NBP Cruise 06-01
CORSACS (Controls on Ross Sea Algal Community Structure)
Synopsis of Week One (12/18-12/26/2005)

Our departure date was delayed a day because of several factors including: late arriving chemicals and our inability to promptly load a science van on the helo deck because of repairs (made on Wed night) to the aft crane. The ship had to relocate (early Thurs. morning) to the fueling pier. As a result the science van was finally loaded on Friday. The continuous culture incubators on top of the van were set up on Saturday and the chemicals arrived late on Saturday. Consensus among all parties was reached to set sail on Sunday morning December 18th, 2005.

Since leaving port we have successfully tested all major equipment to be used in the Ross Sea. We deployed the CTD to 1000 m and collected both deep and near surface water. All sensors on the CTD appear to be working. Using the starboard A-frame, we have deployed the in-situ trace metal towfish and pumping system, the trace metal rosette, and both trace metal Niskin and Go-Flo bottles suspended on the Kevlar line. The towfish pumping system was used to collect several hundred liters of clean water that was used to rinse bottles and clean out all the lines for the continuous culture experiments. Iron concentrations (0.08 nM) in seawater taken from the Antarctic Circumpolar Current using the in-situ pumping system were very low, indicating that the system was successful in collecting trace metal clean seawater.

Sampling using the underway seawater system started on Tuesday, December 20, 2005. Samples were collected for total dissolved inorganic carbon, alkalinity, oxygen, photochemical efficiency of photosystem II, chlorophyll a, biogenic sulfur, redox proteins (flavodoxin and ferredoxin), carbonic anhydrase, and algal community composition based on microscopy and pigments (HPLC measurements). Continuous underway sampling of gases in near surface water was also started using the membrane inlet mass spec (MIMS) and included measurements of: carbon dioxide, oxygen, argon, nitrogen and dimethylsulfide (DMS).

As of Monday afternoon December 26, 2005 we have broken our way through the pack ice into the Ross Sea Polynya and are our position is ca. 71^{o} 30’ S, 179^{o} 34’ W. We are steaming south towards our first CTD station as part of the IVARS transect line.in the Southern Ross Sea. We hope to find suitable seawater (i.e. low iron, mixed algal community and lowered CO_2 concentrations) to start our incubations before we arrive at the IVARS station. We will deploy the towfish to start mapping iron concentrations at ca. 74^{o} S. If we do not find suitable water to start the incubations we will sample the IVARS CTD stations and perform the mooring deployment.

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Synopsis of Week Two (12/27/2005 to 01/03/2006)

On December 27th, 2005, we collected large volumes of trace metal clean seawater using the underway towfish pumping systems. This water was used to start several different incubation experiments. These experiments included several different types of incubations to investigate the main objectives of CORSACS. First, the continuous culture experiments involved triplicate bottles testing all permutations of the iron, light and carbon dioxide matrix. That experiment is in its 7th day of incubation and the second day of sampling after the dilution pumps were turned on. A second type of incubations involves the semi-continuous experiments. This experiment is testing the interactive effects of carbon dioxide and light on phytoplankton community structure and various biogeochemical parameters. The first dilution was completed as the cultures were growing faster than expected with growth rates of ca. 0.4 d^{-1}. Thirdly, many different batch type experiments are underway including those testing the effects of cobalt, cadmium and vitamin B_{12} additions. That experiment will be completed today. Various other type of experiments are also being performed including those investigating the effects of temperature on microzooplankton grazing rates.

On December 29 and 30th we occupied and sampled the 12 stations on the southern IVARS transect line. We also successfully deployed the two moorings without any major problems. Sediment traps and other instruments were deployed in relatively calm seas.

Along with our experimental approach we are also focusing on an observational study using underway sampling. We have set up a zonal grid of 4 transect lines including: 76.5^{o} S, 76.^{o} S, 75.5^{o} S, and 75^{o} S. Ten stations are set to be sampled every 30 nautical miles between 167^{o}E and 170^{o} W. We are about two-thirds the way along our first transect line along 76.5^{o}. Up until today we have been completing 4 CTD's per day. In between stations we have been sampling from the towfish. As a result, we hope to obtain an areal data set of surface trace metal concentrations in the Ross Sea. These data have never been collected before here. They will be especially valuable with all the physical data from the TSG and the biological and chemical measurements collected using the ships underway flow through system. In addition, the trace metal team is also performing 3 vertical profiles along each transect line. The towfish had worked well until today. We've had 25 knots winds from the south for the past day which has kicked up the seas. The towfish had hit the ship's hull last night (perhaps on recovery) and the nose was damaged. It has already been repaired.

We are hoping it will be possible to get a helo resupply. We will be near Ross Island next Monday (Jan 09) and hope weather conditions and helo scheduling will be favorable to allow the resupply. We are in need of a zooplankton flow meter, GF/F filters (which did not arrive Lyttleton in time), a UV oxidation lamp (to replace one that burned out) and some acrodisc filters. It is our understanding that 3 of the items are already in McMurdo. Our MPC is in touch with McMurdo about this situation. The Captain, ship's crew, Raytheon crew and the ET's have all been great. The LN generator onboard is worth its weight in gold out here! So far the cruise has been a success.

Happy New Year and Best Wishes to all.

NBP Cruise 06-01
CORSACS (Controls on Ross Sea Algal Community Structure)
Synopsis of Week Three (01/04/2006 to 01/16/2006)

We have now completed 71 CTD stations on three transect lines along 76^{o} 30'S, 76^{o} S and 77^{o} 30' S latitude. On January 10th we had a helicopter rendezvous with us off Cape Bird to bring us some supplies including a meter for the zooplankton net and a new lamp for a UV oxidation system. Recently, we completed a transect approximately perpendicular to the Ross Ice Shelf. We investigated the trace metal concentration gradient from the Ice Shelf. Trace metal clean water was pumped onboard the ship by the underwater towfish. In addition, trace metal niskin and go-flo casts were performed in the Bay of Whales. The towfish was slightly damaged when it hit a small bergy bit but has since been repaired. We now realize that next November it will be very difficult to use the towfish system for underway sampling but still hope to use it to collect clean water for incubations.

The continuous culture experiment was terminated yesterday after 17 days of incubation. The experiment appears to have been successful but we won't know the exact results for quite a while as many samples will have to be processed on shore. Several other experiments have also been completed successfully including a 17 day semi-continuous culture experiment investigating the effects of carbon dioxide and light on algal community structure. Batch incubation experiments have also been completed investigating the effects of iron and light as well as iron and vitamin B_{12}. For a few days we had strong southerly winds and the wind chill factor reached approximately -20^{o} C. Some of the lines to the incubators and chemostats were freezing up. It will be problematical to do these experiments next November when conditions should be quite a bit colder.

We are currently at 75^{o} S, 178^{o} E and working on our last major transect line into Terra Nova Bay. While transiting we are continuing to collect various samples using the ship's underway flow through system. We also are planning on deploying the towfish tomorrow to collect trace metal clean water to begin our last set of incubation experiments. These experiments will include those described above as well as one to investigate the interactive effects of temperature and iron on algal community structure.

Our ability to plan our transect lines in advance during this cruise has been complicated by the need to refuel at some undetermined place and time. At present, however, we have made contact with the tanker *Gianelli* and hope to meet her at the ice edge to refuel after she completes transferring fuel to the *Krasin*. We will break off of our transect line on 75^{o} S today to steam south to meet her. Hopefully we will be able to refuel sometime on January 17th and then head north to complete our transect line. We will make radio contact with them later today to coordinate times to make the refueling as time efficient as possible.