CARGO 2 Synopsis

INTRODUCTION

This was a rescheduled cruise due to inclement weather during the original scheduled period. Weather was poor during the rescheduled time as well. Cruise departed six hours ahead of schedule. CD-1 was sampled. Crew then spent the majority of the time in the Apostles. We changed plans and elected to sample several stations (including two new stations that were named on this cruise) in and around Chequamegon Bay. The bottle array was not deployed.

New Stations (added to master lat long sheet)

CH#3Sterner

46 43.587 N
090 50.471 W

CH#4Sterner

46 54.004 N
090 42.966 W

Brovold/Haustein

Core sampling.

Collected water column samples at CD-1 (10 depths), Ste-I (1 depth), and CH-3 (1 depth). Unable to sample WM as planned b/c of rough weather. Sample description in table below.

Note: 1 completely <u>full</u> carboy (20L) is sufficient to do all of the core chemistries, however, anything additional such as the bottle arrays and on- deck incubations will require additional water to be collected.

Size fractionation of seston. – Fractions <80, <40, <20, <10, <5, <2, and <0.7um

The following samples were taken at:

CD1 (5, 10, 15, 25, 40, 55, 100, 200, 225, and 244m)
Ste-I (20m)
CH-3 (18m)

SAMPLE	FRACTION	VOL FILT	#REPS	MEDIA	
14C DIC GC method	80		2	glass vial /crimped top	

14C DIC	80		1	brown vial	
14C DOC	80		1	brown vial	
15N PON	80	1000-2000	2	25mm GF/F filter	
CHN	80	1000	2	25mm GF/F filter	
PP	80	1000	2	25mm GF/F filter	
Chla	80	200	2	25mm CN filter	
pH	80		1	500 mL bottle	
NO3	80		1	125 mL bottle	
Si	80		1	60 mL bottle	
DOC/TDP	0.7		2	60 mL bottle	
NH4	0.7		1	500 mL bottle	
Chla	40	200	2	25mm CN filter	
Chla	20	200	2	25mm CN filter	
CHN	10	1000-2000	2	25mm GF/F filter	
PP	10	1000	2	25mm GF/F filter	
Chla	10	200	2	25mm CN filter	
Chla	5	200	2	25mm CN filter	
CHN	2	1000-2000	2	25mm GF/F filter	
PP	2	1000	2	25mm GF/F filter	
Chla	2	200	2	25mm CN filter	
HPLC1	80	1000	1-2	47mm GF/F filter	
HPLC2	80	800	1	1000 mL bottle	

SPEC PH – Bob Sterner ran samples for pH using the new Spec method from Eric Brown

CARGO-2 Post-cruise synopsis (McKay)

We sampled Lake Superior stations CD-1, Sterner-I, Sterner-J, CH-3, and CH-4.

Station	Date (time)
CD-1	10/5 (04:00)
Sterner-I	10/6 (10:00)
Sterner-J	10/6
CH-3	10/6 (14:00)
CH-4	10/6
Sterner-I	10/7

Photosynthesis-irradiance (PE) curves (McKay)

Using a photosynthetron, conducted PI measurements on unfiltered and < 2 µm fractions from Sta. CD-1, Sterner-I and CH-3 and on a net plankton (20-153 µm) fraction from Sterner-I. Filtration conducted pre-incubation using 2 µm PCTE membrane and low vacuum (~5 inches/100 mm Hg). Controlled temperature of the photosynthron using a circulating water bath so that it approximated in situ temperature at each sampling location. Sub-samples for analysis of chl, DIC and elemental analysis were processed by Sandy Brovold.

Net plankton sample: 20 µm hand net cast to about 15 m × 6 hauls. Sample pooled and passed through 153 µm mesh. Samples for chl analysis: 3 × 50 mL (provided to Sandy).

Prior to analysis, all samples dark adapted @ ≥ 30 min.

Station	Depth (m)	Incubation Temp (°C)	Incubation time (h)
CD-1	5, 15, 25 m	10/5-8/4-8	2
Ste-I	net tow	13	1
Ste-I	20	13	2
CH-3	10	13	2

Nucleic acids (McKay)
At several stations in vicinity of Apostle Islands, seston was collected using Sterivex filtration cartridge (0.22 µm) in conjunction with a 60 mL syringe (samples Ste-J, CH-3 and CH-4). The sample from Ste-I was passed through the cartridge using a peristaltic pump – although the seal was not tight, so I moved to using the syringe (with multiple refilss for subsequent samples). All samples were stored at -20° C and returned to St. Paul. Samples will be sent to BGSU.

