Deforestation and the decline in forest quality are among the main drivers of global biodiversity loss. To stop this negative process, one of the main tasks of modern forestry is the protection and monitoring of biodiversity. However, forest biodiversity is made up of all the richness of fauna and flora, and the assessment of the occurrence and abundance of each species separately is very costly and labor-intensive. Therefore, the assessment of biodiversity of selected groups, especially animals, is carried out with the use of well-described and studied biodiversity indicators. This concept covers such elements of the forest, the quantity and quality of which is relatively quick and easy to describe or count, and which at the same time strongly correlate with the occurrence of the groups of animals we are interested in. For example, the quantity and quality of dead wood are among such biodiversity indicators that have been used in forestry for years - the more dead wood in a forest, the more wood-decomposing insects can be expected to be in such a forest.

One of the latest biodiversity indicators that has been proposed for use in modern forestry to protect and monitor invertebrates and small vertebrates is the abundance and diversity of tree microhabitats - a complex of cavities, cracks, injures, rot holes and epiphytes that occur on trees and used by numerous species of insects, arachnids, snails as well as reptiles, birds, bats and rodents. However, although there is a lot of evidence in the literature on the use of individual tree microhabitats by specific species (e.g. we know how many birds nesting in cavities in the forest), there is a relationship between the diversity and abundance of all tree microhabitats present in a given fragment of the forest and the general diversity in this forest animals from higher trophic levels such as birds and bats remain very unclear. Some authors have shown that tree microhabitats are a better indicator of bird and bat diversity than other forest features, such as the presence of large trees or dead standing trees. However, there are also studies that have shown a weak relationship between the richness and density of microhabitats and the diversity of the organisms studied, which undermines the use of tree microstructures as an indicator of biodiversity. However, the research done so far has been done on a very narrow range of forest habitats. Biodiversity, on the other hand, is always the result of the interaction between the habitat, tree species composition, age and dimensional structure of trees, and the availability of resources, e.g. dead wood. Therefore, individual elements of the forest, including tree microhabitats, may play a different role in shaping its biodiversity, depending on whether the forest is a simple, single-species coniferous forest or a complex, multi-species deciduous forest.

The aim of this project will be to investigate the impact of the quantity and quality of tree microhabitats on the diversity of birds and bats in temperate forests. The innovative element of this project will be that the research will be carried out in a gradient of forest habitats of varying degrees of biological complexity. The research will be carried out on study plots located both in very simple, single-species coniferous forests, in medium-complex mixed forests and in very complex, multi-species riparian forests and hornbeam forests. On each study plot, I will describe the species composition of trees, measure trees and the availability of tree microhabitats and dead wood, and make an inventory of birds and bats. Then, having a complete set of data on the habitat and its biodiversity, I will investigate by building various statistical models what is the relationship between the structure and species composition of trees, the quantity and quality of tree microhabitats and the species richness and abundance of birds and bats. The results of this project will provide fundamental knowledge about the impact of tree microhabitats on biodiversity, which is crucial to enhance modern forestry. The knowledge provided as a result of this project will also contribute to a better understanding of ecology, the processes shaping biodiversity and the functioning of natural forests, which I hope will contribute to better protection of these valuable areas.