Meredith L. Greer, Bates College, Lewiston, ME, USA
Kathryn L. Cottingham, Dartmouth University, Hanover, NH, USA
Holly A. Ewing, Bates College, Lewiston, ME, USA
Kathleen C. Weathers, Cary Institute of Ecosystem Studies, Millbrook, NY, USA
Laura M. Griesinger, Bates College, Lewiston, ME, USA
Cristina M. Herren, Dartmouth University, Hanover, NH, USA
Sophie Leonard, Bates College, Lewiston, ME, USA
Audrew Lustig, Bates College, Lewiston, ME, USA and French Institute of Pondicherry, India

Life cycle dynamics of *Gloeotrichia echinulata* and connections to nutrient cycling

Gloeotrichia echinulata is a large nitrogen-fixing cyanobacterium that has been identified in several northern New England lakes. We hypothesize that *G. echinulata* could accelerate eutrophication by contributing to increased quantities of nitrogen and phosphorus in the water column. Our group has collected data at Lake Sunapee, New Hampshire, USA, for several years. Differential equations and statistical approaches have been employed in conjunction with both weekly and daily data sets to help determine key drivers of the *G. echinulata* life cycle. Knowledge of this life cycle may bring better understanding of the role of *G. echinulata* in moving nutrients into the water column.

Our group has collected several years of weekly data, taken from multiple sites, on the recruitment rates of *G. echinulata*. Recruitment is a life cycle phase that follows shortly after the germination phase, when *G. echinulata* changes from dormant to active. During recruitment, *G. echinulata* moves from sediment to water column and can unlock phosphorus that has been trapped in the sediment. The literature suggests possible influences of light, temperature, and growing degree days on both the germination and recruitment stages in the life cycle of *G. echinulata.* We model these suggestions and compare their results with the weekly data.

Additionally, a researcher at one site has collected multiple years of daily data showing *G. echinulata* abundance in the water column. Modeling explores the relationship between current abundance and factors including recent abundance, light, and temperature. During its life cycle phases in the water column, *G. echinulata* can fix nitrogen from the air, thus introducing additional nitrogen to the water column.

Finally, we construct a coupled differential equation model of nitrogen (N) and phosphorus (P) cycling. The model gives a way to quantify the effects of *G. echinulata* on internal N and P loading, indicating the extent to which varying abundances of *G. echinulata* can shift equilibrium values of N and P.