

Nitrate-induced changes and effect of varying total nitrogen to total phosphorus ratio on the phytoplankton community in Lake Chivero, Zimbabwe: Microcosm experiments

Lindah Mhlanga^{1*} and Wilson Mhlanga²

¹University of Zimbabwe, Department of Biological Sciences, PO Box MP 167, Mt. Pleasant, Harare, Zimbabwe

²Bindura University of Science Education, Department of Environmental Science, Private Bag 1020, Bindura, Zimbabwe

Abstract

Microcosm experiments were conducted to assess nitrate-induced changes and the effect of varying the ratio of total nitrogen to total phosphorus (TN:TP) on the winter and late summer phytoplankton communities in Lake Chivero, Zimbabwe. In both winter and summer, nitrate addition altered species composition from a cryptophyte-dominated to a chlorophyte-dominated assemblage and increased chlorophyll *a* concentration and total algal biomass. The shift in algal dominance and increase in chlorophyll *a* concentration and total algal biomass also occurred in the control showing that isolation from allogenic processes like turbulence had an effect on phytoplankton structure. *Microcystis aeruginosa*, a common cyanobacterium in Lake Chivero, did not assume dominance in any of the treatments. From an application perspective it is interesting that varying nitrate loadings in microcosms favoured chlorophytes rather than increasing undesirable cyanobacteria. Nutrient manipulation can be used as a management option to avoid cyanobacteria occurrence, by maintaining either cryptophytes or chlorophytes. However, the practicality of such an intervention needs to be assessed.

Keywords: chlorophytes, cryptophytes, Lake Chivero, microcosms, phytoplankton, TN:TP ratio