

## Beaufort Gyre Exploration Project: Dispatch 29: Phytoplankton Productivity

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Phytoplankton play a critical role in the cycling of elements in the ocean by taking up dissolved nutrients containing carbon and nitrogen, and returning them back to seawater upon their death and decomposition. Phytoplankton physiology is then responsible for changes in the carbon balance in the upper water column, which in turn influences atmospheric CO<sub>2</sub> concentrations and modifies global climate.

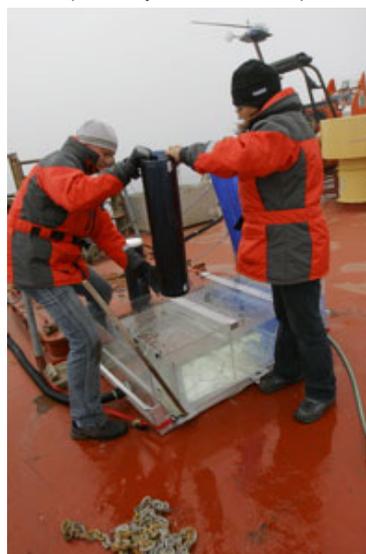
Studying the rate at which phytoplankton take nutrients from the water column provides a snapshot of the efficiency of carbon export to deeper water as cells die and sink out of the surface waters. Communities that display high rates of "new production", that is growth utilizing nitrogen in the form of nitrate, can be used as an indicator of a net vertical flux of organic matter out of the euphotic zone. High rates of new production are normally attributed to algae called diatoms which also contribute significantly to the downward flux of biogenic silica. In contrast, high rates of "regenerate primary production" (ammonium and urea-based) are generally indicative of low export rates and the presence of phytoplankton assemblages characterized by small cells (less of a diatom contribution).

To determine nitrogen uptake rates, on-deck incubators are used to simulate the light and temperature conditions found from the ocean's surface down to a depth of around 100 meters depending on the physical characteristics of the water being sampled. Live cultures drawn from these depths are inoculated with a chemical tracer and grown for 24 hours to allow phytoplankton to take up these chemicals along with those found naturally in the water column. These samples are then frozen for later analysis.

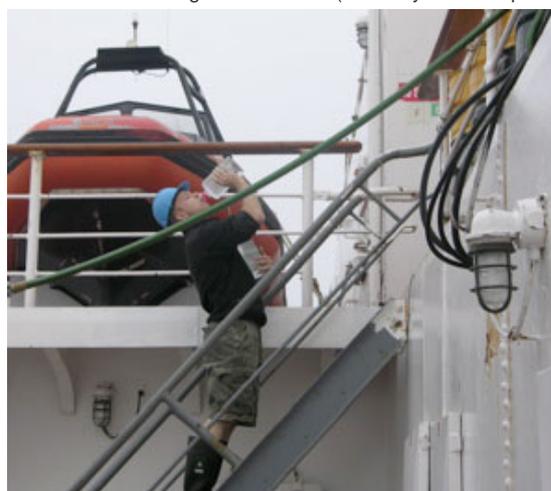
*Last updated: October 19, 2015*



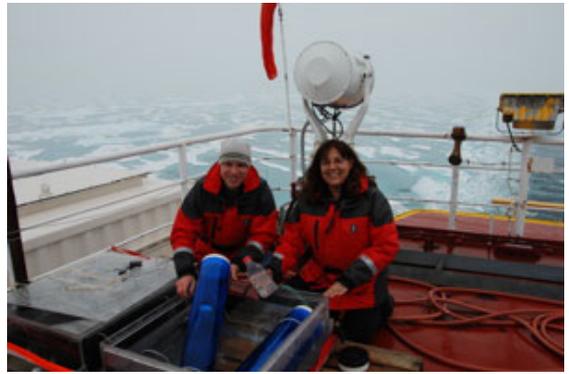
Ian Wrohan and his advisor, Dr. Diana Varela (UVic) are standing next to the CTD rosette during the first leg of this cruise. (Photo by Steve Romaine).



Ian and Diana loading the incubator. (Photo by Paul Galipeau).



The two flights of stairs between the CTD rosette and the incubators were often too much for Ian... His samples didn't always make it. (Photo by Luc Rainville).



Ian and Diana by the incubators. The blue photographic paper around the chambers simulates the light conditions at a 30-m depth. (Photo by Karen Scarcella).

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