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ABSTRACT

Understanding how species feed, use natural resources, and how they influence the ecosystem is one of the key subjects of the protection of biological diversity, wildlife management, and timber production. Availability of the resources and their distribution in the environment have great impact on animal feeding, their distribution, and behavior, also in the presence of other species.

In my PhD dissertation I focused on three aspects of using the feeding resources by the herbivores that depend on the same area of occurrence, seasonal diet variation within a few years, and in the presence of potential competitors. My research focused on moose (*Alces alces*), roe deer (*Capreolus capreolus*), and red deer (*Cervus elaphus*). In all three aspects I applied the PCR-based qualitative method that used two universal *g* and *h* primers, one of them fluorescence-labeled. To analyze the winter diet of moose, roe deer, and red deer in the lower basin of the Biebrza River Valley, I also applied the quantitative method, i.e. DNA metabarcoding with large-scale sequencing NGS. Both methods gave highly and significantly correlated results, what shows their credibility and mutual complementation.

In the first part of my research I focused on comparing the winter diet of moose, roe deer, and red deer in the lower basin of the Biebrza River Valley. I demonstrated that to a large extent the herbivores feed on the same types of plants and they have at least 9 common key resources. Pine was the preferred plant as it comprised a large part of the diet of all cervids. It was possible due to the winter clearings. My research confirmed previous suggestions that this method of tree management, if conducted on a proper scale, can limit the damage caused by moose, roe and red deer. Simultaneously, the availability of pine is very small and the density of cervids is high. Therefore, the natural reconstruction of this plant species is impossible and it cannot be the main stable food source for these animals. Assessing and comparing the composition of moose, roe deer, and red deer diets allowed me to confirm the hypothesis that the red deer is the species of high diet plasticity. Therefore, it imitates the roe deer niche. My research also showed that the food niche of moose, roe deer, and red deer in the lower basin of the Biebrza River Valley overlap to large extent. Nonetheless, because of a different proportion of trees and bushes to herbs and grasses in the diet of particular species and a large number of plants that were eaten by different 9

species, I assume that these niches are separated. This is probably the effect of food competition that the herbivores successfully minimize through resource partitioning. What is interesting, when winter clearings are frequent, the pine is easily accessible, and the overlap of niches is increased, what is visible in the diet of moose and roe deer.

In the second part of my thesis, I verified the hypothesis that the differences in the winter diet composition result from the differences in the food base. I characterized the diet composition of moose by analyzing the DNA isolated from its faeces sampled in the Biebrza River Valley, Kampinoski National Park, and Poleski National Park in the winter 2007–2008. I demonstrated similar moose diet composition that was estimated from the frequency of occurrence of various trees and bushes in their stools, what according to the literature, proved that moose rely on a given stable group of plants. I assume that moose can adapt their diet to the contents and availability of the food base in a given environment. This confirms high food plasticity of this species.

The last part of my PhD dissertation focused on moose diet variation in three winter seasons from 2011 to 2014 in the lower basin of Biebrza River Valley. The results of my research demonstrated that in the same area and with similar population density, the herbivore diet's components may differ. Moose relied on the groundcover food less often, but they relied strongly on trees, especially during harsh winters with high snow cover depth and duration. This seems to be a key factor that influences their diet.

The results of my PhD dissertation might have practical aspect. They clearly demonstrate that the forest management greatly influences the diet of moose, roe deer, and red deer and *vice versa* – the knowledge about their diet may help in proper forest management that can lower forest damages.