

Short communication

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Incident of algae blooms of Lake Svyatozero (Karelia, Russia)

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ABSTRACT. The article presents results of the investigation of the littoral zone state in the northern part of Lake Svyatozero (Karelia) according to microbiological and phytoplankton indicators. We studied the causes of the appearance of a "bloom spot" in September 2019. The total abundance of bacteria was $6.42 \cdot 10^6$ cells/ml, the abundance of saprophytic bacteria growing at 22°C was $20.3 \cdot 10^3$ CFU/ml, saprophytic bacteria growing at 37°C was $1.74 \cdot 10^3$ CFU/ml. The development of bacteria indicated that self-purification processes were completed. The total abundance of phytoplankton was $198712.5 \cdot 10^3$ cells/l, and the total biomass was 14.945 mg/l. A total of 17 phytoplankton species were identified, 14 of which were ranked Cyanophyta (96.7% of the total abundance and 99.8% of the total biomass). *Microcystis aeruginosa* inhibiting the development of bacterioplankton was found in the water. Blooming of blue-green algae was apparently due to secondary pollution of the water body following low water level, wind intensity, waterborne soil movement, and warm weather. During the study period, water from the littoral zone in the northern part of Lake Svyatozero was estimated as highly polluted with the quality class 4 and was characterized as a stopgap measure from mesotrophic to the eutrophic water body.

Keywords: eutrophic lake, algae blooms, phytoplankton, bacterioplankton, water quality assessment.

1. Introduction

In September 2019, extremely high phytoplankton bloom was detected in the littoral zone of the northern part of the lake. The aim of the research was to determine the causes of algae blooms and assess the quality of the water in the littoral zone of the lake using bacteria- and phytoplankton indicators.

2. Material and methods

Hydrobiological studies were conducted in accordance with general hydrobiology techniques (Metodika..., 1975; Kuznetsov and Dubinina, 1989). Trophic status, saprobity, and water quality assessment of the littoral zone of Lake Svyatozero were assessed according to Sladeczek (1973), Romanenko (1985), Oksyuk et al. (1993), Barinova et al. (2006).

3. Results and Discussion

The total abundance (TA) of bacteria was $6.42 \cdot 10^6$ cell/ml; the abundance of saprophytic bacteria (SB) was $20.3 \cdot 10^3$ CFU/ml. The developmental character of littoral bacterioplankton is indicative of the polytrophic type of water body. Total bacterial

count (TBC), being the indicator group of bacteria of anthropogenic pollution and allochthonous microbial flora, was $1.74 \cdot 10^3$ CFU/ml. The ratio of SB to TBC was high (11.7), thus, indicating the completion of self-purification processes. A share of SB in TA was 0.1% that implied the septic condition of the littoral zone.

The total abundance of phytoplankton was $198712.5 \cdot 10^3$ cells/l, and the total biomass was 14.945 mg/l. A total of 17 phytoplankton species was identified, of which 14 species ranked Cyanophyta (96.7% of the total abundance and 99.8% of the total biomass), followed by one Chlorophyta, one Bacillariophyta and one Euglenophyta. The dominant species were *Microcystis wesenbergii* Komarek., *Microcystis aeruginosa* Kütz. (Elenk) f. *aeruginosa*, *Woronochinia naegeliana* (Ung.) Elenk. f. *naegeliana*, *Microcystis flos-aquae* Kirchn. Saprobity index (1.7) of littoral phytoplankton is indicative of the β -mesosaprobic type of water body according to biomass. Water quality was witness to a high level of pollution.

4. Conclusions

Due to the extremely high bloom of blue-green algae, the abundance of bacterioplankton was suppressed. *Microcystis aeruginosa* Kütz. (Ellen) f.

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aeruginosa was detected in samples. It caused toxic effects on the development of bacterioplankton (Kopylov and Kosolapov, 2007). The bloom of blue-green algae was probably related to the secondary pollution of the water body, with a low water level, the intensity of the wind-induced current, waterborne soil movement, and favourable weather conditions. The water from the littoral zone in the northern part of Lake Svyatozero was estimated as highly polluted with a quality class 4.

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