Impacts of Climate and Hydro-ecological Changes on Abundance and Composition of Phytoplankton in a Mesotrophic Reservoir Ecosystem: A Case study in Ubolratana, the Most Productive Reservoir in the North Eastern Thailand

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Abstract

The analysis on integrated impacts of temperatures, precipitations, and water storages on phytoplankton populations and related aquatic resources in Ubolratana reservoir, the most productive reservoir in the North East Thailand, had aimed to illustrate adaptation regime of primary food source in both quantity and quality along the times in the reservoir ecosystem. The changes of air temperature (monthly differences of the highest and the lowest temperatures) during 5 decades of water storage were slightly observed. During 2014-2016, the reservoir had faced severe drought conditions. Contrastingly, during 2017 the water storage became increased from 60 to 116 % during early- to late- loading periods of August to October 2017, as comparatively higher inflow volumes. The nutrient pathway along the riverine to the lacustrine sites were highly varied by the distances and the nutrient levels in August was about twice of October. The changes of nutrients along the distance implied ecological zonation of the reservoir into three zones of *Riverine*, *Transition*, and *Lacustrine*. The *Riverine Zone* generally had 2-times higher nutrient concentrations than those in the *Transition* and *Lacustrine* Zones. In the reservoir, major phytoplankton groups were in Divisions of Euglenophyta, Cyanophyta, and Chlorophyta, respectively. During the water increasing period in 2017, total phytoplankton densities of the *Riverine Zone* decreased from 90,651 to 38,084 cells/L, while those of the *Transition Zone* increased from 7,384 to 30,027 cells/L. Total densities in the *Lacustrine Zone* were not significantly changed. Nevertheless, the toxic cyanobacteria species such as *Cylindrospermopsis* sp. were increased to the high level of 5,042 cells/L. The overall results indicated that climate changes had roles on reservoir hydro-ecological factors and, thus, affected on the reservoir ecological sustainability. Inflow-induced water storage should be one of the key factors on the changes of the reservoir phytoplankton population (including several toxic species). For further conservation of reservoir biological resources, management of water storage and related factors should be in depth consideration.