



**Alaska  
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Center**

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Fisheries Service

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# Ecosystems and Fisheries-Oceanography Coordinated Investigations (EcoFOCI) Field Manual

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# **Ecosystems and Fisheries-Oceanography Coordinated Investigations (EcoFOCI) Field Manual**

by

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## Introduction

This manual is meant to be a helpful source of information during scheduled Ecosystems and Fisheries-Oceanography Coordinated Investigations (EcoFOCI) cruises. Since it is not reasonable to expect everyone to remember every aspect of the gear and sampling procedures performed at sea, this manual serves as a quick reference to answer some of the more common questions that arise. It is also our hope that this manual will help to standardize the way in which samples are taken, labeled, preserved, etc. The EcoFOCI Field Manual is intended to augment the Cruise Instructions provided to the scientists and the crew of the research vessel. The sample requester and the Chief Scientist will provide instructions for special samples or experiments. This manual has been designed for operations aboard NOAA vessels and slight modification to some of the procedures may be necessary when using the manual aboard other vessels.

The EcoFOCI manual also contains information pertaining to the Cruise Operations Database (COD) and tips on how to code certain sampling scenarios. It is important that the COD sheets are properly and completely filled out and entered into the application during the cruise and checked for errors before returning from the field. At sea, the data are used to map cruise stations, check station locations, calculate and map standardized rough count catch information, and create cruise reports. At the laboratory, the data are used to check and complete sample-shipping inventories, fill in tables in the Polish data entry application (PPSI), and complete tables in the EcoFOCI ichthyoplankton database and biological oceanography database (BOB).

This research is contribution EcoFOCI R747 to NOAA's Ecosystem and Fisheries-Oceanography Coordinated Investigations Program.



## Acronyms Used In This Manual

**ADCP**

Acoustic Doppler Current Profiler

**CalCOFI**

California Cooperative Oceanic Fisheries Investigations

**CalVET**

CalCOFI Vertical Egg Tow

**COD**

Cruise Operations Database

**CTD**

Conductivity-Temperature-Depth

**EcoFOCI**

Ecosystems and Fisheries-Oceanography Coordinated Investigations

**FL**

Fork Length

**FOO**

Field Operations Officer

**GMT**

Greenwich Mean Time

**HMIG**

Hazardous Materials Identification Guide

**ID**

Inner Diameter

**MACE**

Midwater Assessment and Conservation Engineering (RACE-AFSC)

**MOA**

Marine Operations Abstract

**MOCNESS**

Multiple Opening and Closing Net and Environmental Sensing System

**MSDS**

Material Safety Data Sheets

**NOAA**

National Oceanic and Atmospheric Administration

**OD**

Outer Diameter

**PMEL**

Pacific Marine Environmental Laboratory (NOAA-NMFS)

**RACE**

Resource Assessment and Conservation Engineering (AFSC-RACE)

**SCS**

Shipboard Computer System

**SL**

Standard Length

**TL**

Total Length



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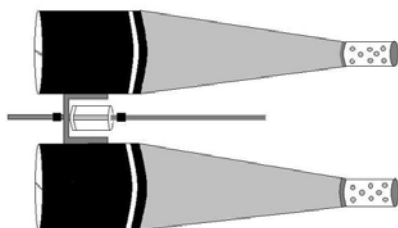






### **20BON (20-cm bongo)**

The 20-cm bongo with 150- $\mu$ m mesh is used to collect zooplankton in conjunction with the 60-cm bongo.



### **Assembly**

Assembly requires the attachment of the nets, and mounting of the flowmeters. Nets are attached using a stainless steel hose clamp to secure the nets on the frame. Tape around the hose clamp with electrical tape, to help protect the nets from chafing or tearing on any sharp edges. Make sure some of the heavy nylon material extends over the end of the frame to help protect the fine mesh of the nets when setting the frame on deck.

### **Rates/Fishing**

The 20-cm array is placed about 1 m above the 60-cm bongo frame using the special cable provided that has stops (nicopress sleeves) to attach the 20-cm frame. Grasp the 20-cm frame with the net numbers on the frame facing up. With the nets of the 20-cm bongo straddling the towing cable, turn the top of the brass swivel in the middle of the frame so the cable (between the two stops) can be placed in the groove. Turn the top of the swivel back, and secure with the cotter pin found at the top of the swivel. Clip the safety cable onto the towing cable.

It is helpful when the nets are going over the side for someone to hold the 20-cm codends up above the 60-cm frame to avoid tangling (also watch when using a SEACAT, so that it does not hit the inclinometer or block on the A-frame). Watch as the nets are on the surface and starting down to make sure that all the nets are fishing properly.

Rates (same as 60-cm bongo)

- Ship speed 1.5 - 2.0 knots to achieve 45° towing angle.
- 45 m/min wire-out speed, winch and weather permitting.
- 20 m/min wire-in speed.

## **20BON (cont'd)**

The 20-cm/60-cm bongo array will be monitored from a designated computer on board, and commands given to the winch operator to stop and/or retrieve the tow. Unless specified otherwise, these tows will be fished to within 5 - 10 m of the bottom and will have 153- $\mu$ m mesh.

### **Preservation**

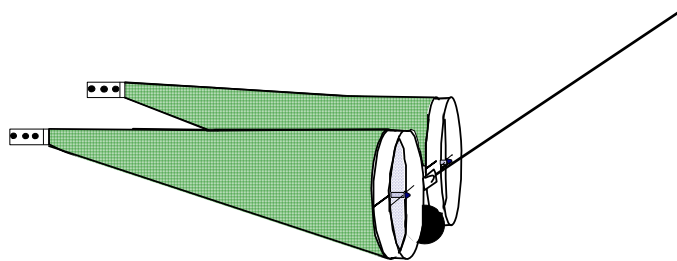
Preservation will depend on cruise requirements but will usually be QTOWF. Make sure the Tyler sieve used is 150- $\mu$ m mesh or smaller.

### **Maintenance**

Check nets for holes and fill flowmeters with water as needed.

### **60BON (60-cm bongo)**

The 60-cm bongo is used for standard double oblique MARMAP tows. A SEACAT (Sea-Bird SBE 19plus) should be attached to the wire above the bongo frame to provide real-time tow data.



The depth of the nets are monitored from inside the ship on a computer using Sea-Bird software. Commands are given to the winch operator to stop the winch and begin retrieval when the nets reach the desired depth. When the nets surface, they are brought aboard and washed to get the sample into the codend. A flowmeter in each net records the distance traveled (used to calculate the volume of water filtered) and the SEACAT records the depth profile of the tow. Tows not meeting specifications may be repeated at the discretion of the Scientific Watch. The scientists are responsible for recording flowmeter readings, tow duration, and maximum depth on the COD form. On selected tows (FOX time series (e.g., Line 8), and certain patch or transect studies) a 20-cm bongo frame with two 153- $\mu$ m mesh nets will be attached 1 m above the 60-cm bongo frame using the special cable provided that has stops to attach the 20-cm bongo frame (see **20BON**).

### **Assembly**

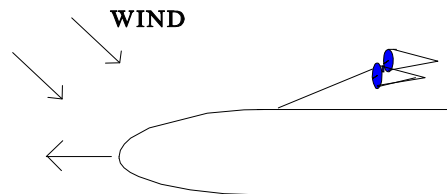
Attachment of the nets requires sliding the open end of the net over the frame and securing with a stainless steel hose clamp. Electrical tape is often placed under the clamp to reduce net chafing. Duct tape or electrical tape is also wrapped around the outside of the hose clamp to prevent the nets catching on any sharp edges. The lead weight (about 45 kg) is shackled to the center pivot on the frame. A Survey Tech will be responsible for mounting the SEACAT, which will require about a 1/2 hour to complete all connections. A flowmeter is mounted in the center of the each mouth opening using heavy monofilament and nico-press sleeves to attached it to eyebolts on the inside of the frame.

Prepare for the tow while the ship is approaching the station. Make sure the proper codend (or sock) is attached to the proper net, record the flowmeter readings, prepare field logs (COD), jars, and jar labels.

## **60BON (cont'd)**

### **Rates/Fishing**

- 45 m/min wire-out speed (if winch speed permits, but at least 40 m/min). During periods of bad weather and heavy surge, instruct the winch operator to start wire out at a slower rate (20 - 30 m/min) to prevent backlash on the winch, speeding up as conditions permit.
- 20 m/min wire in speed.
- The ship speed (1.5 - 2.0 knots) is adjusted to maintain a 45° wire angle. Wire angles are obtained with a handheld angle indicator and relayed to the bridge using VHF radios.
- Perform tows in a single direction as shown. This position, relative to the wind, helps ensure against the net and cable being run over by the ship.



### **Preservation**

Preservation of samples will depend on cruise requirements. Usually, one or both nets will be a QTowF, and possibly a QTowS, RCountL, or Discard. The cruise instructions and/or the Chief Scientist should have specific information for each net and sample type. For QtowF, place codend in bucket and immediately take into laboratory for processing. Gently wash contents into a Tyler sieve (**make sure mesh size of sieve is not larger than mesh of codend**) and then wash material into a funnel placed in the mouth of a 32-oz. jar. Leave room in the jar to add 50 ml of formaldehyde and 25 ml sodium borate buffer, and fill the rest of the jar with seawater.

### **Maintenance**

Check nets for holes or rips after each tow, and repair or replace as necessary. Check flowmeter counts after each tow by comparing values of the two flowmeters. If a meter has low counts, check for jellyfish tentacles wrapped around the shaft, or a possible bent shaft. Immediately replace any suspect flowmeters. Periodically check to make sure they are filled with water.

-

**60BON (cont'd)**

**Sampling Protocol Guideline**

Determining which mesh to use and depth to fish is decided by the time of the year, size of eggs/larvae, plankton required, and bottom depth. This table is meant to be a guideline, but the Chief Scientist or Principal Investigator should inform shipboard personnel of a specific requirements as to net mesh size and sample processing.

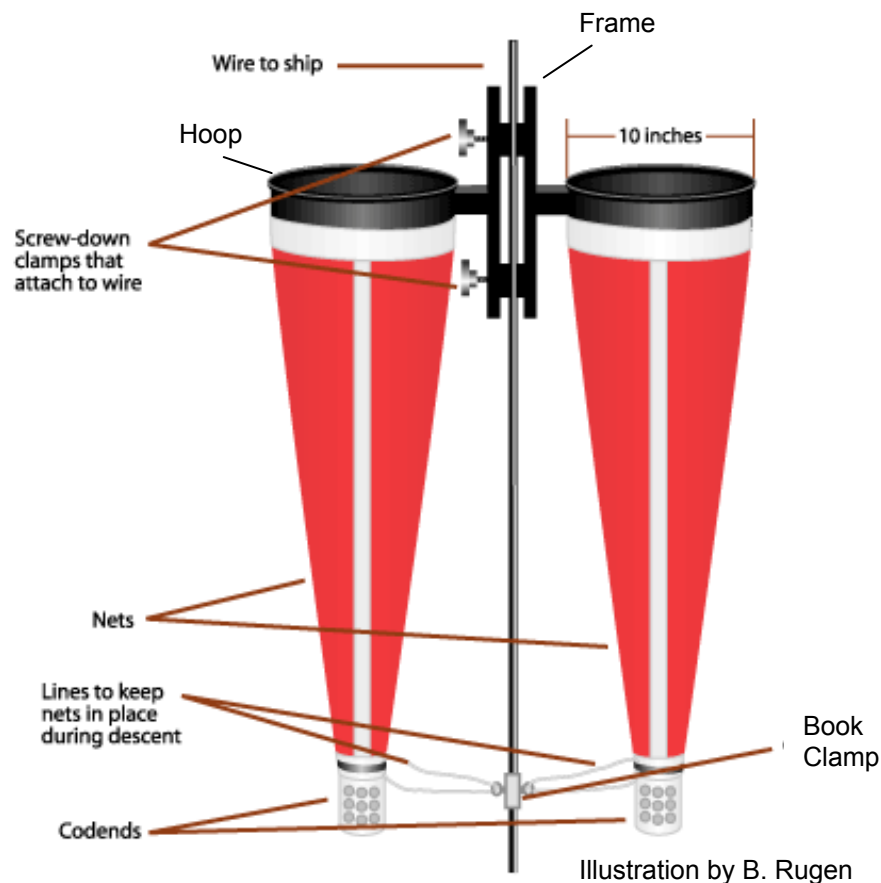
	Net 1		Net 2		Sample Depth
	Mesh	COD Code	Mesh	COD Code	
<b>Pollock Eggs</b>	505 µm	QTowF	505 µm	RCountE Discard	5 - 10 m off bottom (400 m max.)
<b>Larvae &lt; 6 mm</b>	333 µm	QTowF	Varies		5 - 10 m off bottom (400 m max.)
<b>Larvae ≥ 6 mm</b>	505 µm	QTowF	Varies		100 m (or 5 - 10 m off bottom if shallow)
<b>FOX Sta. Zooplankton studies (with 20-cm bongo)</b>	505 µm or 333 µm (same as 'Grid')	QTowF	333 µm	QTowF	5 - 10 m off bottom

### **CaIVET (CaICOFI Vertical Egg Tow Net)**

EcoFOCI generally uses the CaIVET net to sample microzooplankton in the water column. They have also been used to sample pollock eggs.

#### **Assembly**

Attach nets to hoops using the hose clamps on each hoop. There are two mesh sizes, 53- $\mu\text{m}$  used for microzooplankton collection and 500- $\mu\text{m}$  used for pollock egg collection. The top side of the hoop has a solid continuous bead of material around it. Attach hoops to frame using the provided hardware. Fill flowmeters with fresh water and attach inside the net mouth using the threaded rods. Secure frame above the SEACAT unit to the winch cable by tightening the knobs on the frame. Tie a piece of parachute cord around the collars of each net, securing the hose clamps over the cord. Attach a snap hook or carabineer to the other end of the cord. Secure codends to wire by clipping the hooks onto the book clamp on the winch cable (stretch nets taught). Attach a bongo weight to the bottom of the SEACAT using a shackle.





## **CaIVET (cont'd)**

**Important note: The CaIVET net must be mounted above the SEACAT. If the SEACAT is above the net, it will interfere with the catch.**

The SEACAT should be mounted at a maximum of 2 to 3 m below the CaIVET. To ensure that the CaIVET is fishing from 0 to 60 m, drop the gear in the water and stop when the mouth of the CaIVET is just below the surface. Have the person monitoring the SEACAT data note the depth reading of the SEACAT and tell the winch operator to zero the wire-out display. Have the person monitoring the SEACAT stop the winch at a depth 2 to 3 m more than 60 m since the SEACAT is below the CaIVET.

On some ships, space on the wire (vertical clearance) may be an issue. Depending on the height of the block above the deck, there may be a danger of pulling the CaIVET into the block upon retrieval, if the frame has to be very close to the block to get it aboard. If this is the case, before the first tow measure where the frame will need to be attached to the wire for the nets to be stretched taught. Mark this spot on the wire with a piece of electrical tape.

During deployment, one of the scientists can attach the codends to the book clamp, standing on the platform (if there is one). Then have the winch operator let some wire out, stopping when the scientist can reach the tape mark. Attach frame to the wire by tightening the knobs on frame. Upon retrieval of the net, do the same steps in reverse. Detach the net and have the scientist hold the frame while the rest of wire is brought in and the SEACAT and weight are brought aboard.

If the weather permits the nets can be washed while net is hanging over the side. If not calm enough, then wash the nets after frame has been removed from cable.

## **CaIVET (cont'd)**

### **Rates/Fishing**

Standard tow depth for microzooplankton collection is 60 m. The CaIVET depth should be monitored by the SEACAT and files should be saved unless otherwise specified. The net should be lowered and retrieved at a rate of 45 - 60 m/min depending on winch capabilities. **The tow should be vertical with ship maneuvering only to maintain zero wire angle. If wire angle is not zero, note the wire angle and how long it stayed at that angle.** If wire angle is 10° from zero (vertical) for more than 30 seconds during the tow, performance will be recorded as “questionable”. **Record tow time only on ascent since the net is designed to flush on descent.** Net contents should be washed into codends being careful not to introduce contamination from the deck hose. Do not squirt hose into the mouth of the net; wash through the sides instead.

Special requests for tows to near bottom are not uncommon. If using 53- $\mu$ m mesh, then the wash-down procedure will be the same as above.

### **Labeling**

Please use two identical, self-adhesive FOCI labels. Place one on the side of the jar and the other on the cap. **DO NOT USE MICROZOOPLANKTON LABELS BECAUSE ADDITIONAL INFORMATION ON MICROZOOPLANKTON LABELS IS NOT INTENDED FOR CaIVET AND WILL ONLY CONFUSE THE SORTERS.**  
NO INSIDE JAR LABELS.

### **Preservation**

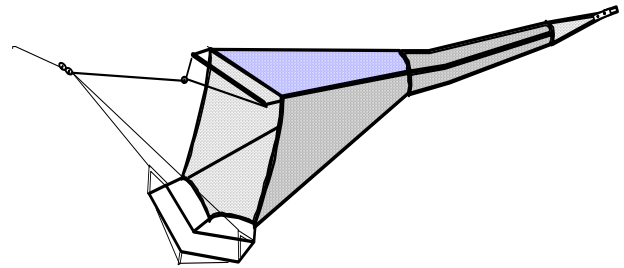
Samples are preserved using filtered seawater (< or = 53- $\mu$ m) in 32-oz jars. Add 50 ml of formaldehyde and 20 ml of sodium borate buffer. Check with cruise instructions / Chief Scientist to see if both sides of the net need to be preserved. If both nets are preserved in one jar, note that on the sample label by recording “net” as “1+2”.

### **Record Keeping**

Record tow time on COD form for ascent only since the net is designed to flush on descent. If both nets were preserved in one jar (to increase the number of microzooplankton sorted), then be sure to note this on the COD form in the Haul Comments section. Also, record flowmeter revolutions for both nets, as the volume filtered will be used to standardize the catch. If the wire angle was 10° from zero (vertical) for more than 30 seconds during the tow, note this on the COD form and change the performance to “questionable”.

### **IKMT (Isaacs-Kidd Midwater Trawl)**

The Isaacs-Kidd Midwater Trawl collects mesopelagic biological specimens larger and more active than those taken by standard plankton nets. The trawl consists of a net of special design attached to a wide, V-shaped, rigid diving vane. The vane keeps the mouth of the net open and exerts a depressing force, maintaining the trawl at depth for extended periods at speeds up to 5 knots.



### **Assembly**

The following items are required to assemble the net:

- 1) net
- 2) bridle
- 3) depressor vane, with hinged side arms
- 4) spreader bar (iron pipe to aid in keeping net open)
- 5) codend
- 6) flowmeter

Using shackles, attach the depressor and spreader bar to the net and then the bridle (see the diagram on the following page). Attach a codend of desired mesh and place a flowmeter across the mouth opening using heavy monofilament and nicopress sleeves.

### **Rates/Fishing**

The IKMT is deployed off of the stern. The use of SCANMAR or another real time depth device to provide depth is desired. Here are some general guidelines for towing, but the Chief Scientist should have exact rates and speeds:

- ship's speed 3 to 4 knots (can be as high as 6 knots)
- wire-out speed 50 m/min
- wire-in speed 20-30 m/min
- wire angle estimated to be about 65 degrees

Have the ship slow down to about 2 knots when the net is 10 m from surface or in sight to aid in retrieval.

### **Preservation**

Preservation will depend on cruise requirements, but will usually be QTOWF.

### **Maintenance**

Check the net for holes and periodically check the flowmeters for water and reasonable revolutions.

### **LG-CB (10" ID modified Large Clarke-Bumpus)**

A modified 10" Clarke-Bumpus net (153- $\mu$ m mesh) may be installed inside a Tucker or Methot net to collect quantitative plankton samples.

#### **Assembly/Preparation**

A Clarke-Bumpus net may be attached to the inside of net 1 and/or net 2 of the Tucker trawl (see illustrations). The tether cord lines on the frame are attached with the snap-rings to the brass rings sewn on the inside of the Tucker nets approximately 0.5 m back from the net frame. During installation inside a Tucker net, make sure that the Clarke-Bumpus net is stretched out behind the tether cords to prevent tangling. A flowmeter is placed in the center of the Clarke-Bumpus net. The flow counts from this flowmeter will be recorded in the COD for both the LG-CB and Tucker net. Be sure to mark the net with the same number as the Tucker net that it is inside of. A LG-CB net may also be suspended inside the Methot trawl on the upper right hand corner of the frame.

#### **Fishing / Rates**

If this gear is used inside the Tucker or Methot net, then the rates will be the same as fishing rates requested for the Tucker or Methot.

#### **Preservation**

To preserve the sample collected by the LG-CB, remove the tether cords from the gear frame and rinse the sample down into the codend with seawater while on deck. Remove the codend from the net inside of a 5-gallon bucket to ensure that none of the sample is lost. The codend and bucket is then taken to the preservation area for processing. The contents of the codend and any sample that may have spilled into the bucket is then poured into a 153- $\mu$ m mesh sieve. Make sure to rinse the bucket into the sieve to be sure that none of the sample remains in the bucket. A plankton sample from a LG-CB should be preserved in a 32-oz jar as a QTowF sample type. Follow the preservation instructions listed for a QTowF in Section: SAMPLING.

#### **Record Keeping**

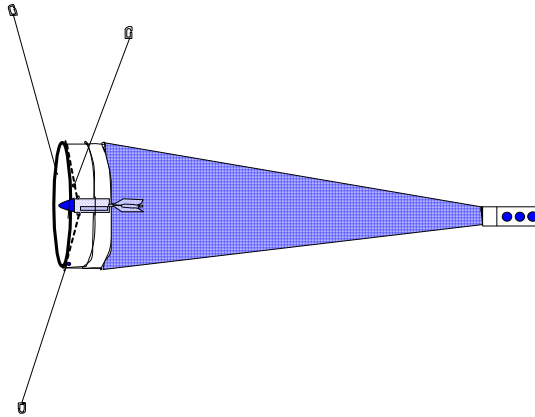
The LG-CB is recorded on the COD form as a separate piece of gear in conjunction with the net that it was strung inside of.

#### **Maintenance**

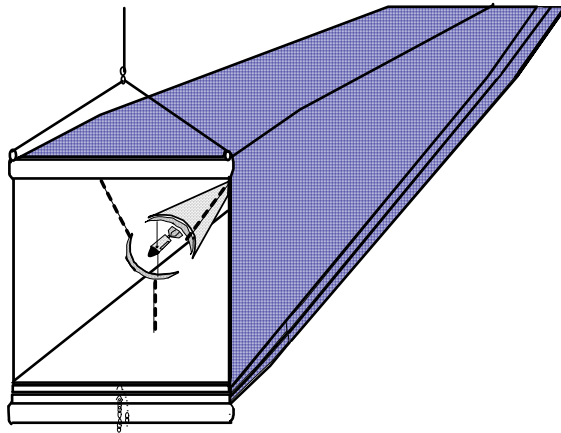
Rinse and dry the net and codend before storage. Remove the flowmeter and store in the flowmeter box.

**LG-CB (cont'd)**

**Profile**



**Large Clarke-Bumpus inside Tucker Trawl (Net 2)**



**LIVE (Live Vertical Tow From A 60-cm Bongo With Taped Codends)**

Live larval fish obtained for use in various analyses such as larval condition, etc.

**Preparation**

Locate the following equipment:

larval forceps	microscope slides
pipettes (glass or plastic)	divided petri dishes
white bowls or pans for sorting	
ice-bed to put under sorting bowl/pan	
chilled and filtered seawater	
scintillation vials	
labels (for outside of vials only)	
alcohol-proof pen	
1.5 ml microcentrifuge tubes	
freezer boxes and blue freezer block	

**Collection**

A live tow for larval fish uses the 60-cm Bongo with 333- $\mu$ m or 505- $\mu$ m net mesh with duct tape covering the mesh of the codends. The selection of the net mesh size will depend on the time of field collections, larval size, amount of algae, etc. This is meant to be a vertical tow with ship speed used to maintain a zero wire angle if the weather is rough. Make sure that the SEACAT is on and the data is saved for each haul. The wire-out rate is 45 m/min with the maximum gear depth to 70 m wire out (if bottom depth > 80 m). If the larvae come up dead (sometimes happens due to rough weather and difficulty of maintaining a zero wire angle), then try gear depth to 40 - 50 m. The wire-in speed should be 10 m/min. Begin timing the tow when the net is starting up. Observe time restrictions, if specified, for each sample type. The time limit is usually 12 minutes total for net retrieval and preservation. Do not rinse down the nets when they return to the deck. Open the codends immediately into clean (live) 5 gallon buckets. Carefully pour the codend contents into a sorting bowl or pan (an ice bed is not needed) and sort for larval fish quickly to accommodate time restrictions using either a pipette or forceps.

**Preservation**

Sort larvae directly into specified preservative, if possible. Remember that preservation of live larvae (wigglers) is best so that a time restriction or tissue degradation is not a problem.

**LIVE (cont'd)**

**Record Keeping**

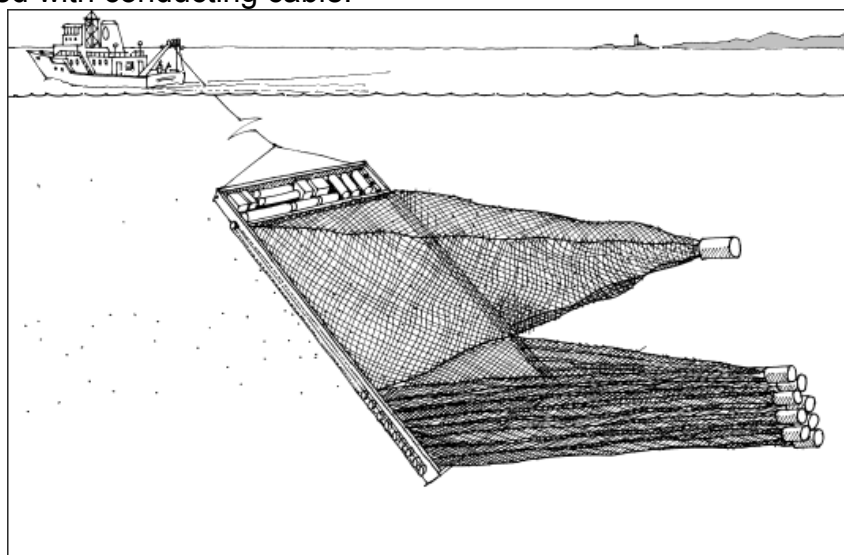
Be sure to keep the Green Larval Notebook updated with specimen numbers (see Section: MISCELLANEOUS for example page). It is also important to save the SEACAT file for each live tow since this will be our only chance to obtain *in situ* data for the larvae.

**Miscellaneous**

Please remember to rinse the nets and codends thoroughly and record the new initial flowmeter revolutions before starting a quantitative tow (standard 60-cm bongo, QTowF).

### **MOC1 (1-m<sup>2</sup> MOCNESS)**

The 1-m<sup>2</sup> Multiple Opening/Closing Net Environmental Sensing System (MOCNESS) allows the opportunity to quantitatively sample selected depth strata. The MOCNESS can be equipped with up to nine nets, one of them being the drogue. Therefore, it can take up to eight plankton samples at specified depth intervals in one tow. Nets with three different mesh sizes are available for use: 153- $\mu\text{m}$ , 333- $\mu\text{m}$  and 500- $\mu\text{m}$ . Appropriate mesh size is determined by the size range of target organisms. The MOCNESS is also equipped with various instruments that measure ocean properties like temperature, salinity, and fluorescence. The MOCNESS requires an oceanographic winch equipped with conducting cable.



<http://research.usm.maine.edu/gulfofmaine-census/education/research-technology/sampling-tools-for-physical-capture/>

Illustration Credit: C. Michael Lewis for Gulf of Maine Research Institute (GMRI).

Used with permission, L. Incze.

The MOCNESS is an intricate piece of equipment. A trained scientist will always be on a cruise when the gear is being fished. The information provided here is general in nature and meant for Watch Standers. More detailed information is available in the MOCNESS binder upon request.

### **Assembly**

Assembly and testing of the MOCNESS is labor-intensive and typically takes most of a day. Usually, trained MOCNESS personnel will arrive a day early to assemble and test the MOCNESS. This involves mounting the hardware, electronics and sensors as well as putting the nets and codends on. The computer and modem will also be set up in the computer lab inside the ship. Assistance from the ship's Electronic Technicians, Survey Technicians and / or deck department may be needed during set up. Once the MOCNESS is assembled, a deck test will be performed.



## **MOC1 (cont'd)**

### **Rates/Fishing**

The MOCNESS is launched with the nets cocked and the drogue open (Net #1). The MOCNESS should never be fished without a net open as it provides stability while in the water column. The nets will be tripped on the ascent. Usually the deepest sampling net is Net #2 and the last, most shallow is Net #9. The last net should not be closed until the MOCNESS has reached the surface, again to provide stability while fishing.

The maximum depth for the fluorometer is 600 m. It should be removed if the MOCNESS needs to be towed deeper than 600 m.

Generally, the MOCNESS should not be used if wind speeds are 20 kts or above, or if there is any significant wave activity. Lurching of the ship during weather events alternately puts tension and slack into the wire, which can allow the MOCNESS to twist on its bridle. A trained scientist should be asked to evaluate launch feasibility if there is any uncertainty.

The scientist flying the MOCNESS will communicate with the Bridge and winch operator during the tow. A good ship's speed is about 2 knots. The scientist will monitor the angle of the net and may ask the ship to speed up or slow down, if necessary to maintain the desired angle of 45° (limits 40°- 50°).

The MOCNESS should be lowered at 10 m/min while near the surface and 15-20 m/min below 30 m. The retrieval rate will vary with the size of the sampling interval. Typically a winch rate of 7-10 m/min for 10-15 m sampling intervals and 15 m/min for 50 m sampling intervals works well. This can be adjusted to optimize volume filtered but should not exceed 15 m/min. The goal is to have each net sample / filter ca. 100 m<sup>3</sup> of water.

### **Preparation**

Before each tow the following items should be done: Put on codends and secure fasteners with duct tape. Make certain that the number on the codend bucket matches that of the codend collar and net. Cock the nets (usually takes 3 people). Jar labels need to be prepared. Check with the scientist flying the MOCNESS to make sure net numbers on the 32-oz jars match those in recorded files. Before the launch of the MOCNESS, the MOCNESS pilot will lead the Survey Technician or Watch Stander through a series of deck tests on the radio (temperature, flowmeter, net motor, net response).

## **MOC1 (cont'd)**

The MOCNESS pilot will also ask the Survey Technician or Watch Stander to verify that the cap covering the fluorometer, the tubing on the conductivity sensor, and shims from the net bars have been removed.

Watch Standers may be needed to hold tag lines when launching and recovering the MOCNESS (depending on the ship and location of deployment) and to help rinse nets once the MOCNESS is back on deck. Watch Standers will be asked to assume their positions on deck a few minutes before the MOCNESS comes to the surface for help with recovery if needed. The Survey Technician will radio the MOCNESS pilot when the mouth of the open MOCNESS net is halfway out of the water, so the MOCNESS pilot can trip the surface net. The MOCNESS pilot will radio when they are finished and are ready to bring the MOCNESS aboard.

### **Labeling**

Use the waterproof jar labels for the inside of jars. For outside labeling use the self-adhesive FOCl labels. **If samples are large (plankton occupies more than 1/2 of the jar volume) then use more than one jar to preserve the sample. Make sure that each jar used is filled no more than halfway with plankton.** Write the total # of jars on inside and outside labels.

### **Preservation**

Samples are usually preserved in 1.8% formaldehyde in 32-oz jars. Use a sieve with the same mesh size as the net used and then rinse sample into jar using funnel. Fill the jar(s) with seawater and add 50 ml of formaldehyde and 20 ml of sodium borate buffer (for a 32- oz. jar). If any jellyfish are present, then carefully rinse them off on the sieve and discard them. Make a note on the MOCNESS COD form. If a jellyfish was very large and may have affected the quantitative capture of other plankton, then record the performance of that net as “questionable” and explain in Haul Comments.

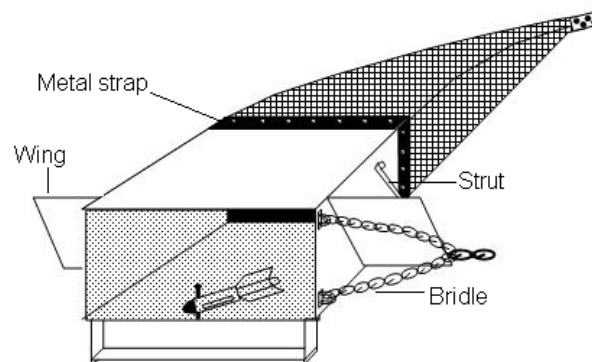
### **Record Keeping**

The scientist who runs the MOCNESS during the tow should complete the information on the MOCNESS COD form. The depth intervals (corrected for pressure offset), volume filtered and number of sample jars used for each net should be recorded. Indicate on the MOCNESS COD form which sensors were used during the tow. Example: Fluorometer (NETFLUOR), Temperature Sensor (TEMP) and Conductivity Sensor (SAL). Write in the appropriate codes in the Samples Collected section on the MOCNESS COD form or check the appropriate boxes. If any of these sensors malfunctioned and the data are suspect, then explain in the Haul Comments section. The summary created by the MOCNESS program (.tab file) should be stapled to the MOCNESS COD form.

## GEAR Net Tows

### NEU (Neuston)

Neuston nets are used for sampling the upper few centimeters of the water column. There are many frame styles that may be used (we use a Sameoto sampler made of stainless steel). The mouth opening is 30 cm × 50 cm and is designed to fish half in and half out of the water.



### Assembly

If the frame is not already put together, some assembly will be required. There are two wings that need to be matched up to the holes on the frame and bolted on. Then bolt on the struts that reinforce the wings. There are a series of holes on the aft end of the frame that the net attaches to with metal straps and bolts. If the net does not already have holes, make them. To make the holes, slide the net over the frame in the position to be used and use a marking pen to indicate where holes are to be made. Remove and cut holes using scissors, re-attach the net, and secure with the metal straps and bolts.

The Sameoto is designed to be towed from the side of the ship to provide an unobstructed mouth opening. Make sure the towing chain (bridle) is connected to the proper side of the frame, depending on which side of the ship you are sampling from (the frame in the picture above is set up to fish from starboard). Some repositioning of the swivel on the tow chain may be required to provide a proper attitude of the frame; ideally it should fish half in and half out of the water.

## **NEU (cont'd)**

The flowmeter is attached with a special bolt to the bottom of the frame, just back from the mouth opening. Remove the lanyard pin from behind the nosecone of the flowmeter by unscrewing the nosecone and backing off the screw that is holding the pin in place.



Place flowmeter on pin, making sure the window for reading the revolutions is facing up, and attach.

### **Rates/Fishing**

The vessel should be moving slowly, about 1.5 to 2.0 knots (the exact speed is a learning process and may vary with sea conditions) so that the net is fishing half in and half out of the water. Lower the neuston net to the surface and pay out 10 - 15 m of wire. It may be necessary to adjust the ship's speed to maintain the proper skimming action. Start the stopwatch when the net starts to fish and tow the net for 10 minutes (unless instructed otherwise). Advise winch operator when time is nearly up at 9'30" to 9'45" and retrieve when ready. Read and record flowmeter revolutions, time of tow, and any comments.

*\*Note\** It may prove helpful (and safer) to attach a long rope tagline to the frame to assist in getting the frame on board. In heavy winds, the sampler tends to act as a kite.

### **Preservation**

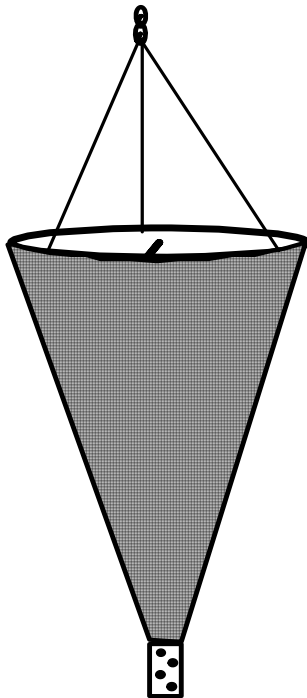
The neuston sample should be preserved as a QTOWF unless stated differently in a special request.

### **Maintenance**

Check net for holes and fill flowmeter with water.

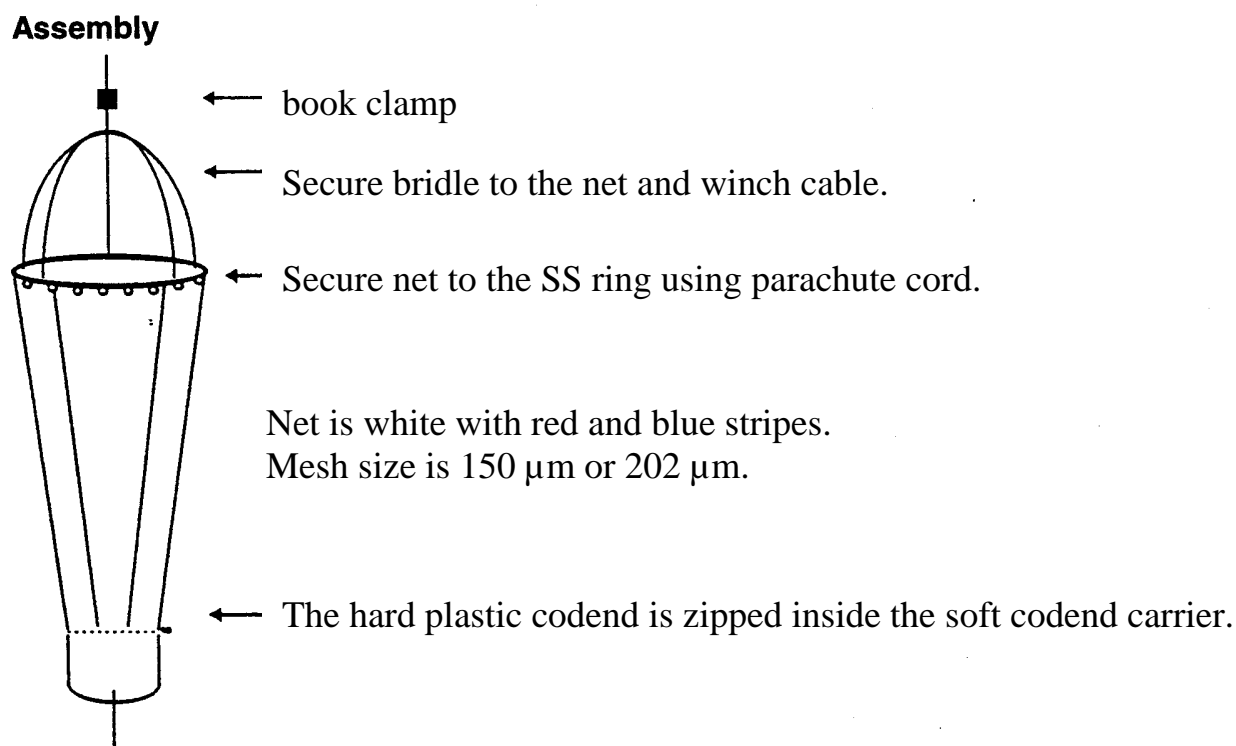
**RING1 (1-m Ring Net)**

The 1-m ring net is normally used for vertical tows. No further description on operation will be provided unless a special request is made.



**RING.8 (Live Zooplankton Net)**

This is a 0.75-m ring net with a large clear polycarbonate codend used to collect live organisms for at-sea experiments.



