Geophysical Research Abstracts
Vol. 20, EGU2018-3639, 2018
EGU General Assembly 2018

Transformation of the phytoplankton seasonal succession: climate change or eutrophication of the reservoir?

Anna Gayazova, Sanjar Abdullaev, and Olga Lenskaya
South Ural State University, Russian Federation

Climate warming and eutrophication are objective processes, resulting in changes of freshwater phytoplankton diversity and abundance. In this paper we used hydrobiological data from the water intake station and climatic data sets to analyze the nature and causes of seasonal transformations of dominant phytoplankton complexes, observed in Shershnevskoe drinking water reservoir, the main water source of the Chelyabinsk metropolitan area, during the last thirty years.
To assess the long-term changes of phytoplankton diversity, dominant algae species abundance and occurrence frequency - the main indicators of conditions, favorable for algae species seasonal vegetation, the whole data sets for the period from 1984 to 2016 were divided into three ten-year subperiods – stages, whereby the statistically significant monthly mean characteristics for each decade were calculated.
As was expected the increasing eutrophication of the reservoir was marked by a general increase in the number of diatoms, green and blue-green algae. However, unidirectional abundance growth from stage to stage was demonstrated only by some dominant algae species. For example, abundance of diatom Asterionella formosa and green algae Monoraphidium contortum increased 1.7 and 2.9 times per decade, respectively. Both species demonstrated similar changes of seasonal succession, namely: the tenfold increase during the cold seasons and the shift of their July's peak to June (A. formosa) and even to May (M. contortum). The climatic changes of the last decades supposed to be the reason of such changes. To confirm this assumption z-score was computed from complete time series of monthly air and water temperature. The value of z-score more than 1.0 indicated a reliable increase of water (air) temperature in May (April–May) of last decade (2005–2016). Therefore, the significant spring warming and the overall extension of the vegetation season is likely responsible for observed abundance peaks shifting.
However, the significant rising of occurrence frequency and abundance of green M. contortum and blue-greens Aphanizomenon flos-aquae and Microcystis aeruginosa during the cold season of last stage, in other words the current all-season vegetation of these species, is mostly connected with the excess of nutrients in cold period. Furthermore, N2-fixing Aph. flos-aquae and Anabaena flos-aquae obviously had no limits on phosphorus during open water season: both species were found in all June's samples, and their occurrence frequency in samples of other warm months of the last decade was also rather high.
The analysis suggested that the observed transformations of the dominant phytoplankton complexes of Shershnevskoe reservoir were mutually caused by increasing eutrophication of the reservoir and ongoing climate warming.