20	–	20
Total – Razem	–	100	–	100	–	100	–	100

Other species – single branches of bird cherry, pine, trembling poplar and oak.
Inne gatunki – pojedyncze gałęzie czeremchy, sosny, osiki i dębu.

The differences in the percentage of particular tree and shrub species used as dam building materials resulted primarily from the availability of these species, since not all of them occurred at both sites or their proportions were different. A good example may be birch, which was common at site 1 (72%) and very rare at site 2.

Kubacki and Wajdzik [2002] observed that one of beaver dams they examined was made of goat willow, alder and bird cherry twigs plastered with mud and slime. Beavers used tree species growing within the shoreline near their lodge. Tomek et al. [1978] described a dam built of alder, birch, goat willow, hazel and alder buckthorn branches and sprouts, cut into sections, accompanied by twigs of trembling poplar, spruce, rowan, bird cherry and sporadically pine. All these tree and shrub species could be found in the vicinity of dams.

We observed that the bark was peeled off some willow branches which were then used to build the dams. Beavers also stripped the bark off a few birch and alder branches at site 1 and at site 2 respectively, but these were rare cases compared with the number of barked willow trees. Thus, it may be concluded that tree branches taken down for dam construction were seldom used as food.

The diameters of tree branches that served as material for dam building were also determined in the study. The percentage of branches of various diameters is presented in Figures 1 and 2. Figure 1 shows that dam 1 was made of the thinnest twigs (0.5-3.5 cm in diameter) in 58%, of medium-sized branches in 31%, and of the largest ones (above 6.5 cm in diameter) in 11%.

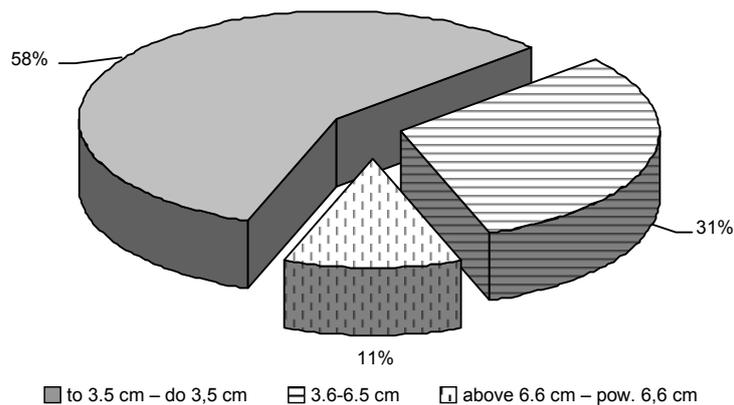


Fig. 1. Percentage of materials used for building dam 1, as dependent on branch diameter

Rys. 1. Procentowy udział materiałów użytych do budowy tamy 1 w zależności od średnicy gałęzi

In the case of dam 2 (Fig. 2), medium-sized, thinnest and thickest branches accounted for 43%, 33% and 24% respectively.

The above differences result from the fact that the shoreline vegetation at the two beaver sites differed in species composition and well as in the size of trees and shrubs. Brzuski and Kulczycka [1999] reported, after other authors, that the base of a beaver dam is made up of tree branches and trunks, 10 to 30 cm in diameter, and that the main construction element are twigs 1.5 to 3.5 cm in diameter, which can be easily manipulated in water. According to Tomek et al. [1978], beavers usually built their dams and lodges using tree branches to 6 cm in diameter, and in exceptional cases larger boughs (to 10 cm in diameter).

We also measured the length of branches and twigs used for dam building. All of them were 0.5 to 3 m long. Thinner twigs were usually shorter, whereas larger branches were even 1.5 to 3 m in length.

Tree species stockpiled in winter caches may indicate the food preferences of beavers. Figures 3 and 4 show that at both sites willow twigs, 0.5 to 1 cm in diameter and 1 to 3 m in length, accounted for over 90% of the stored food supplies. Some larger (6 to 8 cm in diameter and 0.8 to 2 m in length) birch and alder branches were also found. They were placed on the top of willow twigs so as to keep the entire pile under the water.

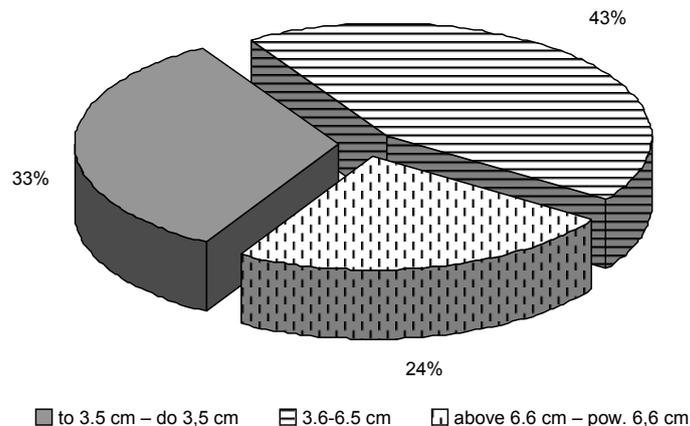


Fig. 2. Percentage of materials used for building dam 2, as dependent on branch diameter

