The liverworts (*Marchantiopsida*) are organisms which played a key role in the evolution of plants. Evidence based on the DNA analysis suggests that liverworts were the first plants that colonized land. They are extremely sensitive to changes of the environment and currently face extinction in many regions of the world due to dwindling natural habitats – largely as a result of human activity. In this context, it is rather disturbing that our knowledge of these plants is still rather limited compared to vascular plants, with many unresolved problems relating to taxonomy and evolution.

The introduction of genetic studies to taxonomy of liverworts has resulted in the discovery of cryptic species within recognized particular species. Cryptic species exhibit a complete, or a nearly complete, absence of morphological differences, while being completely isolated reproductively and unambiguously distinct genetically. Because of being morphologically indistinguishable, they are not classified as classical taxonomic species, since the commonly recognized morphological species concept (MSC) does not apply in their case. On the other hand, however, they conform to the concept of species based on the lack of recombination. At present, the cryptic species are treated as species complexes which can usually only be identified on the basis of DNA markers.

The first cryptic species in liverworts were identified in the 1970s, to this group belongs *Aneura pinguis* that now is named as the *A. pinguis* complex. Until the 1990s the species was universally regarded as morphologically homogeneous within the entire distribution range from Europe, North America, Mexico, India, Japan, Australia to New Zeeland there grow both in the lowlands and in mountains. It is not a common species, though, because of its narrow range of ecological requirements. Up to now, genetic studies revealed that complex of *A. pinguis* consist of at least 11 cryptic species. The genetic differentiations between them are often much greater than average interspecies genetic differentiations in vascular plants. The cryptic species of *A. pinguis* complex exhibit a high degree of correlation with habitat type. For example the first of them occur on damp lime rocks, the second on humus, the third on clay and other on peatbog.

Ecological processes are essential for the formation of new species. What is more, many groups of fungi exist in liverworts as endophytes. Endophytes occur in several families of liverworts, such as genus *Aneura* and they may play a role in the adaptation of plants to habitat. The main aim of the project is to investigate the molecular mechanisms of speciation in the cryptic species of the *A. pinguis* complex and a role of the mycobiome in this process. This project is a pioneer in the use of laboratory methods that to allow for analyzing a large part of the genome of cryptic species.The obtained results will help fill an important gap in the knowledge about this mechanism in liverworts.