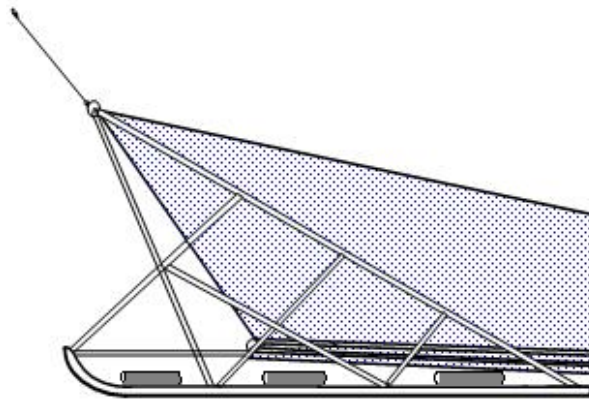
**Rates/Fishing**

This should be a vertical tow with ship maneuvering only to maintain a zero wire angle. The net goes down at differing speeds depending on whether or not the codend is attached to the wire. If codend is attached, descent speed is 45 - 60 m/min (depending on winch capabilities). If codend is not attached, descent speed is 10 m/min. Ascent speed is 10 m/min. Depth of tows will be determined by the SEACAT and files will be saved by request. A flowmeter is not used.

Do not rinse net prior to codend removal. Pour codend contents into a clean live bucket that is chilled by a surrounding ice bed (a plastic tub with ice) or live cooler until sorting can be completed.

### **SLED (Epibenthic Sled)**

The epibenthic sled is designed for near-bottom sampling, using an opening and closing net device (1-m Tucker). This prevents the samples from near-bottom depths being contaminated by material from the upper strata when lowering and raising the gear. Opening and closing of the net is controlled by mounting a double-trip release mechanism to the tow cable above the bridle.



### **Assembly**

#### **ITEMS REQUIRED**

- Sled runners
- Net 'frame' assembly
- Bridle (should be in 'Tucker' box)
- Lead weights (6)
- Wood 'Tucker' box containing nuts, bolts, net slides, release mechanism and messengers, etc.
- Misc. tools, tape, seine twine
- Stand runners on back deck, noting that there is a difference between the left and right runner.
- Unravel net frame assembly. Pipe with turnbuckle underneath is the bottom bar. Align with the net slide bars facing back.
- Insert frame pipes into sled runners. Some twisting and hammering is usually required so holes line up before inserting bolts.
- Use eye-bolts in top bar for attaching bridle (use eye-bolts in addition to other bolts so that all the holes are filled with something).

### **SLED (Cont'd)**

- Make sure the side cables are as tight as possible. They should be fairly tight already, if necessary adjustments can be made using the turnbuckle. Use electrician's tape to wrap any wire strands, hose clamp ends, etc. that might snag or rip the nets - the tape also helps to hold the bottom slide bar onto the bottom pipe.
- Attach the weights to the runner skis, 3 per side, somewhat evenly spaced. If the hose clamps are not still attached to the runners, insert them between the welds under the square brace that runs the length of the runner. Use small blocks of wood (in Tucker box) as spacers between the clamp and square brace.
- Attach the nets to frame, the same as with the Tucker Trawl, except the top net needs to be lashed to the cross pipe with heavy seine twine (I've used the orange stuff in the past). The tripping mechanism is connected as usual; just make sure you have the large-bore tripping weights ready at start of tow to fit on cable being used.

### **Rates/Fishing**

- The sled is deployed off the stern ramp. A depth-monitoring device is very helpful to determine when the sled is fishing at or near bottom (Netmind or Scanmar). If no depth device is available, estimate the wire angle and use the cosine of the angle to help determine wire out (i.e., 55 degree wire angle, .574 cosine, 200 m target depth,  $200/.574=348$  m wire-out). The wire between the ship and sled is not a straight line, so the wire angle is just a guideline - more or less may be required to achieve best results.
- The ship speed while towing the sled should be at 1.5-2.0 knots.
- Wire-out speed should be 40 m/minute.
- Wire-in speed may depend on a number of factors. If the top net (from bottom to surface) is to be saved, wire-in speed should be about 20 m/min. If the top net is not saved, then the winch may retrieve up to 40 m/min. Depending on what winch is used, and the condition of the winch, a steady rate may be difficult. Record as much info as possible on the data sheet regarding winch speeds.
- A Clark-Bumpus (CB) net may be placed inside the sled's net, and a flowmeter inside the CB net with the counts used for the sled and CB. If there is no CB inside the sled, a flowmeter should be strung inside of each net when a quantitative tow is desired.

### **Preservation**

Preservation will depend on cruise requirements, usually will be QTOWF.

### **Maintenance**

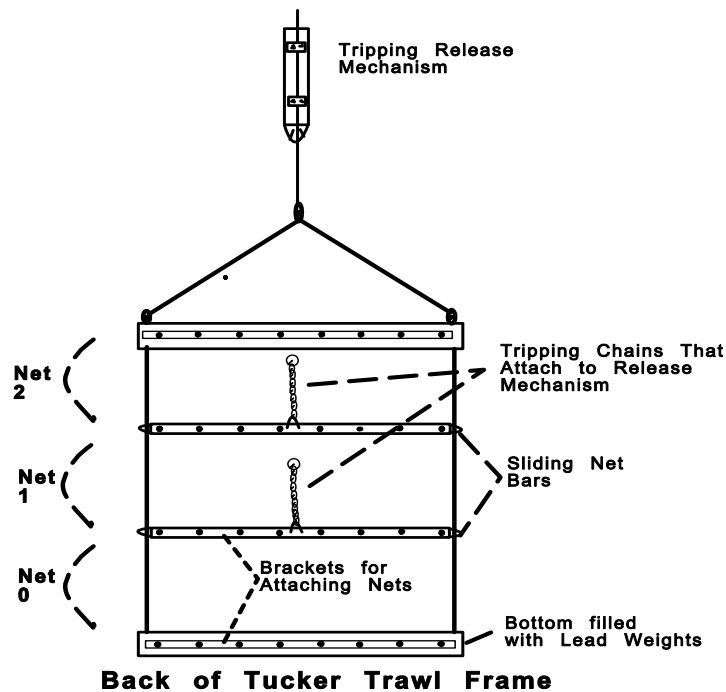
The maintenance for the sled is basically the same as for the Tucker:

- check nets for holes, and repair or replace.
- check flowmeters for damage, fill with water if needed.
- make sure tripping mechanism and chains are at proper tension.
- spray tripping mechanism with WD-40.



**TUCK1 (1-m Tucker Trawl)**

The Tucker trawl has rectangular-mouth nets for horizontal or oblique tows, mounted on an opening-closing frame. Up to three nets may be operated sequentially during a tow, using a double trip release mechanism. The frame consists of two steel pipes connected with side wires on which slide two net bars. The bottom pipe is filled with lead weights.

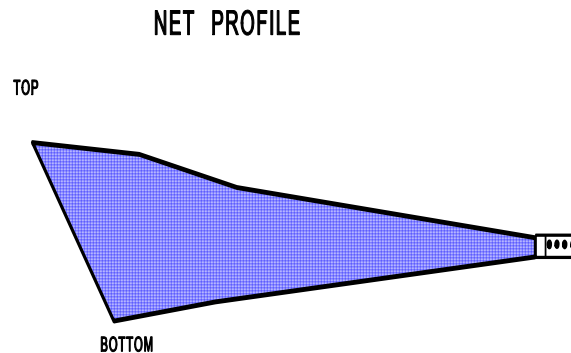


**Assembly**

- Attach the Tucker to an overhead support (or boom) to partially lift the frame, making the net bars more accessible for attaching the nets. Keep the weighted bar on deck to prevent the frame from swinging.
- Attach the top of net 2 to the bracket on the top pipe using the sliders attached to the net.

### **TUCK1 (cont'd)**

-Make sure when attaching all of the nets that they are oriented correctly since it is easy to get the top and bottom confused. The Tucker flies at about a 45° angle, so the 'longer' portion of the net is the top (see below).



- Get the middle net (net 1) ready to attach. Alternate attaching the sliders to the net bar between the top net and the middle net, starting with the net that has seven sliders (the other has six).
- Grab the tripping chains on the net bars for the nets installed, lift, and secure out of the way.
- Attach the bottom net (net 0, 505-um) in the same manner, alternating the sliders between the middle and bottom net. After attaching the bottom net to the sliding net bar, attach to bottom lead pipe with sliders.
- On the corner of each net there should be a brass 'D' ring. Use this ring and a 1- inch shackle (provided) to anchor the nets to the net bars.
- Using the 1-inch shackles, attach the sides of the nets to the side cables on the frame. Attach the release mechanism to the cable using the clamps on the release. Initial installation should not be too tight as adjustments up or down the cable will probably be required. Make sure the bolts used to clamp onto the cable do not interfere with the portion of the release that rotates. If necessary add a washer as a spacer so release moves freely. Orient the release so the clamps are facing aft towards the nets, allowing the tripping chains to fall freely.
- Lift the Tucker with a winch off the deck (or enough to provide tension on all cables). Test the length of the tripping chains by attaching them to appropriate marked slot in the release. If required, alter the length of the chains and/or move the release on the cable.

## **GEAR Net Tows**

### **TUCK1 (cont'd)**

- The bridle should be taking most of the weight, but the tripping chains need to be tight when the sliding net bars are at the top of the frame so that the middle and top nets are completely closed.
- After the release is in position, tighten the bolts on the clamp. Tie down or tape any loose ends of chain that might hang up during a net release. If there are any sharp corners (things sticking out on the termination, etc.), then these will need to be taped.
- During deployment, care must be taken not to bump the top of the release mechanism with the block, or it will trip.
- To attach the rings from the tripping chains to the release, the ring from the top net bar is attached first, then the bottom. Some times hitting the top of the release makes it easier to turn after inserting the ring in its' slot (make sure it clicks and is locked before deployment).
- String a flowmeter inside each net using heavy monofilament and nico-press sleeves. The drogue (net 0) will not need a flowmeter unless a sample is requested from this net. If Clarke-Bumpus nets are to be placed in nets 1 and 2, then flowmeters will not need to be strung inside the Tucker nets.

### **Fishing/Rates**

The rates for normal Tucker operations are:

- ship's speed about 1.5 - 2.0 knots to achieve a 45° towing angle
- 40 - 45 m/min wire-out speed
- 20 m/min wire-in speed

### **Preservation**

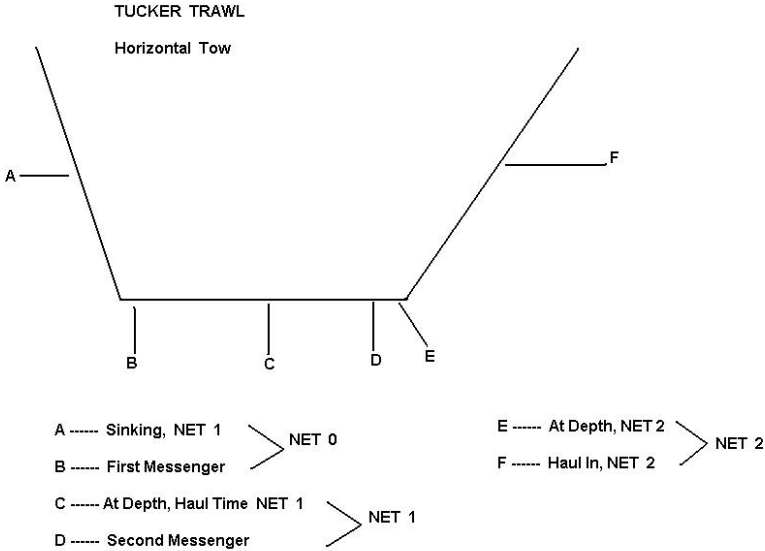
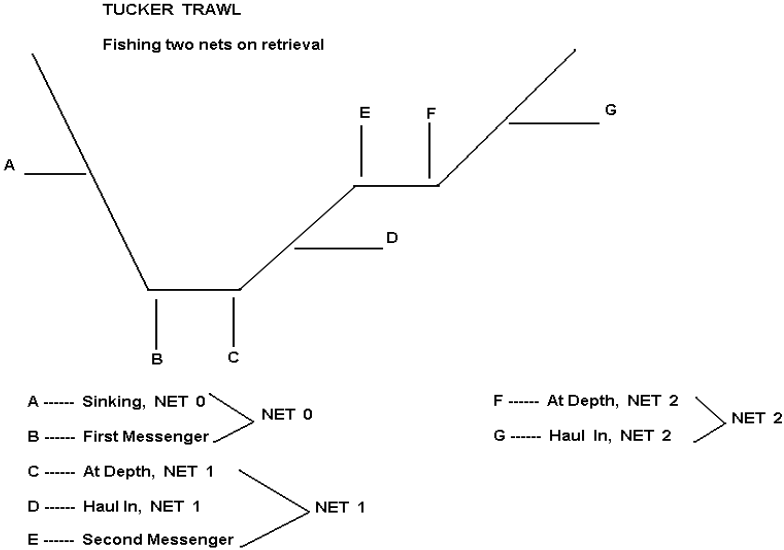
Preservation will depend on cruise requirements, but will usually be QTOWF.

### **Maintenance**

The maintenance for the Tucker should be as follows:

- check nets for holes
- check flowmeters for damage and fill with water if need
- adjust tripping mechanism so chains have proper tension
- spray tripping mechanism with WD-40

**TUCKER1 (cont'd)**





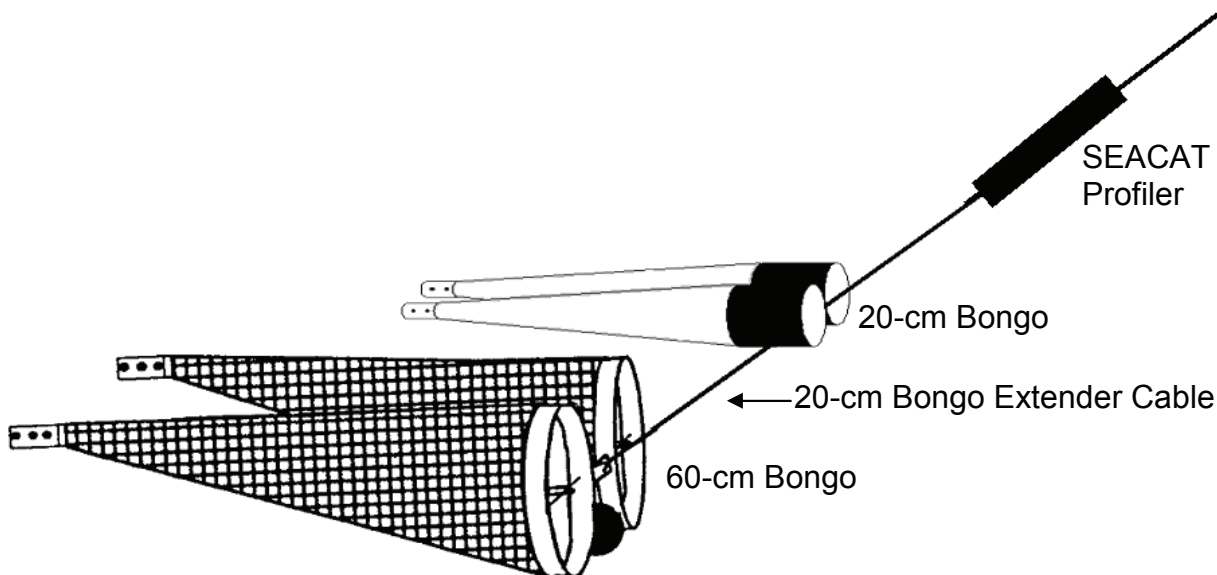


**CAT (SEACAT attached to bongo array or other net tows)**

A Sea-Bird Electronics SEACAT Profiler is attached to the bongo array (and other nets as needed) to measure conductivity, temperature, and depth in the water column. Scientists use the SEACAT readout as an indicator of the depth of the bongo array during a tow and will tell the winch operator to stop the winch and start retrieving the bongo at the desired depth. The SEACAT model and operational procedures will vary slightly from ship to ship. Some ships have their own equipment and others do not. In the latter cases the EcoFOCI SEACATS are used. The information here is meant for general use as a guideline while using the SEACAT at sea. The SEACAT requires an oceanographic winch equipped with conducting cable.

NOTE: EcoFOCI owns two SBE SEACAT Profilers (both 19 Plus with plastic housing) and two Deck Units (both SBE 36). The Profilers and Deck Units are interchangeable with each other. However, if bringing an EcoFOCI SEACAT to use as a backup unit on a vessel that has their own SEACAT, check to make sure the Deck Units and SEACAT Profilers are exchangeable. Some older models are not.

**WARNING: Maximum depth for SBE SEACAT Profiler 19 Plus with plastic housing is 600 m.**



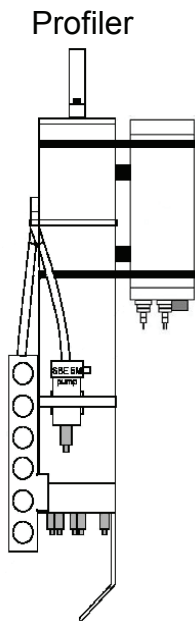
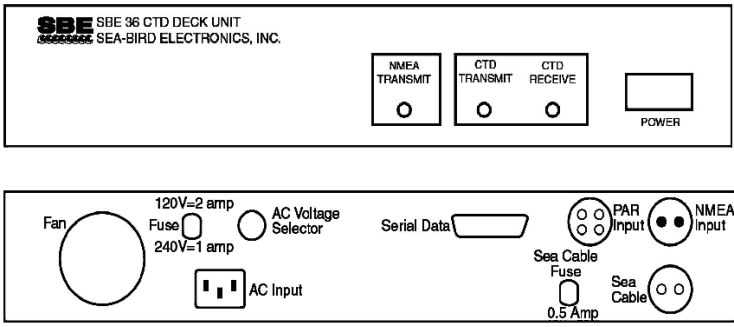
NOTE: The SEACAT is shown being used with the bongo array as an example. It is also used with other gear types including the Tucker, CalVET and Ring nets.

**CAT (cont'd)**

**Assembly**

There are two parts to the SEACAT, the Deck Unit and the Profiler. The Profiler is the underwater unit that is attached to the ship's wire and the bongo array. The Deck Unit is set up inside the ship, usually in a computer lab and allows the SEACAT Profiler to communicate with the computer so you can view the real time data during the tow. Both require assembly and familiarity with the equipment. On some ships the Electronics Technicians and / or Survey Technicians handle the assembly and maintenance of the SEACAT. On other ships it is the responsibility of the Scientific Party. It is strongly suggested if you are going to set up and use an EcoFOCI SEACAT on a ship where there will be no support provided that you get additional training beforehand.

Front and back view of Deck Unit.





**CAT (cont'd)**

SEACAT Profiler Assembly

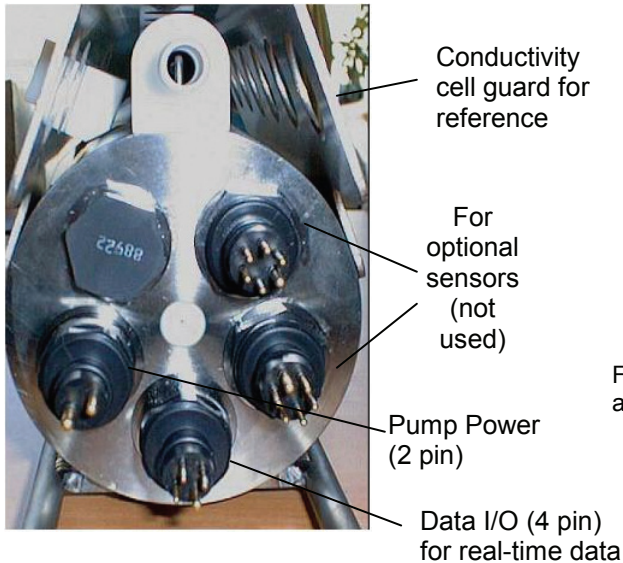
To place the SEACAT Profiler into the mounting bracket, slide the round metal bracket over the battery case and onto the section covered with electrical tape.

Insert the PVC brackets between the battery case and the depth sensor (PDIM). Tighten the hose clamps. Before connecting the SEACAT Profiler to the wire, make sure the pump inlet port and tubing are pointing up (towards winch). **REMEMBER TO REMOVE YELLOW CAP ON THE WATER INTAKE BEFORE USE.**

Connect cables:

- Pump Power to Pump (2 pin)
  - Data I/O to PDIM (4 pin)
  - PDIM to Seacable (2 pin)
- (after electrical termination has been made)

**Be sure the rubber boot gives a little “burp” to ensure that the connector is well seated.**



Close up of SEACAT Profiler connectors.  
Photo from SBE SEACAT 19 Plus Manual.

Used with permission from Sea-Bird Electronics Inc.  
<http://www.seabird.com/products/ModelList.htm>

**Tubing must be pointing up (towards winch), or pump will not work correctly**

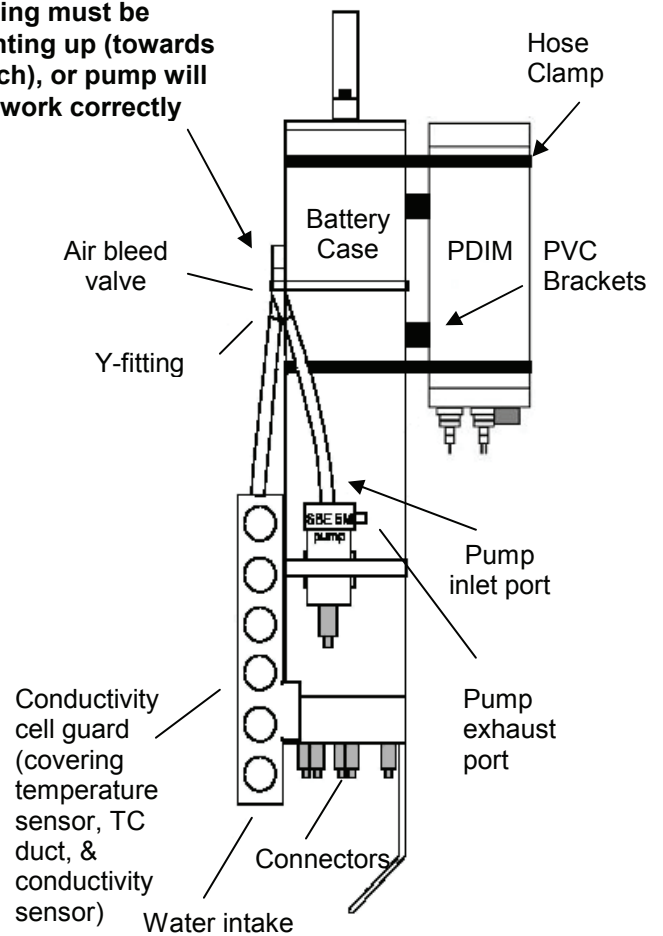


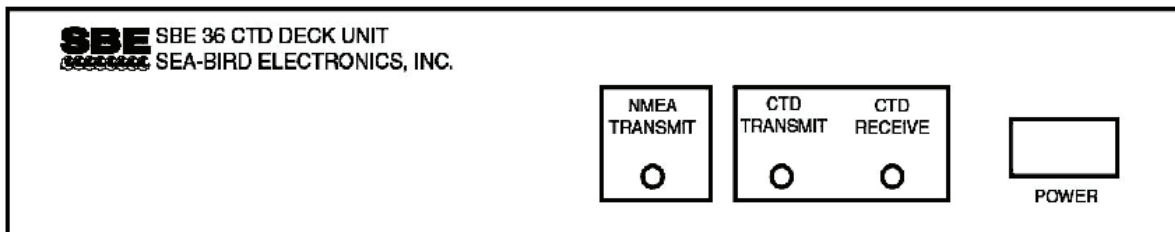
Figure above modified from figures in SBE SEACAT 19Plus and SBE 36 / PDIM CTD Power & Data Systems Manuals.

**CAT (cont'd)**

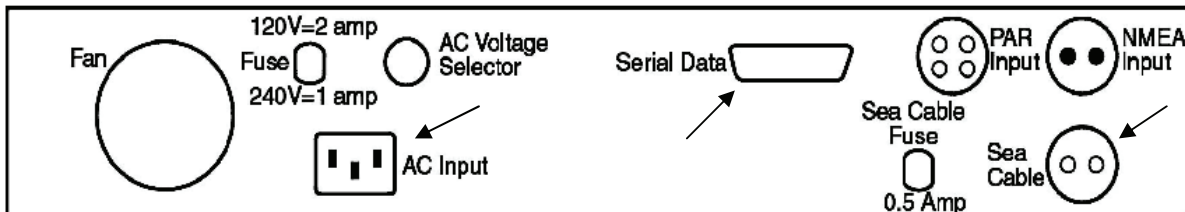
At this point the SEACAT Profiler electrical connection (termination) needs to be made to the ship's seacable. It should be determined before the cruise who will be performing the termination. Often it is the ship's Electronics Technician. If it is going to be someone from the Scientific Party they should be trained and experienced in this procedure. Please refer to the separate SEACAT Termination Instructions in this manual.

After the electronic termination has been completed and tested, the SEACAT Profiler rigging can be completed. Secure all cables to the frame using electrician's tape and/or zip ties. Be sure everything is tight and there are no loose ends, but do not bend the cables too tightly. You should have at least one finger of room in the bend. Connect the cable grip from the seacable to the top of the SEACAT mounting bracket using the thimble (attached to cable grip). Connect the top of the 20-cm bongo extender cable to the bottom end of the SEACAT bracket using a shackle. (If not using the 20-cm bongo, attach the SEACAT mounting bracket directly to the 60-cm bongo.)

Front of Deck unit



Back of Deck unit



Diagrams from SBE 36 / PDIM CTD Power & Data System Manual. Used with permission from Sea-Bird Electronics Inc.

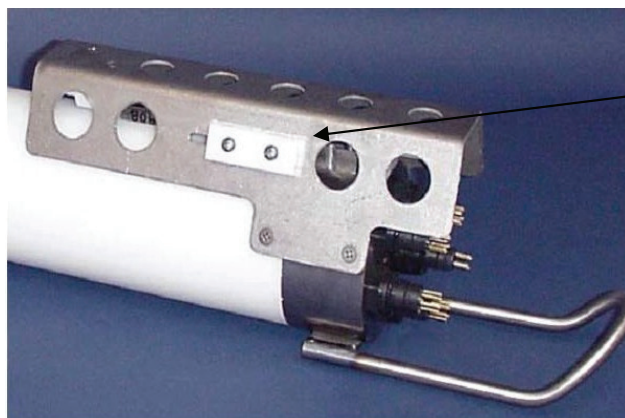
<http://www.seabird.com/products/ModelList.htm>

## **CAT (cont'd)**

### Deck Unit Assembly

Talk to the ship's Electronics Technician and/or other personnel to determine where the seacable output is on the ship. You'll need to set up the computer in an area where this cable can be reached. You may need the Electronics Technician to modify the seacable output by adding the SEACAT Deck Unit adapter. Parts will be provided if needed. Set up the SEACAT computer and Deck Unit in the appropriate area (flat desk, table or counter with room for a clipboard and access to seacable output).

Plug the Deck Unit power cable into the AC Input on the back of the Deck Unit and plug the other end into the ship's clean power. Connect the seacable to the seacable input on the back of the Deck Unit. Connect the Deck Unit to the EcoFOCI computer using a serial cable plugged into com 1 on the computer. Turn on the computer, open the Sea Save software and compare the calibrations that have been entered with those on the paper forms included in the Deck Unit shipping box and Chief Scientist's binder. Verify the calibrations are up to date. If not, enter them and save the calibration file. Get a screen shot of the window with the calibrations and include it with the COD datasheets.



SEACAT Profiler on / off switch

Photo from SBE SEACAT 19 Plus Manual. Used with permission from Sea-Bird Electronics Inc.

<http://www.seabird.com/products/ModelList.htm>

### Testing Communications

Turn on the SEACAT Profiler by sliding the plastic switch to the "on" position. Turn on the Deck Unit. If the SEACAT Profiler and Deck Unit are communicating you should see lights blinking (green/yellow) on the Deck Unit. If you have communications, go through the procedure to acquire data (refer to the SEACAT Operation Instructions in the Sampling: Other section of this manual) and make sure temperature readings are reasonable.

## **CAT (cont'd)**

If you cannot establish communications, check the fuses on the back of the Deck Unit. If one of the fuses has blown, there is likely something wrong with the termination. Use the test cable to rule out problems with the SEACAT Profiler and Deck Unit. Then look at termination wires for signs of a short (black smoke on wire). Assistance from the Electronics Technician and re-termination may be necessary.

### Troubleshooting

- Spikes in the data, loss of data or communications below a certain depth usually indicate the seacable connection is leaking (this may also blow the seacable fuse). Check to be sure the connector from the SEACAT Profiler to the seacable is fully seated (the rubber boot gives a little “burp” when fully connected).
- If the salinity/conductivity data looks suspicious or is spiking, this may be contamination of debris in the conductivity cell. Refer to the “maintenance” section below for how to safely clean the conductivity cell.
- Spiking/noisy data can also be caused by a leaking termination or failing slip-rings on the winch. Re-terminate the seacable only after exhausting all other troubleshooting. If the slip-rings are suspect, this will require attention/repair from the ship’s Electronics Technician.

### **Record Keeping**

A log of SEACAT tows should be kept in a green government record book or on log sheets by the scientists operating the SEACAT. Station, haul, bongo number, bottom depth, wire-out and maximum gear depth should be recorded. The header information should be recorded on the COD sheet from the MOA record “Bongo at depth”. The maximum gear depth, wire out and tow time will also be recorded on the COD sheet. After the survey, a copy of the tow logs should be turned in with the SEACAT data files to the EcoFOCI data manager and submitted to PMEL for archiving.

### **Maintenance**

The SEACAT Profiler conductivity cell should be flushed with fresh water after every tow. If the salinity signal is particularly noisy it may mean that debris has gotten into the cell and it should be cleaned with diluted Triton-X-100 cleaning solution using a syringe kit (cleaning solution and syringe kit included in the SEACAT shipping crate) and rinsed with fresh water. **Never place any object such as a bottle brush into the cell. This will damage the platinization on the conductivity electrodes requiring a re-platinizing job from Sea-Bird Electronics (\$\$\$).** If you do see debris (seaweed etc.) in the cell, GENTLY use the non-cotton end of a cotton swab to push the debris through the cell and out. Be very careful not to touch the sides of the cell.

**CAT (cont'd)**

It is important to note that if the weather is very cold, the instrument may freeze on deck. Under these conditions it is a good idea to bring the SEACAT Profiler inside or into a protected area between tows to prevent the instrument from freezing. At the end of the cruise rinse the SEACAT Profiler with freshwater and dry it thoroughly before packing in it's crate.

If the SEACAT is not working correctly and it is to be used on subsequent cruises, then the SEACAT Profiler and Deck Unit should be transported to Seattle immediately after the cruise for repair.

**SCANMAR**

SCANMAR is used to determine the depth fished as well as the mouth opening characteristics of the trawl gear being fished. With SCANMAR attached to the Methot and other large net frames, it is possible to obtain a real-time towing depth. Trained personnel conduct the setup and operation of the SCANMAR unit.

## **SEACAT Supply List**

\*These items are needed for the electrical termination and operation of the EcoFOCI SEACAT on vessels that do not provide their own Sea-Bird Electronics SEACAT\*.

### SEACAT Operation

- Laptop with SeaSoft Software installed
- Current calibrations (entered into software and hardcopies of calibration sheets)
- Sea-Bird Electronics SEACAT Profiler 19 Plus with plastic housing (and spare if possible) **Maximum depth is 600 m for model with plastic housing**
- Sea-Bird Electronics SEACAT Deck Unit SBE 36 (and spare if possible)
- Sea-Bird Electronics Power Data Interface Module (PDIM) (and spare if possible)
- Mounting Bracket
- Manuals (3) and instructions
- Serial cable that connects deck unit and computer (9 pin on one end 25 pin on the other end)
- GPS cable that connects ship's GPS to deck unit (NEMA input connector on one end and serial connector on the other end) (optional)
- Deckunit Power cable (SBE 17015)
- Cable that connects SEACAT depth unit (PDIM) to seacable. (1 of each length)
  - Seacable to PDIM 80" (SBE 17120 DWG 30588A RMG-2FS to RMG-2MP 2 pin)
  - Seacable to PDIM 30" (SBE 17252 DWG 30588A RMG-2FS to RMG-2MP 2 pin)
- SEACAT Profiler breakout cables (also called Y-connecting cables):  
Used to terminate to the seacable. (RMG-2-FS + G-FLS-P on 38" 18/2 SO cable to Y-mold) (2)
- PDIM interface cable 45" (SEACAT Profiler to PDIM) SBE 17088 DWG 30567 RMG-4FS to RMG-4FS 4 pin
- Pump interface cable: connects pump power on SEACAT Profiler to pump (1 of each length)
  - 15" (SBE 17080 DWG 30565 RMG-2FS to RMG-2FS 2pin)
  - 40" (SBE 17100 DWG 30565 2 pin)
- SEACAT test cable: connects Deck Unit directly to the SEACAT Profiler and bypasses ship's seacable. (1 of each length: 8' and 20')
- Non real-time download interface cable (SBE 801225 9 pin serial)
- Seacable adaptor (short cable that has no connector on one end and a connector that plugs into seacable input on deck unit on the other end)
- D-cell batteries (9) for fish (Alkaline) (spares too)

## **SEACAT Supply List (cont'd)**

- PVC pieces that go between PDIM and battery case
- 2 Rolls of electrical tape and zipties to secure cables on SEACAT Profiler
- Silicone grease
- Spare fuses for Deck Unit (2 boxes of 4 for each kind):
  - MDL 250V 2A <GDL2> (for 110 V operation)
  - MDL 250V 1A <GDL1> (for 220 V operation)
  - AGC 250V 1/2A <GGC1/2> (for seacable)
- Parts for Pin termination:
  - Male pins with covers (1 package of 4)
  - Male locking sleeves (1 package of 4)
  - Male pins without covers (1 package of 4)
  - Female sockets with covers (1 package of 4)
  - Female locking sleeves (1 package of 4)
  - Female sockets without covers (1 package of 4)
- Parts for cable splice termination
- Dummy Plugs (1 of each kind)
  - 2 pin
  - 4 pin
  - 6 pin
- O-rings for the battery cover (2)
- Wire connector crimp ends (round hole with colored ends). Used to connect seacable to Deck Unit cable
- Shackle that connects bottom of mounting bracket to 20-cm bongo extender cable.
- Syringe kit for flushing conductivity cell
- Triton-X-100 detergent
- Ship's seacable (onboard ship. Standard cable is 0.322" – 3 conducting wires)
- Cable grip and thimble (need to know size of cable, left- or right-hand cable). Needed to connect seacable to SEACAT mounting bracket. (Sometimes the ship provides this)
- Silicone grease

## SEACAT Termination

- Heat-shrink tubing with adhesive inside: small for individual connects / large for covering all wires. Shrink ratio should be 2:1 or 3:1. (4 6" pieces of each size)
  - 3/16" or 1/4" diameter (small)
  - 1/2" diameter (large)



## **SEACAT Supply List (cont'd)**

- Electrical tape (Professional grade Scotch Super 33+ is good) (2 rolls)
- 3M Linerless splicing tape (2 rolls)
- 3M Scotchkote (1 can)
- 3M Scotch Cast 82-FL1 flexible power cable inline splicing kit (check expiration date)
- Un-insulated butt connectors
- Safety glasses
- Work gloves
- Heat gun (probably don't need. They usually have one onboard ship. If not, a soldering iron works too.)
- Needle nose pliers
- Wire cutters
- Wire strippers
- Panduit vise (bench mount clamp not suction cup type)
- Razor blades or box cutter
- Dremmel tool and spare cutting disks
- Soldering iron (Weller self-igniting cordless soldering iron is a good choice)
- Butane (for cordless soldering iron) and thin solder
- Sponge
- Panduit Cable cutters (Palidin tools AM25)
- Voltmeter
- Ground wire (Probably don't need unless using with a single conductor seacable where cable armor needs to be used as the ground (i.e. NOAA ship *Oscar Dyson*)
- Measuring tape
- Triangular file

## **SEACAT Termination Instructions**

1. Test the communication between the Sea-Bird Electronics SEACAT Profiler and Deck Unit using the test cable. This way you know both the Deck Unit and SEACAT Profiler can communicate and you can isolate communication problems to determine if the electronics or seacable termination are at fault.
2. Test the seacable signal using a voltmeter. Make sure a signal is getting through from the termination side of the cable all the way into the lab. Use a 9-volt battery and a voltmeter to verify the polarity of the seacable from the end out on deck to the termination in the lab that connects to the SBE Deck Unit. Refer to the SBE PDIM manual. Usually Sea-Bird uses the large pin on the seacable termination (pin-1) as ground and the small pin (pin-2) as the signal or “hot” line.
3. Once you know all the parts are working (seacable, SEACAT Profiler and Deck Unit), you are ready to terminate.
4. There are three ways to terminate:
  - a. Splice termination (wrapping wires or using butt end connectors)
  - b. Potting kit
  - c. Pin connection
5. For all types of terminations you first need to expose the wires in the seacable.
  - a. With the help of the ship’s Electronics or Survey Technician, cut off several feet of the seacable.
  - b. Mark the place where you are going to remove the cable armor with electrical tape. You want at least 12-18” of the cable exposed.
  - c. Use dremmel tool to score the outer layer of armor. Peel armor wire back and break off.
  - d. Mark the place you want to score the inner armor. This should be staggered about ½”-1” from where the outer armor was removed. This staggering gives the cable more strength. Use Dremmel tool to score the inner layer of armor. You need to be careful at this point not to cut too deep, you don’t want to damage the wires inside. Peel back the inner armor and break off. Use wire cutters if needed.
  - e. Use a razor blade or box cutter with a LIGHT touch to cut through the insulation jacket encasing all of the wires. You can also use a Panduit cable cutter to help with this.
  - f. Remove the wire jacket. You should see three conducting wires: white, red and black (In standard 0.322”, 3 conductor cable). [Some ships have a single conducting cable instead of the standard 3 conductor cable. In that case there is only one conducting wire in the cable and the cable armor is used as the ground].

## **SEACAT Termination Instructions (cont'd)**

- g. You will be using the black and red wires; the white one will remain unconnected.
- h. Use wire strippers to expose about 2" of the copper wire inside the black and red wires.

### Splice Termination:

1. Using wire strippers, expose about 2" of the copper wire from the two wires on the break out cable (also called y-connecting cable) on the SEACAT Profiler. These are the wires you will be connecting to the seacable.

There are three conducting wires available in the seacable (red, black, and white) in standard 0.322", 3 conductor cable. Use the red and the black wires for termination. The SEACAT breakout cable only has one wire in each of the pinned ends that you cut off to get to the wires. Follow each wire back to the SEACAT Profiler and there you will see Signal + for one of the wires and Signal – for the other. You solder the red wire onto one of them and the black wire onto the other. **Keep track (probably a good idea to write it down for use later) which color/signal combination you use since that is the same combination you have to get right on the other end of the seacable that connects to the Deck Unit.** You will not damage anything if you get it wrong, it just will not work.

If the polarity of the sea cable is connected backwards between the Deck Unit and the SEACAT Profiler, the seacable fuse may blow on the back of the Deck Unit. Make sure to take plenty of spare fuses for the back of the Deck Unit.

