

Wildlife ecology essay

By Vibeke Halvorsen
4th year
Szent István University



The beaver

1. Introduction

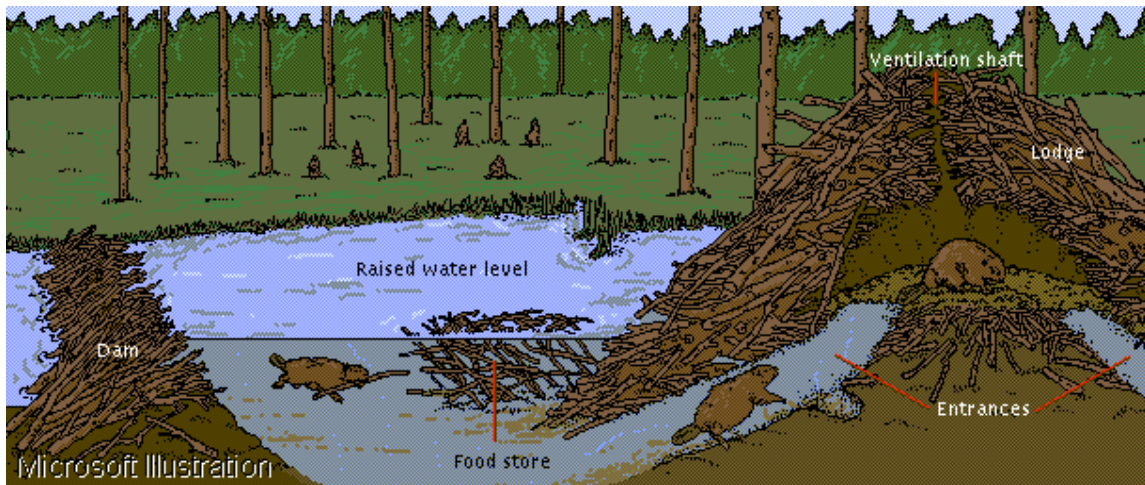
The beaver is one of our largest mammals living in several continents on the Northern hemisphere. There are two different species of beaver: *Castor canadensis* and *Castor fiber*, which interact and compete in areas where they coexist. The two species of beaver use their anal glands to mark their territory, the territory of their colony. The beavers are ecosystem engineers, forming their habitat by building dams, large changes in the environment and ecosystem can be seen. These changes are beneficial or detrimental to the already existing species of the ecosystem, increasing or decreasing biodiversity. Near extinction of the beaver in the 1800s and 1900s also showed the great effect in the ecosystem lacking the beaver. The beaver is an important species in the ecosystem which should be managed as well as its coexisting species.

2. Castoridae

The Castoridae family consist of two different species of beaver; the American or Canadian beaver called *Castor canadensis*, and the European or Eurasian beaver called *Castor fiber*. 10 000 years ago there also existed a giant beaver, *Castoroides ohioans*, which went extinct in the Holocene epoch. There are some differences between the two species living today. The Canadian beaver has 40 chromosomes while the European has 48. Further the nasal bone is more rounded in the Canadian species, and the fur is more brownish. (Nummi, 2006) In reproduction the two species also show some differences, the Canadian beaver usually matures somewhat earlier, and has on average bigger litters. Studies reveal that where the two species have been introduced in the same area, the Canadian will dominate and eventually replace the European beaver. (Rosell, 2005)

The beaver is a semi-aquatic rodent living in creeks, rivers, ponds, and lakes. And they can be found in ecoregions from subtropical to subarctic. (Rosell, 2005) They are in average 90-117cm tall when standing only on their hind limbs, and weigh 13-32kg. Beavers feed on bark and cambium, preferably from willow, aspen, maple, poplar, alder, and birch. These animals have a well developed cecum for digesting cellulose. The diet may also include

water lilies and berries during summer and autumn. The beaver is primarily a nocturnal animal, occasionally seen in daytime. The coat of the beaver is waterproof, and has a glossy shine and a reddish brown or blackish brown color. The beaver also has closable nostrils and ears, and transparent eye membranes to aid it during dives. Being a rodent the teeth of the beaver grows continuously, and in a healthy animal they should be 20-25mm long and have a bright yellowish orange color. Beavers live in lodges which can be found on islands, banks of ponds, or lake shores. The lodges has a "oven-shape", and consist of sticks, grass, moss, and plastered together with mud. Inside there is one large room measuring 2,8 meters in width and as much as 1 meter in height. The beavers also build dams from the same materials as the lodge. The dams enables the building of the lodges providing the increased water level. (Animal diversity)



