

Field Sampling Using the Rosette Sampler

**Glenn J. Warren
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 West Jackson Boulevard
Chicago, IL 60604**

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1.0 Rosette Sampler

The Rosette sampler is the primary sampling instrument for the collection of all Nutrient parameters, phytoplankton, chlorophyll a, phaeophytin a, and dissolved oxygen from the Biological Category, and temperature, total suspended solids, turbidity, specific conductance, and pH from the Physical Category.

A 12-bottle Rosette sampler system (Sea-Bird Electronics 32 Carousel Water Sampler) will be used to collect water samples. This equipment allows an operator to remotely actuate a sequence of up to 12 water sampling bottles. This system consists of a CTD (conductivity, temperature and depth sensor - Sea-Bird Electronics Model 9 Underwater Unit) attached at the bottom of the Rosette, an A-frame, 1000 feet of multi-conductor cable, a variable speed winch and Sea-Bird Electronics Model 11 Deck Unit with attached computer. The CTD measures water depth and temperature, which is graphically (CRT) displayed onboard the research vessel. The bottles can be closed in any predetermined order, remotely from the deck of the vessel while the array is submerged at the various sampling depths. The Rosette sampler is equipped with 8 L Niskin bottles.

The depth at which samples will be collected is detected by a pressure transducer on the CTD. To assure that the display parameters are set to include the entire water column, the Rosette winch operator obtains a depth sounding from the bridge and writes this on the Rosette form, then adjusts the computer program parameters controlling the depth range to be displayed (See "Instructions for use of the Sea-Bird 9/11+..."). The Rosette sampler will then be lowered to the bottom at between .5 and 1 meter/second, raised at least 5 meters after contacting the bottom. The operator will wait three minutes to allow the sampler to drift away from the disturbed area before the B-2 (2 meters up from the bottom) sample is taken. The Rosette sampler will be lowered to B-2 and the sample taken.

Additional time intervals of three minutes are allowed to elapse prior to taking the thermocline sample and the lower epilimnion sample. These intervals provide time for water equilibration within the Niskins.

The knees of the EBT temperature depth trace will be determined by trisecting the angle between the epilimnion and mesolimnion temperature traces (upper knee) and the angle between the mesolimnion and hypolimnion temperature traces (lower knee). The upper knee is the upper α angle intercept, the lower knee is the lower α angle intercept. The lower epilimnion sample is one meter above the upper knee. The upper hypolimnion sample is one meter below the lower knee.

2.0 Sequence of Sampling Events

The following is a brief summary of the sampling events. Some events may be done simultaneously and event order will be subject to conditions.

2.1 Visual and Physical Station Observations

Air temperature, wind speed, aesthetics, wind direction, depth, and wave height.

2.2 Rosette Sampling

Run Rosette/CTD down to define the temperature profile and determine the thermocline location during stratified situations. Examine the CTD profile. Select sampling depths according to depth selection. Trigger sample bottle at correct depths, while verifying the temperature profile. Split Rosette Niskin samples into the required sample bottles/preservatives. A composite 20 m sample is taken for phytoplankton, chlorophyll *a*, pheophytin, and, when appropriate, primary productivity, by compositing Niskin samples at 1, 5, 10 and 20 meters.

3.0 Sample Integrity

Concentrations of chemicals in lake water are very dilute. A small amount of sample contamination can have a large effect on the results. Avoiding contamination is, therefore, a major quality control goal. Each Niskin sampling bottle shall be emptied into the sample bottles as soon as possible. All chemistry sample bottles shall be rinsed once with sample before filling. New 1 g polyethylene containers (PEC) will be used to hold the sample for the on board analyses and preparations.

One gallon polyethylene containers filled directly from Niskin sampling bottles are used for nutrients, pH, specific conductance, alkalinity and turbidity analyses. Samples for analysis of dissolved nutrients are taken from the 1 g containers and filtered into new 125 mL sample bottles.

Samples for chlorophyll *a* analysis are collected directly from Niskin sampling bottles into 300 mL brown polyethylene sampling bottles. Water to be used for primary productivity analysis taken directly from Niskin sampling bottles into 960 mL polyethylene bottles. These samples are composited into brown, 4 L polyethylene bottles.

To reduce contamination from atmospheric dust, empty bottles will be capped during preparation for sampling. Care should also be taken in the storage of bottles to reduce exposure to "dirty" environmental conditions. During sampling, each bottle is rinsed with sample water, emptied, and filled with sample water. The cap is replaced after addition of the preservative, or immediately on samples that require no preservative. Transfer of the samples from one container to another or manipulations of the sample are avoided as much as possible since each such action can result in contamination.