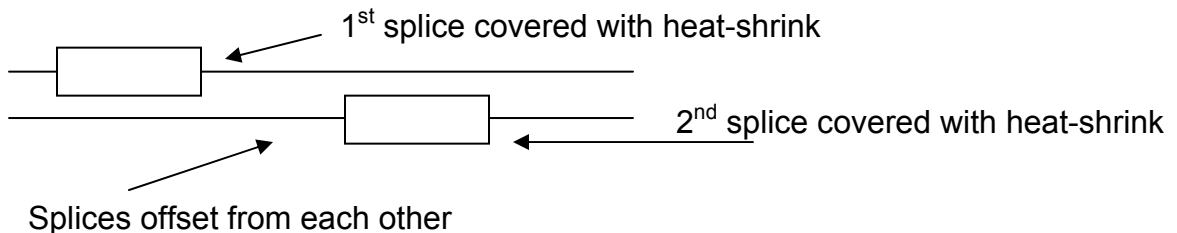
2. Slide two pieces (4 " long) of large diameter (1/2") heat-shrink tubing over the exposed cable on the seacable side. Slide it up pretty far away from the splicing site. One of these will be used to encase all of the wires that have been spliced. The other will be put over the place where the armor wire has been cut away on the seacable, to remove any sharp edges that might wear down the wire jacket.
3. Slide one piece (3" long) of small diameter (3/16" or 1/4") heat-shrink tubing over each exposed wire that is going to be spliced. Try and slide it up as far as possible away from the splicing site. (To prevent it from getting hot and shrinking during soldering)

## SEACAT Termination Instructions (cont'd)

4. There are two ways to do the splice.
  - a. Wrapping copper wires together and soldering them.
  - b. Using an uninsulated butt end connector. If using this method, insert one wire into one side of the connector (hold connector with pliers) and put solder in the hole. Do the same to the other side.

For either splice technique, make sure you have a good solder joint - it should be shiny. During the soldering you can hold the wire with a pair of needle-nose pliers to transfer the heat to the pliers instead of down the wire (so heat-shrink tubing doesn't start shrinking). It's also a good idea to put one of the cables in a vise to free up one of your hands.

5. Once the two splices are complete you are ready to waterproof the connections.
6. Slide the small diameter (3/16" or 1/4") heat-shrink over each splice. Make sure it covers the entire splice (a little over is good). Use a heat gun or soldering iron to shrink the tubing over the connections. (Use heat-shrink on the first splice before you expose the wires on the second splice. That way they can't touch each other). Be sure to offset the spliced areas from one another.



7. At this point, use a voltmeter to test that the signal is coming through the splices and you have a good termination. Once you know the termination works, continue with waterproofing.
8. Slide the large diameter (1/2') piece of heat-shrink tubing over both spliced wires and the unused white wire and shrink using heat gun.
9. Wrap heat-shrink with electrical tape so that the tape extends out past the edges of the heat-shrink. The farther out you extend, the better the protection from water intrusion. Do at least two layers. Wrap layers in opposite directions to keep water out.
10. Wrap linerless splicing tape around spliced area. Do at least two layers, in opposite directions, overlapping wraps.

## **SEACAT Termination Instructions (cont'd)**

11. Coat the whole area in ScotchKote and let dry for at least ½ hour.
12. Slide remaining large piece (1/2") of heat-shrink tubing over the area where the armor wire had been cut away and shrink tubing to eliminate sharp edges of armor wire.

### Potting Kit:

If you have the time to use a Scotch Cast potting kit (requires 24 hours to cure), it's an easier and more reliable way to waterproof your connections. **Remember to check expiration date on a kit before using it. The epoxy will not harden correctly if the epoxy and/or hardener are out of date.** If you are using the potting kit, then you may stop after step 6 in the Splice Termination Instructions above since the wires are covered and can't touch each other. Clamp the cable into the vise. Put the mold over the connection site and wrap electrical tape around the ends of the cable to make a tight seal around the cable. Take the epoxy bag out of the kit (has two different liquids it, one is the epoxy and one is the hardener). Mix up the clear substance while still in the bag by squishing it a few times (especially if it looks cloudy, has an uneven texture or has a few clumps in it). Break the seal in the bag and mix the hardener with the epoxy. Do not mix for more than 1 minute (about 30 – 40 "squishes"). If you mix it too long the epoxy will start to harden. Pour this into the mold. Let it setup overnight.

### Pin Connection

It takes a little more time, but a better way to connect the wires from the seacable to the SEACAT Profiler is to use a pin connection. It's better than the splice termination because if one of the conducting wires in the seacable fails you can more easily switch it over to the other wire (white) that isn't being used.

1. Remove the extension wires off of the SEACAT breakout cable (pull pins out of sockets).
2. Remove plastic collars from extension wires. Slide one of these over the black wire and the other over the red wire in the seacable.
3. Before any copper wire is exposed, slide the jacket over the red and black wires. If needed, use a little silicone grease.
4. Expose the copper wire from the black and red cables. Put each socket pin connector on and solder it together.
5. Then plug pins into sockets on SEACAT breakout cable. Pull up the plastic collars to keep the water out.

## **SEACAT Termination Instructions (cont'd)**

6. Terminate the white wire using pin connection and install an appropriate dummy plug.

After all connections and waterproofing is complete, you are ready to connect the seacable to the SEACAT Profiler. Using the appropriate cable (2 pin) to connect the PDIM on the SEACAT Profiler to the SEACAT breakout cable that is now terminated to the ship's seacable. Refer to the CAT instructions in this manual for further information on rigging the SEACAT Profiler, setting up the Deck Unit, and testing communications.







## **GEAR CTD / Rosette**

### **CTD (CTD Cast)**

A Sea-Bird CTD is used to measure conductivity, temperature and depth in the water column. The CTD is usually equipped with a dual temperature/conductivity sensor pair. Detailed instructions regarding operation of this gear are not included at this time. Currently, operation of this instrument is conducted by PMEL and/or the Survey Department.

### **Assembly**

The CTD should not require any assembly by AFSC personnel. PMEL and/or Survey Department personnel will take care of the setup and keep it in good working condition.

### **Rates/Fishing**

CTD casts are vertical tows. Each ship has specifications for winch rates and the Survey/Deck Department is in charge of those operations. Typically the Survey Technician and/or PMEL personnel will communicate with the winch operator and the bridge during the cast. Typical descent speeds are 15 m/min (Bering Sea above the pycnocline) or 30 m/min (Gulf of Alaska, and Bering Sea shelf below pycnocline).

### **Record Keeping**

An AFSC scientist should stand next to the operator during the cast. The CTD cast sheet and COD sheet haul information need to be filled out when the CTD is at depth.

### **CTDB (CTD Cast With Niskin Bottles)**

A Sea-Bird CTD is used to measure conductivity, temperature and depth in the water column in conjunction with samples collected from Niskin bottles. Detailed instructions regarding operation of this gear are not included at this time. Currently, operation of this instrument is conducted by PMEL and/or the Survey Department. Niskin bottle collections are described in this manual by sample type.

### **Assembly**

The CTD with Niskin bottles should not require any assembly from AFSC personnel. PMEL and/or Survey Department personnel will take care of the setup and keep it in good working condition.

### **Rates/Fishing**

CTD casts are vertical tows. Each ship has specifications for winch rates and the Survey/Deck Department are in charge of those operations. Typically the Survey Technician and/or PMEL personnel will communicate with the winch operator and the bridge during the cast. Typical descent speeds are 15 m/min (Bering Sea above the pycnocline) or 30 m/min (Gulf of Alaska, and Bering Sea shelf below pycnocline).

### **Record Keeping**

An AFSC scientist should fill out the desired bottle depths on the CTD cast sheet before the cast. This person should remain next to the operator during the cast. The person operating the CTD will refer to that sheet to know how many bottles to trip and at what depths. The CTD cast sheet and COD sheet haul information need to be filled out when the CTD is at depth. Record the bottle depths on the COD sheet as well. The types of samples that are taken need to be indicated on both the CTD cast sheet and the COD sheet. (Refer to specific sample types in the sampling section of this manual for details.)





**ANCHO (Anchovy Trawl, also known as Stauffer Trawl)**

The most common purpose of the anchovy trawl is to collect age-0 pollock or predators.

**Description/Assembly**

This gear is maintained by The Research Fishing Gear Program (NOAA / AFSC) and should be requested at least two months in advance to allow time for gear inspection and shipment/loading. A fishing crew is required to setup and fish this gear. Advance warning should be given to the Bridge so that all required personnel may be notified. The anchovy trawl is fished with the 5' x 7' steel V-doors weighing 1,250 lbs. Using other doors may inhibit the fishing performance of the trawls or overstress their construction. If the 5' x 7' doors are ready, the only at-sea preparation is to load the nets onto the net reel.

**Rates/Fishing**

Towing Speed: 2.5 - 3.0 knots

The anchovy trawl is designed to fish mid-water. A Furuno net sounder is attached to the net to enable accurate positioning by depth and to monitor the catch.

Acoustic information (usually from the Simrad EK-60) regarding the distribution of sound scatterers is often intimately associated with making decisions as to the depths and durations this net is fished. In the absence of acoustic data, the rule of thumb is to fish at depth for 20 minutes for single-layer tows, or a retrieval rate of about 10 m/min for oblique tows. Scanmar sensors are sometimes used to study the mouth opening dimensions. These are necessary for standardizing the catch and are as follows (all measurements are in meters)(Wilson et al.1996):

**Anchovy Trawl**

EQ 1)  $Width = 15.253(1-e(-0.012(Wire\ Out+43.762)))$

EQ 2)  $Height = 13.249-0.018(Wire\ Out)$

The path over which the net is fished depends upon the objectives of each tow. The oblique path may be more effective at catching age-0 pollock because ship speed coupled with wire retrieval rate increases the net speed through the water.

## **ANCHO (cont'd)**

### **Record Keeping**

For each tow, take notes indicating net depth and wire out every couple of minutes. These notes begin when the doors enter the water. Document net position until the doors are brought back out of the water. It is of particular interest to have this information when the doors are shot, when the net reaches equilibrium, when haul back begins, and when it reaches the surface. Since the Furuno data are not logged to a computer, it is often desirable to also attach a Scanmar depth sensor to the net.

The Haul-Position Form will be filled out during the tow, but some advanced discussion regarding some of the entries (e.g., gear code) will be necessary. Distance fished and wire-out are recorded for standardizing the catch.

Forms to be used during catch processing are:

On-Deck Sampling Form

Length Frequency Form

### **Catch Processing**

It is desirable to quantify the entire catch, if possible. If sub-sampling is necessary, then first weigh the bag full and then empty using a load cell (record weight and weight unit (i.e., kg)). All species in the randomly selected subsample must be sorted and weighed. If there is a large size difference between adult and juvenile groups, then (for subsampling purposes) treat each as a separate species (see Catch Processing Chart). The wide range in species-specific weights encountered during the field operations necessitates the use of scales with varying sensitivities. Thus, it is imperative that with each weight recorded, its unit also be recorded. All catch information is recorded on the On-Deck Sampling Form. On this form, the Non-Sub column is for that portion of each taxa that was weighed but not enumerated. The Sub columns are for those portions that were weighed and enumerated. If the lengths of any taxa are to be measured, the portion selected for enumerating (e.g., that amount recorded as Sub) can be set aside and the number of individuals tallied from the length frequency data.

Lengths of large specimens of commercially important species should be measured to the nearest centimeter. Smaller specimens should be measured to the nearest millimeter using the small length boards. Although the length measured is usually fork or total, it is sometimes necessary to measure standard length. Be sure to record which length type was measured.

## **ANCHO (cont'd)**

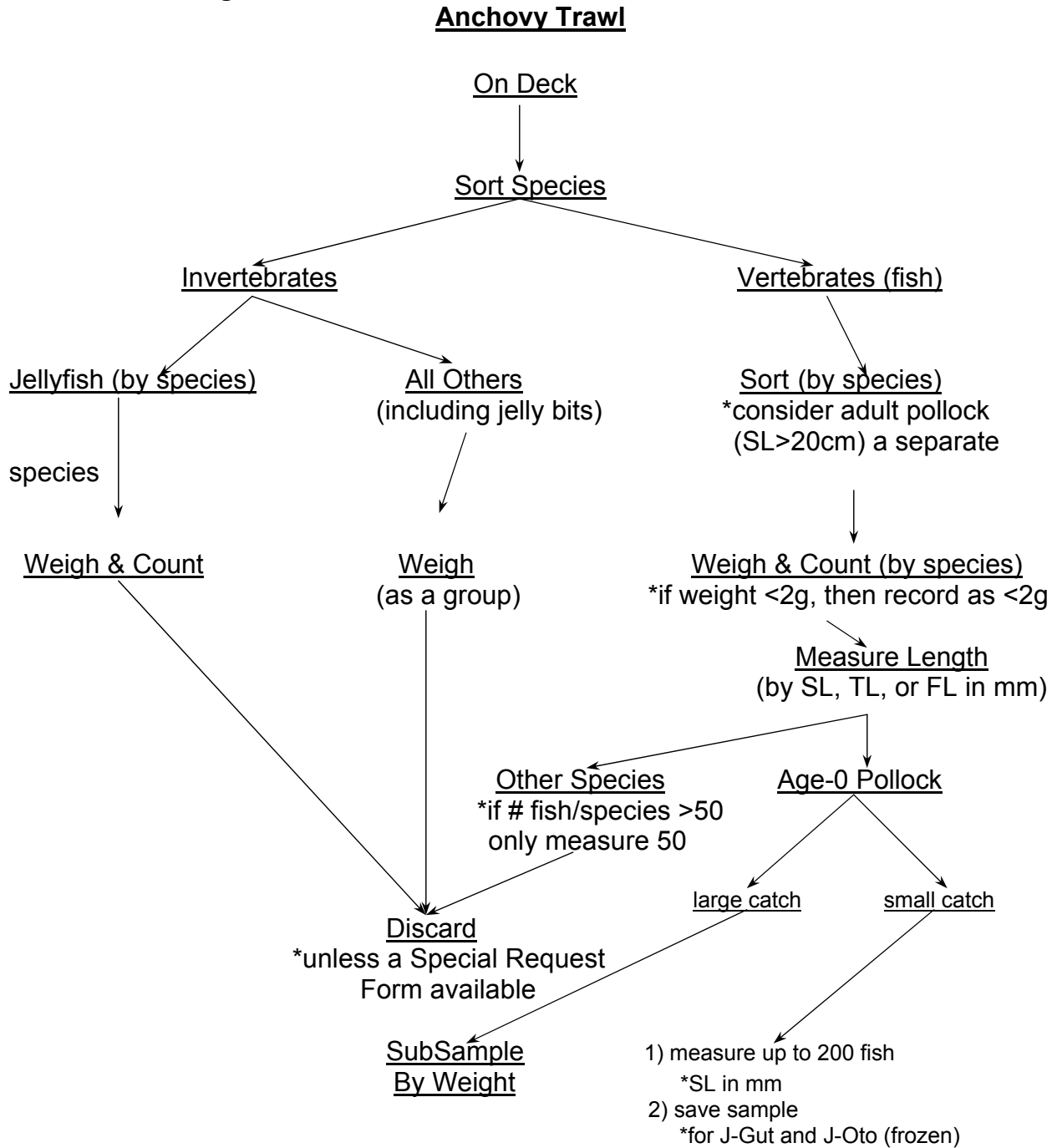
Once separated from the invertebrates, sort the fish to lowest taxonomic order (pay particular attention to sorting cod and pollock from each other). For each species, measure the total weight and count. If the total weight of a species is very small (< 2 g) record its weight as < 2 g. If a species other than pollock is very abundant, randomly select 50 fish and measure their lengths in SL, TL, or FL in mm (use whichever is easiest but make sure to note the length type and units on the Length Frequency Form). If the number of pollock is in the thousands, then subsampling by weight will be necessary. Randomly select a subsample of about 400 individuals and weigh the remainder to the nearest gram. Record this weight in the Non-Sub entry on the On-Deck Sampling Form. For the subsample, record its weight and number of fish as Sub-Weight and Sub-Num. From the subsample, randomly select about 200 fish and measure their standard lengths in mm and record data on the Age-0 Length Form. After measuring, randomly grab about 25-50 fish to freeze (for age and growth studies) and note this number on the On-Deck Sampling Form and the COD Form. See the Sample Request Forms and the Catch Processing Chart for further details.

### Processing Reminders

- 1) mix pollock up
- 2) randomly subsample 400 fish
- 3) weigh subsample fish, weigh non-subsample fish
- 4) discard non-subsample fish (Special Studies?)
- 5) count # of subsample fish and keep 200
- 6) measure up to 200 fish lengths (SL in mm)
- 7) divide fish randomly into 2 - \*100 groups  
\*check Sample Request Forms for #s wanted
- 8) # fish for J-Gut and J-Oto frozen

**ANCHO (cont'd)**

**Catch Processing Chart**





**BEAM (Beam Trawl)**

The most common purpose of the beam trawl is to collect demersal age-0 flatfish, walleye pollock, and Pacific cod.

**Description/Assembly**

The beam trawl is a small trawl to sample fish and invertebrates. The basic design is detailed in Gunderson and Ellis (1986), but with a modified bridle and added top panel as described in Abookire and Rose (2005), the trawl has improved catch efficiency of fish that are further off bottom than juvenile flatfish. The trawl may be fished over soft bottom with either a tickler chain in front of the footrope (Gunderson and Ellis 1986), or over somewhat more rocky bottom with the tickler chain removed and additional ground gear consisting of a 10.2-cm rubber disks over a steel chain attached to the footrope in 10 places (Abookire and Rose 2005). For fishing from a large vessel, a steel beam is used in place of the aluminum beam, with extra flotation provided by a seine float over each side of the beam.

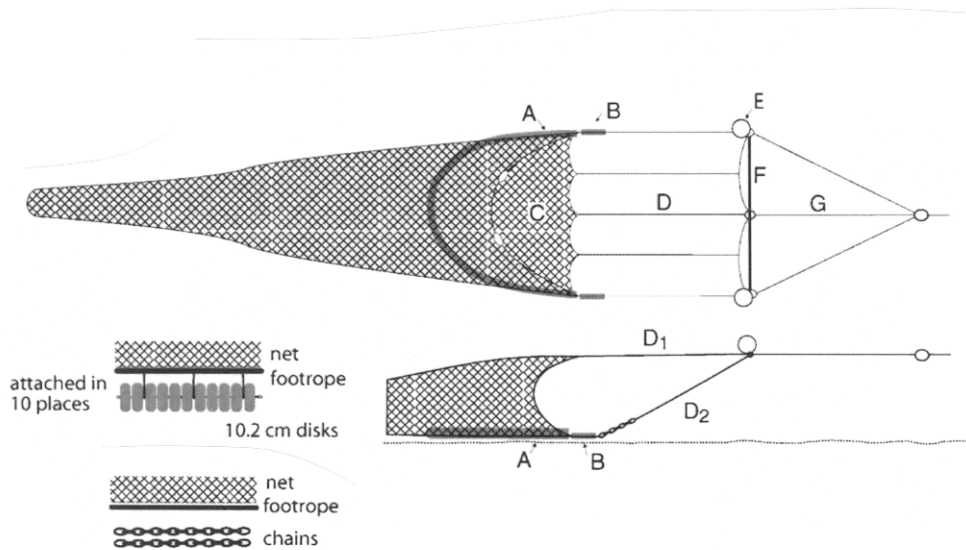


Figure 1. Schematic of the beam trawl described in Gunderson, D. R., and I. E. Ellis (1986) Development of a plumb staff beam trawl for sampling demersal fauna. *Fisheries Research* 4:35-41. Trawl modified in Abookire, A. A. and C. S. Rose (2005) Modification to a plumb staff beam trawl for sampling uneven, complex habitats. *Fisheries Research* 71:247-254.

## **BEAM (cont'd)**

In Figure 1, the top diagram is the trawl viewed from above, the lower right diagram is the trawl viewed from the side of the wing, and two enlargements of the trawl footrope options are in the lower left. A) 5.1-m footrope; B) 9.5-kg tip weight; C) “Ceiling” panel made with 32-mm mesh to limit upwards escapement of off-bottom fishes; D) Five support lines the outermost two of which are top bridles; D<sub>1</sub>) Top bridle from beam to headrope and upper wing tip; D<sub>2</sub>) Lower bridle from beam to wingtip weight; E) 20 cm diameter plastic trawl floats; F) 3.1-m beam; G) Additional middle bridle added ahead of beam. The net can be fished with either a string of 10.2-cm disks over a steel chain attached to the footrope in 10 places, or with two sections of 1.9-cm chain attached between the trailing edges of the tipweights and lower wing tips.

### **Rates/Fishing**

Towing Speed: 1.0 – 1.5 knots

Care must be taken to ensure the net is tending bottom. When towing from small boats, scope of 7:1 is required for depths less than 15 m, and scope of 5:1 is required for depths greater than 15 m. When towing from a larger vessel using a steel cable, much less scope is required, and the Furuno and SBE-39 should be used to ensure bottom contact. The Furuno sensor is mounted on a small board, and should be attached to the upper net panel at the headrope with additional flotation to ensure neutral buoyancy. An SBE-39 pressure and temperature sensor attached to the net provides bottom temperature. Because the bottom will be relatively flat, the pressure readings are also helpful to ensure bottom contact with the bottom, although the information must be downloaded after the net is retrieved and is unavailable during fishing.

### **Record Keeping**

Use the Haul-Position Form to record the time the net enters the water, equilibrium, haul-back, and when the net is out of the water. Ship positions at equilibrium and haul-back are recorded and are crucial to calculate the distance towed. Record positions to as many decimal places as possible.

Forms to be used during record keeping and catch processing are:

On-Deck Sampling Form

Length Form

## **BEAM (cont'd)**

### **Catch Processing**

The catch is sorted to the desired taxonomic levels. If there are large size differences between adult and juvenile groups, then record each as separate species. The wide range in species-specific weights encountered during the EcoFOCI age-0 field operations necessitates the use of scales with varying sensitivities. Thus, it is imperative that with each weight recorded, its unit also be recorded. All catch information is recorded on the On-Deck Sampling Form. On this form, the Non-Sub column is for that portion of each taxa that was weighed but not enumerated. The Sub columns are for those portions that were weighed and enumerated. If the lengths of any taxa are to be measured, the portion selected for enumerating (e.g., that amount recorded as Sub) can be set aside and the number of individuals tallied from the length frequency data.

Lengths of large specimens of commercially important species should be measured to the nearest centimeter. Smaller specimens should be measured to the nearest millimeter using the small length boards. Record length of age-0 flatfish as standard length and larger fish as total or fork length depending on species. Be sure to record which length type was measured.

For each species, measure the total weight and count. If the total weight of a species is very small (< 2 g), record its weight as < 2 g. If a species is very abundant, randomly select 50 fish and measure their lengths in SL, TL, or FL in mm (use whichever is easiest but make sure to note the length type and units on the Age-0 Length Form).

If the number of age-0 flatfish is very large, then sub-sampling by weight will be necessary. Randomly select a sub-sample of about 100 individuals and weigh the remainder to the nearest gram. Record this weight of the remainder in the Non-Sub entry on the On-Deck Sampling Form. For the subsample, record its weight and number of fish as Sub-Weight and Sub-Num. Measure the lengths of the fish in the subsample and record data on the Age-0 Length Form. Freeze age-0 flatfish to return to Seattle, and note frozen samples on the COD form.

### **METH (Methot Trawl)**

The Methot trawl is used for the collection of juvenile fish and/or plankton samples.

#### **Description/Assembly**

The Methot gear is a 5.168 m<sup>2</sup> fixed frame net with 3 × 2 oval mm mesh in the body and a 1.0-mm mesh in the hard codend. A 6-ft IKMT depressor is attached at the lower corners of the frame to provide increased depth with wire-out (see Fig. 1). The depressor is modified by having the hinged side arms removed and attachment points drilled into, or welded onto, the depressor near the hinges. A flowmeter should be suspended off center of the mouth of the net frame and readings should be taken before and after the tow. A Scanmar depth sensor should be attached on top of the frame and aimed forward in the direction of the ship.

#### **Rates/Fishing**

The Methot is deployed using the Rowe or Marco winch off the stern of the vessel (without the stern platform). A Scanmar acoustical depth sensor (with a readout in Data Plot and using a hydrophone suspended from the port quarterdeck boom) should be used to receive real-time depth information. A scientist or survey tech in Data Plot will relay orders for stopping and starting the winch to the winch operator based on trawl depth. It may also be possible to use the Scanmar unit in the Trawl House utilizing a hull-mounted transducer if the vessel is set up to operate this equipment for the survey.

The gear will be deployed at 40 m/min (30 m/min if rough seas) and retrieved at 20 m/min. Trawls are generally oblique or stepped oblique from near bottom or the desired depth to the surface. Depending on the study, particular depth layers may be targeted. Ship speed should be from 2 - 3 knots. **Do not exceed tow speeds of 3.5 knots since the frame may be bent.**

#### **Record Keeping**

Use the On-Deck Sampling Form to record species, weights, and count numbers. Always record numbers and/or weights (by taxonomic group) of the discarded portion of the catch. Information for the Haul Position Form may be obtained from the MOA. A Length Frequency Form may be required for recording freshly measured lengths (usually standard length in mm). If it was necessary to discard any portion of the catch, then make a note in Comments section of the COD on how many (and/or weights) were discarded of each taxonomic group.

**METH (cont'd)**



Figure 1. Methot frame trawl with the Isaacs-Kidd depressor (Methot 1986).  
Methot, R. D. 1986. Frame trawl for sampling pelagic juvenile fish. Calif. Coop.  
Oceanic Fish. Invest. Rep. 27:267-278.

## **METH (cont'd)**

### **Catch Processing**

Once aboard, the net should be quickly washed down and the contents of the codend transferred to a bucket. A large white PVC sieve (1 mm) is provided to remove excess water. The sample(s) collected will be sent to Poland for sorting. In order to get it into a reasonable number of jars, satisfy special requests, and to maintain consistency, please use the following procedures when processing a Methot haul.

\*\* Remove all large jellyfish (>30 mm diameter) from the catch. Rinse each jelly to remove all attached organisms (use a 5 gallon bucket half-filled with water). In case of tentacle entanglement, rinse the jelly as best as you can so that all fish and as many invertebrates as possible are removed. Weigh and count the jellies as a group. Since jellies often break apart, it may be difficult to get individual numbers. These bits and pieces should be included with the group weight but should not be counted unless the pieces obviously represent another whole individual.

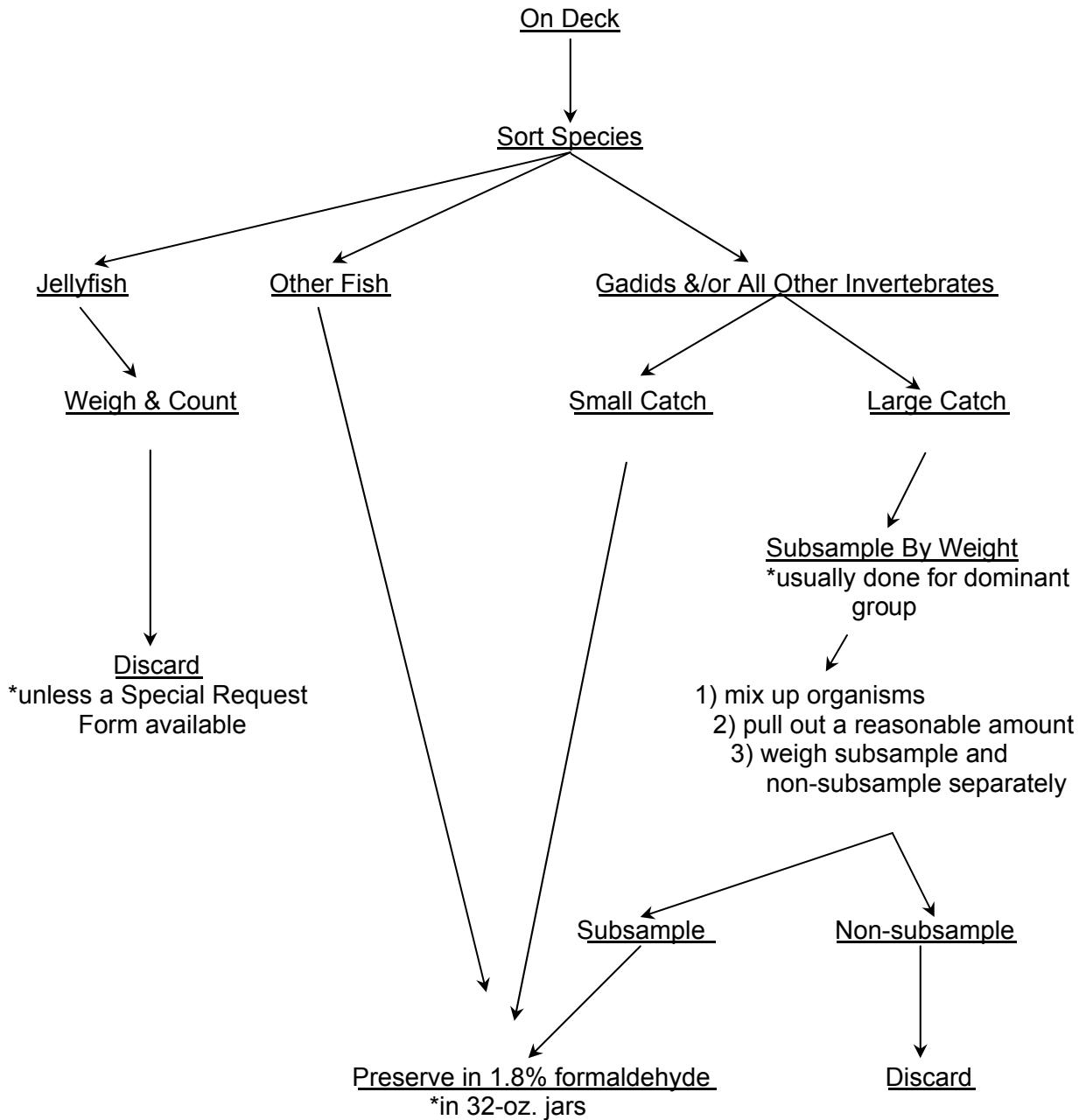
\*\*All remaining fish and invertebrates should be preserved with 1.8% formaldehyde in 32-oz. jars (or frozen, depending on sample request received). First count and weigh all age-0 gadids (small pollock and cod may be difficult to separate). If the amount to be preserved is more than what can be reasonably preserved in 4 jars, then you will have to choose to either save it all or subsample by weight.

\*\*Subsampling by weight is necessary when a sample is comprised of a large amount of invertebrates (usually euphausiids are the primary taxa with some copepods, mollusks, amphipods, etc.) or pollock. Sort out the group of organisms that will have to be subsampled. Do not bother separating the invertebrate groups, just lump it all together and call it an invertebrate mix (make sure that no fish are included). Mix the organisms as best as you can so that a subsample will be representative of the whole (usually this is done in a container with all of the excess water poured off). Remove enough organisms to fill 2 - 4 jars. Weigh the subsample to the nearest gram and then weigh the non-sub-sample as well. Record these weights on the On-Deck Sampling Form specifying the units (kg or g). Also remember to record that the subsample + discard weights = the total weight.

\*\* For pollock, or some other specifically identified fish taxa, follow the same subsampling steps for invertebrates and weigh. Count the number of fish in the subsample and if time permits, count the number discarded.

**METH (cont'd)**

**Catch Processing Chart**



### **SHRIMP (Shrimp Trawl)**

The most common purpose of the shrimp trawl is to collect age-0 pollock or predators.

#### **Assembly/Preparation**

This gear is maintained by The Research Fishing Gear Program (NOAA / AFSC) and should be requested at least two months in advance to allow time for gear inspection and shipment/loading. The shrimp trawl is fished with the 5' × 7' steel V-doors weighing 1,250 lbs. Using other doors may inhibit the fishing performance of the trawls or overstress their construction. If the 5' × 7' doors are ready, the only at-sea preparation is to load the nets onto the net reel. See Figure 1 for trawl dimensions and mesh sizes.

#### **Fishing/Rates**

Towing Speed: 2.5 - 3.0 knots

A fishing crew is required to fish this gear. Sufficient advance warning must be given to the Bridge. The shrimp trawl is designed to fish on bottom but it may also be fished mid-water. A Furuno net sounder is attached to the net to enable accurate positioning by depth and to monitor the catch. Acoustic information (usually from the Simrad EK-60) regarding the distribution of sound scatterers is often intimately associated with making decisions as to the depths and durations this net is fished. In the absence of acoustic data, a rule of thumb is to fish at depth for 20 minutes for single layer tows or a retrieval rate of about 10 m/min for oblique tows. Scanmar sensors have also been used to study the mouth opening dimensions. These are necessary for standardizing the catch and are as follows (all measurements are in meters)(Wilson et al. 1996):

Shrimp Trawl

$$\text{EQ 1) Width} = 15.1(1 - e^{-0.02(\text{WireOut} + 35.1)})$$

$$\text{EQ 2) Height} = 2.2 - 0.004(\text{WireOut})$$

The path over which the net is fished depends upon the objectives of each tow. The oblique path may be more effective at catching age-0 pollock since boat speed coupled with wire retrieval increases the net speed through the water.



**SHRIMP (cont'd)**

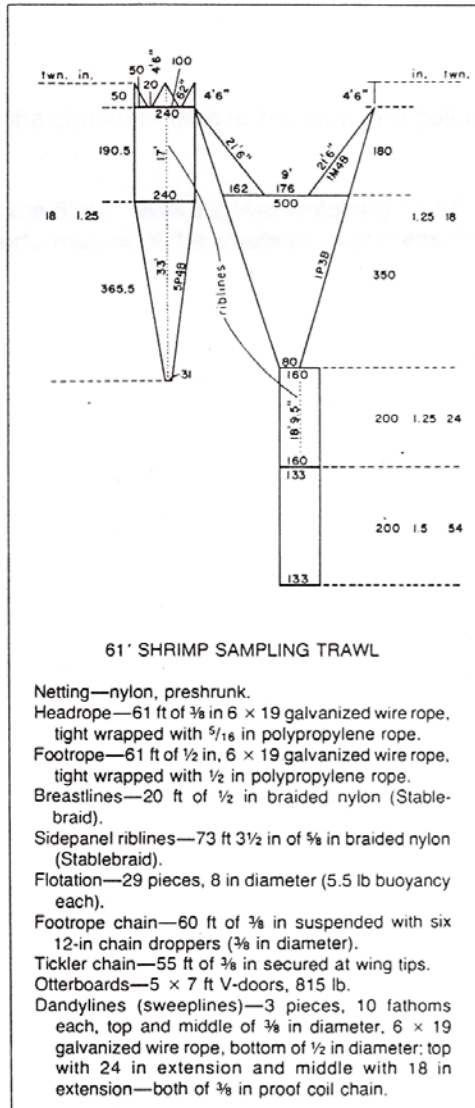


Figure 1. Wathne, F., 1977. Performance of trawls used in resource assessment. Mar.Fish.Rev.: 16-23.

## **SHRIMP (cont'd)**

### **Record Keeping**

For each tow, take notes indicating net depth and wire out every couple of minutes. These notes should start when the doors enter the water. Document net position until the doors are brought back out of the water. It is of particular interest to have this information when the doors are shot, when the net reaches equilibrium, when haul back begins, and when it reaches the surface. Because the Furuno data is not logged to a computer it is sometimes desirable to also attach a Scanmar depth sensor to the net (Scanmar sensors are managed by the Groundfish Assessment Program).

The Haul-Position Form will be filled out during the tow but some advanced discussion regarding some of the entries (e.g., gear code) is necessary. Distance fished and wire-out are recorded for standardizing the catch.

Other forms used during catch processing are:

On-Deck Catch Form

Length Frequency Form.

### **Catch Processing**

It is desirable to quantify the entire catch when possible. If subsampling is necessary, then first weigh the bag full and then again when the bag is empty using a load cell (record weight and weight unit (i.e., lbs)). All taxa must be sorted from the randomly selected subsample and weighed. If there is a large size difference between adult and juvenile groups, then for subsampling purposes, treat each as separate taxa.

Enumerate the number of individuals comprising all, or a weighed subsample, of the biomass of each taxa. The wide range in taxa-specific weights encountered during operations necessitate the use of scales with varying sensitivities (e.g., one weighing in grams and another weighing in kilograms). Thus, it is imperative that each weight be recorded with its unit.

All catch information is recorded on the On-Deck Catch Form. On this form, the Non-Sub column is for that portion of each taxa that was weighed but not enumerated. The Sub columns are for that portion which was weighed and enumerated. If the lengths of any taxa are to be measured, the portion selected for enumerating (e.g., that amount recorded as Sub) can be set aside and the number of individuals tallied from the length frequency data. Often, 150 individuals of each taxa is sufficient to generate a good length frequency distribution.

**SHRIMP (cont'd)**

Lengths of large specimens of commercially important species should be measured to the nearest centimeter. Measuring these larger specimens is expedited by using the Polycorders and associated software, which are managed by Robin Harrison of the RACE Division and may be borrowed by special request through Dave Somerton (AFSC). Smaller specimens should be measured to the nearest millimeter. The length measured is usually fork or total. Standard length is measured on post-larval young-of-the-year pollock because the caudal fin is often damaged or its posterior margin is difficult to see. Be sure to record which length was measured. If the size distribution of each taxa is broad, then it may be necessary to measure more than 150 individuals.







## **FLOWMETER**

The General Oceanics digital flowmeter Model 2030 with a 3-blade rotor is used to determine water volume associated with each plankton tow. The flowmeter incorporates a molded rotor coupled directly to a six-digit counter, which records to 1/10 of a revolution.

### **Calibration**

The flowmeters are calibrated in a water flume at the Harris Hydraulics laboratory at the University of Washington. Calibration speeds duplicate the normal operating speeds of a flowmeter as used in the field.

### **Installation**

The flowmeters are designed to be suspended by a twin monofilament bridle for most applications. The exceptions are the Neuston and CalVET frames which have a special bolt that fits in place of the lanyard pin. To remove or loosen the lanyard pin, the nosecone must be removed by unscrewing, then backing off the set-screw holding the pin in place. Use heavy monofilament attached with nicopress sleeves for the towing bridle.

### **Preparation**

Remove the screw and 'O' ring found on the endplate. This provides access to the inside of the flowmeter. Fill a syringe with freshwater. Hold the flowmeter nose down and gently inject water until full and little or no air bubbles are visible. Replace 'O' ring and screw. The flowmeters are not designed to be absolutely water tight, so periodically check and fill with water as needed. During extreme cold conditions, ethylene glycol (antifreeze) may be added with the water to prevent freezing. If possible, bring equipment inside between deployments when the air temperatures are near or below freezing.

### **Repair and Maintenance**

After each cruise, flush the inside and outside with freshwater to remove any salt deposits. Also, remove as much water as possible by injecting air inside the meter using a syringe and needle.

With the exception of cleaning the rotor of any debris, and repairing a monofilament towing bridle, do not attempt any at-sea repairs. Make a tag describing the problem and affix to flowmeter.

**GEAR**  
**Other**

**MOOR (Oceanographic Mooring At Fixed Location)**

Mooring units are designed and deployed by PMEL and the Survey Department. The recovery or deployment of a mooring will be given an independent station number. Record the mooring number on the COD form in the Comments section.



## **SATBUOY (Satellite-Tracked Drifter Deployment)**

A scientist and a member of the Survey Department conduct the deployment of a satellite-tracked drifter. The drifter is released over the side of the research vessel and the Bridge or another scientist is asked to mark the operation in the MOA.

### **Preparation**

Several days before the estimated time of buoy deployment, activate the buoy by removing the top of the storage box and the magnet that is taped to the side of the buoy. Email [Carol.Dewitt@noaa.gov](mailto:Carol.Dewitt@noaa.gov) at PMEL with the buoy number and GMT date and time. Please ask for a confirmation that the buoy is transmitting and ready for deployment. Coordinate with the Bridge before the following operations:

- 1) Unwind and straighten the line between the buoy and the drogue on the deck to ensure that the line does not tangle during deployment.
- 2) Have the ship slow on approach to the deployment site.
- 3) From the stern of the ship, lower the buoy and slowly let out the line between the buoy and the drogue. Request the time and ship's position from the Bridge or scientist marking the MOA as soon as the drogue is in the water.