(www.norsknettskole.no)

3. *Castor canadensis* in history

One of the earliest description of the Canadian beaver was done by Samuel Hearne in the late 1700s. (Animal diversity) But a real threat against the Canadian beaver started somewhat later, around the 1850s when their fur and skin became immensely popular, for use for example in top hats. Beaver fur was the best material because it holds the shape very well, and withstands rough wear, especially repeated wettings, far better than other types of fur or wool. Europe was the leading market, and after the European beaver almost went extinct, the import from America began. For example in Colorado the beaver population

decreased rapidly due to hunting or trapping, and by the 1900 the beaver was given complete protection. By 1937 all beaver control was restricted to salaried trappers, and in 1941 the Beaver Control Act was set into action, allowing only people from the state to set traps and paying half of the pelt value back to the landowner. In 1947 the fur prices decreased, and with the help of strict enforcement against poachers, the populations most places started to rise. After some decades the increase in beaver populations clearly showed their impact on the environment and laws allowing hunting and trapping was again put into action. (Hay, 2005)

The Canadian beaver was introduced to Europe in the 1920s and 1930s, this was before the confirmation that there were two different species of beaver. Several adult Canadian beavers were moved from America to Poland and Finland. In Finland they thrived and expanded to Russian Karelia in the 1950s. There were also made attempts to introduce the Canadian beaver in Russia, France, Hungary, and Austria. However there is reason to believe that the beaver is now extinct in Poland, France, Hungary, or Austria where no animals have been registered for some time. As I briefly mentioned earlier the litter size of the Canadian beaver is on average larger than in the European relative. In addition studies show that the Canadian beaver also mature earlier and demonstrate higher building activity than the European beaver. In Finland the two species coexisted for some time, but due to the interspecies differences the Canadian beaver eventually dominated over the European beaver. Numerous studies have been done on the subject and in the end it was found that several other factors, such as inbreeding in the European beaver also were important in this domination. (Rosell, 2005) Today the Canadian beaver population is estimated to be 10-15 million worldwide. (Wikipedia: Beaver)

4. The castor gland and the anal glands

The castor gland or sac is a pocket lined with a layer of nonsecretory epithelium containing the exudate called castoreum. This sac is unique to the beaver and is today used in perfumes. Earlier, in the 1700s, it was also used in medicine as treatment for fever, headache and hysteria. This made the castoreum very valuable at one point together with the fur, and in turn also leading to the almost extinction of the beaver. Also the Romans

thought it induced abortion, and the medieval beekeepers used it to increase honey production. The beaver uses it to mark their territory together with the anal glands. (Wikipedia: Castoreum)

The anal glands, also found in most carnivora, is present in both sexes and is used to mark the border of their territories. The anal gland is a holocrine secretory gland, containing a thick fluid. The lipid content and composition, color, viscosity and smell of the anal gland fluid can be used for sexing the beaver, and also to differentiate the two species of beaver, Canadian and European. The anal gland fluid of the European beaver males is oily and has a whitish to straw color, while in females it is a thick greyish paste. The odor is in general quite unpleasant but has different characteristics in the male and female. In the Canadian beaver male the anal gland fluid is brown and viscous, while in the female it is whitish to light yellow and runny. With this knowledge a fast determination of the sex and the species helps scientists control and register the populations and interactions between the two species in Northern countries. (Rosell, 1999)

5. Ecology

Rosell et al. classify beavers as ecosystem engineers having the ability to change, maintain, or create habitats by their building activities. They have also been called a keystone species due to the fact that they dramatically change landscape form and function to the benefit of themselves and more important, other species. But here the scientists do not agree, some claim that because of the beavers and their way of life the biodiversity will decrease over a longer period. (Rosell, 2005) (Glynnis, 2008)