To reduce contamination and to control the volume of the preservatives, automatic pipettes or dispensers are used to dispense all preservatives. Prevention of inadvertent use of the wrong preservative is accomplished by the use of the same color tag on the sample bottle and preservative dispenser. Dissolved oxygen samples are "set up" immediately. This involves filling the bottle to overflowing, allowing overflowing to continue five seconds before adding, in series, the first two reagents, allowing the floc to settle, mixing and allowing floc to settle again. D.O. samples are then completed in the main laboratory.

4.0 Nutrient Sample Filtration

A number of samples must be filtered, after sample splitting. The following are brief summaries. Dissolved nutrient samples will be prepared by vacuum filtration (<7 psi) of an aliquot from the PEC for onboard analyses within an hour of sample collection. A 47 mm diameter 0.45 μm membrane filter (Sartorius) held in a polycarbonate filter holder (Gelman magnetic) with a polypropylene filter flask prewashed with 100 to 200 mL of demineralized water or sample water will be used. New 125 mL polyethylene sample bottles with linerless closures will be rinsed once with filtered sample prior to filling.

5.0 Instructions for Use of SeaBird 9/11+ and Rosette for Collection of Water Samples and Cast Information

The SeaBird 9/11+ is built to provide real time information on a number of water quality parameters as it moves through the water. The software used to run the instrument and collect data (Seasave) has been configured for generalized sampling conditions. Depending on the depth and expected values of the parameters, the configuration will likely require modifications.

The Dolch computer in the Rosette control room is loaded with the software to run the SeaBird 9/11+. After turning on the computer, go to the C:\SEA911 subdirectory. Enter the Seasave program by typing *Seasave*. The first screen that you see will give you choices on whether to Acquire Real Time Data or to Display Archived Data. Highlight the "Acquire..." option and press <Enter>. The next screen will require verification that the data will be written to disk, as well as the entry of a file name for the data to be acquired. After these are entered, highlight the "XY parameters to be plotted" and make sure that the ranges for depth, temp, etc. are appropriate for the station. After making any necessary changes, you exit from this screen by pressing <Esc>. At this point (or before) turn on the SeaBird deck unit. Press <F10> to begin acquiring data. Next you will see a header information screen. At a minimum, enter the station number. You may enter the position (latitude & longitude) information and any notes that you have about the station. After exiting this screen (by following the instructions on the screen), the program will delay slightly to initialize the rosette, and a graph will be displayed with function key menus on the top and bottom of the graph.

Remove the PAR sensor cover, remove the buffer bottle from the pH probe, and remove the Tygon tubing (GENTLY!) from the temperature probe. Deploy the SeaBird Rosette. Keep the Rosette just under the surface of the water for one minute, then turn on the pump by entering <Ctrl><F4>. Wait another minute and then begin the cast. If the altimeter is

working, stop the Rosette 1-2 meters off the bottom. If it is not working, let the Rosette touch bottom, then raise it to 5 meters off the bottom. Determine the sample depths and mark them on a data sheet. If the deepest sample will be below 5 meters off the bottom, wait two minutes before taking the sample. Otherwise begin sampling as the Rosette is raised. Bottles are fired by entering <Ctrl><F3>. A number will appear in the upper right hand of the screen when the bottle has fired. Continue taking samples until the Rosette reaches the surface. Take the surface sample, if required, then turn off the pump by entering <Ctrl><F2>. Exit the Seasave program by entering <Ctrl><F1>, and turn off the deck unit. Bring the Rosette onto the deck. Cover the PAR sensor, return the buffer bottle to the pH probe, return the Tygon tubing to the end of the temperature probe, and fill this with deionized water.

Exit completely from the Seasave program, until you see the C:\SEA911 prompt. Place a formatted disk in the A: drive of the Dolch. Enter "castproc *filename*", where *filename* is the file with the freshly gathered data. The data will be processed and copied to the A: disk. Take this disk into the wet lab and place it in the A: drive of the Compaq LTE Lite. From the Windows screen select the SeaBird icon, then the Seaplot icon. Once in Seaplot, make sure the file of interest is the one to be used by the program. Modify the parameter ranges to coincide with those of the station, and run Seaplot. This will graph the data for display.

Appendix A. Sample Log

U.S. EPA The R/V LAKE GUARDIAN 19____
STATION DATA SHEET - SEABIRD 9/11+ AND ROSETTE

DATE _____ GMT _____ LAKE _____ STATION _____

QA DEPTH: FIELD DUP(D) _____ LAB SPLIT(C) _____

SONAR (BRIDGE) DEPTH _____ AIR TEMP. _____ SEA STATE _____

WEATHER _____

LATITUDE _____ LONGITUDE _____

SURFACE WATER TEMP. _____ SECCHI DEPTH _____

PERSONNEL: ROSETTE _____ NET _____ OTHER _____

Sample Number	Bottle Number	Depth Code	Use (S,D,I)	Depth	Profile Code