

Brine Shrimp Sampling

Introduction

Sampling of brine shrimp in GSL can help assess the impacts on critical biota as related to variations in selenium, mercury and other trace metals concentrations in the lake and also help evaluate the transfer of these contaminants through trophic compartments of the GSL food web.

This Standard Operating Procedure (SOP) was adapted and updated from the procedure of Marden, 2008, prepared as part of the Utah Division of Water Quality's (DWQ's) project, Development of a Selenium Standard for the Open Waters of Great Salt Lake (CH2M HILL, 2008). The objective of this SOP is to collect composite brine shrimp samples from the GSL for the analysis of selenium, mercury and trace metals in whole-body tissues.

Pre-sampling Checklist

The pre-sampling checklist of materials needed during macro-invertebrate sampling will include the following:

- A Global Positioning System (GPS) unit
- A map showing sampling sites with coordinates
- Bound field log book
- Digital camera
- Waders and boots as needed
- 50-cm-diameter, 165 micron mesh size plankton net with removable collection cup that has screen less than 125 micron mesh size
- 1-L Nalgene® Bottle
- Filters and filtration system
- Gloves
- Spray bottle and garden hose with attached water source (i.e., lake water)
- Weights and lines as needed for plankton net
- Safety line for collection cup
- Labels
- Marker pens and pencils
- Cell phone in case of emergency
- Cooler filled with ice
- First-aid kit
- Weather appropriate clothing
- Distilled water
- White plastic or enamel sorting tray
- Forceps

Procedures

Summary of Method

Composite brine shrimp samples will be collected by means of a plankton tow net lowered to a predetermined depth from the back of a boat and raised vertically through the water column to collect the required sample mass. Once the net is free from the water, the net is rinsed from the outside using lake water to free any organisms/debris from the side of the net and to concentrate them into the sample cup at the bottom of the net (see Figure 1, courtesy Brad Marden). The samples are then transferred in Nalgene® bottles by rinsing the cup with filtered lake water and sent to the laboratory for further cleaning/separation and analysis.

Preparation

Prior to use, the net should be carefully inspected for holes or tears. The net and collection cup should be carefully cleaned and thoroughly rinsed using distilled water to remove any visible dirt or contaminant. Ensure that the collected cup is firmly attached to the net. Ensure that sample bottles are prepared and appropriately labeled.

Sampling Procedure

Once the boat is on station, the total depth of water will be measured. If the deep brine layer is present at this station, the depth to the top of the deep brine layer will also be measured. Both total depth of water and the depth to the top of deep brine layer will be documented.



The goal of this sampling effort is to collect brine shrimps from the entire depth of water above the bottom of the lake or above any deep brine layer if present. Samples will generally be collected from the water column beginning 3 feet above the bottom of the lake. If a deep brine layer is observed, hauls should begin approximately 1-foot above the top of the deep brine layer. If the lake depth is less than 6 feet in depth, the boat should be used to tow the plankton net obliquely through the water column to collect the required sample. Care should be taken to keep the net above the bottom of lake to prevent collection of sediment.

Note that a calibrated flow meter will be required if an objective is to measure the density of brine shrimp in the water column. This is not a stated objective for this SOP, thus is not required.

The net will slowly be lowered in a constant upright position to the desired depth. The zero point for the depth is when the rim of the plankton net is at the water surface. Make sure that the tow line is vertical as the net is lowered.

Raise the net at a constant speed until the rim of the plankton net is above the water. Net hauls will be conducted to obtain sufficient mass of brine shrimp for analysis (target 5

grams wet weight) and additional mass whenever feasible should be collected. Do not interrupt the tow by stopping and starting while the net is being towed to the surface.

Once the net is raised above the water surface, rinse it gently from the outside with lake water using a garden hose (as shown in the Figure) to rinse all organisms and debris off of the net and into the sample cup at the bottom. Carefully detach the cup.

Rinse the screening and sides of the collection cup gently with filtered lake water using a spray bottle. At those sites where the water is less saline, other zooplankton may be mixed in with the brine shrimp. Also, the lake water column may contain brine fly larvae during certain times of the year. If so, visible zooplankton will be separated out using forceps and a visual estimation will be made of the relative abundance (by mass) of families of macro-invertebrates within each sample. This will be documented in the field logbook. All other visible detritus, such as algae, sticks etc. will also be removed before storing samples. Further separation of brine shrimp from other zooplankton, if present, will be done in the laboratory. Then transfer the samples from the collection cup to appropriately labeled 1-L Nalgene® bottles using filtered lake water. Store the bottles on ice. Samples will be shipped on wet ice to the laboratory for further separation and analysis. All bottle labels will be double checked before sample storage.

Record the date, station, number of net hauls, depth of tow, angle of tow, and other required information in field log book.

On arrival to the laboratory, the brine shrimp samples will be rinsed with distilled water on a 125µm screen to rinse excess salt from the brine shrimp. This may be repeated up to three times to ensure as much salt is rinsed off as possible. Brine shrimp should then be placed into a large petridish where brine fly larvae or remaining detritus may be removed. The brine shrimp will then be stored in appropriately labeled Nalgene® bottles with as little distilled water as possible. Samples may be frozen for up to one year.

Lack of sufficient organisms for testing requirements at any location will be noted in the field log book. Field notes of all field activity will be recorded in a bound field logbook. Field notes will include date and time, names of personnel conducting the survey, the work performed, any problems identified as well as corrective actions taken, and other appropriate general comments or observations.

Field Logbook

Field activities will be documented through journal entries in a bound field logbook, which is dedicated to this project. The field logbook will be water-resistant, the pages will be sequentially numbered, and all entries will be made in indelible ink. Each page of the field logbook will be dated and signed by the person making the entry. The field logbook will contain all pertinent information about sampling activities, site conditions, field methods used, general observations, and other pertinent technical information. Examples of typical field logbook entries include the following:

- Date and time of sample collection
- Name of personnel present
- Referenced sampling location description (in relation to a stationary landmark), GPS coordinates, and maps
- Daily temperature and other climatic conditions

- Field measurements, activities, and observations (e.g., depth of water, condition of water, other relevant conditions)
- Media sampled
- Sample collection methods and equipment
- Types of sample containers used
- Sample identification and cross-referencing
- Types of analyses to be performed
- Color photographs taken during sampling activities will be numbered to correspond to photo log entries. The name of the photographer, date, time, site location, and photograph description will be entered sequentially in the photo log as photographs are taken.

Additional information will be recorded in the field notebook as required by DWQ.

References

Marden, B. 2006. Synoptic Survey of the Pelagic Zone: Selenium in Water, Seston and *Artemia*; Program Manual for Development of Selenium Standard for Open Waters of Great Salt Lake. Utah Department of Environmental Quality, Division of Water Quality, Salt Lake City, Utah. May 11, 2006.

CH2M HILL. 2008. Development of Selenium Standard for Open Waters of Great Salt Lake. Utah Department of Environmental Quality, Division of Water Quality, Salt Lake City, Utah.