Beavers live in family groups of up to 8 members of related individuals often referred to as colonies. (Animal diversity) They are stimulated by the sound of moving water to build dams which increases the water level allowing them to build lodges, giving them a place to store food called a cache, and somewhere they can hide from predators. The beaver does not have many predators. Their natural predators can be wolves and wolverines, but these animals are rare many places, and so the largest threat to the beaver today is by far humans. Most often by intensified industrial, urban, and agricultural demands upon water resources,

or in other words removing the beavers habitat. Natural abiotic factors also threatening the beaver is drought, often put in context to global warming. (Glynnis, 2008) (Wikipedia: Beaver)

Rosell et al. studied the ability of *Castor fiber* and *Castor Canadensis* to modify ecosystems. The studies was mostly performed I Norway and the U.S. and it considered the interaction between hydrology, geomorphology, water chemistry and temperature, all important factors influencing aquatic and terrestrial organisms. And all these factors can be modified by the beaver. The hydrological effect of one dam is not significant, but a series of dams may have an impact on the water flow and level. Normally beaver dams reduces the severity of flooding, and by this also the erosion. The beaver also alters the geomorphology by digging canals, caches, and building dams. This affects the discharge regime and sediment transport which plays a large role in shaping the river channel. In turn the geology will affect the water chemistry together with soil type, land use, and climate. For example nitrogen levels can be many times higher in beaver ponds due to the accumulation of sediments caused by the dam. This can lead to higher algal production. In general organic chemicals tend to accumulate in the beaver pond sediment due to decreased flow. The effect on the temperature varied greatly, depending on geographical location, size of the pond, and season. (Rosell, 2005)

Foraging by the beaver to find material for building and food can affect the ecosystem. The beaver, as previously mentioned, prefers ash, birch, willow, and poplar etc. and rarely moves more than 60meters away from the pond. In these areas the effect of foraging shows a shift in species composition. Depending on the new species this could lead to either decreased or increased succession. When it comes to the animals living in the same habitat as the beaver the effects are either beneficial or detrimental. This usually leads to a shift in the species composition, but this depends on a various factors for example pond size. (Rosell, 2005)

Class	Example of species	Effect	Reason for effect (in short, simplified)
Aquatic invertebrates	Louisiana pearlshell mussel	Detrimental	Needs flowing water

Terrestrial invertebrates	Fruit fly spp.	Beneficial	Needs rotting bark
Fish	Salmon spp.	Challenging	Because of seasonal migration up and down streams
Amphibians	Salamander spp.	Detrimental	Needs free flowing stream. Increase in predatory fish in beaver ponds
Reptiles	Turtle Chelonia	Beneficial	Prefers shallow, slow flowing water, abundant aquatic vegetation, and soft organic substance.
Birds	Duck spp.	Beneficial	Because of abundant supplies of plant particles, seeds, and invertebrates.
Semi-aquatic mammals	Otter	Beneficial	Use lodges for shelter and breeding.
Terrestrial mammals	Elk	Beneficial	Beaver meadows provide succulent vegetation.

Figure based on facts from Rosell et al. 2005

Glynnis et al. studied amongst other things, the beavers impact on the wetlands of east-central Alberta in Canada over 54-year period. During this period the area experienced all from extremely low number of beavers to significantly higher numbers, giving the scientists the possibility to see the actual impact of the beaver more or less without other variables. They used aerial photographs and beaver census data to examine the effects of the beavers influence on the water level in the Elk Island National Park, situated in a mixed boreal region in the heart of Cooking Lake Moraine. They found that the presence of beaver had a dramatic effect on the open water in the wetlands, and that the presence of lodges and active beaver colonies was the best predictor of open water coverage in the Park. The beaver had a overwhelming effect on wetland creation and can maintain open water areas even through drought, although if the drought gets too severe they will not survive. They concluded that removal of the beaver from the aquatic systems would greatly affect the area, and be classified as a wetland disturbance. (Glynnis 2008)

6. Conclusion

The beaver is an animal capable of making large changes in the ecosystem. Whether it is a keystone species or just an ecosystem engineer is not up to me to decide. But it is easy to see that removal or extinction of the animal will have great impact, in some areas more

than others, for example wetlands. The beaver has a large impact on the species living in the same habitat, these can be beneficial or detrimental. Management of single species as well as whole ecosystems is important to avoid putting other species in danger of extinction, and better understanding the overall effect.

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http://en.wikipedia.org/wiki/Beaver#American_Beaver

<http://en.wikipedia.org/wiki/Castoreum>