SYNOPSIS

CARGO 1, July 30 – Aug 1, 2007

First cruise on Sea Grant project on production and grazing. The lake was stratified and a DCM was present. Science crew was Sterner, Brovold, Seegers, Jeyasingh, and Stark.

Core sampling.

Did water column sampling at CD-1 (10 depths) and WM (8 depths). Depths at CD-1 chosen to get information on the top, middle and bottom of the DCM. Depths at WM given by project-specific standard depths for bottle array deployment. Samples taken for dissolved chems (DOC, DIC, NO3, Ammonium, TDP).

Note: 1 completely full 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.

The following samples were taken at:

CD1 (depths 2, 5, 15, 20, 25, 32, 35, 40, 100, and 244m)
WM (depths 2, 5, 10, 20, 30, 40, 60, and 80m)

Sample	fraction	vol filt	reps	media
14C DIC	80		1	brown vial
14C DOC	80		1	brown vial
Chla	80	200	2	CN filter
CHN	80	1000	2	GF/F filter
NO3	80		1	125 mL bottle
pH	80		1	500 mL bottle
PP	80	1000	2	GF/F filter
Si	80		1	60 mL bottle
Chla	40	200	2	CN filter
Chla	20	200	2	CN filter
Chla	10	200	2	CN filter
CHN	10	1000	2	GF/F filter
PP	10	1000	2	GF/F filter
Chla	5	200	2	CN filter
Chla	2	200	2	CN filter
CHN	2	1000	2	GF/F filter
PP	2	1000	2	GF/F filter
DOC/TDP	0.7		2	60 mL bottle
NH4	0.7		1	500 mL bottle

SPEC PH – We planned to use the new spec method for pH from Erik Brown's lab but we did not have time on board.

Ran these back in the lab as follows.

Note: Make sure to fill sample collection bottle to the top w/ no air space. If in the future we are planning on running samples immediately then have a tub of warm water available to start warming the samples. They need to be about 25ºC.

The Spec was set up according to the protocol from Eric Brown at LLO using two QS 10cm stoppered round cells (OS cells were also brought as backup). Spec set to read at 740nm, 577nm, and 439nm.

Warmed sample was poured into the cell and the cell placed into the Spec holder. The temperature of the sample in the sample bottle was recorded. The sample was read at the 3 wavelengths. 70uL of 2mM Cresol Red was added, the cell recapped, and the sample mixed to obtain a uniform color. The cell was then returned to the Spec and read again at the 3 wavelengths. All data was entered into a copy of the spreadsheet provided by Eric Brown. Cell was rinsed well with nanopure between samples

HPLC

12 samples were taken from CD1 and WM at upper depths as per requested. Each sample was split as follows:

1) Approximately 750 mLs of 80um water was collected in 1L bottles provided by Dick Kiesling as fresh samples. Samples were stored in the on-deck incubator until the end of cruise
2) 200 mLs of 80um water was collected in 250mL brown bottles and preserved with Lugols.
3) 2000 mLs of 80um water was filtered thru a 47mm GF/F filter, wrapped in foil and frozen. Stored at -70ºC until picked up. (1000 mLs in future??)

Picocyanobacteria

No Flow Cytometry done this cruise.

DNA filters: 200 mLs of 80um water was filtered onto a 47mm 0.2um PC filter. Filter then rolled/folded into a cryovial and frozen in liquid N_2 until returning to the lab where they were transferred to the -70 ºC freezer.

Chla filters: 200 mLs of 2um water was filtered thru a 47mm 0.2um PC filter. Samples folded and placed into 15 mL PP falcon tubes and frozen.

PI curves.

Photosynthetron measurements were run at depths of (5,20, and 32m) from CD-1. Depths correspond to grazing measurements done at this site. For all three depths, whole algae plus < 2 size fractionated algae were run. Incubations were 90 min. Temperatures matched those in the lake at those depths. No problems or issues for next time.

