12.3 Phytoplankton sampling from stainless CTDs

Robert Williamson, Mike Lucas, Mark Moore

Without exception, all stainless steel CTD deployments in our survey area were successfully sampled for the core state variables of POC/N, HPLC, Chl-a, BSi, PIC & preserved plankton. In addition, a number of the stainless steel ^{234}Th CTD casts were sampled for chl-a and POC/N when requested by the Paul Morris. The six light depths sampled from the Ti-CTD at Primary Production stations were sampled for size-fractionated chl-a (total, >20µm, >2µm) determinations. Typically, POC/N, HPLC, Chl-a, BSi and PIC samples were collected from 12 standard depths to 500m. Size-fractionated samples (total, >20µm, >2µm) were also routinely collected from two depths, normally at 10m and the chl-a max. (range: 40-80m). Preserved samples for phytoplankton (200mls Lugol's & 200mls Buffered Formalin) and for micro-zooplankton (200mls Buffered Formalin) were also routinely collected at the size-fractionated depths on the stainless steel CTD's. Stainless steel CTD's associated with the major T-CTD primary production stations are coupled with the appropriate Ti-CTD in the Log (see attached Table.).

Sample Collection

Approximately 10L of water was collected from the stainless steel CTD in a light-shaded 10L plastic container for each appropriate depth. These samples were the last to be decanted from the CTD and were used to obtain all the above-mentioned variables. The container was agitated before being sub-sampled each time for the variables sampled.

POC/N

Samples were filtered onto pre-ashed 25mm GF/F filters by low vacuum (300-400hPa) filtration. The volumes used for filtration were dependent on the amount of phytoplankton present at each station. Stations with high concentrations, especially of *Phaeocystis*, required lower volumes in order to prevent the filters from clogging. Typical volumes filtered were 1000ml for the upper mixed layer and 2000ml below. Where filters became clogged the remaining unfiltered volume was measured and subtracted from the initial sample volume to obtain a net sample volume filtered. Filters were placed in labelled petri-dishes and stored at -20°C. These samples will be analysed back at SOC.

Size fractionated POC/N

For each specified depth, 2L was filtered through a 20µm mesh sieve. 1L of the <20µm particle water was collected onto an ashed GF/F to obtain a <20µm fraction. The remaining 1L was filtered through a 2µm polycarbonate membrane filter and the collected water was then filtered onto an ashed GF/F to obtain a <2µm fraction. Samples were stored as above.

HPLC

Filtered samples for HPLC were collected onto regular GF/F filters from 1000ml volumes except where phytoplankton biomass was high enough to clog the filter. In such cases filtered volumes were calculated as for POC/N. HPLC was only collected up to station 15504 from the stainless steel CTD's. However, all of the primary production sample stations (15491, 15496, 15499, 15502, 15511, 15516, 15524, 15531, 15537 & 15543) had water collected at 6 depths per station for HPLC (or pigments) as part of the 15N experimental protocol. HPLC filter samples were stored on-board at –80°C and will be analysed back at SOC.

Chl-a

More than 1200 samples were filtered (by RW & MIL) and read by Mark Moore on the Turner fluorometer. He asks that this stupendous effort of his is duly recognised! (Beers?) The volumes sampled were again dependent on phytoplankton concentrations but were predominantly 200ml or 100ml in higher chl-a water. Samples were collected onto 25mm GF/F filters under low vacuum filtration. Each filtered sample was placed in a 20ml glass scintillation vial with 10ml of 90% acetone added. Vials were stored in a fridge for 24 hours before fluorometric analysis of the extracted pigment was made.

Size fractionated Chl-a

200ml was initially filtered onto 2, 10 and 20µm polycarbonate membrane filters but later the >10µm fraction was deemed unnecessary. Samples were stored and measured as above.

BSi

These samples were obtained by filtering between 250-1000ml onto 37mm 0.4µm polycarbonate membranes. Volumes filtered depended greatly on planktonic concentrations at each station. Clogging occurred frequently and net volumes were calculated as for POC/N. Collected samples were placed in 20ml plastic scintillation vials and stored at -20°C on board. It is our intention on the 2nd Leg of Crozex to analyse the BSi samples on-board (Megan French).

Size fractionated BSi

Volumes associated with total BSi were filtered onto 20µm polycarbonate membranes and stored as above. A very few <2µm samples were taken at the start of the cruise.

PIC

Filtration methods were the same as for BSi except that a small un-measured volume of Potassium Tetraborate (buffer) was used to rinse the 0.4µm membrane after the seawater sample had been filtered. The filtered sample was stored in 20ml plastic scintillation vials and stored at ambient temperatures on board.

Size fractionated PIC

Fractions of >20µm and >2µm were derived from filtering samples onto 20 and 2µm membrane filters. Again, Potassium Tetraborate was used to rinse the membrane and the sample was stored as above.