

# Impacts of nutrient loading and fish grazing on the phytoplankton community and cyanotoxin production in a shallow tropical lake: Results from mesocosm experiments

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## Abstract

Given the increasing eutrophication of water bodies in Africa due to increasing anthropogenic pressures, data are needed to better understand the responses of phytoplankton communities to these changes in tropical lakes. These ecosystems are used by local human populations for multiple purposes, including fish and drinking water production, potentially exposing these populations to health threats if, for example, an increase in toxic cyanobacterial blooms is associated with increasing eutrophication. To test the short-term response of the phytoplankton community to the addition of nutrients (phosphorus and nitrogen, alone or in combination) and Nile tilapia, we developed an in situ mesocosm experiment in a freshwater lagoon located near Abidjan (Ivory Coast). We found that phytoplankton growth (estimated by chlorophyll-a quantification) was highly stimulated when both nitrogen and phosphorus were added, while there was no clear evidence for such colimitation by these two nutrients when considering their concentrations in the lagoon. Phytoplankton growth was accompanied by significant changes in the diversity and composition of this community and did not lead to an increase in the proportions of cyanobacteria. However, the addition of fish to some mesocosms resulted in a drastic decrease in phytoplankton biomass and a dominance of chlorophytes in this community. Finally, these experiments showed that the addition of nitrogen, alone or combined with phosphorus, stimulated microcystin production by cyanobacteria. In addition, no evidence for microcystin accumulation in the fish was found. Taken together, these data allow us to discuss strategies for controlling cyanobacterial blooms in this tropical ecosystem.

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