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Menyanthes trifoliata L. as an indicator of biogeochemical processes in thermokarst ecosystems on the north of Western Siberia

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With increasing anthropogenic impact on the environment, including local contamination as a result of human activities as well as global pollution through longrange atmospheric transport, the question of trace elements accumulation on all levels of aquatic ecosystems is becoming increasingly important.
We studied thermokarst lakes (four most typical subarctic lake ecosystems: thermokarst lake, young khasyrey, khasyrey and old khasyrey) with coasts composed of peat sphagnum moss, peat sediments and detritus. Element composition of lake water and macrophytes were analysed using ICP MS. As a biological model we selected the plant macrophyte Menyanthes trifoliata L. The general dynamics of chemical element concentrations in Menyanthes trifoliata L. in all four ecosystems are very similar. However, there are some differences, namely, concentrations K, Sb, Pb and Ba are higher in plants growing in the intertidal zone of thermokarst lakes in comparison with other ecosystems. Plants growing in the old khasyrey are mostly enriched by major elements such as Mg and Ca and trace elements (Mn, Co, Rb, Sr, Cs). Minimal concentrations in plants of all ecosystems are typical for rare earth elements, biologically unavailable for plants in fresh waters, as well as for three- and tetravalent hydrolysates. In the course of work the coefficients of biological accumulation (Kb) of chemical elements in Menyanthes trifoliata L. relative to water were calculated for all the four stages of lake ecosystems development. High values of Kb are exhibited by macronutrients (K, Mg, Na) which are necessary for plants' life cycle and these values depend on the stage of lake development. In particular with the lake maturation we observe the Kb value decrease for Mg, but also the Kb increase for Na. Actively accumulating elements in Menyanthes trifoliata L. are Rb, Sr, Ba, Pb and this may be partly due to possible contamination of the water bodies. The high content of Mn, Pb and low content of Cr obtained in the course of the work are agreement with previously published works by other authors. Another heavy metals strongly accumulating in grass Menyanthes trifoliata L. are Pb, Zn, Sr, Co and this can indicate various sources of longrange atmospheric pollution or local lexivation from thawing peat.
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