Standard Operating Procedure for Field Sampling of Cyanobacteria in Lakes

2010

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1. Materials:

- Integrated water sampler (see page 3 for details)
- HDPE bottles (1 liter)
- Cooler with ice/refrigeration/freezer
- Labels for samples

Labeling:
Please include: *date, time, body of water, sample location/site/depth, and weather conditions*.
*If bloom material is sampled, please also indicate (if possible) when the bloom was first reported and how long it persisted for.

2. Sampling Types:

A. Lake Water Quality Monitoring

B. Cyanobacteria Blooms

A. Lake Water Quality Monitoring:

1) Sampling should be done mid-day between the hours of 10 am and 3 pm.
2) Cyanobacteria are transported by wind and water currents and thus tend to have a very patchy distribution. In order to obtain a sample that is representative of the entire lake, it is necessary to collect samples from several locations. The number of locations needed depends on the size and complexity of the lake.
3) Lake water should be sampled from at least 3-5 locations that represent the major embayments and sub-basins within the lake, including the deepest site. Samples from each of the locations may be combined for a single toxicity test. They can also be stored and analyzed separately if information on the spatial variation of microcystin

concentrations in the lake is desired. Note, however, the latter method involves additional microcystin testing and corresponding expenses.

4) To minimize variability due to vertical strata, collect water by lowering an "integrated tube sampler" to a depth of 3 meters (see attached description of constructing a tube sampler and its operation). Take care not to sample close to bottom sediments.
5) Combine samples from all locations into a single large container (e.g. empty 1 gal drinking water bottle).
6) After all samples are collected, shake the collection container thoroughly and pour into the 1 liter sample bottle to approximately ¾ full, leaving space for freezing.
7) Put the sample on ice and in the dark until drop-off at UNH CFB lab.
8) Freeze sample if storage time, prior to delivery, exceeds 12 hours.

B. Cyanobacteria Blooms:

1) Visual surface "blooms" of cyanobacteria are important to sample since they often have higher concentrations of cyanobacteria than are present in the open water due to an accumulation effect. If possible, take a picture and submit it electronically in addition to the water sample as it may help identify the dimensions of the bloom.
2) It is recommended that you wear gloves during handling of any cyano-bloom material and wash hands thoroughly when finished sampling.
3) Once the bloom is located, skim the surface with a clean 1 liter HDPE sample bottle to collect the "scum". Carefully, clean the exterior of the bottle from any scum material.
4) Put the sample on ice until drop-off at UNH CFB lab.
5) Freezing the sample may be necessary if time of drop-off/delivery exceeds 12 hrs.

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3. Analyses:

- Bloom organisms will be identified to determine whether they are potentially toxic cyanobacteria.
- Samples will be processed in duplicate for the concentration of the liver toxin, microcystin, using the Envirologix, Quantiplate-ELISA Kit, (Portland, Me) with increased sensitivity (UNH, CFB). This method detects variants of microcystin as well as nodularins, a similar toxin produced by the cyanobacteria *Nodularia*. Microcystins will be reported as ng microcystin per liter of lake water.
- Fluorescence of phycocyanin (a pigment characteristic of cyanobacteria) will be measured and converted to equivalent *Microcystis aeruginosa* cells ml^{-1}.

Deliver to:

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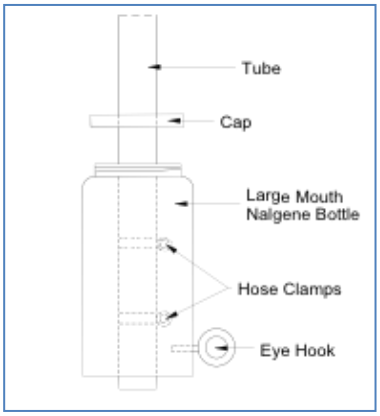
HOW TO MAKE AN Integrated Tube Sampler (modified after NH DES)

MATERIALS:



- Tygon tubing (0.5 inch diameter; available in most hardware stores)
- Plastic bottle (0.5 liter wide mouth Nalgene works well)
- Eyebolt, nut and washers
- Ballast material (ready-mix cement)
- Silicone adhesive
- Small hose clamps

CONSTRUCTION

1. Cut the Tygon tubing to desired length (the length of the tubing should exceed the sampling depth by at least 0.5 meters). Mark the tube at 0.5 meter intervals using a waterproof permanent marking pen.
2. Drill a hole the size of the tube in the cap and bottom of a Nalgene bottle.
3. Place cap on tube, followed by the hose clamps positioned about 4 to 6 inches from end of tube. Tighten the clamps so that they will not slip on tube.
4. Place the bottle so that approximately 2-3 inches of tube protrudes through the bottom of the bottle. Slide the cap up the tube such that the bottle is open.
5. Screw and secure that eyehook into bottle, using a nut and washers.
7. Prepare cement mix according to instructions and pour in the bottle around the tube until bottle is filled to the bottom of the neck.
8. Slide cap in place and screw on tight. Apply silicone to seal around the tubing.
9. Allow tube sampler to dry for 24 hours before use.
10. Attach a calibrated line to the eyebolt for retrieval of the sampler.

OPERATION

1. Lower tube to desired depth using markings on the tube to judge the depth
2. Crimp the tube above the water.
3. Retrieve the tube using the line attached to the bottle to prevent loss of water from the tube
4. Place the open end of tube (protruding from the bottle) into the sample jar.
5. Note that if samples from more than one location are being combined (e.g. for cyanobacteria sampling), be sure to select a container of adequate volume.
6. After all sites are combined, *mix the container thoroughly* and pour into HDPE plastic sample container (0.5-1 liter), allowing room for expansion if samples will be frozen.
7. Place sample in cooler with ice until frozen or processed for microcystin analysis.