Description for the general public

Submerged vegetation plays a significant role in the functioning of aquatic ecosystem not only as a food source for herbivorous hydrobionts, spawning place for fish or as a competitor for the phytoplankton. Communities of submerged vegetation are also an effective trap for nutrients responsible for the eutrophication process and its negative effects, and for carbon, including C in CO_2, which is considered a key factor in global warming. These substances are built into the body of plants and are excluded from circulation. In this way, submerged vegetation is a key functional component of aquatic ecosystems, significantly affecting their ecological status.

Our project aim is to investigate the amount of carbon accumulated by submerged vegetation, and then deposited in the bottom sediments of lakes. We plan to compare communities of submerged vascular plants with communities of charophytes, macroalgae which are considered particularly effective in influence on the accumulation of carbon and, generally, in improving the quality of water.

These plants are able to store carbon in two ways: by building biomass and by producing abundant (up to 80% of dry biomass) encrustations made of calcium carbonate. After the end of the growing season, both forms of carbon are deposited in sediments.

We will analyse seasonal changes in charophyte biomass and in the formation of carbonate encrustations. The effect of habitat conditions on these processes will be checked by analysing lake water properties. Studies will be carried out in Lubuskie and Mazurskie Lake Districts (W and E regions of Poland, respectively), which, additionally, will allow for considering the effect of the growing season of different length. Sediment cores taken from under plant patches will be analysed for the content of organic matter and carbonate carbon. Isotope dating the same sediment cores will serve for estimating the durability of carbon deposits. The analysis of macrofossils there should confirm that carbon deposition in the past was also mediated by charophytes. For comparison, analogue studies will be made in sites of lakes overgrown by submerged vascular plants known to produce much less, if any, carbonate encrustations. We will also consider the role of phytoplankton in this process.

We expect to verify the hypothesize that charophytes, thanks to their specific features, are able to permanently store and deposit substantial amounts of C, and their effectiveness in this respect is higher compared to submerged vascular plants. In this way charophytes may not only affect the improvement of water quality, but also the accumulation of atmospheric CO_2, which is of great importance in the face of global warming and its expected results in the form of a significant deterioration in water quality.