Cruise Synopsis

Cruise Name: SINC 6
Dates: June 25-27, 2010
Vessel: R/V Blue Heron
UNOLS Cruise ID: BH10-06

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Environmental conditions

Start of the cruise was delayed ~ 2h due to medial reasons. Some swell was experienced on the afternoon of the first day but light winds and calm conditions prevailed for the duration of the cruise. The sky was overcast, with fog on the first day with clouds continuing into the second day. The sky was partly cloudy the second day. The lake had already gone through spring overturn and nearshore surface temps were 15-16 C. Both CD-1 and WM were stratified.

Water chemistry

Note – continue taking samples for further development of evaporation/concentration of [TDP]

CD-1, mid-day June 25. Surface temperature = ~12C. Sampled depths (2, 5, 12, 20, 30, 100, 150, 246m) for standard water chemistry parameters.

WM, mid-day June 26. Surface temperature = ~7.8C. Sampled modified in situ bottle array depths (2, 5, 10, 20, 30, 40, 60, 90, 120, 155m). High resolution depth sampling done for NO3, NH4, TDP, and chlorophyll by addition of depths (1, 3, 8, 14, 18, 23, 25, 35, 45, 50, 55, 65, 70, 80, 100, 110, 130, 140, 159).

Nearshore underway, early AM May 16. Made use of underway water sampler system (not all electronics yet functioning). Sampled 13 points along same transect of as SINC 5 to get information on water chemistry associated with south shore warming.

Other CTD casts done at STE-C and GRAB5.

^{14}C production, nitrification.

At site WM did standard, JGOFS based primary production in situ array with modified depths and bottle numbers. Began at water collection at midnight and bottles were in the lake around 0500 (sky was a little light at this time). Nitrification using Hicks method done at all depths.

^{15}N nitrification measurements

Two bottles per depth in bottle array using same procedure as previous array experiments using 250uL of 40uM Ammonium 15N Chloride stock per bottle.

Surface samples from 13 underway points were run in duplicate.

Bottom sampling

Multicore used at CD-1, WM, and STE-C, and attempts were made at GRAB 5, but the bottom was too sandy. Total of five cores taken at each site. Three given to Katsev lab, who did oxygen profiling. Two used for depths slicing for DEA. One used for sampling for FISH.

Flow Cytometry
Samples for flow cytometry were collected from all sampled depths at CD-1 and WM, including the high resolution sampling at WM, and across the nearshore underway transect. Samples were fixed with buffered formaldehyde (1% final concentration) and flash-frozen in liquid nitrogen before transport back to Bowling Green.

Genetics
Samples from nucleic acid extraction were collected from near-surface and near-bottom depths at both CD-1 (12m and 246m) and WM (2m and 159m). Samples were flash-frozen in liquid nitrogen before transport back to Bowling Green.

Copper chelation experiments
Three experiments were conducted to test the effects of copper chelation on nitrification and prokaryotic growth. Near-surface (2m) and near-bottom (246m at CD-1 & 159m at WM) whole water samples were aliquoted into triplicate 250 mL bottles, spiked with ^{15}N-NH_4 as per the standard nitrification protocol, and treated with 20 nM or 100 nM Cyclam. Replicate experiments were conducted on samples collected at CD-1 and WM, with a third experiment conducted on whole water collected at CD-1 then aged with 100 nM Cyclam for 24h before conducting the experiment.

Fluorescent *in situ* hybridization
Whole water samples from FISH analysis were prepared from near-surface (2m) and near-bottom (246m at CD-1 & 159m at WM) depths. Samples were fixed with formaldehyde and mounted onto black 0.2 µm polycarbonate filters and frozen from transport back to Bowling Green.

Microplankton enumeration
The abundance and biomass of microplankton was measured to evaluate the possible role growth and grazing may have on nutrient cycling in the water column of Lake Superior. Samples were collected from the routine depth distribution profiles at both offshore sites in the lake (9 depths at CD-1, and 10 depths at WM). Subsamples were drawn from Niskin bottles and subsequently preserved with glutaraldehype (final conc 1%) for pico/nanoplankton and microplankton enumeration (both hetero- and autotrophs). These

samples were immediately refrigerated, and microscope slides were prepared on shipboard within 24-hour of collection (Carrick and Schelske 1997).

Grazing rates

Microzooplankton grazing on pico- and nanoplankton was determined using two independent measurements at 3 depths in the water column (epilimnion @ 2 m depth, metalimnion in the DCM, and hyolimnion near bottom) at both offshore stations. First, bottle enclosure experiments were used to provide simultaneous rate measurements of Ppico growth and grazing losses (attributable to microzooplankton) using the prokaryotic inhibitor, ampicillin (e.g., Campbell and Carpenter 1986). Samples were preserved on shipboard for analysis back at Penn State. A second set of enclosure experiments were performed, where fluorescent microsphere were used as tracers to measure species-specific grazing rates of dominant microzooplankton on bacteria-sized particles (0.45 um in diameter). The microsphere tracers were added (at ~10% of natural bacteria conc.) to nature plankton assemblages (raw lake water); a time-course of samples were collected and preserved on shipboard to be analyzed back at Penn State.