### **Record Keeping**

A deployment of a satellite-tracked buoy will be given an independent station number unless there will be sampling in conjunction with this operation. In this case, the deployment may be given a station number and a haul number. Consecutive haul numbers will be used for operations coordinated with the deployment. Record the Argos buoy identification number and the drogue depth on the COD sheet. The ARGOS buoy identification number is located on the float. Once the buoy is deployed, contact [Carol.Dewitt@noaa.gov](mailto:Carol.Dewitt@noaa.gov) at PMEL and send her the following information:

Ship's cruise number  
Argos buoy number  
GMT date and time of deployment  
Latitude and longitude  
Purpose of deployment (i.e., larval patch, mooring site 2)

### **Special Request**

The gears listed here are those that have been used in the past by other collaborating institutions/researchers. These gears are not routinely used, but the codes and descriptions have been retained should they be needed in the future.

### **BIOOTHER (Other Biological Gear)**

A biological gear that does not fall under any specific gear type. Be sure to include an explanation in the comments of the COD form.

### **BOTTLES (Niskin Bottles Without CTD )**

Occasionally Niskin bottle collections are used without a CTD cast. Be sure to include an explanation of the samples taken and depth of each sample in the comments on the COD form.

### **PHYOTHER (Other Physical Gear)**

Physical gear used that does not fall under any specific gear type. Be sure to include an explanation in the comments of the COD form.

### **SEDTRAP (Sediment Trap)**

The deployment or recovery of a sediment trap. Instructions regarding this gear will be given when requests are made.

**GEAR**  
**Other**

**TRANS (Dedicated Transect)**

A dedicated transect is defined as a continuous underway collection of data (no stations between the start and end). This is not to be confused with the vessel-mounted sensors that are logging data for the ship. A dedicated transect is only recorded in the COD if the data will be used by EcoFOCI. Transect data recorded during EcoFOCI surveys for MACE will be copied by the Survey Department and given to the Chief Scientist.







## SAMPLING Egg

### QTOWF (Quantitative Tow Preserved In Formaldehyde)

A quantitative tow for eggs, larvae, or zooplankton, preserved in 1.8% formaldehyde.

#### Preparation

Pre-label jar(s) for preservation of cod end contents.

#### Collection

Gears and mesh sizes will vary.

#### Labeling

Use the waterproof Inside Jar labels for the inside of the jars, which should be filled out in pencil. For outside labeling, use the self-adhesive Outside Jar labels filled out in pen. See Section: FORMS and LABELS for examples. Remember to label the top and one side of each box of jars with the cruise, gear type, and station #s.

#### Preservation

Rinse codend contents into sieve to reduce the amount of seawater before preservation. Make sure that the sieve you have selected is the same mesh size (or smaller) as the mesh used on the sampling net. Using a wash bottle filled with filtered seawater, rinse the sieve contents into a labeled jar (jar size depends on sample type and gear used). For a 32-oz jar, add 50 ml of formaldehyde, 20 ml of sodium borate, and more seawater to fill jar to within 1/4" of lip (**shoulder of jar**). See table below for preserving samples in different volume jars. Screw cap on tight enough to retain liquid when you turn the jar end-over-end to mix the sample and formaldehyde thoroughly. Place jar in the appropriate box.

Jar Volume	Formaldehyde Volume	Sodium Borate Volume
8 oz	12.5 ml	5 ml
16 oz	25 ml	10 ml
32 oz	50 ml	20 ml

## **SAMPLING**

### **Egg**

#### **QTOWS (Quantitative Tow Preserved In Stockard's / by special request only)**

A quantitative tow of pollock eggs taken by special request for preservation in Stockard's solution to study developmental egg stages.

#### **Preparation**

Make Stockard's solution before tow is complete.

50 ml 37% formaldehyde  
40 ml acetic acid  
60 ml glycerin  
850 ml fresh water

Since you may need more than a liter of Stockard's at a time, it is best to make it up in an old gallon jug (milk jug from galley, distilled water jug, etc.) and transfer it to a wash bottle.

Have a pre-labeled 32-oz. jar ready for use.

#### **Collection**

Gears and mesh sizes will vary.

#### **Labeling**

Labels should have Stockard's clearly written in one of the margins. Use a waterproof Inside Jar label for the inside of the jar (fill out data fields in pencil). For outside labeling, use the self-adhesive FOCI label (fill out data fields in PEN). Put jar in box labeled Stockard's on the side and the top in addition to the cruise and station number. Make sure that the Stockard's samples do not get placed in the same box as formaldehyde samples.

#### **Preservation**

Gently transfer sample into 32-oz. jar using a wash bottle filled with 100% Stockard's solution. Top-off jar with 100% Stockard's solution.



### **RCOUNTE (Rough Count Egg)**

A rough estimate of fish egg abundance obtained at sea.

#### **Preparation**

Locate the following equipment for subsampling:

Stempel pipette (10 ml subsample)  
quadrant petri dish  
formaldehyde sieve  
large mesh sieve  
5-gallon bucket (dead/formaldehyde)  
long forceps (dead/formaldehyde)  
vinyl or gloves (when handling formaldehyde)

#### **Collection/Preservation**

Samples to be rough counted must be preserved for 24 hours or longer. Gloves are provided for protection against 1.8% formaldehyde. The following procedures should be done in a wet lab on every 32-oz. QTOWF sample collected from grid stations.

Select a jar of formaldehyde-preserved plankton to be rough counted. Remove Inside Jar label. Depress plunger on Stempel pipette, insert in jar, and stir the sample. When eggs are equally distributed throughout the jar, release the plunger and withdraw the pipette. Release subsample into quadrant dish. Count eggs using a dark background for contrast or use a microscope (whichever is easiest for you). To obtain the number of eggs per jar, multiply the number of eggs in the subsample by 85. Return subsample and original Inside Jar label to sample jar.

If a sample contains a lot of chaetognaths, then sieve the sample. Use formaldehyde sieve (333 or 505- $\mu$ m) to separate plankton from fluid (save formaldehyde in a spare 32-oz. jar, to be used again). Put a large mesh sieve on top of 5-gallon bucket and place in sink. Empty plankton into the large sieve and rinse well with seawater to wash eggs into bucket (leave Inside Jar label with chaetognaths). Pour eggs through formaldehyde sieve and then transfer into 32-oz. jar. Fill jar to the shoulder with seawater. Obtain subsample as outlined above. When subsampling is completed, pour contents of jar, contents of large mesh sieve (chaetognaths and label), and contents of 5-gallon bucket into formaldehyde sieve. Transfer into 32-oz. jar using little or no seawater. Preserve sample in the original jar and formaldehyde solution.

#### **Record Keeping**

Fill out the Egg Notebook provided with cruise number, station number, egg subsample count, and estimated egg number per jar.







## **SAMPLING**

### **Larval**

#### **L-MUSC (Larval Pollock Muscle DNA)**

Pollock larvae collected for muscle tissue DNA for condition analysis.

#### **Preparation**

Label a white freezer box with cruise number, sample type, and sample owner. Have a few slides next to the microscope for measuring the fish on. Also, have ready a few pairs of larval forceps, pipettes, chilled seawater, and several divided petri dishes filled with chilled seawater sitting on ice. Label 20 microcentrifuge tubes before each tow/station according to the instructions given below.

#### **Collection**

Larvae are collected from the Net 2 side of a 60-cm bongo tow. It is important to quickly sort and measure the larvae to reduce the amount of shrinkage. Carefully pour the codend contents into a sorting tray or bowl sitting on ice. Remove pollock larvae quickly using either a pipette or forceps, and place them into a petri dish of chilled seawater. **DO NOT POUR CODEND CONTENTS DIRECTLY ONTO ICE.** Add a drop of chilled seawater onto a microscope slide and measure the standard length of each pollock larva and place it into its own labeled microcentrifuge tube. Place the tube in ice, and record the larval length, tube number, date, station and haul in the Larval Pollock Condition notebook. If length is recorded in ocular micrometer units, be sure to note which microscope was used and the magnification. When time permits, convert units to mm using the unit conversion tables found in Section: MICROSCOPES. Keep the tubes containing the larvae in ice until all larvae have been measured. Unless otherwise requested, try to collect 10 - 20 larvae from each station.

#### **Labeling**

Label microcentrifuge tubes with the cruise number and a consecutive number for each larva (e.g., 5MF08-01, 5MF08-02).

#### **Preservation**

After all of the larvae have been measured, quickly transfer the sample tubes to the properly labeled freezer box in the -80°C freezer. After the first station, it is important that the box remain in the freezer.

#### **Record Keeping**

Be sure to keep the Green Larval Notebook updated with the number of larvae preserved and their specimen numbers in the Comments column. Make sure that the SEACAT file for each haul is saved.

## **SAMPLING**

### **Larval**

#### **L-OTO (Larval Otoliths)**

Larval pollock collected for otolith analyses.

#### **Preparation**

Have chilled seawater ready to sort codend contents. Keep and maintain a container of seawater (unfiltered is fine) in the refrigerator for this purpose. You will need the following equipment to sort and process these samples:

- larval forceps
- glass or plastic pipettes with the tips cut off
- white bowls or pans for sorting
- ice-bed to put under sorting bowl/pan
- ice-bed for petri dish
- 20-ml scintillation vials
- labels for outside of vials
- alcohol-proof pen
- buffered 95% ethanol
- petri dishes (quadrant dish works best)

#### **Collection**

Otolith samples of larval pollock may be taken from the rough count obtained from a 60-cm bongo, Live Tow, or other gear specified by the Chief Scientist and/or the sample requester. Do not use a QTowF sample for this type of sample. Pour the sample into a bowl or tray of chilled seawater for sorting out larval pollock. **DO NOT POUR SAMPLE DIRECTLY ONTO AN ICE BED...THE LARVAE WILL GET STUCK.** Quickly pick out the larvae using larval forceps or a pipette depending on which works best for you and place the larvae in a petri dish of chilled seawater for identification and preservation. Make sure you use the small ice-bed under the petri dish while sorting. Preserve 20 - 30 larvae per station for otoliths.

#### **Labeling**

Use an alcohol-proof pen for filling out the side labels for the scintillation vials as well as for writing on the caps. Label each scintillation vial with a small, peel adhesive FOCI label on the side of each vial. Write the cruise#, station#, haul#, and preservation type (E for ethanol) on the caps of the scintillation vials.

#### **Preservation**

Preserve larval pollock in 95% ethanol in a labeled 20-ml scintillation vial for each station/haul.

**L-OTO (cont'd)**

**Record Keeping**

The SEACAT file is to be saved in conjunction with the samples so that the depth/temperature/etc. data will be available for analysis. Record the station#, haul#, #larvae in 95% ethanol, grid location, etc. in the Green Larval Notebook. See Section: Miscellaneous for example entries in the Green Larval Notebook for this sample type.

## SAMPLING Larval

### QTOWF (Quantitative Tow Preserved In Formaldehyde)

A quantitative tow for eggs, larvae, or other preserved in 1.8% formaldehyde.

#### Preparation

Pre-label jar(s) for preservation of codend contents.

#### Collection

Gears and mesh sizes will vary.

#### Labeling

Use the waterproof Inside Jar labels for the inside of the jars, which should be filled out in pencil. For outside labeling, use the self-adhesive Outside Jar labels filled out in pen. See Section: FORMS and LABELS for examples. Remember to label the top and one side of each box with the cruise, gear type, and station #s.

#### Preservation

Rinse codend contents into sieve to reduce the amount of seawater before preservation. Make sure that the sieve you have selected is the same mesh size (or smaller) as the mesh used on the sampling net. Using a wash bottle filled with filtered seawater, rinse the sieve contents into a labeled jar (jar size depends on sample type and gear used). For a 32-oz jar, add 50 ml of formaldehyde, 20 ml of sodium borate, and more seawater to fill jar to within 1/4" of lip (**shoulder of jar**). See table below for preserving samples in different volume jars. Screw cap on tight enough to retain liquid when you turn the jar end over end to mix the sample and formaldehyde thoroughly. Place jar in the appropriate box.

Jar Volume	Formaldehyde Volume	Sodium Borate Volume
8 oz	12.5 ml	5 ml
16 oz	25 ml	10 ml
32 oz	50 ml	20 ml



## SAMPLING Larval

### **RCOUNTL (Rough Count Larval)**

A rough estimate of larval abundance obtained while at sea. The following is for a larval rough count.

#### **Preparation**

Locate the following equipment for subsampling:

- 4-liter plastic beaker
- variety of smaller volume beakers for subsampling
- larval forceps
- pipettes (glass or plastic)
- white bowls or pans for sorting
- ice bed to put under sorting bowl/pan
- chilled and filtered seawater for raising sample volume
- 20-ml scintillation vials
- labels (for outside of vials only)
- alcohol-proof pen
- dissecting microscope for identification of larvae

#### **Collection**

Empty codend into a plastic 4-liter beaker and raise the volume of seawater/plankton to a convenient level (usually to 2,000 ml since it is easy to identify on the beaker, but the thickness of the plankton will often determine this for you).

Gently stir the plankton such that the larvae will be well-mixed from top to bottom in the beaker. While the plankton is still moving, use a smaller plastic beaker and dip out a 10% subsample (e.g., from a total of 2,000 ml you should take out 200 ml) all at once. The rough count calculation is:

$2,000 \text{ ml} / 200 \text{ ml} \times \# \text{ of larvae} = \text{rough count.}$

Pour out the subsample into a bowl or sorting tray that is sitting on an ice bed. **DO NOT POUR DIRECTLY ONTO AN ICE BED.** Quickly pick out the larvae using the larval forceps or a pipette depending on which works best for you, and place them in a petri dish of chilled seawater for identification and preservation (if requested).

#### **Labeling**

If larvae from the rough count are to be saved, then follow the labeling procedures for the sample type requested. For example, see L-OTO in SAMPLING/Larval section for instructions on labeling vials for otolith samples.

## **RCOUNTL (cont'd)**

### **Preservation**

If a request has been made that the rough count codend is to be preserved in formaldehyde for quantitative analysis (QTowF), then the larvae from the rough count may still be preserved for a requested sample type. Put a label in the formaldehyde jar with the plankton stating how many larvae have been removed and preserved elsewhere for analysis. Make a note in the comments section of the COD as to number, species, and if possible, the standard length of each fish removed. When entering the data into COD, be sure to indicate in the box next to QTowF that fish were removed. Make sure all of the plankton from the sorted subsample is also put in the jar.

### When preserving larvae for otolith analysis

Usually it is good to have 20 - 30 larvae per station for otolith analysis but this is not often possible if the larvae are coming just from the sub-sample. If you are willing and time permits, then pick some more larvae from the large sample and put them in a separate scintillation vial labeling them as the second sorting. Add this new number (say 20 from the rough count and 10 from the rest of the sample = 20 + 10) to the column of the ethanol-preserved larvae. Please use the plus sign to indicate the new larvae and remember that the new larvae are not to be added to the rough count number column in the Green Larval Notebook.

### **Record Keeping**

Fill in the Green Larval Notebook with the rough count, number of larvae preserved in each preservative, station number, grid number, etc. See **MISCELLANEOUS** section for an example of how to fill out the Green Larval Notebook. Also see the **MISCELLANEOUS** section for the equation to convert RCOUNTL to #larvae/10 m<sup>2</sup>.

### **Miscellaneous**

Make sure that the codend is rinsed thoroughly before starting the next tow. Rinse all of the sorting equipment.





## **SAMPLING**

### **Juvenile**

#### **J-GUT (Juvenile Fish Stomach Samples)**

Juvenile fish preserved for gut content analysis. A random sample of 50 fish is typically preserved by freezing. Samples may also be preserved in a 32-oz jar with 3.8% formaldehyde (100 ml formaldehyde and 40 ml sodium borate solution) with seawater to complete jar volume. Samples to be frozen should have a label inside the bag. Fish should be arranged in the bag such that the tails will not be vulnerable to breakage during transport since the fish will be measured at a later date. J-GUT samples are collected by special request only and more instructions will be provided when needed.

## **SAMPLING Juvenile**

### **J-LENGTH (Juvenile Fish Length Measurements)**

Juvenile fish that are measured for length frequency analysis. A random sample of up to 150 fish is typically measured. The measured fish may be preserved for other studies, if requested. These samples are collected by special request only and more instructions will be provided when needed.

## **SAMPLING**

### **Juvenile**

#### **J-OTO (Juvenile Pollock Otoliths)**

Juvenile (age-0) pollock collected for otolith analysis.

#### **Preparation**

Have a supply of specimen labels, pencils, permanent markers, and freezer bags ready for use.

#### **Collection**

Juvenile pollock may be collected from any of the trawl types (this will be decided by the Chief Scientist). Samples should be randomly selected. Select 20 - 50 fish per station, if possible.

#### **Labeling**

Make sure samples are labeled with the station number, date, cruise number, and haul number on the inside and outside of the freezer bag. Use a specimen label filled out in pencil for the inside of the freezer bag.

#### **Preservation**

Place fish in the freezer bag with the filled out specimen label such that all of the tails are straight and laying flat in the bag since fish length will be measured at a later date.

#### **Record Keeping**

Place all requested forms (except COD) for each haul in the Juvenile Cruise Binder that will be provided by the Chief Scientist.

## **SAMPLING Juvenile**

### **J-WGHT (Weights Collected For Juvenile Fish)**

Weights collected for juvenile fish. This entry into the COD program is usually individual fish weights, but total catch weights may be entered, if requested. These samples are collected by special request only and instructions will be provided when needed.



## SAMPLING Juvenile

### QTOWF (Quantitative Tow Preserved In Formaldehyde)

A quantitative tow for juvenile fish preserved in 3.7% formaldehyde.

#### Preparation

Pre-label jar(s) for preservation of codend contents.

#### Collection

Gears and mesh sizes will vary.

#### Labeling

Use the waterproof Inside Jar labels for the inside of the jars, which should be filled out in pencil. For outside labeling, use the self-adhesive Outside Jar labels filled out in pen. Remember to label the side of each box with the cruise, gear type, preservative, and box number.

#### Preservation

Rinse codend contents into sieve to reduce the amount of seawater before preservation. Make sure that the sieve you have selected is the same mesh size (or smaller) as the mesh used on the sampling net. Sort out the fish and rinse them off using a wash bottle filled with filtered seawater. Fill a 32-oz jar about half full with fish and add formaldehyde, sodium borate, and more seawater to fill jar to within 1/4" of lip (**shoulder of jar**). See table below for preserving samples in different volume jars. Double the amount of chemicals listed for a 32-oz jar for a final concentration of 3.7% formaldehyde. Screw cap on tight enough to retain liquid when you turn the jar end-over-end to mix the sample and formaldehyde thoroughly. Place jar in the appropriate box.

Jar Volume	Formaldehyde Volume	Sodium Borate Volume
8 oz	12.5 ml	5 ml
16 oz	25 ml	10 ml
32 oz	50 ml	20 ml

## **SAMPLING Juvenile**

### **RCOUNTJ (Rough Count Juvenile)**

A rough estimate of juvenile fish abundance obtained at sea.

#### **Collection**

Gear and mesh size will vary. Count all individuals, if less than 200. If more than 200, then randomly sub-sample about 200 juveniles and count and weigh them. Weigh the remaining portion of the juveniles and use the following formula to calculate total catch:

$$\text{Total \# Caught} = \frac{\text{sub-sample \#}}{\text{sub-sample weight}} \times \text{Total Sample Weight}$$

\* Total Sample Weight = sub-sample weight + fish weight not sub-sampled

Divide by distance towed and multiply by 10 to give a rough estimate of fish number per 10 minute tow. Make sure weight units are consistent (do not mix grams and pounds without converting to a common unit).

#### **Preservation**

Preservation will vary upon requested sample type.

#### **Record Keeping**

Fill out a Catch Form and record rough count in the COD.





### **A-GUT (Adult Stomachs For Gut Content Analysis)**

Collection or at-sea analysis of adult fish stomachs for prey items. These samples will be taken by special request. Stomach Content Forms will be provided when needed.

#### **Collection**

A random sub-sample of all age classes of potential pelagic predators (e.g., eulachon, arrowtooth flounder) should be set aside from either the bottom trawls (Shrimp or Nor'eastern) or midwater trawls (Shrimp or Anchovy) as the tows are being processed. It is preferred that fish that are already weighed, sexed, and measured be used in this study. Those chosen for stomach analysis should be taken at random from the available fish and should be examined for signs of regurgitation in the oral cavity (extruded stomach or food particles present). Those showing no evidence of regurgitation may be sampled. A fish to be sampled should be placed on a clean board so that any stomach contents that fall out of the stomach during removal may be placed in a stomach bag or a petri dish.

#### For At-Sea Stomach Analysis

- 1) Record the length (TL), weight, and sex of each specimen on the Stomach Content Form.
- 2) Weigh an empty petri dish and tare the scale.
- 3) Estimate the percent of the stomach fullness and record. Carefully cut open the stomach over a large petri dish and let the contents fall into the dish. Scan the stomach with a gloved finger to remove all prey/prey parts.
- 4) Weigh the filled petri dish and record the weight.
- 5) Record the percent frequency of prey items and weigh and length any intact, identifiable fish.

#### Stomach Preservation For Later Analysis

Each stomach should be excised from as close to the esophagus as possible to the pylorus, and placed in a small stomach bag with a completed stomach bag tag as to cruise, station, and consecutive specimen number. Also fill out a Specimen Label and put it inside the stomach bag. Specimen numbers should also be written on the Specimen Form in a separate column marked Stomach Number. A minimum of 20 stomachs per species per haul should be taken unless requested otherwise. Smaller fish collected for stomach analysis, such as eulachon or other smelt, may be preserved whole in a large stomach bag after first slitting open the side of the fish to allow formaldehyde penetration.

## **A-GUT (cont'd)**

Up to 10 fish may be put together in the same bag. Place all of the stomach bags in a 5-gallon bucket with formaldehyde solution. The buckets should be labeled on the top and side with cruise number, hauls, species contained in the bucket, and the sample requestor's name. Seal each bucket with an uncut lid.

### **Preservation**

#### For At-Sea Stomach Analysis

Freeze partially digested fish in a labeled bag if the fish cannot be accurately identified.

#### Stomach Preservation For Later Analysis

The stomach bags should be tied securely and then immersed in a bucket containing 10% formaldehyde/seawater solution. One liter of 37% formaldehyde per 5-gallon bucket will make the 10% solution. Try not to put more than 60 stomachs in each bucket, in order to allow sufficient preservation.

### **Record Keeping**

Arrange with the Bridge before the trawl as to who will be filling out the Haul Position Form for the trawl. Fill out a Specimen Form with the ID number, length, weight, and sex for each tow. If the stomach work is done as a piggyback study during another project's cruise, please get copies of the Haul Position Forms and any trawl catch information before leaving the vessel.

### **Miscellaneous**

If possible, try to make the stomach collections within an hour of when the trawl is on deck to minimize digestion of contents.

## **SAMPLING**

### **Adult**

#### **A-LENGTH (Adult Fish Length Measurements)**

Adult fish measured for length frequency analysis by length-board or poly-corder. Instructions on the operation of a poly-corder will be given at the time of use. These samples are collected by special request only.

**SAMPLING**  
**Adult**

**A-WGHT (Weights Collected From Adult Fish)**

Weights collected from adult fish. These samples are collected by special request only.



## **SAMPLING**

### **Adult**

#### **STRIP (Strip Spawning of Adult Pollock)**

Stripping and fertilization of pollock eggs for transport to a rearing facility.

#### **Preparation**

Check that the refrigerator or cold room is set at the proper temperature; typically this is 3°C. Attach the Cuno filter housing, without a filter, to the ship's seawater system and let the system run for 15 to 30 minutes. Next, place a 25 µm filter in the housing and fill the carboys and gallon jars used to incubate the eggs. Store filtered seawater in the refrigerator or cold room.

You will need the following equipment to process, maintain, and transport the fertilized eggs:

- Cuno filter housing
- 25-µm filter cartridge
- plastic white bowls
- large PVC sieve
- ladle
- net with circle (about 500 eggs will fit in circle)
- wash bottle
- gallon jars and netted plastic lids
- red crates (each crate will hold six 1-gallon jars)
- 2.5 gal. seawater carboys (for 25-µm filtered seawater)
- long plastic pipettes
- 1/4" Styrofoam (to put between jars in red crates)
- thermoses
- coolers
- blue ice
- duct tape
- shipping labels

#### **Collection**

Select females that are running ripe or will extrude eggs with gentle pressure. Select males that are leaking milt or will release milt with gentle pressure. Use 1 - 2 males per female, depending upon availability or instructions given.

## **STRIP (cont'd)**

Put about 2 liters of 25- $\mu$ m filtered 3°C seawater into a large white plastic bowl. Extrude eggs from a female by applying gentle pressure with the base of your thumb. Good eggs are completely translucent and should flow freely from the vent. If you have to apply a lot of pressure, the female is probably not ready and you may contaminate the sample with fecal material. Extrude a small amount of milt from one male into the bowl and mix gently by hand briefly. Extrude milt from a different male into the bowl and mix briefly.

Let the eggs and milt sit about 5 - 10 minutes after mixing. Put the large PVC sieve into another large bowl that is filled with filtered seawater and gently ladle surface eggs into the sieve. The best eggs will be in the top 1/2" of water in the bowl so ladle eggs only from the surface. Rinse eggs by gently pouring filtered seawater into the sieve until the bowl is full. Quickly lift sieve out of the bowl, dump rinse water, fill bowl with seawater, put sieve back into bowl, and pour more water over the eggs. Repeat this procedure until the rinse water is clear. Leave the eggs exposed to air only briefly.

Fill a white bowl with about 2 liters of filtered seawater. Transfer eggs into the bowl by backwashing the sieve with a wash bottle filled with filtered seawater. Ladle surface eggs onto the net with the circle on it. The small circle equals about 500 tightly packed eggs in a single layer. About 1,500 eggs should then be transferred by backwashing eggs off of the net with a wash bottle into a gallon jar which has been filled 3/4 full with 25  $\mu$ m filtered seawater. Screw on a white plastic lid with screening. Place jars in red crates with 1/4" Styrofoam between jars and keep them at 3°C. Label the jars with spawning date and time.

### **Maintenance**

About 50% of the seawater should be changed every day with filtered seawater (stored in carboys at 3°C). Pour water out through the screening. Use the wash bottle to remove any eggs off of the screen and back into the jar. Dead eggs need to be removed daily; they are white and sink to the bottom of the jar. Dead eggs can be concentrated in the center of the jar by gently swirling the water with a long plastic pipette and then waiting for the eggs to settle on the bottom where they can be removed with a long plastic pipette. Fill the jar 3/4 full with filtered seawater from carboys.

**STRIP (cont'd)**

**Transportation**

To ship eggs, fill each thermos about 3/4 full of filtered seawater and chill overnight. Put blue ice in a -20°C freezer overnight. Gently pour eggs from gallon jars onto the small net with the circle on it. Approximately 500 eggs can fit inside of the circle in a single layer. It is best to transport only 500 - 1000 eggs per thermos. Top off thermos with filtered seawater (leaving about 1" of air space) and cap. Put as many blue ice packages into each cooler as possible (at least 4 in small cooler, 6 in large cooler). Place a completed shipping label outside each cooler. Tape coolers shut with duct tape.







## **SAMPLING CTD / Rosette**

### **ABSORB (Spectral Absorbance Samples Collected From CTD Casts)**

Absorbance samples may also be collected from the underway water system.

#### **Preparation**

The chlorophyll manifold is required for filtration; if it is not already set up, then follow the instructions on the CHLOR page in SAMPLING, CTD/Rosette. Rinse the cups and bases with freshwater before and after filtering to reduce the chance of contamination. Place a 2.5-cm glass fiber filter (nominal pore size 0.7  $\mu\text{m}$ ) on each of the bases you will be using. Twist cup into place. Label microcentrifuge tubes (see Labeling below).

#### **Collection**

The goal is to filter enough water so that color (brown or green) is easily visible on the filter. In clean waters (i.e., low phytoplankton) this will be approximately 1 liter. In dense waters the volume can be as low as 100 ml. It is better to err on the side of filtering too much than not enough. Collect chlorophyll samples (see CHLOR page) whenever an absorbance sample is collected.

#### CTD

Use a graduated cylinder or calibrated poly bottle (used for chlorophylls) to collect water from the Niskin bottle. Do not dump the Niskin bottles until you are sure you have filtered enough water.

#### Underway/Surface

These samples require the flow-thru fluorometer to be set up; if it is not, then follow directions on SURFACE CHLOROPHYLL page in SAMPLING. Collect water by adjusting the flow of the garden hose in the sink. Use graduated cylinder or calibrated poly bottle (used for chlorophylls) to collect the water. Make note of the fluorometer reading from the SCS window. Adjust the garden hose back down to a trickle (so bubbles can escape).

When filtering samples, vacuum pressure should be  $< 7$  psi to reduce the chance of particle breakage. Keep a record of the total volume filtered (see RECORD KEEPING section). When finished, use two forceps to remove the filter from the base without touching the forceps to the colored area. Bend the filter in half (color on the inside), being careful not to let the two inner sides touch each other. You just need to bend it enough so that it fits inside a labeled microcentrifuge tube. PLEASE DO NOT CRAM FILTERS INTO THE BOTTOM.

## **ABSORB (cont'd)**

### Blanks

Collect four blanks for each new box of filters used by filtering 100 ml of distilled water (you can ask the Survey Department for distilled water) through each of four filters. Place each filter in its own labeled microcentrifuge tube. These samples are used for laboratory calibrations.

### **Labeling**

#### CTD

Label each tube with FOCI cruise number, CTD cast, depth and volume filtered.

#### Underway/Surface

Label each tube with FOCI cruise number, GMT Date, GMT time and total volume filtered.

### Blanks

Label each tube with the FOCI cruise number, GMT Date and GMT time and the word BLANK.

### **Preservation**

Quickly place samples into the -80 °C freezer in labeled white freezer boxes (cruise and "Absorbance Samples"). It is important that these filters freeze as quickly as possible.

### **Record Keeping**

#### CTD

Note the sample depth and volume filtered on the CTD cast log form and COD form. Record volume filtered and station information on the CTD Cast Chlorophyll and/or Absorbance Sample sheets.

#### Underway/Surface

Record GMT date, GMT time, volume filtered and fluorometer reading (station and haul if on station) on Flow-thru Chlorophyll and/or Absorbance Sampling Log sheets.

### Blanks

Record GMT date, GMT time and the word BLANK on Flow-thru Chlorophyll and/or Absorbance Sampling Log sheets so that you know they were taken and approximately where they are in the freezer box.

### **Maintenance**

Follow instructions on MAINTENANCE for CHLOR in SAMPLING.



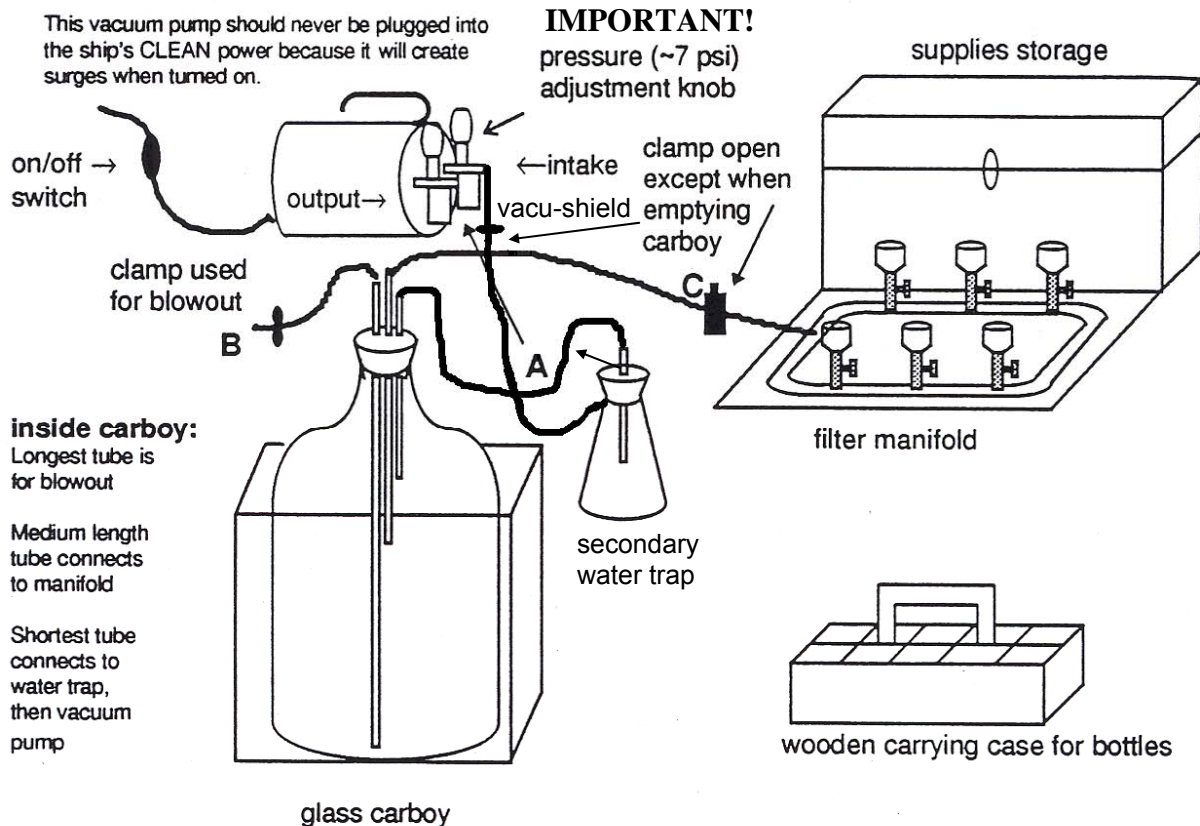
## SAMPLING CTD / Rosette

### CHLOR (Chlorophyll Samples Collected From A CTDB Cast)

Extracted chlorophyll is an index of phytoplankton biomass.

#### Preparation

Connect apparatus as shown.



Locate small plastic calibrated sample bottles and rinse with freshwater.

Note: There are two sizes of calibrated bottles available for chlorophylls. For winter/fall cruises, it is best to start with the larger bottles (~289 ml). If the filters clog (looks very brown or green) and filtration time lengthens, then switch to the smaller bottles (~139 ml). Make sure that you still see some color (light green or brown) on the filters after using the smaller sample volume; otherwise switch back to large bottles. You will most likely need to use the smaller bottles on spring cruises.

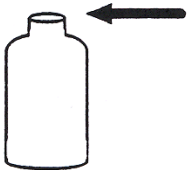
**CHLOR (cont'd)**

Ready filter apparatus by placing a clean 2.5 cm glass fiber filter (0.7 micron pore size, there is no difference between sides) on each of the six bases using the Millipore forceps. Rinse filter cups with freshwater and twist into place. Label microcentrifuge tubes (see Labeling section).

**Collection**

Water is collected on the “upcast” with Niskin bottles at depths determined by the Chief Scientist. Typical casts include the collection of MZ, chlorophyll, and nutrients from a single Niskin bottle with chlorophyll and nutrients being sampled first. If this is the case, then the procedure is as follows:

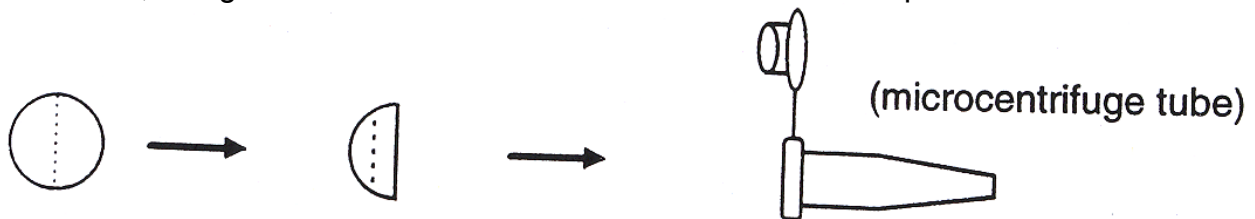
On deck, use a freshwater rinsed graduated cylinder to remove 500 ml of seawater from the Niskin bottle. Rinse calibrated sample bottle twice with a small amount of water from the graduated cylinder. Remember that the 500 ml will be used (in most cases) for a chlorophyll and nutrient sample.



After 2 rinses fill bottle to the top (gently tap to remove air bubbles and add more water if necessary) and screw on cap.

Chlorophyll degrades in strong light or heat so if you can't filter the bottles right away, please store them on ice in the dark (or in a refrigerator) until you can filter them.

In the lab, gently pour samples into filter cups and filter samples using low vacuum (7 psi). **It is critical the vacuum is  $\leq 7$  psi.** When finished, remove filter cup. Use two forceps to fold filter into fourths lengthwise (like a burrito) with filtered material (color) on the inside, being careful not to touch colored area with the forceps.



Place filter into labeled microcentrifuge tube. **Please do not jam filter into bottom** because they are difficult to remove when frozen. Wrap all samples from a single cast in a sheet of aluminum foil and label the foil (see below).

## **CHLOR (cont'd)**

### **Labeling**

Label each tube with FOCI cruise number, station, haul and depth using a fine-tip permanent marker. **If there are multiple samples taken from the same depth** (separate Niskin bottles or not) **you must record the volume filtered on each microcentrifuge tube.** To calculate chlorophyll concentration you must have volume filtered. Wrap all samples from a single cast together in a sheet of aluminum foil. Label outside of foil with FOCI cruise number, station, and haul using a broad-tip permanent marker.

### **Preservation**

Place aluminum foil packet into a gallon size freezer bag or white freezer box and place in the -80° C freezer. The bag or box should be labeled with the cruise #.

### **Record Keeping**

Complete the sample depth, volume and sample number information on the COD form. Also, please fill in the sample volume on the CTD cast log form next to corresponding depths. This information has proved very helpful in the past when questions regarding station numbering arise.

### **Maintenance**

Emptying the carboy:

The water that collects in the large glass carboy will need to be periodically emptied. Water should never reach the level of the shortest tube; if it does, then water will be sucked into the secondary water trap. If you ever see water in the secondary trap, stop filtering and empty the carboy. If the secondary water trap fills, water will get sucked into the pump. A vacu-shield, a special inline filter that water cannot pass through, has been installed. This should protect the pump, but it is only a backup. Please replace the vacu-shield if water enters it. To empty the carboy, disconnect the hose that connects the water trap to the vacuum pump (hose with vacu-shield). Disconnect hose labeled **A** from top of water trap and connect to pump output. Open the clamp used for blow out (labeled **B**). Close the clamp nearest the filter manifold (labeled **C**). Turn on the vacuum pump. Water should flow out of the tubing (the one with clamp **B** on it). Water can be used for MZ samples and stored in white plastic FSW carboy or just poured down the sink. When done, close clamp **B** and open clamp **C**. Return tubing labeled **A** to the top of the water trap and reconnect tubing from the side of the water trap to the pump intake.

**Caution: By pumping air into the carboy, you are creating a potentially dangerous situation. Stay with the carboy and immediately turn off the pump as soon as you start to hear air coming out of hose B.**

## **SAMPLING CTD / Rosette**

### **CHLOR (cont'd)**

#### **Pump:**

If the provided pump has an oil reserve (will be located near intake valve) you must make sure that there is oil in the pump. Running an oil pump without oil will cause the pump to seize. Extra pump oil is supplied.

Periodically spray WD-40 inside the pump through the intake and allow it to run without vacuum to purge the pumping chamber of any condensable vapors (seawater). To do this you must disconnect the tubing from the intake and output valves on the pump. Turn the pump on and spray the WD-40 directly into the intake hole and let the pump run for 3 - 5 minutes.

