

Global Environmental Science.
Senior Thesis Project.

Investigation of limiting nutrients in Ordy Pond, O'ahu:
Correlations between nutrient cycles and growth responses of natural
phytoplankton populations in a coastal eutrophic pond.

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Abstract

Nutrient limitation of phytoplankton was studied in coastal Ordy Pond in the 'Ewa Plain, O'ahu. Pond water was sampled three times from May 2001 to September 2001. Nutrient limitation in the pond was assessed in three consecutive nutrient enrichment experiments by addition of phosphorus (P), nitrogen (N), trace metals, and combinations of these three types of nutrients. Growth response of phytoplankton was measured in terms of the chlorophyll concentrations in each treatment. In these three enrichment experiments, only the "Everything" treatment (enriched with P, N, and trace metals) stimulated substantial growth of phytoplankton. In addition, none of the treatments without enrichment of P resulted in significant phytoplankton growth. These results indicate that the phytoplankton communities in Ordy Pond are simultaneously co-limited by the availability of P, N, and trace metals. Phytoplankton populations appear to be more strongly limited by P availability than by N or trace metals. Severity of N limitation varied depending on the TIN : TIP ratios in the pond water. In the second experiment, when the TIN : TIP was above the Redfield ratio of 16 : 1, trace metals were second in importance as limiting nutrients and N was third in importance. In the third experiment, when the TIN : TIP was below the Redfield ratio, N was exhausted before trace metals and became second in importance. Measurements of chlorophyll-a, b, and c, concentrations in the third experiment suggest that phytoplankton communities in the surface waters of the pond consist predominantly of green algae, and that cyanobacteria and diatoms are minor constituents.