

Response of the phytoplankton community to weekly additions of monoammonium phosphate in a dystrophic lake

By PATRICIA CHOW-FRASER and HAMISH C. DUTHIE

With 5 figures and 6 tables in the text

Abstract

A dystrophic basin was enriched with low-level weekly additions of monoammonium phosphate over a two year period. We compare measured summer average Chl-a concentrations obtained during the pre- and post-fertilization periods with values predicted from documented relationships between Chl-a and P-loading, fertilizer loading, and TP concentrations (spring and summer average values). Predicted Chl-a were generally 2 to 6 times higher than measured concentrations. Measured phytoplankton biomass concentrations were also 1 to 6 times lower than those predicted from documented TP-biomass regression equations. There was an inconsistent relationship between biomass and Chl-a between years in our study; Chl-a was better correlated with the biomass of 8 flagellate species (mostly *Cryptomonas*) than with biomass of all algal taxa.

Of the 48 phytoplankton taxa recorded, the biomass of 17 were statistically higher, and 4 were statistically lower in the fertilized basin when compared to a control basin. Enrichment did not change the species composition of the phytoplankton in the fertilized basin; all species that benefitted from P-additions were already present in the basin prior to fertilization. The species that amassed the greatest increase in biomass was *Tabellaria fenestrata*. Other taxa that showed an increase were *Cryptomonas*, *Chroomonas*, *Ochromonas*, *Chromulina* and *Peridinium*. The biomass of *Synedra*, *Tetradion*, *Selenastrum* and *Pseudokephyrion* were statistically lower in the fertilized basin than in the control.

Introduction

Over the past three decades, enrichment of oligotrophic lakes with inorganic phosphorus and nitrogen (LANGFORD 1950; PARSONS et al. 1972; SCHINDLER 1975; STOCKNER & SHORTREED 1985) has resulted in an accumulation of empirical relationships between nutrient loading and mean summer chlorophyll-a concentration (Chl-a_{sum}), that has been useful for predicting a lake's trophic response to cultural eutrophication. Dystrophic lakes have seldom been included in these studies, despite their common occurrence (WETZEL 1975).

Empirical relationships based on non-dystrophic lakes may have limited applicability for dystrophic systems since DILLON & RIGLER's (1974) relation-