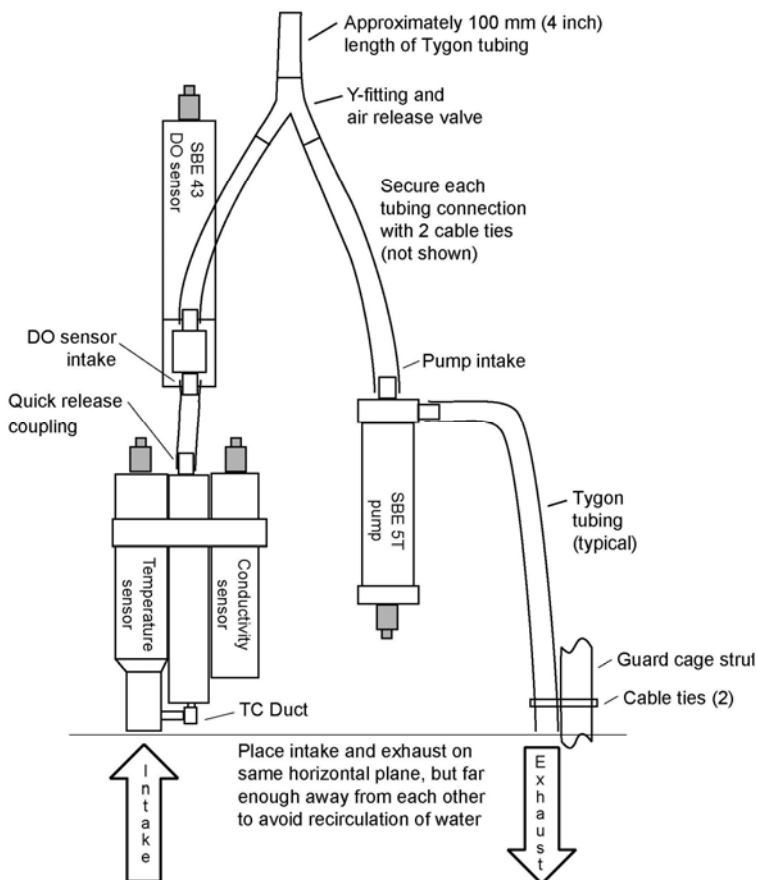
#### **Miscellaneous**

If the -80°C freezer goes down, please transfer samples to the -20° C freezer. Record on next COD form when the samples were transferred and how long they were at > 0°C.

## SAMPLING CTD / Rosette

### FLUOR (Fluorometer Data Collected From a CTD Cast)

The Western Environmental Technology Laboratories Inc. (WET Labs) WETStar fluorometer is typically on a saddle mounted on a Sea-Bird Electronics 911plus CTD and held in place by a hose clamp encircling the WETStar and CTD. The following Sea-Bird image shows a general CTD set-up. We would replace the SBE 43 oxygen sensor with a WETStar fluorometer. The WETStar is rated for a maximum depth of 600 m. For deeper casts the fluorometer needs to be removed and a single piece of Tygon tubing installed between the quick-release coupling and the air-release valve.



Modified from Sea-Bird application note 64-1. Used with permission from Sea-Bird Electronics Inc.  
<http://www.seabird.com/>

**FLUOR (cont'd)**

WETStar Fluorometer Specifications: (from <http://www.wetlabs.com/>)

**Mechanical**

Size: Pressure housing - 6.7 x 2.7 in (17.1 x 6.9 cm)  
Overall height (including bulkhead connector and tubing fittings) - 10.2 in (25.7 cm)

Weight: in air: 1.7 lb (0.8 kg)  
in water: 0.25 lb (0.1 kg)

Rated Depth: 600 m

Housing: Acetal copolymer

**Electrical**

Response Time: 0.17 sec (analog)

Input: 7 - 15 VDC

Output: 0 - 5 VDC (analog)

Current Draw: < 40 mA (analog)

Linearity:  $\geq 99\% R^2$

**Optical Chlorophyll**

Dynamic ranges: 0.03 - 75  $\mu\text{g/l}$  (standard)

Sensitivity:  $\geq 0.03 \mu\text{g/l}$

Excitation: 460 nm

Emission: 695 nm

This WETStar is primarily designed to measure the fluorescence of chlorophyll-containing phytoplankton, which absorb light of wavelengths between 400 and 520 nm and emit light between 670 and 730 nm.

A pump, used during calibration and during field work, will provide a consistent flow and ensure the highest quality data.

**FLUOR (cont'd)**

**Record Keeping**

Record on the CTD COD sheet that the fluorometer is being used by filling in the appropriate project code for "Fluor" in the Samples Collected section.

**Maintenance**

After each cast, flush the instrument with clean freshwater, paying careful attention to the flow tube. Soapy water will cut any grease or oil accumulation. The tube is high quality quartz that can easily be broken or scratched, so use caution. Do not use a dowel or stiff brush in the tube. A long cotton swab works nicely for cleaning the tube. At the end of the cruise, the instrument should be rinsed thoroughly, air-dried and stored in a cool, dry place. Solvents such as methanol may also be used to clean the tube.

### **LUGOLS (Seawater Samples Preserved Using Lugol's)**

Lugol's is an acidic, iodine-based preservative used to fix protozoa in seawater samples.

Gloves should be worn when working with Lugol's. When not being used, Lugol's needs be stored in the dark due to its photoreactivity.

#### **Preparation**

Depending on the sample request and jar type provided, you may be asked to calibrate sample jars before collection (some requests may ask you to eyeball the water level). If asked to calibrate, then see Miscellaneous section (next page) for an example.

#### **Collection**

Drain water from Niskin bottles directly into the jar up to the "fill" line. Cap and bring into the lab for preservation.

#### **Labeling**

Label with two FOCl jar labels on the sides of the bottle. Record the depth sampled in the Mesh space on the label. Write LUGOL'S in the margin of the label. NO INSIDE JAR LABELS, PLEASE.

#### **Preservation**

Samples are to be preserved in a 2% Lugol's solution. Use "dead" graduated cylinder or syringe to measure the appropriate amount of Lugol's required for the jar size provided. Carefully pour into jar using a funnel if necessary. GENTLY mix samples end-over-end and store them in the dark.

#### For a narrow mouth 1-liter bottles:

Add 16 ml of Lugol's to 800 ml of seawater (this is about 2%).

Some sample requests will provide pre-filled bottles that already contain the correct amount of Lugol's. In this case, you will use an "intermediate bottle" to collect the sample from the Niskin bottle. This prevents the preservative from contaminating the sample in the Niskin bottle. Rinse the "intermediate bottle" three times with water from the Niskin bottle before collecting the sample. If asked to use a piece of silicon tubing on the Niskin bottle, place tubing inside the "intermediate bottle" and fill to fill line. The tubing reduces turbulence during sampling and minimizes damage to delicate microzooplankton. Take sample inside and GENTLY pour sample from intermediate bottle into the pre-filled sample bottle. Label with two self-adhesive Outside Jar labels on the sides of the bottle. GENTLY mix sample end-over-end and store in the dark.



## **LUGOLS (cont'd)**

### **Record Keeping**

Mark an "X" next to the appropriate sample depth in the "other" column on the COD form and fill in the total number of Lugol's samples. Also, write LUGOLS in the "Other" column of the CTD Cast Log Form, corresponding to depth sampled.

### **Miscellaneous**

#### Lugol's Recipe (Unesco, 1978)

1. Dissolve 100 g KI in 1 L distilled water.
2. Add 50 g iodine (chrySTALLINE).
3. Add 100 ml glacial acetic acid
4. Put on a stir plate with a stir bar in the solution and let it mix for a day to let the iodine dissolve.
5. Decant any precipitant.

Phytoplankton Manual Publ. by: Unesco; Paris (France)., 1978., 337 p., Monogr. Oceanogr. Methodol., (no.6).

#### Calibrating jars

For 1-liter narrow-mouth sample jars, use a graduated cylinder and measure 800 ml of freshwater and pour into the sample jar. Use a permanent marker to draw a line on the outside of the jar at the water level. This is referred to as the "fill" line. Empty jar and store until needed.

## SAMPLING CTD / Rosette

### MZ (Microzooplankton Samples Collected From a CTDB Cast)

Microzooplankton samples collected to determine prey abundance for larval pollock and other fish larvae.

**NOTE:** Although the original definition of MZ was just for samples collected from CTD casts, we now also consider the sample abbreviation for CalVET tows (where microzooplankton collection is the primary goal) to be MZ also. It must be entered this way to allow for easier sample tracking.

### Preparation

First time setup requires the assembly of the pieces shown below.

put tape label on each collar designating appropriate sample depth



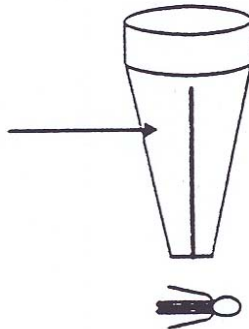
PVC collar

place electrical tape over screw to prevent tearing of other nets



hose clamp

make sure rough seam faces out



41-µm mesh

MZ net clamp

Put a 6" piece of 3/8" ID silicon tubing on the stopcock of the Niskin bottle for each depth to be sampled. Attach bungee cords to Niskin bottle (around bottle and above stopcock) so as not to interfere with spring (if external), but to be used as a hook to hold net during filtering (see figure in Collection section). Tubing and bungee cords can stay on the Niskin bottles during all CTD casts.

**MZ (cont'd)**

CTD cast preparation:

Before each cast, rinse nets with freshwater and fold as shown.

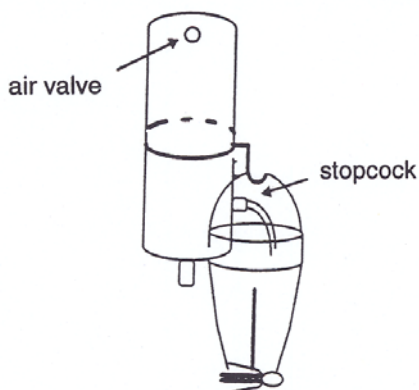


Have approximately 2 liters of filtered seawater (FSW) on hand for each cast. Obtain FSW by emptying the glass carboy used for filtering chlorophylls (refer to MAINTENANCE section of the CHLOR page in SAMPLING for directions). If FSW is not available, then prepare some by filtering seawater through one of the MZ nets. Fill two squirt bottles with FSW. Prepare labels (see Labeling below).

**Collection**

Water is collected on the up-cast with 10-L Niskin bottles at depths determined by the Chief Scientist. Typical casts include the collection of MZ, chlorophyll and nutrients from a single Niskin bottle. If this is the case, then procedure is as follows:

Use a graduated cylinder to remove exactly 500 ml of seawater for chlorophyll and nutrient collection and then attach MZ net to bungee cord and place silicon tubing inside net. Open stopcock and air valve and let Niskin bottle completely drain.



When all bottles have drained, collect nets and bring into lab for immediate preservation.

**SAMPLING  
CTD / Rosette**

**MZ (cont'd)**

**Labeling**

NO INSIDE JAR LABELS. There should be two identical labels, one on the lid and one on the side of the jar that both contain the following information:

NMFS/FOCI Seattle
Cruise: _____
Date: _____
Station: _____ Haul No. _____
Gear: _____
Depth: _____ Volume: _____
Net: _____ Mesh: _____
MICROZOOPLANKTON

**Preservation**

Preserve MZ samples in **8-oz jars** with filtered seawater (at least down to 41 $\mu$ m) and 12.5 ml of formaldehyde (buffered with 5 ml sodium borate).

Place jar into the jar holder in sink. Put the large MZ funnel into jar. Hold net over jar and remove clamp. Gently unfold net and rinse contents into jar with squirt bottle of filtered seawater. NEVER USE SEAWATER FROM SINK WITHOUT FIRST FILTERING.

**Record Keeping**

Mark an "X" next to the appropriate sample depth in the mz column on the COD form and fill in the total number of mz samples. Also, place an "X" in the "CHLOR/MZ" column of the CTD Cast Log Form next to corresponding depth sampled.

## **SAMPLING CTD / Rosette**

### **NUT (Nutrient Samples Collected From a CTDB Cast)**

Nutrient samples are used to determine if conditions are favorable for phytoplankton growth.

#### **Preparation**

Small numbered plastic bottles (60-ml bottles stored in wooden flats) should be located and set out before the CTD cast begins.

#### **Collection**

Collect water from Niskin bottles at depths determined by the Chief Scientist. Typical casts include the collection of MZ, chlorophyll, and nutrients from a single Niskin bottle, with nutrients and chlorophyll sampled first. If this is the case, then the procedure is as follows:

Use a freshwater-rinsed graduated cylinder to remove 500 ml of seawater from the Niskin bottle. Rinse the nutrient bottle two times with the cap on using a small amount of water from the graduated cylinder. Remember that the 500 ml will be used (in most cases) for a chlorophyll and nutrient sample.

Fill the numbered plastic bottle 1/2 to 2/3 full and screw the cap on tight.

**DO NOT OVERFILL BOTTLES !!** Water expands as it freezes and will force open the lid resulting in a contaminated sample that is useless.

Keep track of the bottle number used for each Niskin bottle since these numbers will need to be recorded in the lab (see Record Keeping).

#### **Preservation**

Place bottle in an upright position in the -80° C freezer to freeze the sample quickly. Once frozen, samples can be moved to the blast freezer (-20° C). Try to keep bottles in sequential order. Use the empty wooden carrying case that the bottles came in for storage in the freezer.

#### **Record Keeping**

Record the bottle number of each sample and the total number of nutrient samples on the COD form. Also record this information on the CTD Cast Log Form in the "Nutrient Bottle#" column corresponding to depth sampled. The sample is useless unless the depth is known.

**Note: If these samples are going to be processed by the PMEL nutrient analysis lab, then the code on the COD form should be CMNUTS not NUT.**

**SAMPLING  
CTD / Rosette**

**NUT (cont'd)**

**Miscellaneous:**

If the blast freezer goes down or space becomes limited, then the samples may be kept in any alternate freezer available. Please check with the Operations Officer or Survey Tech first. Record on next COD form that the freezer failed and samples were moved.

## **SAMPLING CTD / Rosette**

### **PAR (Photosynthetically Active Radiation)**

Photosynthetically Active Radiation is measured using a light meter attached to the CTD/Rosette. Installation and maintenance of this unit is conducted by PMEL and the Survey Department in conjunction with AFSC. The Chief Scientist should ask the Survey Department to confirm that this unit is installed and functioning before entering PAR into the COD.

### **Miscellaneous**

Record PAR on the COD for all casts in which it is used. It will be up to the end user of the data to determine whether the data meets specific light criteria.

**Important Note:** Maximum depth for this instrument is 1,000 m. Remove the unit and cap the cable connection if the CTD cast will exceed this depth.

## **SAMPLING CTD / Rosette**

### **PHYTOF (Phytoplankton Samples From a CTDB Cast)**

Seawater samples collected from a CTD cast for phytoplankton cell counts.

#### **Preparation**

Prepare labels for jars (outside only). NO INSIDE LABELS.

#### **Collection**

Water is drained directly from a Niskin bottle into a 32-oz. or 1-liter jar. Attach a piece of silicon tubing to the stopcock on the Niskin bottle to direct the water into the jar. Gently fill the sample jar to the shoulder and complete volume with 25 ml of formaldehyde and 10 ml sodium borate.

#### **Labeling**

Use a self-adhesive Outside Jar label on the top and side of the jar.

#### **Preservation**

Preserve sample in a 32-oz or 1-liter jar using 25 ml of formaldehyde and 10 ml sodium borate. Gently turn jar end-over-end to mix the sample.

#### **Record Keeping**

Record PHYTOF in "Other" column of CTD Cast Log Form corresponding to depth sampled. Also record it on the COD form.



**SAMPLING**  
**CTD / Rosette**

**POC (Particulate Organic Carbon Samples Collected From A CTD Cast)**

These samples are not requested on a regular basis. Instructions will be given when needed. Please note in the Comments Section on the COD form who these samples were collected for.







## **SAMPLING**

### **Dedicated Transects**

#### **ADCP (Acoustics Doppler Current Profiler)**

A vessel-mounted Acoustics Doppler Current Profiler collects data continuously while the ship is underway. The ADCP measures the instantaneous current velocity over a set depth range of the water column and is a function of the sound frequency used by the ADCP. PMEL staff must process this data since the raw data is not error corrected. Check with the Survey Department to make sure the equipment has been functioning correctly before recording data to be processed.

#### **Miscellaneous**

Dedicated transects do not contain any stations between the beginning and the ending of the transect.

## **SAMPLING**

### **Dedicated Transects**

#### **EK60 (EK-60 Data Collected on Dedicated Transects)**

The EK60 is used to detect the presence of unusual acoustic signals or heavy fish sign.

The Simrad EK-60 Scientific 18, 38, 120, and 200 kHz Echosounding System (*Miller Freeman* and *Oscar Dyson*) will be turned on during some scientific operations and should be monitored regularly for the presence of unusual acoustic signals or heavy fish sign. The EK-60 settings will be established at the beginning of the cruise and remain the same throughout the cruise. Because of the complexity of the system, only those scientists who have been trained by acoustic personnel will be allowed to use the EK-60. A COD form should be filled out only for dedicated acoustic transects (i.e., no stations between beginning and ending of the transect).

## **SAMPLING**

### **Dedicated Transects**

#### **SSF (Sea Surface Fluorescence)**

Seawater from the scientific seachest is pumped (past a TSG sensor) to the Chem Lab and through a continuous flow fluorometer. The fluorescence values are automatically recorded by the SCS system. The ship's SCS manager is responsible for ensuring that data from the instrument are correctly logged by the SCS. The scientists are responsible for collecting calibration samples (see SURFACE CHLOROPHYLL section in SAMPLING).

## **SAMPLING**

### **Dedicated Transects**

#### **TSG (Thermosalinograph)**

A Sea-Bird thermosalinograph is mounted in the scientific seachest and the values are logged by the SCS system. The ship's SCS manager is responsible for ensuring that data from the instrument are correctly logged by the SCS.







**AMGEN**

Samples preserved at sea for genetic analysis in the laboratory for species identification.

**Collection**

Remove up to 25 specimens per taxon from a non-QTOWF sample. A list of taxa that are of interest will be provided. At each station, all larvae should be put in one vial; more than one vial may be used if many larvae are collected. Enter total number of vials used at each station for this study in COD.

**Labeling**

Label a scintillation vial for each station with cruise, station, haul, and preservative type (i.e., E for ethanol).

**Preservation**

Preserve samples in 100% ethanol (non-denatured only).

**Record Keeping**

Log station information, taxa, and number of each taxon into the green field notebook provided.

**Miscellaneous**

Seal vials with electrical tape prior to transport.

## **ATHGEN**

*Atheresthes* specimens selected for at-sea genetic analysis.

### **Collection**

From each fish selected for analysis, the person performing the genetic analysis will remove the eyeball and will either prepare the sample for DNA extraction or preserve it in 100% ethanol (non-denatured only). Clean forceps used for eyeball removal with ethanol or water after each use to prevent contamination between specimens. The fish body will be preserved in 1.8% formaldehyde in a scintillation vial for confirming fish identification at a later date. The following is a list of supplies needed:

- scintillation vials
- strip tubes
- 100% ethanol (non-denatured)
- electrical tape for sealing vials (for transport)
- 1.8 % formaldehyde

### **Labeling**

Label all specimens sequentially and in conjunction with each other throughout the entire survey so that each eyeball and fish may be matched up later.

Label scintillation vial for each station with cruise, station, haul, preservative (Form), and sequential number of specimen (e.g., #1, #2, etc.). Label strip tube with sequential number of specimen (#1, #2, etc.).

### **Preservation**

Preserve eyeball samples in 100% ethanol (non-denatured only). Preserve each fish body in 1.8% formaldehyde.

### **Record Keeping**

Record total eyeball/fish numbers in COD for each station/haul. Log station information and sequential numbers of specimens in green field notebook provided.

**DEPLOY (Deployment of Buoy or Mooring)**

A deployment of a satellite-tracked buoy or mooring will be given an independent station number unless there will be sampling in conjunction with this operation. In this case, the deployment may be given a station number and a haul number. Consecutive haul numbers will be used for operations coordinated with the deployment. Record the Argos buoy identification number on the COD sheet. The ARGOS buoy identification number is located on the float. Once the buoy is deployed, contact [Carol.Dewitt@noaa.gov](mailto:Carol.Dewitt@noaa.gov) at PMEL and send her the following information:

Ship's cruise number  
Argos buoy number  
GMT date and time of deployment  
Latitude and Longitude  
Purpose of deployment (i.e., larval patch, mooring site 2)

## **DISCARD**

The COD was created such that every gear or net entry must have at least one corresponding sample entry. If a gear or net collection fails, BUT SOME DATA WAS COLLECTED ON THAT HAUL, you must enter the failed gear/net in the COD with DISCARD as the sample type.

### Example

A 60-cm bongo tow is done with the intention of saving both nets as QTOWF. When the net is brought on board, you notice that net 2 has a broken codend. The decision is made not to redo the entire haul, but to save the contents of net 1 as QTOWF. Net 2 should be entered in the COD with performance= FAIL and sample type= DISCARD. If the decision had been made to redo the entire haul, then there is no need to enter the failed haul in the COD.

EcoFOCI also uses DISCARD in situations involving rough counts. When a rough count is done, but the codend is not saved (as in QTOWF), the sample types entered in the COD would be RCOUNT and DISCARD.

## **SAMPLING**

### **Other**

#### **LIVE (Collection of Live Organisms For At-Sea Experiments)**

The collection of zooplankton, predators, or fish eggs for live experimental work at sea. These samples are not collected on a regular basis and are by special request only.

In the Comments Section on the COD form, write a note that explains what species were collected and what experiment and researcher they were collected for.

**RECOVERY (Recovery of Buoy or Mooring)**

A recovery of a buoy or mooring will be given an independent station number unless there will be sampling in conjunction with this operation. In this case, the recovery may be given a station number and a haul number with the sampling assigned the same station number with consecutive haul numbers used. Record the buoy or mooring number on COD.



## **Collecting Genetics Samples**

Genetics samples should be taken from freshly caught fish. Samples may include eggs, whole fish, or any fin or other tissue (except the liver). For fin clips, grasp a fin with forceps and cut off a small piece (the size of a paper match is plenty). Samples may then be stored at room temperature indefinitely. If large amounts of tissue are placed in a single jar, the ethanol may become discolored after a day. If this is the case, then pour off the ethanol and replace it with fresh ethanol to improve preservation. If ethanol is not available, collect fin clips in a jar or plastic bag and then freeze them. Keep frozen until ready to use.

If transporting ethanol preserved samples is a problem, then be prepared to remove the samples from the ethanol for “moist” shipping. When you are ready to ship the samples, pour off the ethanol and place them (moist) in a Ziploc bag. You might want to double-bag to prevent leakage. At this point they may be shipped without subsequent degradation. It is a good idea to either replace the ethanol or freeze these samples when it is convenient after they have been transported. Without ethanol, samples will rot and become completely useless so it is essential to freeze them if the ethanol is not replaced.

**NOTE: Always use non-denatured 100% ethanol. This is sometimes called absolute ethanol.**

### **Contact the following persons if you have questions:**

Ingrid Spies/ Mike Canino  
NOAA/NMFS/AFSC Genetics Laboratory  
7600 Sand Point Way NE  
Seattle, WA 98115  
(206) 526-4786 / (206) 526-6277 / (206)526-4108  
[Ingrid.Spies@noaa.gov](mailto:Ingrid.Spies@noaa.gov)  
[Mike.Canino@noaa.gov](mailto:Mike.Canino@noaa.gov)

## **CTD Data Processing**

A Sea-Bird SEACAT 911 Plus is used to measure conductivity, temperature, and depth in the water column. Installation and maintenance of sensor units are conducted by PMEL and the Survey Department. The chief scientist should ask the Survey Department which sensors are installed and operating correctly. All CTD data processing should be conducted on the computer that the data acquisition program is installed on (configuration files will depend on what sensors are present and it is difficult to determine the set parameters if processing is done later).

### CTD Data Processing

Bring up an MS-DOS window and type: C:\gctd and then proc\_new or C:\data\ctd\current\proc\_new (if the shortcut is not functioning)

The following information must be entered for the header of each processed data file:

Cruise# (i.e., MF0506)

Consecutive Cast Number (i.e., 001, 002, etc. restricted to 3 numbers)

Latitude (must include N or S at end or program will not let you get past this part)

Longitude (must include W or E at end or program will not let you get past this part)

Date (in GMT)

Time Mark at Depth (in GMT)

Bottom Depth

Station ID (i.e., 01H1 or 01.1)

### To Plot CTD Data

Bring up an MS-DOS window and type: C:\gctd

C:\copy\_cnv (make a copy of file and add \_up.cnv as the new extension since the program only recognizes up-cast data to go with bottle samples)

Select Start Process (this automatically draws the plot)

Print out plot for future reference

**SAMPLING**  
Other

**Line 8 Sampling**

Line 8 Station Locations

Station	Latitude	Longitude	Lat (dd)	Long (dd)	CTDB	Chlor	Nuts	MZ	20/60 Bongo
FOX61	57° 43.20' N	155° 15.60' W	57.72	-155.26	x	x	x	x	x
FOX60	57° 40.80' N	155° 10.20' W	57.68	-155.17	x	x	x	x	x
FOX59	57° 38.40' N	155° 04.20' W	57.64	-155.07	x	x	x	x	x
FOX58	57° 36.60' N	155° 00.60' W	57.61	-155.01	x	x	x	x	x
FOX57	57° 33.00' N	154° 52.80' W	57.55	-154.88	x	x	x	x	x
FOX56	57° 31.20' N	154° 46.80' W	57.52	-154.78	x	x	x	x	x
FOX55	57° 28.80' N	154° 42.00' W	57.48	-154.70	x	x	x	x	x

Line 8 CTDB Sample Depths

Depth	Chlorophyll	Nutrients	MZ
0	Y	Y	Y
10	Y	Y	Y
20	Y	Y	Y
30	Y	Y	Y
40	Y	Y	Y
50	Y	Y	Y
75		Y	
100		Y	
150		Y	
200		Y	
250		Y	
300 m or 10 m off bottom			

Info. provided by: A. Dougherty/J. Napp

19-May-09

## **Line 8 Sampling (cont'd)**

A combination of 6 large and 5 small Niskin bottles will be needed to collect all of the CTDB samples (in one cast) requested for each Line 8 station. Fox 56, 57, 58, 59, 60, and 61 will be sampled, but Fox 55 will not be included in the sampling grid unless requested. The CTDB will go to 300 m, or 10 m off bottom at all stations. If the gear fails at one or two depth intervals, then take the gear back down to those depths and get the samples. If three or more bottles fail to fire, then you will have to do the cast over again at all depths.

### **Chlorophyll Samples**

Remember to record bottle depth and bottle volume filtered on the COD. Label each centrifuge tube with the FOCI cruise number, FOX number, station number, haul number, depth, and volume filtered. Wrap all of the tubes from a cast together in a sheet of aluminum foil which has the FOCI cruise number, FOX number, station number, and haul number written on it. Place the foil packet into a cruise labeled white freezer box or bag and put it in the -80° C freezer.

### **Microzooplankton**

When a Niskin bottle will be used for nutrients, chlorophyll, and microzooplankton samples, use the following guidelines:

Draw out 500 ml from the large Niskin bottles (10 liters) into the graduated cylinder to be used for chlorophyll and nutrients. The volume amount on the MZ jar label will now be 9.5 L. Use a MZ label on the top of the jar and on the side of the jar. **Do not use an inside jar label.**

Microzooplankton samples are preserved in the 8-oz. jars with 12.5 ml of 37% formaldehyde and 5 ml of sodium borate solution.

### **Nutrients**

Record the bottle number on the COD in the appropriate column corresponding to depth sampled. Make sure that you only fill the nutrient bottles 1/2 to 2/3 full allowing room for expansion during freezing.

## **Line 8 Sampling (cont'd)**

### **20/60-cm bongos**

The bongos will be fished to 300 m or 10 m off bottom at all Line 8 stations occupied. If the bottom is hit or the gear fails, it will have to be done the over. There will be no sub-sample of larvae taken from net 2 of the 60-cm bongos. Note the change in mesh on net 2 of the 60-cm bongos.

#### 20 cm

Net 1 (153- $\mu$ m mesh) preserved with 50 ml of formaldehyde and 20 ml of sodium borate solution

Net 2 (153- $\mu$ m mesh) discard or use as backup if Net 1 fails

#### 60 cm

Net 1 (505- $\mu$ m mesh) preserved with 50 ml of formaldehyde and 20 ml of sodium borate solution

Net 2 (333- $\mu$ m mesh) preserved with 50 ml of formaldehyde and 20 ml of sodium borate solution

## **MOCNESS Data Collection**

### **NETFLUOR (Fluorescence Data Collected During a MOCNESS Tow)**

Fluorescence is continuously measured using a Western Environmental Technology Laboratories Inc. (WET Labs) Environmental Characterization Optics (ECO) Fluorometer. The ECO Fluorometer uses an LED as an excitation source to measure the fluorescence emission in a sample of water. You can tell if the sensor is getting power by removing the white cap and checking for the blue light. The face of the instrument is very delicate, be sure to rinse it with freshwater at the end of the cruise and only wipe it down using a soft cloth to prevent scratching. When fluorometer is not in use, use the protective cap. The maximum depth rating for this instrument is 600 m.

### **TEMP (Temperature Data Collected During a MOCNESS Tow)**

Temperature is measured using a Sea-Bird Electronics SBE3 Temperature Sensor. The sensor should be rinsed with fresh water after each cruise and let dry before packing away.

### **SAL (Salinity Data Collected During a MOCNESS Tow)**

Salinity is estimated using a Sea-Bird Electronics SBE4 Conductivity Sensor. After each MOCNESS tow flush the conductivity cell with 0.1% Triton X-100 solution. Rinse thoroughly with fresh water and drain. Attach Tygon tubing to the cell ends to protect the cell between tows. At the end of the cruise let the conductivity cell soak in 0.1% Triton X-100 solution for an hour, using the Tygon tubing as a soaking tube. Agitate solution through the cell using Tygon tubing and syringe kit used to flush the CTD 911Plus sensors (obtain from Survey Tech). Drain and flush with freshwater for 5 minutes. Remove large droplets of water by blowing through cell and let dry. Store the conductivity sensor dry with clean, dry Tygon tubing looped around the cell.

### **Record Keeping**

When any of these sensors are used during a MOCNESS tow, write in the appropriate codes (NETFLUOR, TEMP, SAL) on the MOCNESS COD sheet in the Samples Collected section or check the appropriate boxes. If any of the sensors malfunctioned during a tow and the data are suspect, then explain in the Haul Comments section.

## **Mooring Biological Sampling Plan (Bering Sea)**

This is the sampling plan for Mooring Sites 2, 4, 5, 8 and the 70-m Isobath. The order and number of operations are subject to change.

**CalVET Note:** If the samples from Net 1 and 2 do not have much algae, then combine the codend contents and save in one jar. Add a note in COD Haul Comments that states that the nets were combined. Put a label on the side and lid of the jar. Do not place a label inside the jar.

### 70-m Isobath

Check with the Chief Scientist as to which stations along the 70-m Isobath will be sampled with the CTD and/or bongo.

CTDB (chlorophyll sample depths to be determined)

20/60-cm Bongo Sampling Depth: 5 m off bottom

\*preserve only Net 1 of each mesh size(153  $\mu\text{m}$  / 333  $\mu\text{m}$ )

The following example sampling plan applies to all the mooring sites listed above. The depth of the triplicate chlorophylls (from three different bottles) will be determined by the depth of the moored fluorometer at each mooring station. Check with the Chief Scientist for this depth information.

### Site # – Before Mooring Retrieval

CTDB Chlorophyll Depths: 0, \_\_ (3), 20, 30, 40, 50 m

CTDB Nutrient Depths: (if requested by PMEL)

CalVet, 3 tows to Depth: 60 m

\*preserve only net 1 (53  $\mu\text{m}$ ) from each tow

20/60-cm Bongo Sampling Depth: 5 m off bottom

\*preserve only net 1 of each mesh size (153  $\mu\text{m}$  / 333  $\mu\text{m}$ )

### Site # – After Mooring Deployment

CTDB Chlorophyll Depths: 0, \_\_ (3), 20, 30, 40, 50 m

CTDB Nutrient Depths: (if requested by PMEL)

### Site # (East)

CTDB Chlorophyll Depths: 0, 10, 20, 30, 40, 50 m

20/60-cm Bongo Sampling Depth: 5 m off bottom

\*preserve only Net 1 of each mesh size(153  $\mu\text{m}$  / 333  $\mu\text{m}$ )

## Mooring Biological Sampling Plan (cont'd)

### Site # (South)

CTDB Chlorophyll Depths: 0, 10, 20, 30, 40, 50 m

20/60-cm Bongo Sampling Depth: 5 m off bottom

\*preserve only Net 1 of each mesh size(153  $\mu$ m / 333  $\mu$ m)

### Site # (West)

CTDB Chlorophyll Depths: 0, 10, 20, 30, 40, 50 m

20/60-cm Bongo Sampling Depth: 5 m off bottom

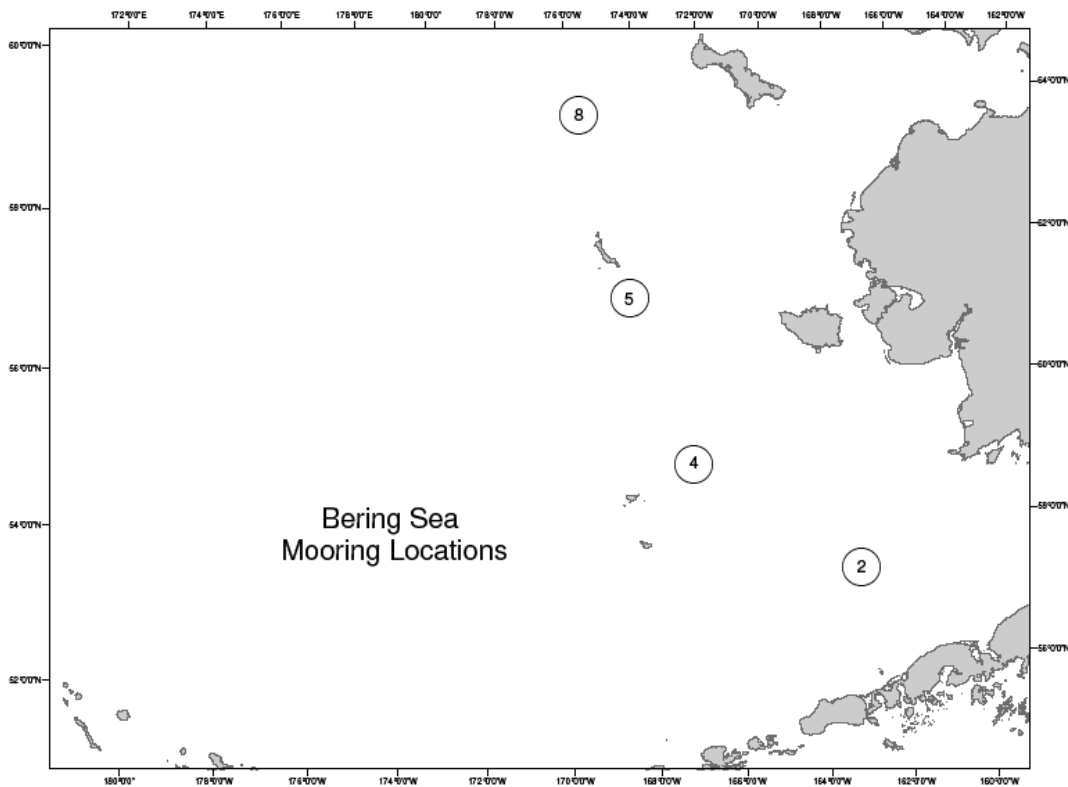
\*preserve only Net 1 of each mesh size(153  $\mu$ m / 333  $\mu$ m)

### Site # (North)

CTDB Chlorophyll Depths: 0, 10, 20, 30, 40, 50 m

20/60-cm Bongo Sampling Depth: 5 m off bottom

\*preserve only Net 1 of each mesh size(153  $\mu$ m / 333  $\mu$ m)





## **SEACAT Data Processing - Important Notes**

Before the start of each survey, you will need to check that the data files from the previous cruise have been moved from the default directories. Also check that the correct calibrations have been entered for the SEACAT unit that you will be using. All acquisition and processing programs are directed such that SEACAT and CTD casts will be stored in the following directories:

C:\data\seacat\current  
C:\data\ctd\current

After renaming or moving files make sure the following files are in

C:\data\seacat\current  
proc\_new.pl  
proc\_all01.pl  
proc\_new\_mod.pl  
catproc.txt  
plot\_last.pl  
plot\_last.txt  
catproc\_mod.txt  
catproc.txt\_org  
cp\_flash.pl  
psa folder  
calibration files

For C:\data\ctd\current, the following files should be present:

proc\_new.pl  
ctdproc.txt  
ctdproc\_dat.txt  
ctdproc\_hex.txt  
ctdproc\_nobot\_dat.txt  
ctdproc\_nobot\_hex.txt  
ctdproc\_nobot.txt  
check\_bottle\_fire.pl  
check\_bottle\_fire.txt  
count\_btl.pl  
psa folder  
calibration files

Note: Files in the current folders may change when Sea-Bird upgrades their program. CTD files are now recorded as .hex files instead of .dat files.

## **SEACAT Data Processing**

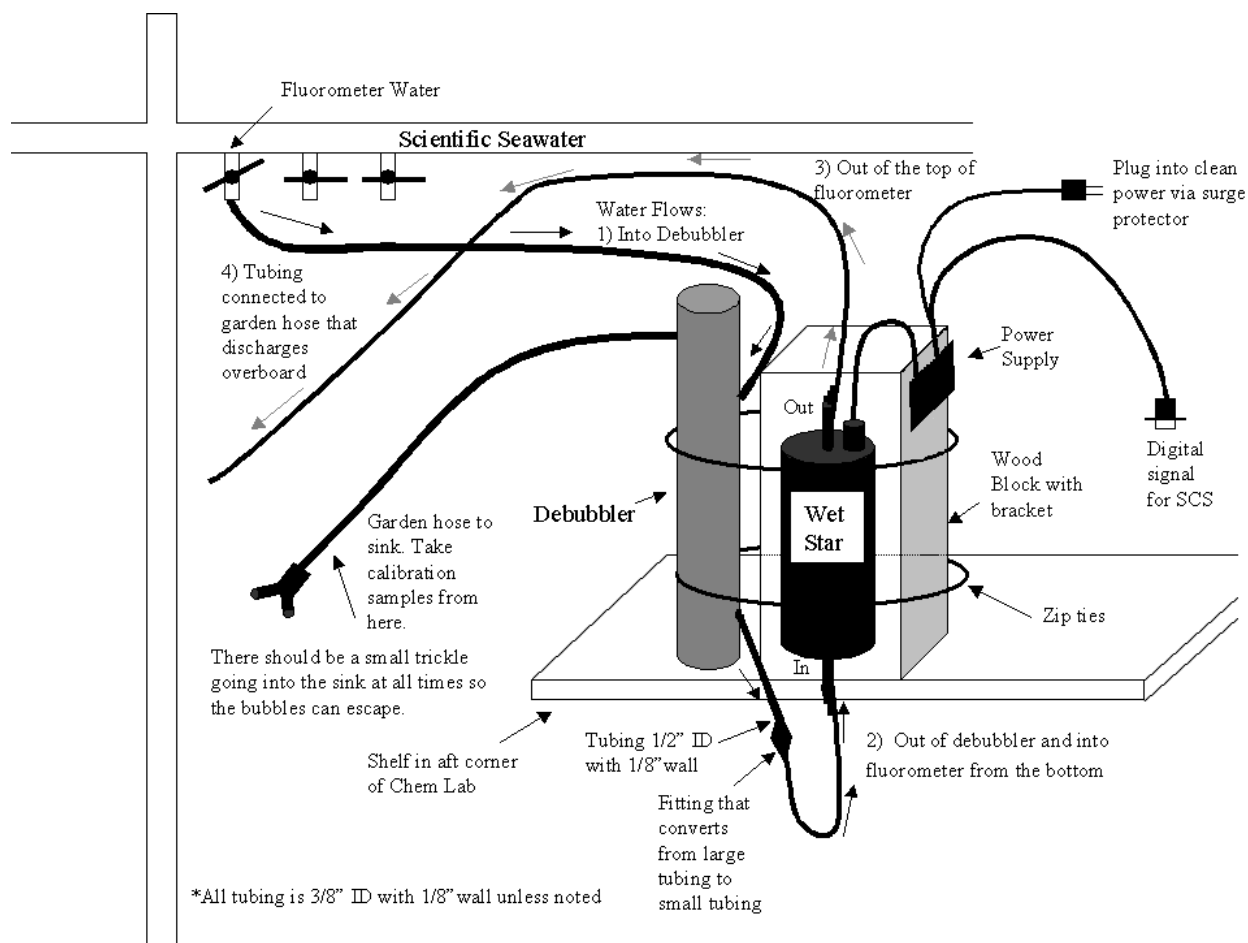
- 1) Bring up a MS-DOS window and type C:gcat
- 2) C:\data\seacat\current\proc\_new
- 3) Program will flash by and process the file. If the processing screen does not flash by, then type X and hit Enter until it does.
- 4) Only enter the following header information:  
  
Cruise ID (e.g., MF00-01)  
Consecutive Cast Number (e.g. 001, 002, etc. restricted to 3 numbers)  
Latitude (dd mm.mm N)  
Longitude (dd mm.mm W)  
Date [    ] if numbers in brackets ok, hit Enter  
Time [time unit turned on]  
Water Depth  
Station ID (e.g., 1.1, 01H1, HB36)  
Water Mass Code (G for Gulf, B for Bering)
- 5) Review header information. If ok type Y, if not type N and edit entries.
- 6) To plot graph, C:\data\seacat\current\plot\_last  
If cast number is correct, click Start Process.

