

## SUMMARY

Diatoms (Bacillariophyta) are considered to be one of the best indicators used to assess the ecological status of surface waters. The Water Framework Directive requires users to classify all surface waters according to the indicative ecological status, which gives a more holistic view of the assessment of the condition of a given ecosystem. The examined ecological state of surface water allows for appropriate preventive actions against the deterioration of environmental conditions. However, many countries, including Poland, still have problems with the precise interpretation of diatom indicators in lakes. Many countries are also in the process of introducing ecological indicators (e.g. diatom indicators) for the assessment of aquatic ecosystems. The human impact on the environment and climate change led to a progressive decline in the diversity of diatoms in lakes. The components of  $\beta$  diversity (eg species turnover or nesting) and the factors influencing changes in  $\beta$  diversity are still poorly understood, although diversity plays an important role in explaining ecological processes. Understanding the mechanisms responsible for changes in the components of  $\beta$  diversity (species nesting and turnover) along with gradients in environmental factors is currently a major problem in the biology and conservation of many species. Estimating the  $\beta$  diversity allows to measure the differences between the communities. It also contributes to the understanding of the different levels of impact of environmental conditions and water quality on aquatic communities.

The aim of the doctoral dissertation was to investigate the influence of selected environmental factors on the species diversity of diatoms and on the values of diatom indicators in the lakes of the Wigry National Park.

The study examined how selected environmental factors affect diatomaceous communities. It was analyzed (in article 1: **Diversity 2020**) how environmental differences between lakes a) disharmonic, b) harmonious with greater human impact on the environment and c) harmonious with more limited human impact are affecting diatom assembles. Significant differences were seen in the  $\alpha$  Index of the Dominance Index. Overall, as study shows three groups are characterized by different environmental factors especially by pH, chloride

and sulfate ions which is reflected by different dominance structure. The differences in the diversity of  $\beta$  and the Diatom Index of Lakes (IOJ) and the reactions of diatoms to selected environmental factors were investigated **(in article 2: Water 2022)**. The representativeness of the samples in estimating the ecological state of the lake was also examined. Results have proved that grouping of similar species decrease in the accuracy of the environmental assessment. Additionally, in article 3, precise taxonomic studies indicate and document how valuable and rich in rare species and protected are the lakes of the Wigry National Park **(in article 3: manuscript)**.

The work concerns the analysis of changes in the composition of diatom communities in environmental gradients, with particular emphasis on the diversity of  $\alpha$  and  $\beta$  and with changes in the value of the Diatom Index of Lakes. The research results concern the differences in the diversity of  $\alpha$  and  $\beta$  depending on anthropogenic changes in aquatic ecosystems. Environmental changes should be appropriately measured, especially in the most vulnerable freshwater ecosystems.