

Summary for general public

Riparian ecosystems are crucial components of the landscape. They are confined to the river valleys covering relatively small area, yet they provide many benefits to both the environment and society, including maintaining high biodiversity, functioning as ecological corridors, improving water quality and contributing to water retention. Unfortunately, they are also among the most threatened ecosystems due to river regulations, alteration of natural flows, land use, invasion of alien species and climate change, among others. To successfully protect the riparian ecosystems, comprehensive studies are needed to improve our knowledge of mechanisms that lay behind ecosystems functioning and pressures that lead to riparian habitat degradation. Until recently, riparian ecosystems studied mainly on the higher levels of biodiversity organization, including species and communities. Thanks to the quick development of molecular methods, it has recently become possible to get insights into the level of genetic diversity. The proposed research falls within 'riverscape genetics', which is a branch of 'landscape genetics' focused on rivers and riparian landscapes. This scientific discipline involves concepts and methods of landscape ecology, population ecology and population genetics.

In this study we aim to understand how the environmental factors, such as hydrology and topography, influence genetic diversity and structure of riparian forests plant species and what are the spatial patterns of genetic diversity in the river network. To address these questions, we selected six common riparian plants with multiple dispersal strategies. We hypothesize that the spatial patterns of genetic diversity and relationship between environment and genetic structure depends strongly on dispersal strategies. For example, gene flow among population of species highly adapted to hydrochory may be driven by hydrological characteristics of river networks, while the species adapted also to other dispersal agents, like wind or animals, are less dependent on hydrological and spatial characteristics of river networks. In addition, we will examine how dam affects gene flow between isolated populations, i.e. localized upstream and downstream of dams. The isolation by dams will be also interpreted in terms of different dispersal strategies of the studies species.

This project aims to extend our knowledge on functioning of riparian population at the genetic level, but it also has important practical significance. Nowadays, many efforts are made globally to assure successful conservation and restoration of riparian habitats. However, disregarding lessons from landscape genetics may hinder these restoration and conservation efforts. For example, conservation of riparian biodiversity without focusing on genetic connectivity may be unsuccessful. Genetic isolation of rare riparian organisms rowing along fragmented river may lead to its extinction in the long perspective. What is more, many restoration and conservation efforts focus mainly on large rivers due to the higher level of alteration. Recent studies showed, however, that due to the specific spatial pattern riparian populations located along small headwaters can be genetically unique, and for that reason may largely contribute to the whole network-scale genetic diversity.

One of the aims of this project is to summarize knowledge available on genetic structure and diversity of riparian plants. As a result, we will publish scientific review paper which also identifies knowledge gaps and suggests future directions. In addition, we plan to disseminate the results of this study through publishing three additional scientific papers and several presentations on international conferences.