**SURFACE CHLOROPHYLL SAMPLES: NOAA ship *Miller Freeman***

Seawater from the scientific seachest is pumped to the Chemistry Lab and through a Western Environmental Technology Laboratories Inc. (WET Labs) WETStar continuous flow fluorometer. The Scientific Computing System (SCS) records the fluorescence values. The scientists are responsible for collecting calibration samples and maintenance.

**Preparation**

Setup the fluorometer in the aft corner of the Chemistry Lab as shown. In many cases this instrument is setup during the winter inport and is left installed for the entire field season.



**SURFACE CHLOROPHYLL SAMPLES: NOAA ship *Miller Freeman***  
(cont'd)

When setup is complete, check with bridge and then turn on seawater pump (switch is located above the starboard sink on the quarter deck). Open the valve labeled “fluorometer water” in the Chemistry Lab. Adjust the garden hose in the sink so a small trickle of water drains into the sink. Any air bubbles from the debubbler will escape with this water.

Using a graduated cylinder and a stop watch, measure the flow rate through the fluorometer. Go to the back deck and find the garden hose leading off the side of the ship. This is the fluorometer output. Take the hose and time how many seconds it takes to fill up the graduated cylinder and convert this to a flow rate in ml/second. The fluorometer is calibrated using a flow rate of 24 ml/sec. Adjust the “fluorometer water” valve to get as close to this flow rate as possible, while still keeping a steady bubble free flow through the instrument. After all adjustments have been made, mark the position of the valve with a piece of tape. All tubing must be wrapped with black electrical tape after the flow rate with little or no bubbles/leaks has been established. This prevents light shock of the phytoplankton after leaving the ocean and entering the lighted lab.

**Collection**

The fluorometer will continuously record phytoplankton fluorescence. To be able to see the real-time data, have the Survey Department establish an SCS window showing the fluorometer data on the computer screen in the Chemistry Lab.

It is necessary to periodically take chlorophyll calibration samples. Calibration samples are usually taken on station, at specified times during each shift or on dedicated transects. The Chief Scientist will decide when and how frequently these samples should be taken. The chlorophyll manifold is required for filtration; if it is not already setup, then follow the instructions on the CHLOR page in SAMPLING.

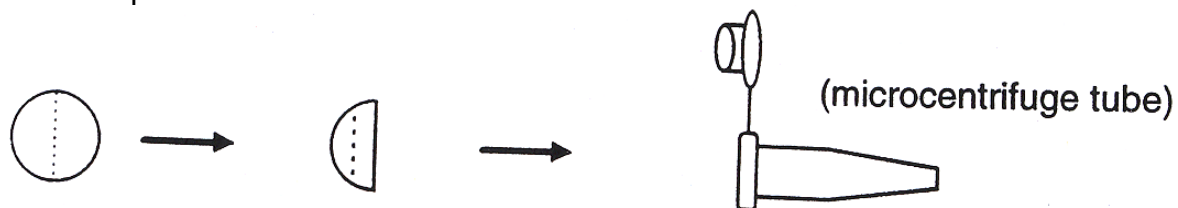
**SAMPLE COLLECTION:**

Adjust the hose from the debubbler in the sink so there is a stronger flow. Allow the water to flow for a few seconds (PLEASE NOTE THAT WATER FROM SINK GOES TO THE SHIP'S SANITARY SYSTEM; SO DON'T RUN IT TOO LONG) and fill plastic calibrated bottle to the top (gently tap to remove air bubbles and add more water if necessary) and screw cap on. **Adjust the hose so there is only a trickle running into the sink once more.**

**SURFACE CHLOROPHYLL SAMPLES: NOAA ship *Miller Freeman***  
(cont'd)

Record GMT time and fluorescence values from the SCS fluorometer window on the computer screen in the lab. See RECORD KEEPING section.

Gently pour sample into filter cup and filter sample using low vacuum (7 psi). When finished, remove filter cup. Use two pairs of forceps to fold filter into fourths lengthwise with filtered material (color) on the inside, being careful not to touch colored area with the forceps.



Place filter into labeled (see Labeling) microcentrifuge tube. **Please do not jam filter into bottom** because they are difficult to remove when frozen.

**Labeling**

Use a fine point permanent marker to label the microcentrifuge tube with FOCI and / or ship cruise #, sample ID or station, GMT date, GMT time and volume filtered (ml).

**Preservation**

Place microcentrifuge tube in cruise-labeled white freezer box in -80°C freezer. (If needed, samples from multiple cruises may be placed in the same box).

**Record Keeping**

Record the sample ID or station, GMT date, GMT time, fluorescence value and volume filtered on the Flow-thru Chlorophyll Sampling Log sheet (a copy is found in the FORMS section of this manual).

## **SURFACE CHLOROPHYLL SAMPLES: NOAA ship *Miller Freeman*** (cont'd)

### **Maintenance**

#### Daily Cleaning Procedure:

Clean the fluorometer flow cell once a day. This is very important: if the fluorometer isn't cleaned properly, phytoplankton can build-up and cause the instrument to foul.

Disconnect the serial cable to SCS. Turn off the water by turning the "fluorometer water" valve to the off position (horizontal). Disconnect tubing on both the intake and outlet fittings (remove clamps using pliers and pull tubing off the fluorometer fittings). Swab inside of fluorometer with the long Q-tips provided. Swab tube from the top and the bottom until it is clean. Reconnect tubing. Water comes in at the bottom and out of the top of the fluorometer. Reconnect clamps using pliers to secure tubing onto fittings. Turn water back on and line up valve with tape mark so flow rate remains consistent. Reconnect SCS cable and check to make sure that the SCS is receiving data. Please record GMT time of cleaning (start and stop) on flow-thru chlorophyll sheet.

#### After the Cruise:

At the end of the cruise, in addition to the "daily cleaning" procedure, rinse the fluorometer tube with freshwater using a squirt bottle. Then rinse it with a diluted solution of Triton-X-100 cleaning solution. This helps remove stubborn phytoplankton build-up. Be sure to rinse thoroughly with freshwater to remove all of the soap. Reconnect the tubing onto the fluorometer fittings with clamps.

### **Miscellaneous**

If you ever notice that the fluorometer values have 'pegged' (i.e., values are constant), notify the Chief Scientist or Survey Department. Maximum count value for WETStar Fluorometer is 4,095 counts. If the fluorometer is 'pegged' at this reading, it is likely the instrument has fouled. Cleaning may fix it, or the cell may be stained and need to be repaired/replaced at the factory.

#### Expected Range By Area:

Bering Sea Spring Bloom: ~1,233 – 1,822 Counts (20 – 30 µg/l)

Gulf of Alaska Spring Bloom: ~351 – 645 Counts (5 – 10 µg/l)

Bering Sea and Gulf of Alaska Summer: ~57 – 100 Counts (0 – 3 µg/l)

WET Labs (Western Environmental Technology Laboratories Inc.)  
PO Box 518, 620 Applegate St., Philomath, OR 97370  
Phone: 541-929-5650, Fax: 541-929-5277, Email: [wetlabs@wetlabs.com](mailto:wetlabs@wetlabs.com),  
<http://www.wetlabs.com/>

### **SURFACE CHLOROPHYLL SAMPLES: NOAA ship *Oscar Dyson***

Seawater is pumped continuously from the bow of the ship with optional intakes at two depths. The lower intake should be used to minimize air bubbles. The water passes through a flow sensor, strainer, one of two pumps and then is piped aft and up to the Chemistry Lab. There is a suite of oceanographic instruments installed, one of which is a Western Environmental Technology Laboratories Inc. (WET Labs) Environmental Characterization Optics (ECO) fluorometer (labeled “Fluoro” in the diagram below). The ECO fluorometer is a M/N FLNTUS with a bio-wiper for automatically cleaning the optical window. Usually the Survey Department cleans and maintains the instruments, but the scientists may be responsible for taking calibration samples as requested.

The information in this manual is general in nature and applies to taking calibration samples for the underway fluorometer. Refer to the binder in the Chemistry Lab and / or the Survey Department for more detailed information about this underway system and how to take other types of samples.

#### **Preparation**

The fluorometer will already be set up in the Chemistry Lab. This set up was designed by scientists at PMEL and is maintained by ship personnel.

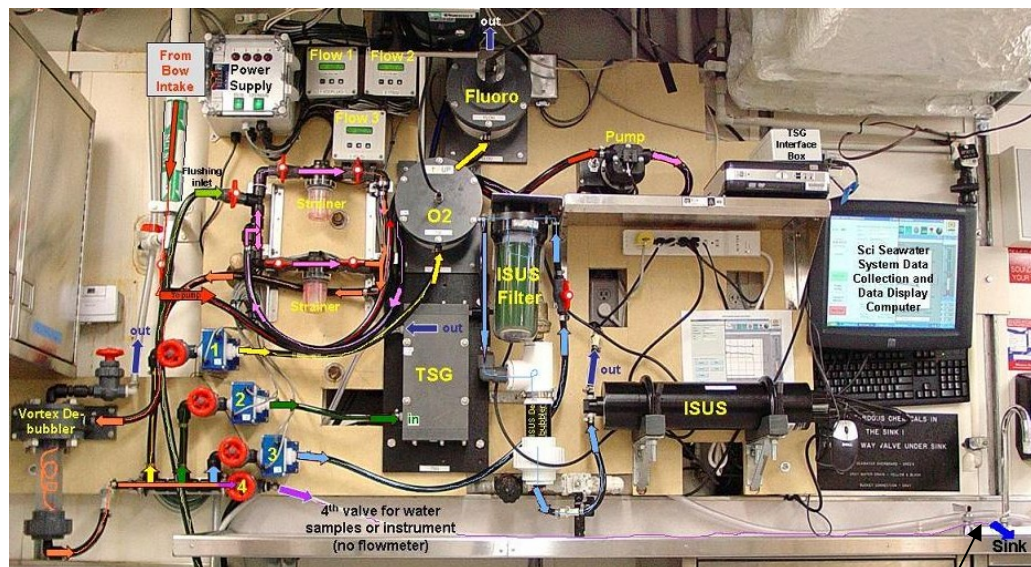


Photo by Kathryn Hough and Jessica Sheehan

Calibration samples are taken from tube in sink. Turn valve 4 to start the flow to take a sample.

**SURFACE CHLOROPHYLL SAMPLES: NOAA ship *Oscar Dyson***  
(cont'd)

The underway seawater instruments are:

1. Sea-Bird Electronics SBE 38 remote temperature sensor to measure the water temperature near the forward intakes before the water is warmed by the ship.
2. A vortex debubbler to remove air bubbles.
3. Sea-Bird Electronics SBE 45 thermosalinograph (TSG) to measure the seawater salinity corrected for water temperature.
4. WET Labs ECO fluorometer with bio-wiper to measure chlorophyll fluorescence. This will be calibrated with water samples to determine the extracted chlorophyll concentration, an index of phytoplankton biomass.

PMEL has added the following:

1. Three electromagnetic flow meters to measure the water flow rate in three separate instrument branches.
2. Satlantic ISUS (In-Situ Ultraviolet Spectrometer) V3 nitrate sensor.
3. Aanderaa 3835 Optode oxygen sensor.

The first flow meter, strainer, pumps and SBE 38 are in the bow thruster compartment. The remaining instruments are in the Chemistry Lab. The instruments feed data to the ship's Scientific Computer System (SCS) where the measurements are recorded.

1. Before departure, while the ship is in port:
  - a. Request that an engineer inspect and clean the sea strainer and if necessary inspect the pumps. (Survey Department may do this).
2. After clearing the harbor:
  - b. Have the Survey Department start the water flow to the Chemistry Lab.
  - c. Determine that the SCS system is recording data and the values are in the correct range. (Survey Department may do this).
  - d. Verify with the Chief Scientist how often calibrations samples should be taken (usually twice per day, once during the day and once at night, or some other scheme). Instructions presented here are for taking chlorophyll calibration samples. If other samples are requested, get specific instructions on what other samples are to be taken and how often. Refer to the binder in Chemistry Lab for procedures for collecting other types of samples.



## **SURFACE CHLOROPHYLL SAMPLES: NOAA Ship *Oscar Dyson*** (cont'd)

### **Collection**

The fluorometer will continuously record phytoplankton fluorescence. To be able to see the real-time data, have the Survey Department establish an SCS window showing the fluorometer data on the computer screen in the Chemistry Lab.

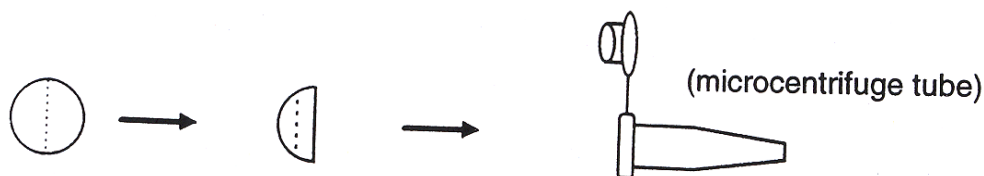
It is necessary to periodically take chlorophyll calibration samples. Calibration samples are usually taken on station, at specified times during each shift or on dedicated transects. The Chief Scientist will decide when and how frequently these samples should be taken based on sample requests (usually twice per day, once during the day and once at night). The chlorophyll manifold is required for filtration; if it is not already set up, then follow the instructions on the CHLOR page in SAMPLING.

### **SAMPLE COLLECTION:**

The tube in the sink is used to collect water from the underway system for all calibration samples. Open valve #4 (see diagram) to start the flow into the sink. Fill a calibrated plastic bottle to the top (gently tap to remove air bubbles and add more water if necessary) and screw the cap on. Close valve #4 to stop the flow into the sink.

Record GMT time and fluorescence values from the SCS fluorometer window on the computer screen in the lab. See RECORD KEEPING section.

Gently pour sample into filter cup and filter sample using low vacuum (7 psi). When finished, remove filter cup. Use two pairs of forceps to fold filter into fourths lengthwise with filtered material (color) on the inside, being careful not to touch colored area with the forceps.



Place filter into labeled (see Labeling) microcentrifuge tube. **Please do not jam filter into bottom** because they are difficult to remove when frozen.

### **Labeling**

Use a fine point permanent marker to label the microcentrifuge tube with FOCl and/or ship cruise #, sample ID or station, GMT date, GMT time and volume filtered (ml).

**SURFACE CHLOROPHYLL SAMPLES: NOAA ship *Oscar Dyson***  
(cont'd)

**Preservation**

Place microcentrifuge tube in cruise labeled white freezer box in -80°C freezer. (If needed, samples from multiple cruises may be placed in the same box).

**Record Keeping**

Record the sample ID or station, GMT date, GMT time, fluorescence value and volume filtered on the Flow-thru Chlorophyll Sampling Log sheet (a copy may be found in the FORMS/LABELS section of this manual).

**Maintenance**

Daily Cleaning Procedure:

The instrument has an automatic bio-wiper, so there is no daily cleaning necessary.

After the cruise:

The Survey Department will take the fluorometer with mount off the tank, wipe out the tank and wipe any algae off the interior of the mount. This will be done between cruises and weekly on longer cruises as necessary. THE FLUOROMETER SHOULD NOT BE REMOVED FROM THE GREY, PLASTIC CIRCULAR MOUNT. THIS VOIDS THE WARRANTY.

**Miscellaneous**

WET Labs (Western Environmental Technology Laboratories Inc.)  
PO Box 518  
620 Applegate St.  
Philomath, OR 97370  
Phone: 541-929-5650  
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<http://www.wetlabs.com/>





## **Algae Problems**

*Phaeocystis pouchetti*---greenish-brown, stinks, foams when net is hosed down.

*Phaeocystis* has been a continuing problem in the mid-spring for the Gulf of Alaska and Bering Sea ichthyoplankton surveys. This alga clogs the 333- $\mu\text{m}$  mesh of the 60-cm bongo and makes sample preservation time consuming. There has also been some concern expressed about the potential for the loss of larvae and zooplankton when the codend is removed from the net. Since the sample tends to back-up in the net and not settle in the codend completely, there is a tendency for the sample to be released horizontally as soon as the codend collar is separated. This usually results in plankton-covered hands and the sample coming dangerously close to being lost over the rim of the 5-gallon bucket that the codend is sitting in to catch any spillover.

Instructions:

### 1) Assessing The Problem

The more algae clogging the mesh of the net, the darker the color of the net. If the net has passed through a very heavy patch of algae, then it will be brownish and barely draining any seawater as the bongo frame is hanging alongside the sampling platform. When the algae are less abundant, the net will be a light green/brown and will still filter seawater without backing up the codend contents. Properly assessing the way the algae is affecting the seawater filtration will be the key to making the net rinse-down as quick as possible without compromising the sample quality.

### 2) Rinse-Down

A complete rinse-down of a heavily clogged bongo net is not worth the time and effort. The 60-cm bongo net (333- $\mu\text{m}$  mesh) consists of two net sections, a PVC collar, and the PVC codend. The best option is to do a quick rinse of the first net section (from the frame to the first reinforced seam) and a thorough rinse-down of the second section. The codend will quickly backup with the foam released by the algae. Remember that dead larval fish may rise to the top of the sample and get lifted up by the foam. Once the seawater and foam start to raise about a third of the way between the codend collar and the seam of the two net sections, it is much easier to finish the rinse-down without the codend attached to the net. Place the codend in a 5-gallon bucket, which has the splashguard attached and slowly remove the codend from the collar. Be prepared for the sample to be forcefully released into the bucket. Leave your now plankton-covered hands in the bucket while someone else rinses the sample off of you. Once you are sample-free, rinse down the second section of the net into the bucket with the rest of the sample. **Make sure that you rinse off the splashguard into the bucket before it is removed.**

### **Algae Problems (cont'd)**

#### 3) Sieving Sample

Use the 12 or 18-inch sieve(s) of the appropriate mesh (most likely the 333  $\mu\text{m}$ ) for removing the extra seawater and foam. Wash off the sides and top of the codend into the bucket before you lift it out to be poured into the sieve(s). Plankton that has spilled into the bucket will have to be filtered through the sieve(s) also. Rinse out the bucket into the sieve(s) so that the bucket looks clean. Clear the clogged sieves often by stroking the underside with your fingers to keep the water moving. Do not to blast the sieve mesh with seawater to unclog the mesh since this may damage the organisms in the sample. Use a squeeze bottle to move the sample from the sieves into the jar(s) for preservation.

#### 4) Preservation

A plankton sample with a large amount of algae may require several 32-oz jars for preservation. Fill each jar a third of the way full with sample and top it off with seawater and 50 ml of formaldehyde and 20 ml sodium borate. Make sure you mix the jar contents thoroughly by turning the jar end-over-end several times before placing it in the appropriate box.

**Reattach the clean codends to the bongo nets only after both sections of the net are thoroughly rinsed out and inspected for trapped algae in the seams. While on deck, rinse out the buckets used for carrying the codends/samples before the next station to ensure that there is no contamination from the last sample.**

## **Algae Problems (cont'd)**

*Chaetoceros spp.*---brown, spiny algae, packs down in codend like peat moss

*Chaetoceros* may be encountered in the spring in either the Bering Sea or the Gulf of Alaska. This type of algae is not difficult to rinse from the nets, but it may damage the more delicate organisms in the sample. *Chaetoceros* does not foam when it is being rinsed with seawater but it does settle down into the codend as a dense mass of material similar to peat moss.

Instructions:

### 1) Rinse-Down

Rinsing down a 333- $\mu\text{m}$  or 505- $\mu\text{m}$  bongo net will not be a problem with this alga. Do not blast the net too hard or for any longer than necessary. It is ok if some of the algae are left in the seams of the net as long as you remember to give the net a very thorough cleaning before the codend is reattached.

### 2) Sieving Sample

Pour the codend contents into the 12 or 18-inch sieve(s) of the appropriate mesh. Do not blast the sample with seawater in hopes of getting rid of some of the algae since you will only damage the larvae and zooplankton further by forcing algae through the sieve mesh. Use a squeeze bottle to move the sample out of the sieve for preservation.

### 3) Preservation

Preservation of this type of sample requires some extra thought as well as extra jars. Since the sample will be thick and heavy, it will require many 32-oz jars to preserve it properly. Fill each jar a third of the way with sample and top off with seawater and 50 ml of formaldehyde and 20 ml sodium borate. Make sure you mix the jar contents thoroughly by turning the jar end-over-end several times before placing it in the appropriate box.

**Reattach the clean codends to the bongo nets only after both sections of the net are thoroughly rinsed out and inspected for trapped algae in the seams. While on deck, rinse out the buckets used for carrying the codends/samples before the next station to ensure that there is no contamination from the last sample.**

## **Jellyfish Problems**

If there are jellyfish bigger than 5 cm in a codend of a QTowF sample, then they will have to be removed to ensure proper preservation of the plankton.

### **1) Culling the Population**

Pour the codend contents into a 12-inch sieve of the appropriate mesh size. Pick up each jellyfish larger than 5 cm and hold it over the sieve while rinsing it off with seawater from a squeeze bottle. If the jellyfish is a handful, then have someone else rinse it off while you hold it over the sieve. Inspect each specimen to be sure that it is clean of larvae and plankton.

In the event of a large jellyfish with gear-tangled tentacles, the rinse-down of the jellyfish will have to be done while still on deck. Carefully untangle the jellyfish from the gear and rinse it off, using a seawater squeeze bottle (not the hose), into the net before the codend is removed. This is definitely a two-person task and should be done as quickly as possible.

### **2) Determining Sample Quality**

The sample quality may be in question when large jellyfish are blocking the flow of seawater through the nets and/or codends. If jellyfish tentacles have to be removed from a flowmeter, then there is a good chance that the revolutions of the flow meter are in question. If either of these situations arises, then the sample should be recorded in the COD as questionable, with notes in the comments section to explain why.

**Do not measure or preserve large jellyfish (unless you have received a proper request for them---a.k.a. Sample Request Form.**







**Cruise Operations Database (COD) Application and Data  
Entry Documentation**

Documentation and Application Maintained by: Kimberly Bahl, and Tiffany Vance  
Developed by: Lisa Rugen and William Rugen

Revision Date: 6 August 2009

## The COD Data Form

The data forms completed in the field for the Cruise Operations Database (COD) are designed to closely resemble the data entry forms in the COD application. Though the constraints of the page and the monitor do not allow for the appearances to be exactly the same and still remain efficient, the flow and order of the data fields are similar enough to allow the user to easily navigate the at-sea application once the form is completed.

A data form must be completed for each station/haul entered into the application. There should always be a hard copy available for later reference. This form should be updated if changes are made to the data entered. Changes should be noted on the form beside the item being corrected. Changes should also be initialed and the date of the change indicated. The hard copy is assumed to be accurate and if there are any discrepancies between the electronic version and the hard copy, the information on the hard copy should be used and the data in the COD application/database changed to reflect what is present on the form.

There is space for six gear/nets on each sheet. More than one type of gear may be present on a form. The first block for gear is set up to handle CTD/CTDB sampling as well as any other gear. Each of the five subsequent blocks is identical. An example of this would be the use of a Tucker trawl with the large Clarke-Bumpus net hung inside. Not only can there be multiple gears on a form, but there may also be multiple purpose codes. Each block however may only have one gear and one purpose code. The first block for gear is set up to handle CTD/CTDB sampling as well as any other gear. Each of the five subsequent blocks is identical.

MOCNESS sampling has its own form where the top section is the same as the general form, but the gear/net data blocks are modified for the needs of the MOCNESS. The differences will be explained in an additional section for the MOCNESS form.

### Data Recording

This section will deal with completing the form for the COD database. Each form field will be explained and examples given where needed.

### Date Entered

Day/Month the data were entered into the database.

### Error Checked

Marked to confirm that the data entered have been error checked against using the original data form and the proof sheets printed out by the application.

## The COD Data Form (cont'd)

### Scientist

Fill in the name or initials of the person responsible for entering the data into the database. An entry is important in case there are questions about the data or the entry process.

### FOCI Cruise

This field is the cruise designation used by the AFSC component of FOCI. This designation is the combination of the number of cruises on a vessel in a calendar year (e.g., third cruise on the NOAA ship *Miller Freeman* in 1988 would be 3MF88). This number is assigned before the cruise season starts and should be included in the cruise instructions.

### Station

A new consecutive station number is assigned each time the vessel moves to a new sampling location. As a general rule of thumb, a new station number is used whenever the ship moves and conducts a scientific operation more than 0.5 nautical miles from the previous sampling site. The exceptions to this rule are diel and drift-sampling operations where it is preferable to have all the samples assigned the same station number with multiple hauls to identify the operations. If a station location is reoccupied later in the cruise it should be assigned a new consecutive station number. The location should be noted in either the FOCI Station field or in the haul comments.

### Haul

The haul number is the consecutive number of sampling procedures at a particular station. For example, if a station is occupied and the first operation is a bongo, the haul number for that would be 1. If a CTD were done at the station after the bongo, then it would get a haul number of 2.

### FOCI Station

This is used to note if a station has a long-term designation, such as historical FOX line stations, grid station designations, or long-term mooring sites. It is only for designations that remain the same each year.

### Alt. Station

The alternate station is a designation within a cruise that helps track data based on station numbers used by other projects or gear types. For instance, both MOCNESS and CTD sampling programs use alternate station designations that allow users to more easily track data. An example would be CTD010 or BON121 (used to coordinate SEACAT data to station number).

**The COD Data Form (cont'd)****Ship's Cruise**

This is the cruise designation used by the vessel. It is determined by the vessel and included in the cruise instructions.

**GMT-Date**

The Greenwich Mean Time date of an operation at mark is usually when a gear reaches its maximum depth. The format is dd-mm-yy (e.g., 15-Sep-01). Do not use a numerical designation for month as this can lead to confusion (i.e., is 04/05 April 5<sup>th</sup> or May 4<sup>th</sup>?). This information is available on the MOA (electronic or paper) or Bridge log.

**GM-Time**

The Greenwich Mean Time of an operation is marked when a gear reaches its maximum depth. This information is available on the MOA (electronic or paper) or Bridge log.

**Bottom Depth**

The bottom depth in meters recorded at the mark. This information is available on the MOA (electronic or paper) or Bridge log.

**DLat**

Degrees latitude recorded at the mark. This information is available on the MOA (electronic or paper) or Bridge log.

**MLat**

Decimal minutes latitude recorded at the mark. This information is available on the MOA (electronic or paper) or Bridge log.

**DLong**

Degrees longitude recorded at the mark. This information is available on the MOA (electronic or paper) or Bridge log.

**MLong**

Decimal minutes longitude recorded at the mark. This information is available on the MOA (electronic or paper) or Bridge log.

**Hemisphere Information**

On the paper form, it is assumed that the hemisphere for latitude and longitude are north and west, respectively. If it is different, then it should be noted. The COD application defaults to these values, but they may be changed.

## The COD Data Form (cont'd)

### Haul Comments

This section allows for the notation of information that is particular to the station/haul. It may include events that have made the effectiveness of a gear questionable, notes about organisms removed from a sample, or other information that would be of interest or relevant to the operations at that station and the samples collected. Some of this information is used in the IchBase database. **No commas should be used in this field.**

### Gear

The gear abbreviations that the database uses to identify the gear commonly used during FOCI surveys. A list of gear abbreviations may be found in the COD program during data entry.

### Net

Net number.

### Mesh

Mesh size of the net in microns. Some gears, such as the Methot, have asymmetrical mesh openings in the sides of the net. In such cases, the largest dimension of these openings should be used.

### Performance

This refers to the performance of the specific gear/net. Things that may affect the performance of a gear/net include, but are not limited to: holes found in the net, suspicious flowmeter readings, missing haul information (tow time, max gear depth, etc.), bad wire angles, part of the sample lost during preservation, or wrong sieve used for processing. If any option other than 'good' is chosen, it must be explained in the Haul Comments.

The definitions of the performance codes are as follows:

Good – gear/net performed as expected, sample successfully preserved. Tow is 'good' even if flowmeter revolutions seem low or high. However, for any tow involving questionable flowmeter revolutions, it should be explained in the Haul Comments. For example, "Flowmeter counts seem low and jellyfish tentacles on flowmeter upon retrieval." A post-processing check will be done upon return to laboratory and Performance will be updated accordingly.

Quest – sample preserved but quantitative validity or some aspect of preservation was not completely successful. Tow performance is 'quest' if tow time or gear depth had to be estimated. Tow performance is 'quest' if wire angle is  $<35^\circ$  or  $>55^\circ$  for more than 30 seconds during an oblique or horizontal tow, or if wire angle is + or -  $10^\circ$  from  $0^\circ$  for

## The COD Data Form (cont'd)

more than 30 seconds during a vertical tow. Tow performance is 'quest' if a large jellyfish was removed and it's not clear that all critters were rinsed off.

Fail – failure during tow or preservation process that leads to sample not being kept. If 'fail' is used, there should be no sample kept.

Lost – sample preserved but later lost either during transport or storage.

### Purpose Codes

This field refers to the sampling objective of a particular gear/net. This information should be determined ahead of time by the Chief Scientist.

The definitions of the purpose codes are as follows:

Gridpre - the first occupation of an area whose primary purpose is to locate areas of high plankton abundance. This survey is used to determine where a main sampling grid should be performed.

Grid – a grid of pre-specified stations whose primary goal is to estimate plankton abundance. This may be on a large or small scale. See further explanation below.

Gridpost – the reoccupation of a surveyed area (on the same cruise) whose primary goal is to estimate plankton abundance. Usually used for egg surveys or mortality experiments.

Plnksurv – the surveying of plankton. It is not part of a large-scale grid survey, but rather fewer stations to quantitatively survey an area or an exploratory sample to determine the presence or absence of organisms. It is advised to explain the main goal in the Haul Comments.

Juvsurv – sampling done to determine the abundance and distribution of juvenile fish.

Diel – samples collected to study day/night differences. Sampling is usually done at one location over the course of at least one day/night period.

Drift – samples collected while following a drifter buoy or otherwise tracking a particular parcel of water. It may encompass day/night sampling, but unless the specified goal is to study day/night differences, the purpose should be 'drift'.

Phys – any sampling of physical factors whose purpose is not 'diel' or 'drift'.



## The COD Data Form (cont'd)

Gear – sampling done to determine the relative sampling efficiency of different gears.

Adult – any sampling done to collect adult fish.

Other – any operation whose purpose is not defined by any of the other purpose codes. An explanation of the operation and whom it is being collected for should be included in the haul comments.

### Grid Purpose Code

The collection of Grid stations from a survey are used to estimate mean density of any species that is of interest. This mean density is an estimate of the true density only in the area that is surveyed. A valid survey for this purpose must sample the entire region as synoptically as possible. This is important because the population that is being surveyed moves over time and the ideal survey would provide a snapshot of the population's density throughout the survey area. The best that we can do is to carefully control the placement of the stations in both space and time.

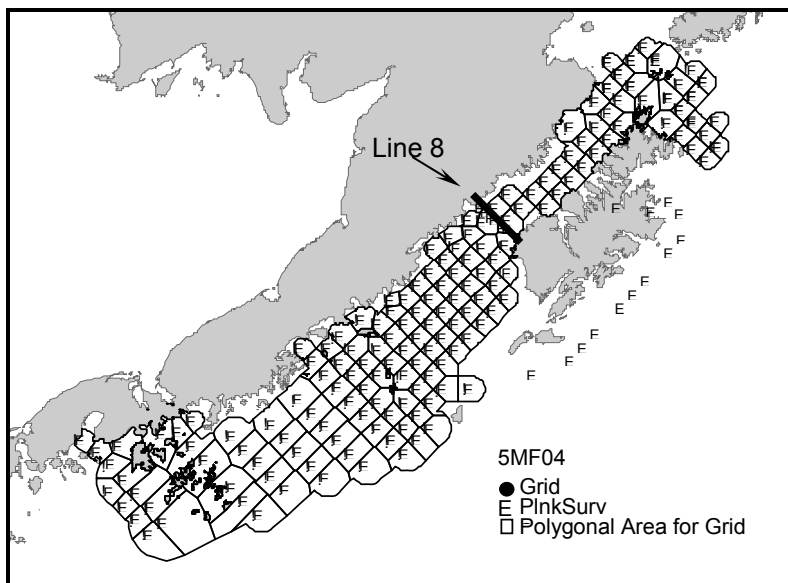
By planning the timing in which the Grid stations are occupied, we may sample the entire region as quickly as possible and minimize the time between stations. If there is a long delay between the sampling of adjacent stations, then the population will have shifted position between the two stations and we might miss a portion of a population or we might inadvertently sample it twice, depending on the movement of the population relative to the direction that the stations are occupied. Similarly, if a station is sampled twice during a survey for whatever reason, only the station that was sampled consecutively with the other Grid stations should be designated as purpose code Grid. The other station should be given a different purpose code to reflect why it was re-sampled. A special situation is if a station is re-sampled immediately because the first tow had poor performance. In this case, the first tow should not be used to estimate density, only the second tow. If the first tow failed, then it can still be considered a Grid station because it will be automatically excluded from any analysis because of its Fail performance code. If the first tow is coded as Questionable performance, then it should be given a different purpose code (e.g. PInkSurv or JuvSurv) so that it will be excluded from the estimation of mean density. (Not all Questionable tows should be recoded to be something other than Grid and redone; this should be done only for those tows where there is considerable suspicion that the observed catch/10m<sup>2</sup> is biased due to problems with the sample itself or with the sampling effort.)

The spacing of the Grid stations is a set, predetermined number because our goal is to estimate the mean density of animals over the survey region; to do this we need to space our stations to cover the entire region. An efficient way to do this is to spread the stations either evenly over the entire surveyed area, or place a higher density of

**The COD Data Form (cont'd)**

stations in the area where we suspect there is a higher density of animals. (This is also a good design to map an animal's spatial distribution, so Grid stations are also very useful for this purpose too.) Perfectly even spacing is not possible because of land masses or other obstacles, so we do the best that we can to spread the stations over our region of interest. This region should be contiguous so the population that occupies it is a meaningful entity and an estimate of its mean density in the region is of interest. There are 3 main issues with station spacing. First and foremost, the Grid station locations must be specified before the survey begins, they cannot be added on the fly to include extra sampling where the animal density is discovered to be high. (That doesn't mean that extra sampling can't be done, this just means that these extra samples cannot be Grid stations.) Second, the stations should be reasonably contiguous so that together they sample a single region. If they're split between two or more regions, then they should be used to estimate mean density separately for each region. Lastly, if the stations aren't spaced evenly over space then we need to correct for the unequal spacing when estimating mean density. This is done by computing a weighted mean density. The weights are the areas that each station represents. These are computed after the cruise is completed and are recorded in IchBase as PolygonalArea in the Haul Table.

An example of a survey with both Grid and PlnkSurv stations, and the associated polygonal areas, is given below for cruise 5MF04. Note that the Line8 stations are now given a purpose code of Line8. The few stations east of Kodiak Island are given a PlnkSurv purpose code. Even though the stations east of Kodiak are evenly spaced, they do not encompass a meaningful area for which a mean density can be estimated, hence they are PlnkSurv, not Grid.



## The COD Data Form (cont'd)

### Depth/Wire Out

These fields refer to the minimum and maximum depth and wire out for a net/gear in meters. For most gears, the minimum depth and wire out is 0 m, but some, like the Tucker trawl or MOCNESS may have minimum depths greater than that. It is important that the depth information is accurate as it is used to calculate the catch/10m<sup>2</sup>.

The depth information is determined either through electronic means (SEACAT) or by using a combination of wire out and wire angle. For the latter the equation is:

$$\text{gear depth} = \text{COS (wire angle)} * \text{wire out}$$

### Flowmeter

The flowmeter count is used to calculate the volume filtered by a gear/net. The flowmeter will show six digits with the rightmost digit representing the tenths; it is not recorded and used only to round the total up or down.

Meter # - the identification number of the flowmeter used inside the gear. Each flowmeter has a different calibration factor so it is important to make sure to have the correct flowmeter number.

Final rev. – the final reading on the flowmeter.

Initial rev. – the initial reading on the flowmeter used.

Total – the total flowmeter count from a gear/net. Obtained by subtracting ‘initial rev.’ from the final rev.’.

### Tow Time

Though there are several fields in this section, the only one usually entered is the ‘Total’. The proceeding fields may be used when calculating tow times for Tucker trawls, though a simple stop and reset of the stopwatch will also work.

### Samples Collected

This section lists all the standard samples collected and includes spaces for unlisted sample types. Each sample collected for EcoFOCI related activities needs to be recorded here. It is also necessary to record the samples collected for “outside” or “piggybacking” projects as the information recorded and entered are used to produce the cruise summary, statistics, and report. A short description of the sample codes may be viewed in the COD application by placing the cursor over the sample abbreviation of interest.

Each sample type collected needs to be circled; a project code included in the box to the right of the sample abbreviation, and where appropriate, the number of samples collected by that gear/net. Samples that require a sample number have a field next to the project code box. All other samples are defaulted to a sample number of one.

## The COD Data Form (cont'd)

Two sample types that differ are 'Discard' and 'QTowF' (plankton samples that will be sent to Poland). The Discard code does not require a project code whereas a QTowF sample does. In addition, the QTowF samples require notation of whether any fish were removed from the preserved sample. Either 'yes' or 'no' should be circled. When a plankton sample is not sorted for fish and preserved "as is", the value recorded for number of samples represents the number of jars used to preserve the sample. If fish were removed from the preserved sample, then the taxa, amount, and lengths of the fish should be recorded and noted in the haul comments and a copy of the documentation (i.e. length sheets) attached to the COD form. The gear/net performance should then be recorded as 'quest'. This is very important, as it alerts the data user that a sample is not complete and should not be subsequently used as 'good' unless the fish removed are standardized (i.e. lengths adjusted for shrinkage, data added to length files, etc.).

### CTDB Bottle Sample Info

In the first 'Samples Collected' section there are extra fields that must be completed when chlorophyll, nutrient, or microzooplankton samples are taken using the CTDB. For these, depth information must be recorded for each sample, the volume of the chlorophyll sample, the number on the nutrient bottle, and the volume of water filtered for the microzooplankton sample. There are also two blank columns for unlisted sample types that might be collected using CTDB bottles. The sample abbreviation for these sample types should be written at the top of the column.

### MOCNESS COD Forms

The MOCNESS data forms look similar to the regular COD data forms. The header section is identical. The differences that appear in the gear/net sections are the following:

- 1) The gear field is already completed
- 2) The number of sample types available is greatly reduced
- 3) There are no flowmeter fields, only a field for the volume filtered.