Station	Depth sampled (m)	DNA/RNA	Volume filtered (mL)
Ste-I	20	DNA	1000-2000
Ste-J	? (14.5?)	DNA	960
CH-3	10	DNA	~700
CH-4	? (14.5?)	DNA	840

Grazing Studies CARGO2 (Seegers)

At CD-1 full grazing dilutions were run at 3 depths: 25m, 15m, and 5m. The depths were chosen in the DCM and a depth above and below the DCM. The depths correspond to the depths used for the primary production runs. Bacteria samples were also taken for each depth with whole water. Dilution levels (proportion whole lake water): *0.050, 0.100, 0.150, 0.200, 0.300, 0.400, 0.500, 0.650, 0.800, 1.000.*

The on-deck incubations were kept cool with surface water using the ship's hose. The surface temperatures was 13 ºC. Mesh screening was used on incubation cover to filter . sunlight. The mesh reduced the light levels to 25% of the air light levels. The incubations began at 09:00 and ended 36 hours later October 6, 2007 at 21:00. Filtering continued until 04:00.
Additional filter rigs would greatly reduce the time spent filtering.

The stormy weather did not allow us to follow the cruise plan. Instead we hide behind the Apostle Islands and sampled water. At Sterner-I 2 full grazing dilutions were run at a depth of 20m. Dilution levels (proportion whole lake water): *0.050, 0.100, 0.150, 0.200, 0.300, 0.400, 0.500, 0.650, 0.800, 1.000.* The water was mixed. The purpose of these runs was to help answer questions about technique. The two runs were identical except they were set-up in 1L and 2L bottles. The bottles were added to the on-deck incubator at 10:30 (1L) and 11:30 (2L). The incubations were terminated after 24 hours. The filtration continued back in Duluth until 18:00. Additional filter rigs would greatly reduce the time spent filtering.

The final morning (10/7/07) water was taken from a single 20m CTD cast at Sterner-I. The cast was completed at 05:00. The water was put into TMC 20Lcarboys and then into coolers to transport back to St. Paul for incubations. The water spent 18 hours in the carboys before the incubations began at 23:45. Three full dilution runs were

complete. Dilution levels (proportion whole lake water): *0.050, 0.100, 0.150, 0.200, 0.300, 0.400, 0.500, 0.650, 0.800, 1.000.* The light dark cycle was 14 light and 10 dark. The incubations were run at 10ºC for 48 hours, 72 hours, and 96 hours.

Respiration measurements (Becky Stark)

Respiration was measured for both whole water and for the <1um fraction at all depths from CD-1, Ste-I and CH-3. Respiration was also measured for the <2um fraction at station CH-3. For each depth, eight airtight vials were overfilled with either whole or filtered water. In half of the vials, respiration was stopped immediately by the addition of HgCl2 to 0.01%. Respiration in the other vials was stopped at the end of the incubations by the addition of HgCl2. Stopped vials were brought back to the lab for measurement of oxygen concentrations using a Membrane Inlet Mass Spectrometer. Respiration rates are calculated as the difference in oxygen concentration at the start and end of the incubations, divided by the duration of the incubation.

For this cruise, respiration measurements were taken for samples incubated at both in-situ temperatures and at 25 deg C in order to estimate the effect of temperature on respiration rates. Incubations of different durations were also performed to determine if incubation duration has any effect on the respiration rates measured.

Station	Depth(s) Sampled	Incubation temperature(s)	Duration(s) of incubation	Water fractionation
CD-1	5, 10, 15, 25, 40, 55, 100, 200, 225, and 244m	20 deg C (all depths) 13 deg C (5, 10, 15 m) 4 deg C (25, 40, 55, 100, 200, 225, 244 m)	48 hours	Whole, <1um
Ste-I	20 m	4 deg C, 13 deg C, 20 deg C	24, 48 and 72 hours	Whole, <1um
CH-3	18 m	13 deg C	48 hours	Whole, <1um, <2um