ABSTRACT

In fragmented landscapes, survival and dynamics of plant species may be determined not only by local habitat conditions but also by landscape structure and its changes over time as well as by species life-history traits and their local population dynamics. Understanding the factors and processes determining diversity, distribution and variation in performance in species of fragmented habitats is thus very complex. Most previous studies focused only on some particular factors. However, studies that explored the relative importance of all these factors for species diversity and composition are rare, especially in dry grassland communities. Also studies exploring variation in species performance in relation to landscape fragmentation usually deal only with a single species and were often done in different study systems making generalization difficult. The aim of this Ph.D. thesis was to explore factors that are responsible for species diversity, distribution and interspecific and intraspecific variation in performance of dry grassland species occurring in a system of dry grassland-like forest openings in the forested landscape.

In **Chapter 1** I examined the effect of current and past landscape structure and local habitat conditions on species richness at dry grassland-like forest openings and assessed their relative importance. I analyzed information on past and present landscape structure using aerial photographs from 1938, 1973, 1988, 2000 and 2007 and calculated the area and isolation of each locality in the present and in the past and the continuity of localities. I found that local habitat conditions had the strongest effect on species richness, followed by historical landscape structure. Current landscape structure had the weakest effect. The highest species richness was observed on larger and more heterogeneous localities with rocks and shallow soils, which were already large and well connected to other localities in 1938 or at least in 1988.

In **Chapter 2** I found that also species composition was determined by landscape structure in the past and at present, and the past landscape structure in each time period separately was equally important as the present landscape structure. Perennial species that are insect or wind pollinated, flower over limited periods of time, are dispersed by animals, have low nutrient requirements and have competitive or partly stress-tolerant strategies were found to be restricted to continuous localities existing at least since 1973 or 1988 and to localities that are currently well interconnected. In contrast, self-pollinated, ruderal species prevail in currently less-connected localities.

In **Chapter 3** I explored the effect of population size and connectivity on plant performance of 21 dry grassland species differing in their life-history traits. I found that population size and connectivity significantly affected the performance of all the studied dry grassland species, but the effect of decreasing population size and connectivity was not always negative. These effects were detected not only in the field, but also in the common garden environment (but they were weaker there). This indicates that the differences in plant performance of most dry grassland species are not only due to differences in the actual habitat conditions but also due to effects of their population size and connectivity *per se*. The

between species comparisons identified range of species traits determining species sensitivity to changes in population size and connectivity.

Extensive data obtained in **Chapter 3** also allowed to explore more general question related to determinants of above- and below-ground biomass allocation patterns in the different species which I aimed in **Chapter 4**. I found isometric as well as allometric patterns of biomass allocation in the studied species. I confirmed that biomass allocation pattern is species- and age-specific and that plant life-history traits are much more important in explaining allocation pattern among species than is phylogenetic relatedness among species within a habitat. The pattern of biomass allocation can thus be used as additional species trait explaining species sensitivity to landscape structure. Species with lower shoot–root allocation slope at adult plants, which is typical for earlier flowering species with higher SLA, are more sensitive to decreasing population connectivity as was shown in **Chapter 3**.

The overall results indicate that knowledge of landscape structure in the present and in the past is important for understanding the current species diversity and distribution and that species traits can be used as useful predictors of species responses and sensitivity to the landscape structure as well as of biomass allocation patterns.