The data for the 'Volume Filtered' field may be found on the MOCNESS tow summary that is printed out for each MOCNESS tow. These data must be available before data entry is started. If the volume filtered data is not available, then record the volume filtered as 0 or 1.

## **The COD Application and Database**

### **Application Set-up**

A new blank COD application should be set up at the beginning of each cruise. The Chief Scientist should have a blank version on CD that includes the necessary files and a readme.txt file that explains the installation of the application. The COD application is comprised of 3 files:

COD2000AtSea.mdb – the main part of the application and database.

CodMap.xls – a file that allows for mapping station and sample locations.

CompactCurrent.mbd – a file that compacts the COD application and database when it is closing.

These files should be transferred to a directory with the current cruise designation. The monitor resolution should be set at 1024 x 768 (or higher) with small font chosen. If the monitor is not set up properly, the user will not be able to view all the necessary parts of the application forms.

The application can be opened by double clicking the COD2000AtSea.mdb file.

### **Moving Around in the COD**

While in the COD application, the user can move between fields using the enter button, tab (forward)/shift + tab (backwards), clicking on a field with the mouse, or, when appropriate, hot keys. Hot keys are underlined options that may be moved to directly by using alt + underlined letter. Unless specifically noted, all options are activated with a single click.

### **Main Menu**

When the starting menu screen is loading, the user may see the menu page flashing rapidly. To reduce the amount of flashing, move the cursor to one side of the screen.

When the COD application is opened, the menu will list six options: Enter Data, Edit Data, Make Map, Cruise Setup, End of Cruise, and Exit Application. When an option has the cursor over it, the option will be highlighted and if there is a sub-menu, the items will appear to the right of the main menu item. All menu options are activated by a single click.

### **Cruise Start**

Before any data entry can occur, certain cruise variables must be entered into the database. To do this, place the cursor over 'Cruise Setup' and choose 'Cruise Number'. A tabbed form with the following headings will appear: Cruise, Flowmeters, Gear Dictionary, Sample Dictionary, Project Dictionary, Project Defaults, and Exit. These are cruise variables that should be filled out at the beginning of the cruise, though some may be added or modified as sampling progresses.

## The COD Application and Database (cont'd)

### Cruise

This tab is where the FOCI and ship's cruise designation are set. If there are any data in the database from a previous cruise, this page will show the cruise designation and list how many records exist in each table. If any records exist from a previous cruise, they must be removed as the COD can only contain data from one cruise at a time. To proceed, first enter the FOCI and ship's cruise designation in the proper fields, and then choose the appropriate button on the bottom of the form.

Create a backup and then start a new cruise – This option should be chosen if it is unknown whether the previous cruise was backed up. The application will prompt the user for a file name and location, save the backup files, then reset the cruise designations. The 'Cruise' form should then show the new designations and that there are no records in any table with the new designation.

Update all records with the new cruise info – This option is used when incorrect information was entered for the FOCI and/or Ship cruise designation. Enter the correct information into each field, and then click the button. Data must be entered into each field, even if only one was incorrect. The user will receive a warning/confirmation before the changes are made. This change can be made at any point during the cruise and all further data entered will use the corrected information. Click 'yes' to continue, 'no' to return to form.

Start new cruise (forget the backup) – This option should only be used if there are no data present in the database, or it is certain that the data from a previous cruise were saved. Once the button is clicked, the user will get warning/confirmation that any existing data will be deleted without being saved. Click 'yes' to continue, 'no' to return to form.

### Flowmeters

This tab is where the flowmeter calibration data are entered. The calibration data for a flowmeter must be entered before any entries can be made for gear using that flowmeter. The calibration factors can usually be found on the underside of the lid of the flowmeter case, or on a sheet provided to the Chief Scientist. Flowmeters should be calibrated each year before the field season.

Flowmeter – The flowmeter identification number. Usually found on the side of the flowmeter.

Slope – The slope from the calibration regression.

Intercept – The intercept from the calibration regression.

## The COD Application and Database (cont'd)

After these fields are completed for a flowmeter, they can be entered into the database by clicking the 'Add' button. When the button is clicked, the data will appear in the area below the buttons. The new flowmeter data should be verified at this time. If there are any errors, click the 'Edit' button and these fields will become directly editable. Click on the field of interest and make the needed changes. Once all the errors are corrected, click the 'Lock' button to return to entry mode.

### Gear Dictionary

This section allows the user to add abbreviations and descriptions for gears not already included in the gear dictionary. All gears regularly used by EcoFOCI are already included in the relevant database and cannot be modified. An abbreviation and accompanying description must reside in the database before data can be entered for a gear. Most fields have a brief description for entry.

Gear – A descriptive abbreviation for the gear being added. Must be eight letters or less and should not include spaces.

Description – A description of the gear being added. Should include complete name of the gear and what study is associated with the gear, especially if it is for an outside investigator. Cannot be longer than 80 characters.

Purpose – This allows the user to set a default purpose code for the new gear. Most gears have a default purpose code, which streamlines the entry process and reduces the chances for incorrect data being entered. All purpose codes are in the accompanying drop-down list. Only the purpose codes listed may be used.

Is net information required for this new gear? – This field determines whether a gear needs accompanying mouth area data. If the volume filtered is required for sampling with the new gear (i.e. will data be quantitative), then the user needs to select 'Yes'. If 'Yes' is chosen, then the user must also complete the 'Mouth Area' field. If 'No' is chosen, then volume filtered will not be calculated by the application, and the 'Mouth Area' field must be left blank.

Mouth Area – This field is required if volume filtered is going to be calculated. The area must be in meters squared.

After entering information into the appropriate fields, the data are added to the database (and data entry and edit forms) by clicking the 'Add' button'. This will add the new gear to the list of gears in the area below the buttons.

To edit data for new, or non-standard EcoFOCI gear, click the 'Edit' button. Doing this will toggle the button to 'View All' and change the list of gears below the buttons to show

## The COD Application and Database (cont'd)

only the gears that can be edited. Editing is done directly to the field of interest. If any changes are made, then the application will prompt the user for a confirmation and review what the field contained previously and the change being made. Choose 'Yes' to accept the changes and 'No' to return to the edit 'Gear' tab. To return to the complete list of gear, click the 'View All' button.

### Sample Dictionary

This section allows the user to add abbreviations and descriptions for sample types not already included in the sample dictionary. All samples regularly collected are already included in the relevant database table and cannot be modified. An abbreviation and accompanying description must reside in the database before data may be entered for a sample. Most fields have a brief description for entry. The entry fields and buttons work the same as for the Gear Dictionary.

Sample – A descriptive abbreviation for the sample type being added. Must be eight letters or less and should not include spaces. If the sample is being collected specifically for someone, especially an outside investigator, and there is enough space, it is good to include the investigator's initials in the abbreviations.

Description – A description of the sample type being added. This should include the complete name of the sample and what study is associated with the sample, especially if it is an outside investigator. Cannot be longer than 100 characters.

Is number sampled information required for this new sample? – This field determines whether a sample type needs accompanying information about the number of samples collected with a particular gear/net. The default value is one.

After entering information into the appropriate fields, the data are added to the database (and data entry and edit forms) by clicking the 'Add' button. This will add the new sample type to the list of samples in the area below the buttons.

To edit data for new, or non-standard sample types, click the 'Edit' button. Doing this will toggle the button to 'View All' and change the list of sample types below the buttons to include only the sample types that can be edited. Editing is done directly to the field of interest. If any changes are made, the application will prompt the user for a confirmation and review what the field contained previously and the change being made. Choose 'Yes' to accept the changes and 'No' to return to the edit 'Gear' tab. To return to the complete list of sample types click the 'View All' button.



## The COD Application and Database (cont'd)

### Project Code

This section allows the user to add or edit project codes. Project codes are used to help track who samples were taken for, and who should receive them after the cruise or field season. Most of the project codes should be set before the field season by the task leaders and should already be resident in the database. Since a project code is needed for each sample collected, the Chief Scientist must know prior to sampling which project samples are being collected and pass this information on to those entering data into the COD. If the project is not known at the time of entry, Z (Miscellaneous Sampling) should be used as a placeholder until the correct information is acquired.

Project Code – A one or two letter code used to identify the project. This code may change from year to year, even for projects that span multiple years. Due to space limitations on the paper and electronic form, this is a shorthand way to reference project names. The project code is not stored in the database and it is just used for reference.

Project – The name of the project for which samples are being collected. Cannot be longer than 10 characters.

PI Component – The name of the study and principal investigators for the project.

Once these fields are completed for a project, they can be entered into the database by clicking the 'Add' button. Once the button is clicked, the data will appear in the area below the buttons. These data should be verified at this time. If there are any errors, click the 'Edit' button and these fields will become directly editable. Click on the field of interest and make the needed changes. Once all the errors are corrected, click the 'Lock' button to return to entry mode.

### Project Defaults

This section allows the user to set default project codes for standard sample types. The project code will automatically be filled for that sample type on the data entry screen. The project codes can be changed on the entry or edit form. This is useful for efficiency and accuracy while entering data into the COD. To select a default project code, either type the one or two letter project code or select the appropriate code from the dropdown list next to each sample type. Once all the desired defaults have been set, click the button on the bottom of the form labeled 'Set project default codes now'. These defaults may be changed at any time during the cruise. It will not reset project codes already entered into the database, it will only change the defaults for subsequent data entry.

### Exit

Returns the user to the main menu.

## The COD Application and Database (cont'd)

### **Enter Data**

This option opens the COD data entry form. When the entry form opens, three fields will already be completed; FOCI cruise, Ship Cruise, and GMT-Date. FOCI Cruise and Ship Cruise cannot be changed on this form, they can only be changed using Cruise Setup > Cruise Number from the main menu. The GMT-Date field is automatically filled based on the internal time and date settings of the computer. This field is editable.

No data are transferred to the database tables until one of the “enter” buttons (‘Next Gear/Net’, ‘Next Station/Haul’, ‘Exit’) is clicked, and even then confirmation is required. All the data on the form can be changed on the entry form or cleared previous to this without using the edit form. All data can be cleared from the form by clicking the ‘Clear’ button. When the cursor enters a new field by means of keystroke (enter or tab, not click of mouse) the entire field is highlighted and can be typed over.

For fields with dropdown boxes, the information can either be chosen from the dropdown or by typing the information in directly. If data are typed in, then note that the fields are set to auto-complete so only a few keystrokes are needed to get correct information (i.e. in the gear field, type the number 6 to get 60BON, or type mo to get MOCNESS).

### **Add ‘New’ Gear button**

This button is used when the user has started to enter data for a gear/net, but the gear used is not yet entered into the database. Clicking this button will open a pop-up form that will allow them to enter the pertinent data for the new gear. As in the process described under the Cruise Startup section, the user will enter a new gear abbreviation, description, default purpose, and if needed mouth area information. Use the ‘Add’ button to add the new gear to the database, and then ‘Exit’ to return to the COD entry form.

### **Add Flowmeter button**

This button is used when the user has started to enter data for a gear/net but the flowmeter used is not yet entered into the database. Clicking this button will open a pop-up form that allows them to enter the pertinent data for the new flowmeter. As in the process described under the Cruise Startup section, the user will enter a new flowmeter number, calibration slope, and calibration intercept. Use the ‘Add’ button to add the new flowmeter to the database, and then ‘Exit’ to return to the COD entry form.

### **QTowF Sample Note**

If entering data for ‘QTowF’, the user must also designate if any fish were removed from the preserved sample. There is a box present on the pop-up form set to the default of ‘No’. If any fish were removed prior to preservation or shipping of the sample to Poland,

## The COD Application and Database (cont'd)

'Yes' needs to be chosen, the performance code changed to 'quest', and the number, taxa, and lengths of the fish removed noted in the 'Haul Comments' field.

### Add 'New' Sample button

This button is used when the user has started to enter data for a gear/net, but the sample type collected is not yet entered into the database. Clicking this button will open a pop-up form that will allow them to enter the pertinent data for the new sample types. As in the process described under the Cruise Startup section, the user will enter a new sample abbreviation, sample description, and whether number sampled information is required. Use the 'Add' button to add the new sample type to the database, and then 'Exit' to return to the COD entry form. The new sample type will appear in alphabetical order in the 'New' Samples section at the bottom of the form.

### Getting Data Into the Database

Once all the necessary data fields are completed, the user can use one of the four buttons on the right to proceed. Once chosen, the Next Gear/Net button, Next Station/Haul button, and the Exit button will prompt the user for confirmation on saving the data to the database tables and then run a series of quality control checks. If errors are detected, then the application will notify the user of the problem, and place the cursor in the corresponding data field. Once corrected, the user will need to click the appropriate button again, and the quality control process will be rerun. Once all of the errors are corrected on the form, the application proceeds to the desired screen.

### Next Gear/Net button

This button is used if another gear/net is going to be entered for the current station/haul. The application will prompt the user to confirm the entry of the current data set into the database before proceeding. 'Yes' will prompt the application to open a new entry screen with data common to the station/haul (cruise, station, haul, lat, long, etc.) already completed and disabled.

This is a "smart" process in that it takes into account the gear type chosen when filling in data fields and locking the data. For example, if data for a Tucker trawl are entered, the application will not automatically fill the depth fields, and will prompt the user if they want to enter a corresponding Clarke-Bumpus net. If the answer is yes, the application will fill in the haul data for the top section as well as the flowmeter and depth information. If the answer is no, then the application will fill in only the header information, but leave the flowmeter and depth information blank. The application will also automatically fill the 'Haul Comments' field and open the new screen with the focus on that field, and any text highlighted so that if the data are not pertinent to the new gear/net they can easily be deleted.

## The COD Application and Database (cont'd)

After entering a gear/net for a station/haul, all further gears/nets entry screens for that station/haul will list all the gears/nets already entered for that station/haul in the upper right hand corner. This serves two purposes. First, it shows what has already been entered for that station/haul. Secondly, it provides a quick edit option for any of the gears/nets previously entered for that station/haul. To activate the edit option, double click the gear/net of interest. The application will ask the user if they want to save the current data (the records must be complete to save), then open the requested gear/net in the edit format. Any changes can be made to any field at this point, including deleting the entire record. If any data common to all gears/nets for a station/haul are changed, they will automatically be updated for all the associated records in the other gears/nets for that station/haul. After the desired changes are made, the user can easily move back to the entry form by choosing 'Add New Record' or return to the main menu by choosing 'Exit'.

### **Next Station/Haul button**

This button is used when all the gears/nets are entered for a station/haul, and data for a new station/haul are going to be entered. After clicking this button, the user will be prompted to confirm the data entered. 'Yes' will save the data to the database and take the user to a blank data entry form, 'No' will not save the data and take the user to a blank entry form, and 'Cancel' will return the user to the current entry form. If the 'Next Station/Haul' button is chosen before all the gears/nets are entered for a station/haul, the data common to a station/haul can be recalled by entering the station and haul information for the station/haul of interest.

### **Clear button**

After clicking on this button, the user is prompted to save the data ('Yes'), clear the form ('No'), or return to the form as is ('Cancel').

### **Exit button**

This will return the user to the main menu. After clicking the button, the application prompts the user to save the data ('Yes'), not save the data ('No'), or return to the current form ('Cancel').

### **Edit Data**

This option allows the user to choose a station/haul and edit the data that have been entered into the database. When this option is chosen, a pop-up form will prompt the user for the station/haul of interest. This information can either be entered directly (auto complete is activated) or by choosing from the dropdown list. Choose 'Edit' to proceed to the edit form or 'Exit' to return to the main menu. To edit any field on the form, highlight the field of interest and type in the corrected data. All data are edited directly in the database and requires a confirmation of the changes. A pop-up form will show the user the original data entry and the requested change and give them the option to

## The COD Application and Database (cont'd)

accept or reject the changes. Choosing 'Yes' will change the data and return the user to the edit form while 'No' and 'Cancel' will not affect the changes and returns the user to the edit form. Once changes have been made to the gear/net, the user may then edit another gear/net from the same station/haul, add a new record, edit different data from another station/haul, delete the current record, or exit the edit form.

Editing another gear/net for the same station/haul – Accessing these data for editing is done by clicking on the gear/net of interest in the upper right corner of the screen. All the gear/nets that have been entered for the current station/haul are listed there. A single click will change the data present on the edit form to the selected gear/net. The active record is listed in blue, while other available gears/nets are listed in red.

Adding a new record – To edit data from another station/haul, click the 'Add New Record' button. Clicking this button will take the user to a blank data entry form. If the new gear/net is from a station/haul that already has entries, the common haul data (date, lat, long, etc) will automatically be filled and locked and a list of the other gears/nets already entered for that station/haul will appear in the upper right corner of the screen once the station and haul fields have been completed. If the data are for a new station/haul, the form will work the same way as if accessed through the Enter Data option from the main menu.

Delete Record – This option allows the user to easily delete all the data associated with the current record from the database tables. Clicking the button will prompt the user for confirmation, then delete the data and return the user to the edit form where data for the next gear/net from that station haul will be displayed. If no other gears/nets exist, the user will be returned to the station selector pop-up window for the edit function.

Exit – This will return the user to the station selector pop-up window for the edit function. From here, the user may select another station/haul to edit, or exit to the main menu.

### Run Checks

By clicking this option, the user will print out a series of standard quality control reports aimed at finding potential data entry mistakes. The reports look for:

- 1) Stations with duplicate alternate station numbers
- 2) Incorrect alternate station naming structure
- 3) CTDB samples where number sampled does not equal bottle depths entered for samples
- 4) A table of flowmeter/gear/nets to look for incorrectly entered flowmeter numbers
- 5) Hauls where performance is not 'good', but do not have haul comments
- 6) HaulIDs where GMT-Date or GMT- Time appear incorrect or out of order
- 7) HaulIDs where flowmeter revs equal zero

## The COD Application and Database (cont'd)

- 8) Hauls where it is indicated fish were removed from the sample but there are no haul comments.

These reports should be printed out several times a cruise, including at the end of the cruise after all data have been entered.

### **Proof Sheets**

These sheets are used to proof the data entered. This must be done for all data entered. Clicking this option will call a pop-up form that allows the user to select which of the station/hauls they want printed. The station/haul range can be typed in directly or the information chosen from the dropdown boxes. Any number of station/haul proof sheets can be printed at anytime of the cruise, though it is suggested that the process be done every day or every other day as the process of proofing the data may be time consuming. All errors should be marked on the proof sheet and the correct data noted. The data should then be corrected in the database and the proof sheet noted with the date of the correction. When this process is finished the 'Error Checked' field at the top of the data form should be marked.

### **Make Map**

This menu item allows the user to create an editable station location map based on one of several criteria. This function uses the Excel charting function to create the map. The default area of the map is the western Gulf of Alaska and the eastern Bering Sea with boundaries of 50° – 60° N and 150° – 180° W. The boundaries may be modified by double clicking on the bottom or left boundary line and changing the minimum and/or maximum values on the 'scale' tab.

Station locations are marked with a red '+' and station number. These maps are useful as figures in cruise reports, for looking at trends during or after cruises, and as a quality control for the location data that have been entered. The latitude and longitude of any station can be viewed in the chart view by placing the cursor over the red '+' of a station. A small yellow box will temporarily appear showing the latitude and longitude in decimal degree format.

When exiting the Excel chart, the user will be prompted to save the changes to CodMap.xls. If the user chooses 'Yes', the application will inform them they cannot change CodMap.xls as it is a program file, but they can save it under a different name and bring up the 'Save As' dialog box to help facilitate the process. If the user chooses 'No', Excel will close and they will be returned to the main menu of the COD application.

## The COD Application and Database (cont'd)

### Haul ID

This option creates a map of all the haul ids (unique identifier code comprised of cruise, station, haul, gear abrv, net) that have been entered into the COD for the current cruise. Only the station number appears because of space limitations, but a station number is present for each haul id entered. Any station number not grouped with other locations with the same station number need to be checked for errors.

### Station

This option creates a map showing one location for each station. It uses the first instance of the station it finds in the haul table. This is useful for cruise reports and checking location entry mistakes.

### Rough Count

This option creates a map of standardized rough counts (catch/10m<sup>2</sup>) for all stations where rough counts have been entered as a sample type. The user can choose rough counts for eggs (sample type RCountE), larvae (RCountL), or juveniles (RCountJ). The map will show the station locations and rough counts entered.

### Gear

This option allows the user to make a station map with all the locations of any of the gears used during the cruise. After choosing this option, the application brings up a pop-up form where the user can choose a gear type. The gear abbreviation can be typed in directly (auto complete is activated) or chosen from the dropdown box. Only one gear can be mapped at a time. The map created will show the station locations and station numbers.

### Sample

This option allows the user to make a station map with all the locations of any of the sample types collected during the cruise. After choosing this option, the application brings up a pop-up form where the user can choose a sample type. The sample abbreviation can be typed in directly (auto complete is activated) or chosen from the dropdown box. Only one sample type can be mapped at a time. The map created will show the station locations and station numbers.

### PI/Project

This option allows the user to make a station map with all the locations of samples collected for a project during the course of a cruise. After choosing this option, the application brings up a pop-up form where the user can choose a project name. The project name can be typed in directly (auto complete is activated) or chosen from the dropdown box. Only one project can be mapped at a time. The map created will show the station locations and station numbers.

## The COD Application and Database (cont'd)

### Recover Database

This option allows the user to load the data tables from a previously saved version of the COD. It is useful if the database is corrupted or otherwise unusable. Once chosen, the user will be notified that the process will overwrite the data currently present in the database tables, and prompted for confirmation before proceeding. If 'Yes' is chosen, a dialog box will appear prompting the user for the location of the file to be used to populate the data tables. It is a good idea to back up the database file after each entry session on the hard drive or a removable hard drive device.

### End Of Cruise

This menu option lists a series of options that are generally used at the end of a cruise and facilitate the creation and completion of a cruise report.

### **Summary**

This option allows the user to print out or save to file a summarized chronological list of cruise activities and the samples collected. This summary is a part of the cruise report required for each cruise. The format of the summary table is: date, time, station, haul, foci grid, alternate station, depth, latitude, longitude, gear type, samples collected, and haul comments. The header information includes the FOCI and ship's cruise designations. The summary must be printed out separately to include in the cruise report.

When this option is chosen, the application prompts the user to save the data to a file ('Yes'), print out the report ('No'), or return to the main menu ('Cancel'). If 'Yes' is chosen, the user is prompted to save the file. The format of the file is rich text format (.rtf) and opened in Word. From here the user can save in any of the formats supported by Word. If 'No' is chosen, the report will print to the default printer and not be saved to a file. 'Cancel' returns the user to the main menu.

### **Statistics**

This option allows the user to print out or save to file a list of cruise statistics. These statistics are part of the cruise report required for each cruise. The statistics reported are: the gears used, the number of hauls for each gear, the sample types collected, the number of tows they were collected at, and the total number samples by sample type. The cruise statistics are automatically included in the cruise report if the 'End of Cruise' > 'Cruise Report' option is used to create the cruise report. 'Cancel' returns the user to the main menu.

When this option is chosen, the application prompts the user to save the data to a file ('Yes'), print out the report ('No'), or return to the main menu ('Cancel'). If 'Yes' is chosen, the user is prompted to save the file. The format of the file is rich text format (.rtf) and opened in Word. From here the user can save in any of the formats supported



## The COD Application and Database (cont'd)

by Word. If 'No' is chosen, the report will print to the default printer and not be saved to a file.

### Station Map

This option creates a station map for the cruise and opens it in Excel chart format. The map includes the eastern Bering Sea, the western Gulf of Alaska, the Alaskan peninsula, Aleutian Islands, and the 50 m, 100 m, 200 m, and 1000 m isobaths in addition to the station locations. The first haul for each station is used as the proxy for that station. The marker for each station is a red '+' and the station number. The map boundaries can be edited as described in the 'Make Map' section of the instructions.

### Cruise Report

This option allows the Chief Scientist to easily create a cruise report in a standardized form using a series of tabbed pages for data entry. Once all the fields are completed, the cruise report is created (including section headings, cruise statistics, page numbers, etc.), saved as an .rtf file, and opened in Word. This option allows for easy report creation by letting the user copy and paste information from the Cruise Instructions into the cruise report. Many of the fields include dropdown boxes for easy completion of entry.

General – This tab includes the general cruise information such as the vessel used, the area of operation, the cruise dates and ports, and participating scientists and organizations. Data can be chosen from the dropdown boxes, typed in directly (auto complete is activated), or chosen from a list. When using a list, any number of the listed items may be chosen by clicking the relevant information. Use shift + click to choose a contiguous items and ctrl + click to select non- contiguous items.

Personnel – This tab allows the user to choose the participants of a cruise (excluding the Chief Scientist). Use shift + click to choose a contiguous items and ctrl + click to select non- contiguous items.

Objectives – This tab is where the cruise objectives are listed. This can often be copied and pasted from the cruise instructions.

Narrative – This tab is where the cruise narrative/summary is entered. Usually this is a quick overview of the cruise and operations.

Miscellaneous – This tab includes the data fields for acknowledgements, time lost to weather and/or equipment failure, and recommendations for future cruises.

## **The COD Application and Database (cont'd)**

Create Report – This tab starts the process of creating the cruise report. Once chosen, the application prompts the user for a file location and filename, saves it as an .rtf format file, and opens the file in Word.

Exit – Returns the user to the main menu.

### **Exit Application**

This option allows the user to backup the database tables, compacts the application, and closes Access. When clicked, the user is prompted to decide whether they wish to make a backup of the database tables. 'Yes' allows the user to choose a location and filename, then compacts and closes the application. 'No' will compact and close the application. 'Cancel' will return the user to the main menu.

### **COD Table Structure**

These tables house the sample, cruise, and haul data used by the COD application. It also contains the quality control tables and queries used for loading new data. The user can create new tables, queries, forms, reports, macros, or modules. These objects can also be exported to other databases or be linked to by other users if the permissions allow. Only one cruise can be resident in any one COD2000AtSea.mdb file.

There is a companion application used by the database manager that contains the data for all completed COD2000AtSea.mdb files. It is called COD2000Seattle.mdb. In addition to acting as a storehouse, it is used to input, manage, and track the shipment and processing of samples sent to Poland.





## CHEMICALS

### Aboard Ship

Aboard NOAA vessels, an MSDS packet is available in the Survey Office/Field Operations Officer's Office for all of the chemicals that FOCl are responsible for.

Please try to minimize the opportunity for a chemical spill. Remember not to leave chemical containers too near the edge of counters or sinks. If a small amount is spilled, then quickly wipe it up with paper towels for alcohols and FanPads for formaldehyde, seal in a plastic bag, and have the ship incinerate it when possible. A larger spill, such as an entire 5-gallon container of formaldehyde, should be handled according to ship's procedures (probably involving neutralization and flushing overboard with a fire hose).

We provide the ship with the necessary materials for neutralization of the chemicals we bring on board.

All FOCl chemical bottles/container should be labeled (use a HMIG label) according to the following:

- name of chemical
- concentration
- components of solution (if applicable)
- acid, base, oxidizer, etc.
- type of health hazard

## Chemicals Aboard Vessels - Chief Scientist Guidelines

### Before the cruise:

Know what chemicals you and your group will be working with. You should have a chemical inventory for your cruise, which should include chemicals for visiting scientists.

### At the beginning of the cruise:

Hold a pre-cruise meeting with as many of your cruise personnel as possible to discuss what chemicals are aboard and what they will be used for. The pre-cruise meeting will be the time to discuss the Standard Operating Procedures for each chemical. The Standard Operating Procedures will cover the following topics:

- \*\*\* hazard ratings
- \*\*\* personal protection gear needed
- \*\*\* special handling instructions
- \*\*\* first-aid
- \*\*\* spill cleanup procedures
- \*\*\* deactivation/disposal procedures at sea
- \*\*\* shipping procedures and restrictions

### At the completion of the cruise:

**1)** Tally each jar/vial size used and calculate how much preservative was used for each container type.

For example:

50 1-liter jars of plankton = 50 x 50 mls formaldehyde = 2,500 mls or 2.5 liters formaldehyde used

**2)** If any formaldehyde or other FOCI chemical has been spilled, make a written estimate of how much of the chemical was lost.

## CHEMICALS

### Directions For Making Sodium Borate Solution

A saturated solution of sodium borate will be needed for the buffering of formaldehyde-preserved plankton samples. This will be a saturated solution so there should always be some sodium borate on the bottom of the container after 24 hours that will not go into solution. When the amount of liquid is down to about half of the container volume and there is still some sodium borate on the container bottom, add 41  $\mu\text{m}$  filtered seawater or freshwater to raise the volume of the solution. Add more sodium borate when needed to maintain a layer of undissolved chemical on the bottom of the container.

Materials needed:

5-gallon red carboy or 1-gallon container  
4 500-g bottles of sodium borate for a 5-gallon container  
1 250-g bottle of sodium borate for a 1-gallon container  
funnel  
41- $\mu\text{m}$  filter cup

## CHEMICALS

### Preservation Reminders

Please copy and post this reminder sheet for the formaldehyde preservation of 8-oz and 32-oz plankton samples as close to the preservation area as possible.

To preserve a 32-oz plankton sample add:

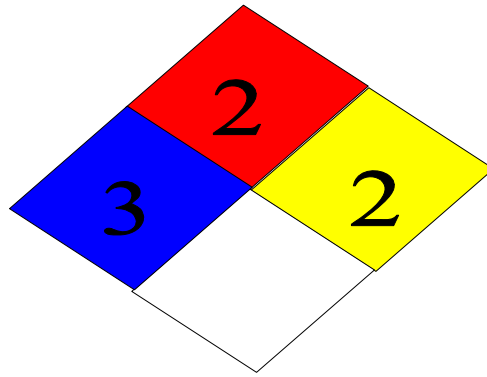
50 ml formaldehyde and 20 ml sodium borate solution

To preserve a 8-oz plankton sample add:

12.5 ml formaldehyde and 5 ml sodium borate solution



**Standard Operating Procedures - 37% Formaldehyde**



Chemical Name: 37% Formaldehyde

UN Number: 1198

Hazard Ratings: (on a scale of 0 to 4)

Health (blue): 3                  Flammability (red): 2

Reactivity (yellow): 2          Special (white):

Personal Protection Gear Needed

\*nitrile gloves

\*ventilation hood or open area with cross ventilation

\*goggles or face shield

### Standard Operating Procedures - 37% Formaldehyde (cont'd)

#### Special Handling Instructions

- \* If a ventilation hood is not available, then pouring of chemical must be done outside. At least two people should be involved with large chemical transfers in case of an emergency. The Spill Kit should be close at hand when transferring formaldehyde.
- \* Chemical must be stored at temperatures above 15°C to prevent polymerization of paraformaldehyde.

#### First Aid

- \* If swallowed, give large amounts of drinking water and induce vomiting.
- \* If vapors inhaled, get out into fresh air immediately. Give oxygen if breathing is difficult.
- \* If spilled on skin or splashed in eyes, flush with water for at least 15 minutes.

#### Spill Cleanup Procedures

##### **For small spills** (500 – 1,000 ml):

Cover spill quickly with Fan Pads and spray on Formalex to deactivate and absorb chemical. Let material sit for 10 - 15 minutes. Put used Fan-Pads in a plastic bag and dispose of materials in the garbage.

##### **For large spills** (1,000 ml - ?):

Use a combination of Fan Pads and Formalex as quickly as possible to contain spill and deactivate it. Vacate area and try to ventilate room, if possible.

### **Standard Operating Procedures - 37% Formaldehyde (cont'd)**

#### Deactivation/Disposal Procedures At Sea

\*Formalex is a pink liquid that is to be used in a 1:1 ratio to ensure proper chemical deactivation. Spray or pour Formalex directly onto formaldehyde spill. Formalex should also be used in conjunction with Fan-Pads to stop, deactivate, and contain spills.

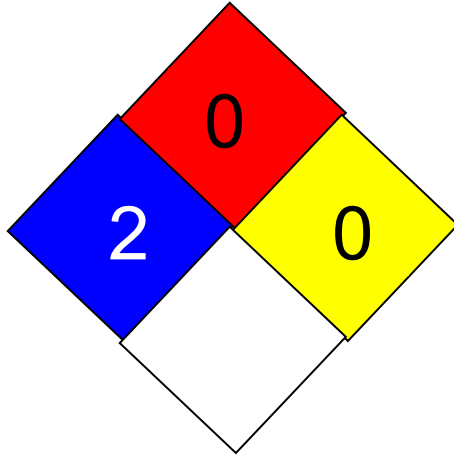
\*Fan-Pads may be used to absorb small spills alone but these pads work best when used with Formalex to immediately control the vapor layer.

#### Shipping Procedures and Restrictions

37% formaldehyde cannot be shipped by air due to its flammability rating.

All quantities should be over-packed with absorbency material in case the original container is damaged during shipping. When shipping by barge or land, labels including the UN number and an MSDS should be available on the over-pack container.

Standard Operating Procedures – 3.7% Formaldehyde



Chemical Name: 3.7% Formaldehyde  
UN Number: 1198

Hazard Ratings: (on a scale of 0 to 4)

Health (blue): 2          Flammability (red): 0

Reactivity (yellow): 0      Special (white):

Personal Protection Gear Needed

- \*nitrile gloves
- \*ventilation hood or open area with cross ventilation
- \*goggles or face shield

### Standard Operating Procedures – 3.7% Formaldehyde (cont'd)

#### Special Handling Instructions

\* If a ventilation hood is not available, then pouring of chemical must be done outside. At least two people should be involved with large chemical transfers in case of an emergency. The Spill Kit should be close at hand when transferring formaldehyde.

\* Chemical must be stored at temperatures above 15°C to prevent polymerization of paraformaldehyde.

#### First Aid

\* If swallowed, give large amounts of drinking water and induce vomiting.

\* If vapors are inhaled, then get out into fresh air immediately. Give oxygen if breathing is difficult.

\* If spilled on skin or splashed in eyes, then flush with water for at least 15 minutes.

#### Spill Cleanup Procedures

##### **For small spills (500-1,000 ml):**

Cover the spill quickly with Fan-Pads and spray on Formalex to deactivate and absorb chemical. Let material sit for 10 - 15 minutes. Put used Fan-Pads in a plastic bag and dispose of materials in the garbage.

##### **For large spills (1,000 ml - ?):**

Use a combination of Fan-Pads and Formalex as quickly as possible to contain spill and deactivate it. Vacate area and try to ventilate room, if possible.

### **Standard Operating Procedures – 3.7% Formaldehyde (cont'd)**

#### Deactivation/Disposal Procedures At Sea

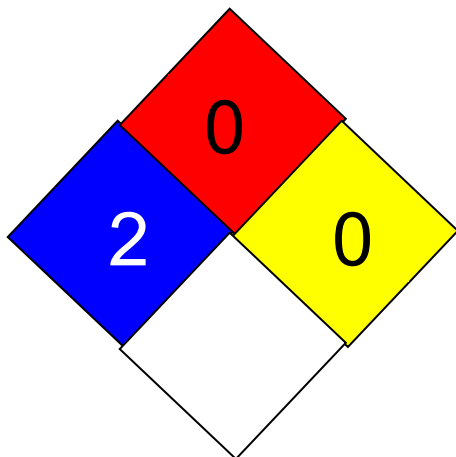
\*Formalex is a pink liquid that is to be used in a 1:4 ratio to insure proper chemical deactivation. Spray or pour Formalex directly onto formaldehyde spills. Formalex should also be used in conjunction with Fan-Pads to stop, deactivate, and contain spills.

\*Fan-Pads may be used to absorb small spills alone but these pads work best when used with Formalex to immediately control the vapor layer.

#### Shipping Procedures and Restrictions

All quantities should be over-packed with absorbency material in case the original container is damaged. When shipping, labels are not required for quantities under 1000 lbs by D.O.T. but the container should have MSDS and the UN number readily available.

Standard Operating Procedures – 1.8 % Formaldehyde



Chemical Name: 1.8 % Formaldehyde

UN Number: 1198

Hazard Ratings: (on a scale of 0 to 4)

Health (blue): 2                      Flammability (red): 0

Reactivity (yellow): 0              Special (white):

Personal Protection Gear Needed

\*nitrile gloves

\*ventilation hood or open area with cross ventilation

\*goggles or face shield

## CHEMICALS

### Standard Operating Procedures – 1.8 % Formaldehyde (cont'd)

#### Special Handling Instructions

\* If a ventilation hood is not available, then pouring of chemical must be done outside. At least two people should be involved with large chemical transfers in case of an emergency.

#### First Aid

\* If swallowed, give large amounts of drinking water and induce vomiting.

\* If vapors are inhaled, then get out into fresh air immediately. Give oxygen if breathing is difficult.

\* If spilled on skin or splashed in eyes, then flush with water for at least 15 minutes.

#### Spill Cleanup Procedures

##### **For small spills (500-1,000 ml):**

Cover the spill quickly with Fan-Pads and spray on Formalex to deactivate and absorb chemical. Let material sit for 10 - 15 minutes. Put used Fan-Pads in a plastic bag and dispose of materials in the garbage.

##### **For large spills (1,000 ml - ?):**

Use a combination of Fan-Pads and Formalex as quickly as possible to contain spill and deactivate it. Vacate area and try to ventilate room, if possible.



## CHEMICALS

### Standard Operating Procedures – 1.8 % Formaldehyde (cont'd)

#### Deactivation/Disposal Procedures At Sea

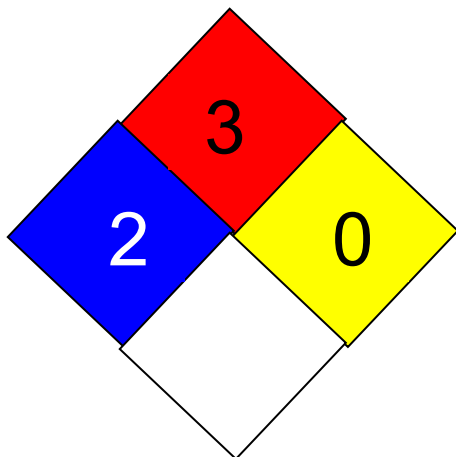
\*Formalex is a pink liquid that is to be used in a 1:4 ratio to insure proper chemical deactivation. Spray or pour Formalex directly onto formaldehyde spill. Formalex should also be used in conjunction with Fan-Pads to stop, deactivate, and contain spills.

\*Fan-Pads may be used to absorb small spills alone but these pads work best when used with Formalex to immediately control the vapor layer.

#### Shipping Procedures and Restrictions

All quantities should be over-packed with absorbency material in case the original container is damaged. When shipping, labels are not required for quantities under 1000 lbs by D.O.T. but the container should have MSDS and the UN number readily available.

Standard Operating Procedures – 100% Ethanol



Chemical Name: 100% Ethanol (non-denatured)

UN Number: 1170

Hazard Ratings: (on a scale of 0 to 4)

Health (blue): 2                      Flammability (red): 3

Reactivity (yellow): 0              Special (white):

Personal Protection Gear Needed

\*nitrile gloves

\*goggles or face shield

## CHEMICALS

### Standard Operating Procedures – 100% Ethanol (cont'd)

#### Special Handling Instructions

- \* Keep away from heat, flame, and other potential ignition sources.
- \* Store in a well-ventilated area or in a flammables cabinet.

#### First Aid

- \* If swallowed, give large amounts of drinking water and induce vomiting.
- \* If vapors are inhaled, then get out into fresh air immediately. Give oxygen if breathing is difficult.
- \* If spilled on skin or splashed in eyes, then flush with water for at least 15 minutes.

#### Spill Cleanup Procedures

Absorb ethanol with 3M Sorbent Pads and allow to dry in a well ventilated area away from ignition sources.

#### Deactivation/Disposal Procedures At Sea

Use 3M Sorbent Pads to absorb the ethanol. Put used pads outside to dry (secure from blowing overboard and expose to flame) or under a ventilation hood. Once dry, the pads may be reused or burned.

