Diurnal and vertical dynamics of phytoplankton community structure in a shallow, tropical lake, Laguna Lake, Philippines

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The diurnal succession of phytoplankton species is an important aspect of the biology of tropical lakes as vertical distribution is largely controlled by thermal stratification, under water light climate, and nutrient availability. Frequent reorganization of relative abundance and phytoplankton species composition occur as a result of physical, chemical and biological variable interaction. Diel profile measurements were conducted for 48 continuous hours at a single station in the western lobe of Laguna Lake, Philippines in the dry season to study the dynamics of phytoplankton populations to changing environmental conditions. A submersible in situ spectrofluorometer was used for the monitoring of phytoplankton groups. Results revealed significant vertical and diurnal variations of lake variables in spite of a shallow water depth, brought by the intense surface heating from solar irradiance (about 800 W/m^2) and accentuated by the lake's high turbidity (16-32 ftu). Significantly correlated variations of pH, DO and chlorophyll-a were indicative of the higher biological activity concomitant to the inflow of polluted sea water from Manila Bay as corroborated by numerical simulations. The absence of thermal over-turn was observed to be regularly followed by bottom anoxic conditions (2-4 mg/l) concurrent to increases in phytoplankton biomass, suggestive of the importance of diel wind-induced mixing. The vertical mixing regime is observed to strongly influence the phytoplankton community structure with the resuspension of bottom matter and nutrients, and seemed to favor both chromophyta, R-strategist (45%) and cyanophyta, S-strategist (35%) phytoplankton groups. Chlorophyta and cryptophyta, the recessive groups, thrived in light saturated environments and showed no pattern of vertical migration. Diurnal observations of phytoplankton dynamics based from changing environmental conditions provide important information for water quality management regarding ecosystem health and early detection of cyanobacterial blooms.