TITLE: BEST microzooplankton grazing and phytoplankton growth rates
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Data Set Overview:

During the R/V Thompson long spring BEST cruise in May-June 2010, 18 microzooplankton grazing experiments were completed using the dilution assay approach in on-deck incubations at ambient water temperatures. The data set presents phytoplankton intrinsic growth rates (day^-1) in the absence of grazing and microzooplankton grazing impact on phytoplankton (day^-1). Date station locations, depth of water taken for each experiment, and initial chlorophyll-a concentrations are also provided.

Methods:

Truncated dilution experiments were carried out following the protocol of Landry et al. (2008) with triplicate 10 % whole water and whole water treatments. All carboys, bottles, and tubing used in setting up dilution assays were pre-soaked in 10% HCl and thoroughly rinsed with deionized water. Nitex gloves were worn during experimental set-up. Water for the dilution assays was collected in 30-liter Niskin bottles at a pre-determined depth, either the Chl-a maximum or a depth in the upper mixed layer corresponding to a depth sampled for phytoplankton production. Seawater was gently transferred into 50 liter carboys through silicon tubing. After collection of seawater, all other preparation steps were carried out in a temperature-controlled environmental chamber set at 0 to -1 ºC under dim light (approximately 0.1 % of incident light). For dilutions, particle-free seawater was prepared by gravity filtration through a Pall 0.2 µm filter that was initially presoaked in 10% HCl and then thoroughly rinsed with deionized water. Five to seven liters of seawater were passed through the 0.2 µm filter before beginning collection of particle-free water for the dilutions. Experimental bottles were filled within two to three hours of sample collection.

Initial samples were taken from whole seawater samples for determination of chlorophyll-a concentration and for microscopic enumeration of microzooplankton abundance, biomass, and general taxonomic composition. Depending on the phytoplankton concentration, from 25 ml to 150 ml quadruplicate volumes were settled via vacuum filtration onto GFF filters in dim light. The filters were extracted in 6 ml of 90% acetone in 13 x 100 mm glass culture tubes at -20 ºC for 18 to 24 hours. At the end of the extraction period, the filter was carefully removed from each tube, and the Chl-a concentration determined using a calibrated Turner Designs fluorometer. A

solid chlorophyll standard was used to check for fluorometer drift at the beginning of each reading of Chl-a samples.

We compared the rates of algal growth in whole water and in 10 % whole water diluted with particle-free filtered water over a 24 hour day-night cycle at light levels of 15% to 30% of surface incident light. Growth rates of algae were determined by change in chlorophyll-a (Chl-a) concentrations from the initial to final times of the incubations. Rates of phytoplankton growth (μ) and microzooplankton grazing (m) were estimated from results of the 2-point dilution experiments according to Landry et al. (2008). Briefly two equations are solved for the two unknowns: phytoplankton intrinsic growth rate, μ, and microzooplankton grazing mortality, m:

$$m = (kd - k)/(1-x) \text{ and } \mu = k + m$$

Where kd is Chl-a based growth rate in the diluted treatment, k is Chl-a based growth rate in the whole water treatment, and x is the fractional dilution used in the diluted treatment, in this case x = 0.1.

Reference:

Landry M.L., Brown S.L., Rii Y.M., Selph K.E., Bidigare R.R., Yang E.J., Simmons M.P. 2008. Depth-stratified phytoplankton dynamics in Cyclone Opal, a subtropical mesoscale eddy. Deep-Sea Research II 55: 1348– 1359