Rys. 2. Procentowy udział materiałów użytych do budowy tamy 2 w zależności od średnicy gałęzi

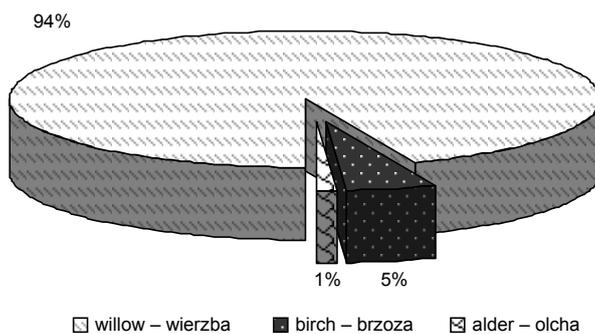


Fig. 3. Contents of a winter food cache at beaver site 1, %

Rys. 3. Procentowa zawartość magazynu pokarmowego na stanowisku 1

Dzięciołowski and Misiukiewicz [2002] analysed food supplies stored by beavers for the winter in four different habitats and described a certain pattern of distribution of twigs and branches in food caches, which was found to be similar to that observed in our experiment. The bottom layer constituted 2/3 of the total pile volume and was composed of shorter branches, to 1.5 m in length. At the top there were longer branches which pressed down those placed underneath. In water bodies and swamps located in arable land willow and birch twigs and sprouts accounted for over 90% of the stored foods. Willow was favoured in all types of habitats. The length of twigs ranged from 0.5 to 3 m, but those 0.5 to 1 m long were used most often. The majority of them belonged to strongly preferred species. Branches whose diameter varied between 1 and 3 cm dominated in food caches, although larger ones (over 9 cm in diameter) were also found.

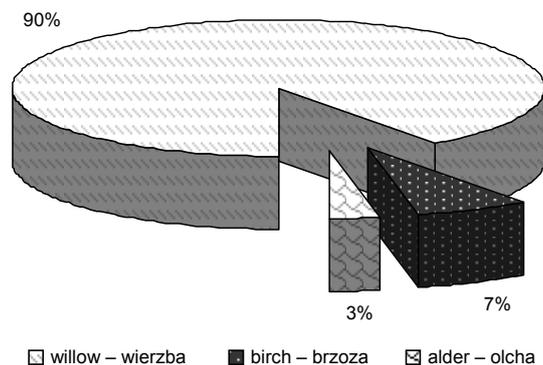


Fig. 4. Contents of a winter food cache at beaver site 2, %
Rys. 4. Procentowa zawartość magazynu pokarmowego na stanowisku 2

From late autumn to early spring beavers feed primarily on tree bark and bast, as well as on sprouts and leaves of shrubs and trees [Żurowski 1989, Czech 1996]. Beavers display a distinct preference for salicaceous species as a source of winter food [Dzięciołowski 1996, Panfil 1960]. However, the nutrient responsible for this preference has not been found [Dzięciołowski 1996]. Twigs and branches of trembling poplar, willow and birch are favoured food stored for the winter, but if the preferred species do not occur in sufficient quantities at a given site, beavers would use alder trees as well [Żurowski 1983]. The winter food caches examined by Dzięciołowski and Misiukiewicz [2002] contained not only willow and birch twigs, but also branches and boughs of other tree and shrub species, such as hazel, trembling poplar, oak, ash, linden, rowan, hornbeam, maple, plum, alder buckthorn and pine. Their contribution depended on their occurrence in the strip of shoreline vegetation at the tested beaver sites.

CONCLUSIONS

The results of the study enabled to formulate the following conclusions:

1. The selection of dam building materials by beavers was related to the occurrence and availability of certain tree and shrub species in the strip of shoreline vegetation. The most popular construction material was alder.

2. Tree branches to 6.0 in diameter and 0.5 to 3.0 m in length were used most often as construction material for dams. The differences in the use of certain tree species as building material resulted from their availability in the strip of shoreline vegetation.

3. The analysis of food stored in winter caches revealed that beaver showed strong preferences for particular plant species. The most favoured source of winter food was willow, which accounted for 90% of the food supplies stored for the winter.

4. Willow twigs and sprouts can be used during winter feeding of beavers, in order to enrich their diet or to prevent damage caused by these animals while storing food in the autumn.

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WYKORZYSTANIE PRZYBRZEŻNEJ BAZY ROŚLINNEJ PRZEZ BOBRA EUROPEJSKIEGO (*CASTOR FIBER* L.)

Streszczenie. Celem pracy było wykazanie i scharakteryzowanie wykorzystania roślinności przybrzeżnej przez bobry do budowy tam oraz określenie preferencji pokarmowych względem poszczególnych gatunków drzew i krzewów. Wykazano, że dobór materiałów

do budowy tam przez bobry był uzależniony występowaniem i dostępnością gatunków drzew i krzewów w pasie przybrzeżnym. Najczęściej do budowy tam były wykorzystywane gałęzie o średnicy do 6,0 cm oraz długości od 0,5 do 3,0 m. Stwierdzono wyraźne preferencje w wyborze pokarmu gromadzonego przez bobry w magazynach zimowych.

Słowa kluczowe: bóbr europejski, roślinność przybrzeżna, preferencje pokarmowe

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