

Influence of the water temperature on organic matter transformations in lakes of various trophic status (experimental studies)

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Abstract

The goal of the study was to determine the degree to which elevated water temperature in nutrient-poor and nutrient-rich aquatic environments has effect on the primary production intensification and on the organic matter transformations by bacteria.

The studies were conducted in experimental conditions. A system was built consisting of six mesocosms and a heating and cooling system. In three mesocosms there was water from the eutrophic lake, in another three mesocosms - from the mezotrophic lake. The system kept three different temperatures: one was the same temperature as in a lake (20°C - the control temperature), in another mesocosms the temperature was 5°C higher, and in another it was 10°C higher than the control temperature. To provide sunlight, the mesocosms with the examined water were placed outdoors.

The study revealed that regardless of the lake's trophic condition rise in water temperature causes an increase of the primary production. However, the phenomenon occurred much more dynamically in the mezotrophic lake at 30°C. High amounts of labile organic matter were measured, as shown by the high DOC concentrations and the parallel low SUVA values, together with the high contribution of organic N and P. At 25°C, the dynamics of the DOC changes was identical in both the mezotrophic and the eutrophic lake.

Mezotrophic lakes are therefore more vulnerable to temperature changes not only because organic matter increases which intensifies eutrophication but also because transformation processes by bacteria may be disturbed.

In the mezotrophic lake, at 20°C, bacterioplankton was found very active. Such phenomenon enables effective transfer of the matter to the higher trophic levels (proto- and zooplankton), which determines ecological stability of the aquatic ecosystems. However, as temperature rises, the phenomenon may be disturbed. The experiment revealed that at the temperature elevated to 25°C in the mezotrophic lake TNB and BB decreased. In the global warming conditions the negative effect of that may be the reconstruction of lake phytocenosis, displayed by an increase of the invasive, stenothermal and heavily toxic blue-green algae.