



Indicative significance of phytoplankton for estimation of large river state near cities and settlements (Ob and Tom Rivers as a case study, Russia)

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The objective of the paper is to demonstrate the impact of settlements on water quality, species composition, and biodiversity in major river systems in Siberia, Russia. The selected rivers are the Ob and Tom. Historically, rivers, dynamic physical systems, are primary sources for drinking water and preferred sites for human settlements. However, human activities cause river pollution. Hydrobionts including phytoplankton and its structural-functional characteristics act as indicators of the state of river ecosystem and water quality. Self-purification of water bodies occurs through biological and physical-chemical processes that determine the capacity of water to remove pollutants on its own. Changes and trends in water quality and ecology due to human activity can be measured by comparing statistics on water quality indicators upstream and downstream of selected settlements via potamophytoplankton analysis.

In this paper, data on taxonomic composition, number and biomass and nutrients (indicators of water quality) were collected at respective upstream and downstream sites of large cities and small towns on both the Ob and Tom. The data were classified using the Saprobic index as well as the Shannon species diversity index. These indices were compared for upstream and downstream sites. The impacts of settlements on water quality were deduced from the comparison. Data for 1998, 1999 and 2006 were utilized. The results are as follows: (a) phytoplankton population and saprobic index increased downstream of large industrial cities; (b) The increase in both indicators was matched by a corresponding decrease in algae species diversity. This pattern was

observed in the Upper Ob at Barnaul, the Middle Ob at Aleksandrovskoye and lower Tom River at Tomsk; (c) phytoplankton population decreased downstream of smaller towns; (d) Nitrogen concentration in the Ob and Tom increased downstream and correlated directly with the volume of waste water discharged into the rivers as well as the observed rise in phytoplankton number and biomass; (e) Present ratio of mineral forms of nitrogen and phosphorus average 4:30 in the Ob water.

These results show both the adverse impact of human activities on water quality and self purification potential in Siberian river systems. Hopefully, the study provides a simple method for measuring change in water quality and suggests methodology for the assessment of efficacy of treatment strategies.