Bottle array, photosynthesis

We deployed the drifter array at WM on schedule at prescribed 8 depths. We used 5 bottles at each depth (one T0, one dark, 3 light). Retrieval was performed without incident on time. The new cable using shackles at each sampling depth needs to be improved for next time. Shackles were larger than necessary, and they tended to stick in the A-frame pulley wheel. Check with BH to be sure this is fixed ahead of next cruise. The HOBO light sensor was used for the first time and the data looked good. We borrowed a depth/pressure sensor from the Brown lab and it reported that the cable remained straight for the entire incubation. Two of the dark bottles lost their foil and shrouding due to them being dislodged from the cable ties on the wire baskets. Look to improve the dark bottle/shrouding/cable tie arrangement for next time.

We added a ^{14}organic carbon treatment similar to the phosynthetron protocol for the first time. Look at data later to insure that the sample volumes used gave appropriate signal. These samples will help determine if there is significant ^{14}DOC produced during the one-day incubation.

Filtrations seemed to run slowly. For next time, insure that the filtration system is running well before packing for the cruise. Also check that all fittings are as tight as possible to minimize any loss of hot sample onto protective padding on the bench.

Grazing studies

At CD-1 we set-up full grazing dilution runs at 2 depths; 32m and 20m. Depth was selected in the DCM and at the bottom of the thermocline above the DCM. An additional depth near the surface could be added. Additional runs limited by amount of time needed for filtration.

Requesting the use of the fish pump may increase time efficiency by allowing for 0.45um filtering to begin prior to sample water coming on board.

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 fire hose. The surface temperatures were warmer than expected throughout the cruise about 18 ºC. Mesh screening was used on incubation cover to filter sunlight. High wind added

some difficulties to keeping screening attached. Will develop better way to attach screening. The incubations began at 15:30 and ended at 2 days later at 13:00. Filtering continued until 18:30 in port. Additional filter rigs would greatly reduce the time spent working while docked.

At WM grazing dilution experiments were added to the in-situ array. Three depths were selected at 2m, 20m, and 30m. Three dilution levels were selected 0.05, 0.15, 1.0.

At CD-1 on final cruise morning collected samples at 3 depths (5m, 20m, and 35m) near 9:00. The samples were placed in 20L carboys and placed in coolers for transfer to St. Paul. Future cruises may want to add cold packs to coolers. Dilutions were set-up that night at 23:00. 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 levels were low in the incubations. The 20m and 35m were incubated at 4ºC. The 5m samples were incubated at 13 ºC. The light dark cycle was 16 light and 8 dark. Had trouble with the timer in the 4ºC incubation. Need a new timer before next cruise.

Coring

Cores were taken at four sites – six at Sterner B, five at WM, five at Cotner G, and three at Sterner C. For most sediment cores, incubations were begun immediately by capping core tubes with airtight caps. I was able to store all incubating cores in the second refrigerator in the wet lab. The overlying water in the sediment core incubations was sampled periodically, on-board, for oxygen and carbon dioxide content, nitrate, ammonium and total phosphorus content. Some sediment cores were sectioned on ship and sediment layers were centrifuged to separate pore water for chemical analysis. This went very smoothly.

Water was collected at a range of depths at each of the above stations to be analyzed for particulate 15N content (Sterner B – 5m, 15m, 25m; WM – 30m, 50m, 100m, 120m, 140m, 160m, 180m; Cotner G – 5m, 30m, 100m, 150m, 190m, 230m, 270m; Sterner C – 5m, 10m, 20m, 30m, 40m).

Respiration measurements

Respiration was measured for both whole water and for the <1um fraction at all PI depths from CD-1 and at all experimental depths at WM, and at Cotner G (5m and 270m) and Sterner B (5m and 25m). For each depth, eight airtight vials were overfilled with either whole or filtered water, and, in half of the vials, respiration was stopped by the addition of HgCl2 to 0.01% at time t=0. Respiration in the other vials was stopped 24 hours after time t=0 by the addition of HgCl2. All vials were incubated at 25 deg C over this interval. Stopped vials were brought back to the lab for measurement of oxygen concentrations using a Membrane Inlet Mass Spectrometer.