

# Influence of Nutrients and Zooplankton Grazing on Phytoplankton: A Collaborative Lab

*Sherry Brooks, Eileen Zerba, Randy Fuller, and Ron Hoham*

Biology Department, Colgate University  
Hamilton, New York 13346  
(315) 824-7882, sbrooks@center.colgate.edu

The purpose of the collaborative lab is two-fold. First it allows the gathering of more extensive data without using an unmanageable amount of time from a laboratory experience. Secondly, it allows introductory students to understand some of the concepts and experiences more advanced courses offer.

This lab experience looks at the producers (phytoplankton) and the primary consumers (zooplankton) of the open water of a lake. Phytoplankton are defined as floating or weakly swimming photosynthetic autotrophs such as diatoms, green algae, and cyanobacteria. Zooplankton are defined as floating or weakly swimming heterotrophs, mostly microscopic, such as protozoans, rotifers, and microcrustaceans (e.g., copepods and cladocerans).

Phytoplankton require light, water, and nutrients (nitrogen, phosphorus, potassium, etc.), among other things. If any of these requirements is in short supply (limited), the growth rate of the phytoplankton will be held at a level lower than possible given unlimited resources. Obviously in a lake, water is not a limiting resource. Light, near the surface where the phytoplankton and zooplankton are found, is also sufficient not to be limiting. Nutrients, however, can often be limiting. Growth rates of phytoplankton may also be limited via predation by zooplankton. Conversely zooplankton growth may be limited by the amount of phytoplankton present.

Four replicate stations were established in a local lake. Each station contained four submerged 5-gallon (19 liter) plastic carboys:

Carboy 1: "CONTROL" (lake water)

Carboy 2: "+ PO<sub>4</sub>" (lake water plus 400 µg/liter KH<sub>2</sub>PO<sub>4</sub>)

Carboy 3: "- Zooplankton" (lake water filtered to remove zooplankton)

Carboy 4: "+ PO<sub>4</sub> / - Zooplankton" (filtered lake water plus 400 µg/liter KH<sub>2</sub>PO<sub>4</sub>)

One week and 4 weeks after the stations were established samples were taken from each carboy for phosphorus analysis, zooplankton identification and enumeration, and phytoplankton identification and enumeration.

Phytoplankton, particularly diatoms, definitely increased with the addition of phosphorus and the elimination of zooplankton. There is some indication that zooplankton increased as the phytoplankton increased.

The students in the *courses* contributed as follows: (1) Introductory Biology: collected samples, identified and enumerated zooplankton, and ran phosphate analysis. (2) Ecology: set up the experiment, identified and enumerated zooplankton, and ran phosphate analysis. (3) Phycology: collected samples, and identified and enumerated phytoplankton.