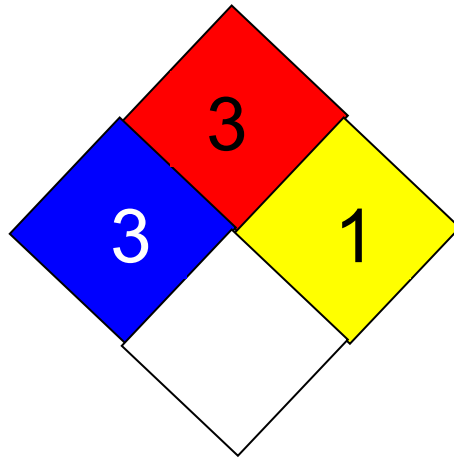
**Standard Operating Procedures – 100% Ethanol (cont'd)**

Shipping Procedures and Restrictions

Due to the flammability rating of 100% ethanol, this chemical can not be shipped by air. Transportation by barge or land vehicle will require the ethanol container to be over-packed with absorbent materials such as clumping kitty litter and 3M Sorbent Pads.

Include the MSDS and UN number with the shipment for reference in the event of a spill.

Standard Operating Procedures – 95% Ethanol



Chemical Name: 95% Ethanol (denatured)  
UN Number: 1987

Hazard Ratings: (on a scale of 0 to 4)

Health (blue): 3                  Flammability (red): 3

Reactivity (yellow): 1        Special (white):

Personal Protection Gear Needed

\*nitrile gloves

\*goggles or face shield

## CHEMICALS

### **Standard Operating Procedures – 95% Ethanol (cont'd)**

#### Special Handling Instructions

- \* Keep away from heat, flame, and other potential ignition sources.
- \* Store in a well-ventilated area or in a flammables cabinet.

#### First Aid

- \* If swallowed, give large amounts of drinking water and induce vomiting.
- \* If vapors are inhaled, then get out into fresh air immediately. Give oxygen if breathing is difficult.
- \* If spilled on skin or splashed in eyes, then flush with water for at least 15 minutes.

#### Spill Cleanup Procedures

Absorb ethanol with 3M Sorbent Pads and allow to dry in a well ventilated area away from ignition sources.

#### Deactivation/Disposal Procedures At Sea

Use 3M Sorbent Pads to absorb the ethanol. Put used pads outside to dry (secure from blowing overboard and expose to flame) or under a ventilation hood. Once dry, the pads may be reused or burned.

### **Standard Operating Procedures – 95% Ethanol (cont'd)**

#### Shipping Procedures and Restrictions

Due to the flammability rating of 95% ethanol, this chemical cannot be shipped by air. Transportation by barge or land vehicle will require the ethanol container to be over-packed with absorbent materials such as clumping kitty litter and 3M Sorbent Pads. Include the MSDS and UN number with the shipment for reference in the event of a spill.









# MICROSCOPES

## INSTRUCTIONS FOR SETTING UP MICROSCOPES

After removing equipment from the box, loosen the knob securing the optics carrier to the column and lift the carrier off the column. Put a light transmission box in place on the stage - line up the two silver pegs on the box with the holes on the stage. You will need to apply a little pressure to seat it. Remove the stage clips and replace the solid round plate on the box with one of the clear glass plates (wrapped up in a plastic bag). Keep the stage clips in the plastic bag. Slide one of the Plexiglas plates onto the column on top of the light box. Slide the optics carrier onto the column and tighten the screw. Get two of the eyepieces, making sure one of them is marked "ocular micrometer" and place on the optics carrier (please don't lose the black plugs you removed from the eye stems - place these into the clear plastic eyepiece containers). Position the eyepiece with the micrometer as you prefer (vertical or horizontal) and tighten the screws on both. Adjust the focus, connect the transformer box, and you're set!

The microscope stand must be mounted onto a piece of plywood so it can be secured to the counter. The holes in the bottom of the stand take 5/16" screws. The stand is aluminum so please take care not to strip the threads. Also, the Plexiglas plate may have to be tied down so it won't swing around.

## REPACKING

Remove the plywood base from the bottom of the stand. Reverse the steps for setting up the scopes, making sure you repack the glass stage plates and eyepieces. To remove the light box, you'll have to wiggle it a bit to work it loose. Slide the optics carrier all the way down the column and tighten the screw. Place the scopes in the shipping container with the bottoms of the stands next to the hinges on the box and the scopes facing inwards - the black knob should be resting on the foam. Wrap the eyepiece containers and Plexiglas plates in the bubble wrap and repack all of the equipment (hint: put transformers at the top of the scopes next to the foam and place the light boxes on the inside of the column with the round plate facing in). The rest of the equipment goes mostly in the center. Place the beige foam over the parts in the middle of the box and shut the lid.

## EQUIPMENT LIST

2 stands with columns	4 stage clips
2 optics carriers with lights	2 Plexiglas plates
2 transmitted light boxes	2 spare light bulbs (6V, 10W)
2 transformers	4 eyepieces (2 with ocular micrometer)
2 transformer electric cords	4 black eye stem plugs
2 clear glass stage plates	1 owner's manual
2 white/black stage plates	

Info. provided by: D. Blood

9-Mar-95

ZEISS STEMI-2000

Magnification Multiplier		6.5 x 1.5873	8.0 x 1.25	10.0 x 1.0	12.5 x 0.8	16.0 x 0.625	20.0 x 0.5	25.0 x 0.4	32.0 x 0.3096	40.0 x 0.2326
Micrometer Units										
0.1	=	0.1587	0.1250	0.1000	0.0800	0.0625	0.0500	0.0400	0.0310	0.0233
0.2	=	0.3175	0.2500	0.2000	0.1600	0.1250	0.1000	0.0800	0.0619	0.0465
0.3	=	0.4762	0.3750	0.3000	0.2400	0.1875	0.1500	0.1200	0.0929	0.0698
0.4	=	0.6349	0.5000	0.4000	0.3200	0.2500	0.2000	0.1600	0.1238	0.0930
0.5	=	0.7937	0.6250	0.5000	0.4000	0.3125	0.2500	0.2000	0.1548	0.1163
0.6	=	0.9524	0.7500	0.6000	0.4800	0.3750	0.3000	0.2400	0.1858	0.1396
0.7	=	1.1111	0.8750	0.7000	0.5600	0.4375	0.3500	0.2800	0.2167	0.1628
0.8	=	1.2698	1.0000	0.8000	0.6400	0.5000	0.4000	0.3200	0.2477	0.1861
0.9	=	1.4286	1.1250	0.9000	0.7200	0.5625	0.4500	0.3600	0.2786	0.2093
1	=	1.5873	1.2500	1.0000	0.8000	0.6250	0.5000	0.4000	0.3096	0.2326
1.1	=	1.7460	1.3750	1.1000	0.8800	0.6875	0.5500	0.4400	0.3406	0.2559
1.2	=	1.9048	1.5000	1.2000	0.9600	0.7500	0.6000	0.4800	0.3715	0.2791
1.3	=	2.0635	1.6250	1.3000	1.0400	0.8125	0.6500	0.5200	0.4025	0.3024
1.4	=	2.2222	1.7500	1.4000	1.1200	0.8750	0.7000	0.5600	0.4334	0.3256
1.5	=	2.3810	1.8750	1.5000	1.2000	0.9375	0.7500	0.6000	0.4644	0.3489
1.6	=	2.5397	2.0000	1.6000	1.2800	1.0000	0.8000	0.6400	0.4954	0.3722
1.7	=	2.6984	2.1250	1.7000	1.3600	1.0625	0.8500	0.6800	0.5263	0.3954
1.8	=	2.8571	2.2500	1.8000	1.4400	1.1250	0.9000	0.7200	0.5573	0.4187
1.9	=	3.0159	2.3750	1.9000	1.5200	1.1875	0.9500	0.7600	0.5882	0.4419
2	=	3.1746	2.5000	2.0000	1.6000	1.2500	1.0000	0.8000	0.6192	0.4652
2.1	=	3.3333	2.6250	2.1000	1.6800	1.3125	1.0500	0.8400	0.6502	0.4885
2.2	=	3.4921	2.7500	2.2000	1.7600	1.3750	1.1000	0.8800	0.6811	0.5117
2.3	=	3.6508	2.8750	2.3000	1.8400	1.4375	1.1500	0.9200	0.7121	0.5350
2.4	=	3.8095	3.0000	2.4000	1.9200	1.5000	1.2000	0.9600	0.7430	0.5582
2.5	=	3.9683	3.1250	2.5000	2.0000	1.5625	1.2500	1.0000	0.7740	0.5815
2.6	=	4.1270	3.2500	2.6000	2.0800	1.6250	1.3000	1.0400	0.8050	0.6048
2.7	=	4.2857	3.3750	2.7000	2.1600	1.6875	1.3500	1.0800	0.8359	0.6280
2.8	=	4.4444	3.5000	2.8000	2.2400	1.7500	1.4000	1.1200	0.8669	0.6513
2.9	=	4.6032	3.6250	2.9000	2.3200	1.8125	1.4500	1.1600	0.8978	0.6745
3	=	4.7619	3.7500	3.0000	2.4000	1.8750	1.5000	1.2000	0.9288	0.6978
3.1	=	4.9206	3.8750	3.1000	2.4800	1.9375	1.5500	1.2400	0.9598	0.7211
3.2	=	5.0794	4.0000	3.2000	2.5600	2.0000	1.6000	1.2800	0.9907	0.7443
3.3	=	5.2381	4.1250	3.3000	2.6400	2.0625	1.6500	1.3200	1.0217	0.7676
3.4	=	5.3968	4.2500	3.4000	2.7200	2.1250	1.7000	1.3600	1.0526	0.7908
3.5	=	5.5556	4.3750	3.5000	2.8000	2.1875	1.7500	1.4000	1.0836	0.8141
3.6	=	5.7143	4.5000	3.6000	2.8800	2.2500	1.8000	1.4400	1.1146	0.8374
3.7	=	5.8730	4.6250	3.7000	2.9600	2.3125	1.8500	1.4800	1.1455	0.8606
3.8	=	6.0317	4.7500	3.8000	3.0400	2.3750	1.9000	1.5200	1.1765	0.8839
3.9	=	6.1905	4.8750	3.9000	3.1200	2.4375	1.9500	1.5600	1.2074	0.9071
4	=	6.3492	5.0000	4.0000	3.2000	2.5000	2.0000	1.6000	1.2384	0.9304

ZEISS STEMI-2000

Magnification Multiplier	6.5 x 1.5873	8.0 x 1.25	10.0 x 1.0	12.5 x 0.8	16.0 x 0.625	20.0 x 0.5	25.0 x 0.4	32.0 x 0.3096	40.0 x 0.2326
Micrometer Units									
4.1 =	6.5079	5.1250	4.1000	3.2800	2.5625	2.0500	1.6400	1.2694	0.9537
4.2 =	6.6667	5.2500	4.2000	3.3600	2.6250	2.1000	1.6800	1.3003	0.9769
4.3 =	6.8254	5.3750	4.3000	3.4400	2.6875	2.1500	1.7200	1.3313	1.0002
4.4 =	6.9841	5.5000	4.4000	3.5200	2.7500	2.2000	1.7600	1.3622	1.0234
4.5 =	7.1429	5.6250	4.5000	3.6000	2.8125	2.2500	1.8000	1.3932	1.0467
4.6 =	7.3016	5.7500	4.6000	3.6800	2.8750	2.3000	1.8400	1.4242	1.0700
4.7 =	7.4603	5.8750	4.7000	3.7600	2.9375	2.3500	1.8800	1.4551	1.0932
4.8 =	7.6190	6.0000	4.8000	3.8400	3.0000	2.4000	1.9200	1.4861	1.1165
4.9 =	7.7778	6.1250	4.9000	3.9200	3.0625	2.4500	1.9600	1.5170	1.1397
5 =	7.9365	6.2500	5.0000	4.0000	3.1250	2.5000	2.0000	1.5480	1.1630
5.1 =	8.09523	6.375	5.1	4.08	3.1875	2.5500	2.0400	1.5790	1.1863
5.2 =	8.2540	6.5000	5.2000	4.1600	3.2500	2.6000	2.0800	1.6099	1.2095
5.3 =	8.4127	6.6250	5.3000	4.2400	3.3125	2.6500	2.1200	1.6409	1.2328
5.4 =	8.5714	6.7500	5.4000	4.3200	3.3750	2.7000	2.1600	1.6718	1.2560
5.5 =	8.7302	6.8750	5.5000	4.4000	3.4375	2.7500	2.2000	1.7028	1.2793
5.6 =	8.8889	7.0000	5.6000	4.4800	3.5000	2.8000	2.2400	1.7338	1.3026
5.7 =	9.0476	7.1250	5.7000	4.5600	3.5625	2.8500	2.2800	1.7647	1.3258
5.8 =	9.2063	7.2500	5.8000	4.6400	3.6250	2.9000	2.3200	1.7957	1.3491
5.9 =	9.3651	7.3750	5.9000	4.7200	3.6875	2.9500	2.3600	1.8266	1.3723
6 =	9.5238	7.5000	6.0000	4.8000	3.7500	3.0000	2.4000	1.8576	1.3956
6.1 =	9.6825	7.6250	6.1000	4.8800	3.8125	3.0500	2.4400	1.8886	1.4189
6.2 =	9.8413	7.7500	6.2000	4.9600	3.8750	3.1000	2.4800	1.9195	1.4421
6.3 =	10.0000	7.8750	6.3000	5.0400	3.9375	3.1500	2.5200	1.9505	1.4654
6.4 =	10.1587	8.0000	6.4000	5.1200	4.0000	3.2000	2.5600	1.9814	1.4886
6.5 =	10.3175	8.1250	6.5000	5.2000	4.0625	3.2500	2.6000	2.0124	1.5119
6.6 =	10.4762	8.2500	6.6000	5.2800	4.1250	3.3000	2.6400	2.0434	1.5352
6.7 =	10.6349	8.3750	6.7000	5.3600	4.1875	3.3500	2.6800	2.0743	1.5584
6.8 =	10.7936	8.5000	6.8000	5.4400	4.2500	3.4000	2.7200	2.1053	1.5817
6.9 =	10.9524	8.6250	6.9000	5.5200	4.3125	3.4500	2.7600	2.1362	1.6049
7 =	11.1111	8.7500	7.0000	5.6000	4.3750	3.5000	2.8000	2.1672	1.6282
7.1 =	11.2698	8.8750	7.1000	5.6800	4.4375	3.5500	2.8400	2.1982	1.6515
7.2 =	11.4286	9.0000	7.2000	5.7600	4.5000	3.6000	2.8800	2.2291	1.6747
7.3 =	11.5873	9.1250	7.3000	5.8400	4.5625	3.6500	2.9200	2.2601	1.6980
7.4 =	11.7460	9.2500	7.4000	5.9200	4.6250	3.7000	2.9600	2.2910	1.7212
7.5 =	11.9048	9.3750	7.5000	6.0000	4.6875	3.7500	3.0000	2.3220	1.7445
7.6 =	12.0635	9.5000	7.6000	6.0800	4.7500	3.8000	3.0400	2.3530	1.7678
7.7 =	12.2222	9.6250	7.7000	6.1600	4.8125	3.8500	3.0800	2.3839	1.7910
7.8 =	12.3809	9.7500	7.8000	6.2400	4.8750	3.9000	3.1200	2.4149	1.8143
7.9 =	12.5397	9.8750	7.9000	6.3200	4.9375	3.9500	3.1600	2.4458	1.8375
8 =	12.6984	10.0000	8.0000	6.4000	5.0000	4.0000	3.2000	2.4768	1.8608

ZEISS STEMI-2000

<b>Magnification Multiplier</b>	<b>6.5 x 1.5873</b>	<b>8.0 x 1.25</b>	<b>10.0 x 1.0</b>	<b>12.5 x 0.8</b>	<b>16.0 x 0.625</b>	<b>20.0 x 0.5</b>	<b>25.0 x 0.4</b>	<b>32.0 x 0.3096</b>	<b>40.0 x 0.2326</b>
Micrometer Units									
8.1 =	12.8571	10.1250	8.1000	6.4800	5.0625	4.0500	3.2400	2.5078	1.8841
8.2 =	13.0159	10.2500	8.2000	6.5600	5.1250	4.1000	3.2800	2.5387	1.9073
8.3 =	13.1746	10.3750	8.3000	6.6400	5.1875	4.1500	3.3200	2.5697	1.9306
8.4 =	13.3333	10.5000	8.4000	6.7200	5.2500	4.2000	3.3600	2.6006	1.9538
8.5 =	13.4921	10.6250	8.5000	6.8000	5.3125	4.2500	3.4000	2.6316	1.9771
8.6 =	13.6508	10.7500	8.6000	6.8800	5.3750	4.3000	3.4400	2.6626	2.0004
8.7 =	13.8095	10.8750	8.7000	6.9600	5.4375	4.3500	3.4800	2.6935	2.0236
8.8 =	13.9682	11.0000	8.8000	7.0400	5.5000	4.4000	3.5200	2.7245	2.0469
8.9 =	14.1270	11.1250	8.9000	7.1200	5.5625	4.4500	3.5600	2.7554	2.0701
9 =	14.2857	11.2500	9.0000	7.2000	5.6250	4.5000	3.6000	2.7864	2.0934
9.1 =	14.4444	11.3750	9.1000	7.2800	5.6875	4.5500	3.6400	2.8174	2.1167
9.2 =	14.6032	11.5000	9.2000	7.3600	5.7500	4.6000	3.6800	2.8483	2.1399
9.3 =	14.7619	11.6250	9.3000	7.4400	5.8125	4.6500	3.7200	2.8793	2.1632
9.4 =	14.9206	11.7500	9.4000	7.5200	5.8750	4.7000	3.7600	2.9102	2.1864
9.5 =	15.0794	11.8750	9.5000	7.6000	5.9375	4.7500	3.8000	2.9412	2.2097
9.6 =	15.2381	12.0000	9.6000	7.6800	6.0000	4.8000	3.8400	2.9722	2.2330
9.7 =	15.3968	12.1250	9.7000	7.7600	6.0625	4.8500	3.8800	3.0031	2.2562
9.8 =	15.5555	12.2500	9.8000	7.8400	6.1250	4.9000	3.9200	3.0341	2.2795
9.9 =	15.7143	12.3750	9.9000	7.9200	6.1875	4.9500	3.9600	3.0650	2.3027
10 =	15.8730	12.5000	10.0000	8.0000	6.2500	5.0000	4.0000	3.0960	2.3260

ZEISS STEMI-2000 C

Magnification Multiplier		6.5 x 1.6	8.0 x 1.25	10.0 x 1.0	12.5 x 0.8064	16.0 x 0.625	20.0 x 0.5	25.0 x 0.4	32.0 x 0.3125	40.0 x 0.25
Micrometer Units										
0.1	=	0.1600	0.1250	0.1000	0.0806	0.0625	0.0500	0.0400	0.0313	0.0250
0.2	=	0.3200	0.2500	0.2000	0.1613	0.1250	0.1000	0.0800	0.0625	0.0500
0.3	=	0.4800	0.3750	0.3000	0.2419	0.1875	0.1500	0.1200	0.0938	0.0750
0.4	=	0.6400	0.5000	0.4000	0.3226	0.2500	0.2000	0.1600	0.1250	0.1000
0.5	=	0.8000	0.6250	0.5000	0.4032	0.3125	0.2500	0.2000	0.1563	0.1250
0.6	=	0.9600	0.7500	0.6000	0.4838	0.3750	0.3000	0.2400	0.1875	0.1500
0.7	=	1.1200	0.8750	0.7000	0.5645	0.4375	0.3500	0.2800	0.2188	0.1750
0.8	=	1.2800	1.0000	0.8000	0.6451	0.5000	0.4000	0.3200	0.2500	0.2000
0.9	=	1.4400	1.1250	0.9000	0.7258	0.5625	0.4500	0.3600	0.2813	0.2250
1	=	1.6000	1.2500	1.0000	0.8064	0.6250	0.5000	0.4000	0.3125	0.2500
1.1	=	1.7600	1.3750	1.1000	0.8870	0.6875	0.5500	0.4400	0.3438	0.2750
1.2	=	1.9200	1.5000	1.2000	0.9677	0.7500	0.6000	0.4800	0.3750	0.3000
1.3	=	2.0800	1.6250	1.3000	1.0483	0.8125	0.6500	0.5200	0.4063	0.3250
1.4	=	2.2400	1.7500	1.4000	1.1290	0.8750	0.7000	0.5600	0.4375	0.3500
1.5	=	2.4000	1.8750	1.5000	1.2096	0.9375	0.7500	0.6000	0.4688	0.3750
1.6	=	2.5600	2.0000	1.6000	1.2902	1.0000	0.8000	0.6400	0.5000	0.4000
1.7	=	2.7200	2.1250	1.7000	1.3709	1.0625	0.8500	0.6800	0.5313	0.4250
1.8	=	2.8800	2.2500	1.8000	1.4515	1.1250	0.9000	0.7200	0.5625	0.4500
1.9	=	3.0400	2.3750	1.9000	1.5322	1.1875	0.9500	0.7600	0.5938	0.4750
2	=	3.2000	2.5000	2.0000	1.6128	1.2500	1.0000	0.8000	0.6250	0.5000
2.1	=	3.3600	2.6250	2.1000	1.6934	1.3125	1.0500	0.8400	0.6563	0.5250
2.2	=	3.5200	2.7500	2.2000	1.7741	1.3750	1.1000	0.8800	0.6875	0.5500
2.3	=	3.6800	2.8750	2.3000	1.8547	1.4375	1.1500	0.9200	0.7188	0.5750
2.4	=	3.8400	3.0000	2.4000	1.9354	1.5000	1.2000	0.9600	0.7500	0.6000
2.5	=	4.0000	3.1250	2.5000	2.0160	1.5625	1.2500	1.0000	0.7813	0.6250
2.6	=	4.1600	3.2500	2.6000	2.0966	1.6250	1.3000	1.0400	0.8125	0.6500
2.7	=	4.3200	3.3750	2.7000	2.1773	1.6875	1.3500	1.0800	0.8438	0.6750
2.8	=	4.4800	3.5000	2.8000	2.2579	1.7500	1.4000	1.1200	0.8750	0.7000
2.9	=	4.6400	3.6250	2.9000	2.3386	1.8125	1.4500	1.1600	0.9063	0.7250
3	=	4.8000	3.7500	3.0000	2.4192	1.8750	1.5000	1.2000	0.9375	0.7500
3.1	=	4.9600	3.8750	3.1000	2.4998	1.9375	1.5500	1.2400	0.9688	0.7750
3.2	=	5.1200	4.0000	3.2000	2.5805	2.0000	1.6000	1.2800	1.0000	0.8000
3.3	=	5.2800	4.1250	3.3000	2.6611	2.0625	1.6500	1.3200	1.0313	0.8250
3.4	=	5.4400	4.2500	3.4000	2.7418	2.1250	1.7000	1.3600	1.0625	0.8500
3.5	=	5.6000	4.3750	3.5000	2.8224	2.1875	1.7500	1.4000	1.0938	0.8750
3.6	=	5.7600	4.5000	3.6000	2.9030	2.2500	1.8000	1.4400	1.1250	0.9000
3.7	=	5.9200	4.6250	3.7000	2.9837	2.3125	1.8500	1.4800	1.1563	0.9250
3.8	=	6.0800	4.7500	3.8000	3.0643	2.3750	1.9000	1.5200	1.1875	0.9500
3.9	=	6.2400	4.8750	3.9000	3.1450	2.4375	1.9500	1.5600	1.2188	0.9750
4	=	6.4000	5.0000	4.0000	3.2256	2.5000	2.0000	1.6000	1.2500	1.0000

ZEISS STEMI-2000 C

Magnification Multiplier	6.5 x 1.6	8.0 x 1.25	10.0 x 1.0	12.5 x 0.8064	16.0 x 0.625	20.0 x 0.5	25.0 x 0.4	32.0 x 0.3125	40.0 x 0.25
Micrometer Units									
4.1 =	6.5600	5.1250	4.1000	3.3062	2.5625	2.0500	1.6400	1.2813	1.0250
4.2 =	6.7200	5.2500	4.2000	3.3869	2.6250	2.1000	1.6800	1.3125	1.0500
4.3 =	6.8800	5.3750	4.3000	3.4675	2.6875	2.1500	1.7200	1.3438	1.0750
4.4 =	7.0400	5.5000	4.4000	3.5482	2.7500	2.2000	1.7600	1.3750	1.1000
4.5 =	7.2000	5.6250	4.5000	3.6288	2.8125	2.2500	1.8000	1.4063	1.1250
4.6 =	7.3600	5.7500	4.6000	3.7094	2.8750	2.3000	1.8400	1.4375	1.1500
4.7 =	7.5200	5.8750	4.7000	3.7901	2.9375	2.3500	1.8800	1.4688	1.1750
4.8 =	7.6800	6.0000	4.8000	3.8707	3.0000	2.4000	1.9200	1.5000	1.2000
4.9 =	7.8400	6.1250	4.9000	3.9514	3.0625	2.4500	1.9600	1.5313	1.2250
5 =	8.0000	6.2500	5.0000	4.0320	3.1250	2.5000	2.0000	1.5625	1.2500
5.1 =	8.16	6.375	5.1	4.11264	3.1875	2.5500	2.0400	1.5938	1.2750
5.2 =	8.3200	6.5000	5.2000	4.1933	3.2500	2.6000	2.0800	1.6250	1.3000
5.3 =	8.4800	6.6250	5.3000	4.2739	3.3125	2.6500	2.1200	1.6563	1.3250
5.4 =	8.6400	6.7500	5.4000	4.3546	3.3750	2.7000	2.1600	1.6875	1.3500
5.5 =	8.8000	6.8750	5.5000	4.4352	3.4375	2.7500	2.2000	1.7188	1.3750
5.6 =	8.9600	7.0000	5.6000	4.5158	3.5000	2.8000	2.2400	1.7500	1.4000
5.7 =	9.1200	7.1250	5.7000	4.5965	3.5625	2.8500	2.2800	1.7813	1.4250
5.8 =	9.2800	7.2500	5.8000	4.6771	3.6250	2.9000	2.3200	1.8125	1.4500
5.9 =	9.4400	7.3750	5.9000	4.7578	3.6875	2.9500	2.3600	1.8438	1.4750
6 =	9.6000	7.5000	6.0000	4.8384	3.7500	3.0000	2.4000	1.8750	1.5000
6.1 =	9.7600	7.6250	6.1000	4.9190	3.8125	3.0500	2.4400	1.9063	1.5250
6.2 =	9.9200	7.7500	6.2000	4.9997	3.8750	3.1000	2.4800	1.9375	1.5500
6.3 =	10.0800	7.8750	6.3000	5.0803	3.9375	3.1500	2.5200	1.9688	1.5750
6.4 =	10.2400	8.0000	6.4000	5.1610	4.0000	3.2000	2.5600	2.0000	1.6000
6.5 =	10.4000	8.1250	6.5000	5.2416	4.0625	3.2500	2.6000	2.0313	1.6250
6.6 =	10.5600	8.2500	6.6000	5.3222	4.1250	3.3000	2.6400	2.0625	1.6500
6.7 =	10.7200	8.3750	6.7000	5.4029	4.1875	3.3500	2.6800	2.0938	1.6750
6.8 =	10.8800	8.5000	6.8000	5.4835	4.2500	3.4000	2.7200	2.1250	1.7000
6.9 =	11.0400	8.6250	6.9000	5.5642	4.3125	3.4500	2.7600	2.1563	1.7250
7 =	11.2000	8.7500	7.0000	5.6448	4.3750	3.5000	2.8000	2.1875	1.7500
7.1 =	11.3600	8.8750	7.1000	5.7254	4.4375	3.5500	2.8400	2.2188	1.7750
7.2 =	11.5200	9.0000	7.2000	5.8061	4.5000	3.6000	2.8800	2.2500	1.8000
7.3 =	11.6800	9.1250	7.3000	5.8867	4.5625	3.6500	2.9200	2.2813	1.8250
7.4 =	11.8400	9.2500	7.4000	5.9674	4.6250	3.7000	2.9600	2.3125	1.8500
7.5 =	12.0000	9.3750	7.5000	6.0480	4.6875	3.7500	3.0000	2.3438	1.8750
7.6 =	12.1600	9.5000	7.6000	6.1286	4.7500	3.8000	3.0400	2.3750	1.9000
7.7 =	12.3200	9.6250	7.7000	6.2093	4.8125	3.8500	3.0800	2.4063	1.9250
7.8 =	12.4800	9.7500	7.8000	6.2899	4.8750	3.9000	3.1200	2.4375	1.9500
7.9 =	12.6400	9.8750	7.9000	6.3706	4.9375	3.9500	3.1600	2.4688	1.9750
8 =	12.8000	10.0000	8.0000	6.4512	5.0000	4.0000	3.2000	2.5000	2.0000



ZEISS STEMI-2000 C

<b>Magnification</b>		<b>6.5 x</b>	<b>8.0 x</b>	<b>10.0 x</b>	<b>12.5 x</b>	<b>16.0 x</b>	<b>20.0 x</b>	<b>25.0 x</b>	<b>32.0 x</b>	<b>40.0 x</b>
<b>Multiplier</b>		<b>1.6</b>	<b>1.25</b>	<b>1.0</b>	<b>0.8064</b>	<b>0.625</b>	<b>0.5</b>	<b>0.4</b>	<b>0.3125</b>	<b>0.25</b>
Micrometer Units										
8.1	=	12.9600	10.1250	8.1000	6.5318	5.0625	4.0500	3.2400	2.5313	2.0250
8.2	=	13.1200	10.2500	8.2000	6.6125	5.1250	4.1000	3.2800	2.5625	2.0500
8.3	=	13.2800	10.3750	8.3000	6.6931	5.1875	4.1500	3.3200	2.5938	2.0750
8.4	=	13.4400	10.5000	8.4000	6.7738	5.2500	4.2000	3.3600	2.6250	2.1000
8.5	=	13.6000	10.6250	8.5000	6.8544	5.3125	4.2500	3.4000	2.6563	2.1250
8.6	=	13.7600	10.7500	8.6000	6.9350	5.3750	4.3000	3.4400	2.6875	2.1500
8.7	=	13.9200	10.8750	8.7000	7.0157	5.4375	4.3500	3.4800	2.7188	2.1750
8.8	=	14.0800	11.0000	8.8000	7.0963	5.5000	4.4000	3.5200	2.7500	2.2000
8.9	=	14.2400	11.1250	8.9000	7.1770	5.5625	4.4500	3.5600	2.7813	2.2250
9	=	14.4000	11.2500	9.0000	7.2576	5.6250	4.5000	3.6000	2.8125	2.2500
9.1	=	14.5600	11.3750	9.1000	7.3382	5.6875	4.5500	3.6400	2.8438	2.2750
9.2	=	14.7200	11.5000	9.2000	7.4189	5.7500	4.6000	3.6800	2.8750	2.3000
9.3	=	14.8800	11.6250	9.3000	7.4995	5.8125	4.6500	3.7200	2.9062	2.3250
9.4	=	15.0400	11.7500	9.4000	7.5802	5.8750	4.7000	3.7600	2.9375	2.3500
9.5	=	15.2000	11.8750	9.5000	7.6608	5.9375	4.7500	3.8000	2.9687	2.3750
9.6	=	15.3600	12.0000	9.6000	7.7414	6.0000	4.8000	3.8400	3.0000	2.4000
9.7	=	15.5200	12.1250	9.7000	7.8221	6.0625	4.8500	3.8800	3.0312	2.4250
9.8	=	15.6800	12.2500	9.8000	7.9027	6.1250	4.9000	3.9200	3.0625	2.4500
9.9	=	15.8400	12.3750	9.9000	7.9834	6.1875	4.9500	3.9600	3.0937	2.4750
10	=	16.0000	12.5000	10.0000	8.0640	6.2500	5.0000	4.0000	3.1250	2.5000







# Cruise Operations Database

Data Entered \_\_\_\_\_ Error Checked \_\_\_\_\_ Scientist \_\_\_\_\_

FOCI Cruise \_\_\_\_\_ Station \_\_\_\_\_ Haul \_\_\_\_\_ FOCI Station \_\_\_\_\_ Alt. Station \_\_\_\_\_  
(e.g. 4MF99)  (e.g. HJ45 or FOX058)  (e.g. CTD015 or MOC004)

Ships Cruise \_\_\_\_\_ GMT-Date \_\_\_\_\_ GM-Time \_\_\_\_\_ Bottom Depth \_\_\_\_\_ m  
(e.g. MF99-08)  (e.g. 20-May-99)

DLat \_\_\_\_\_ MLat \_\_\_\_\_ °N DLong \_\_\_\_\_ MLong \_\_\_\_\_ °W

Haul Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Gear \_\_\_\_\_ Net \_\_\_\_\_ Mesh \_\_\_\_\_ um *please see FOCI Field Manual for Gear abbreviations*

<b>Performance</b> good _____ quest _____ fail _____ lost _____ <i>(explain if not good)</i>	<b>Purpose</b> gridpre _____ pinksurv _____ grid _____ juvsurv _____ gridpost _____ adult _____ diel _____ gear _____ drift _____ other _____ phys _____ <i>(explain)</i>	<b>Depth</b> min. _____ m max. _____ m  <b>Wire Out</b> min. _____ m max. _____ m	<b>Flowmeter</b> meter # _____  final rev. _____ initial rev. _____  <b>Total</b> _____	<b>Tow Time</b> mess. net 0 _____ at depth _____ haul in _____ mess. net 1 _____  <b>Total</b> _____
---	---	---	---	--

### Samples Collected

*circle all samples collected PLUS fill in ProjectCode(s) (in the box) and NumberSampled (on the line when applicable)*

Absorb <input type="checkbox"/>	ChLAM <input type="checkbox"/>	J-Length <input type="checkbox"/>	Lugols <input type="checkbox"/>	QTowF <input type="checkbox"/>	fish removed Y / N
ADCP <input type="checkbox"/>	Chlor <input type="checkbox"/>	J-Oto <input type="checkbox"/>	Merist <input type="checkbox"/>	QTowS <input type="checkbox"/>	TSG <input type="checkbox"/>
A-Genet <input type="checkbox"/>	CTD <input type="checkbox"/>	J-Wght <input type="checkbox"/>	MZ <input type="checkbox"/>	RCountE <input type="checkbox"/>	VideoNet <input type="checkbox"/>
A-Gut <input type="checkbox"/>	Deploy <input type="checkbox"/>	L-Bioch <input type="checkbox"/>	NetFluor <input type="checkbox"/>	RCountJ <input type="checkbox"/>	XBT <input type="checkbox"/>
A-Length <input type="checkbox"/>	Discard <input checked="" type="checkbox"/>	L-Genet <input type="checkbox"/>	Nut <input type="checkbox"/>	RCountL <input type="checkbox"/>	sample <input type="checkbox"/>
A-Oto <input type="checkbox"/>	EBKG <input type="checkbox"/>	L-Gut <input type="checkbox"/>	Ovary <input type="checkbox"/>	Recovery <input type="checkbox"/>	sample <input type="checkbox"/>
Asound <input type="checkbox"/>	EK500 <input type="checkbox"/>	L-Hist <input type="checkbox"/>	PAR <input type="checkbox"/>	ScanMar <input type="checkbox"/>	sample <input type="checkbox"/>
A-Wght <input type="checkbox"/>	Fluor <input type="checkbox"/>	Live <input type="checkbox"/>	PhytoF <input type="checkbox"/>	Shrink <input type="checkbox"/>	sample <input type="checkbox"/>
Brain <input type="checkbox"/>	J-Genet <input type="checkbox"/>	L-Musc <input type="checkbox"/>	POC <input type="checkbox"/>	SSF <input type="checkbox"/>	sample <input type="checkbox"/>
CAT <input type="checkbox"/>	J-Gut <input type="checkbox"/>	L-Oto <input type="checkbox"/>	Pred <input type="checkbox"/>	Strip <input type="checkbox"/>	sample <input type="checkbox"/>

#### CTDB Bottle Sample Info

*please record all samples collected (each bottle should have its own record)*

Depth	Chlor	Nut	MZ	other	other
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x

Depth	Chlor	Nut	MZ	other	other
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x
m	volume	bottle #	x	x	x

Gear \_\_\_\_\_ Net \_\_\_\_\_ Mesh \_\_\_\_\_ um *please see FOCI Field Manual for Gear abbreviations*

<b>Performance</b> good _____ quest _____ fail _____ lost _____ <i>(explain if not good)</i>	<b>Purpose</b> gridpre _____ pinksurv _____ grid _____ juvsurv _____ gridpost _____ adult _____ diel _____ gear _____ drift _____ other _____ phys _____ <i>(explain)</i>	<b>Depth</b> min. _____ m max. _____ m  <b>Wire Out</b> min. _____ m max. _____ m	<b>Flowmeter</b> meter # _____  final rev. _____ initial rev. _____  <b>Total</b> _____	<b>Tow Time</b> mess. net 1 _____ at depth _____ haul in _____ mess. net 2 _____  <b>Total</b> _____
---	---	---	---	--

### Samples Collected

*circle all samples collected PLUS fill in ProjectCode(s) (in the box) and NumberSampled (on the line when applicable)*

A-Genet <input type="checkbox"/>	Brain <input type="checkbox"/>	J-Length <input type="checkbox"/>	L-Gut <input type="checkbox"/>	QTowF <input type="checkbox"/>	fish removed Y / N
A-Gut <input type="checkbox"/>	CAT <input type="checkbox"/>	J-Oto <input type="checkbox"/>	L-Hist <input type="checkbox"/>	QTowS <input type="checkbox"/>	RCountL <input type="checkbox"/>
A-Length <input type="checkbox"/>	Discard <input checked="" type="checkbox"/>	J-Wght <input type="checkbox"/>	L-Musc <input type="checkbox"/>	Pred <input type="checkbox"/>	Shrink <input type="checkbox"/>
A-Oto <input type="checkbox"/>	J-Genet <input type="checkbox"/>	L-Bioch <input type="checkbox"/>	L-Oto <input type="checkbox"/>	RCountE <input type="checkbox"/>	sample <input type="checkbox"/>
A-Wght <input type="checkbox"/>	J-Gut <input type="checkbox"/>	L-Genet <input type="checkbox"/>	Merist <input type="checkbox"/>	RCountJ <input type="checkbox"/>	sample <input type="checkbox"/>

# Cruise Operations Database (MOCNESS)

Data Entered \_\_\_\_\_ Error Checked \_\_\_\_\_ Scientist \_\_\_\_\_

FOCI Cruise \_\_\_\_\_ Station \_\_\_\_\_ Haul \_\_\_\_\_ FOCI Station \_\_\_\_\_ Alt. Station \_\_\_\_\_  
(e.g. 4MF99)  (e.g. HJ45 or FOX058)  (e.g. MOC004)

Ship's Cruise \_\_\_\_\_ GMT-Date \_\_\_\_\_ GM-Time \_\_\_\_\_ Bottom Depth \_\_\_\_\_ m  
(e.g. MF99-08)  (e.g. 20-May-99)

DLat \_\_\_\_\_ MLat \_\_\_\_\_ ° N DLong \_\_\_\_\_ MLong \_\_\_\_\_ ° W

Haul Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Gear MOC1 Net \_\_\_\_\_ Mesh \_\_\_\_\_ µm

<b>Performance</b> good fail quest lost (explain if not good)	<b>Purpose</b> gridpre diel plnksurv adult grid drift juvsurv gear gridpost phys other (explain)	<b>Depth</b> min. _____ m max. _____ m	<b>Volume Filtered</b> recorded after processing Total _____
--	---	--	--

### Samples Collected

*circle all samples collected PLUS fill in ProjectCode(s) (in the box) and NumberSampled (on the line when applicable)*

Discard <input checked="" type="checkbox"/>	J-Length <input type="checkbox"/>	L-Gut <input type="checkbox"/>	QTowF <input type="checkbox"/> fish removed Y / N	sample <input type="checkbox"/>
J-Genet <input type="checkbox"/>	J-Oto <input type="checkbox"/>	L-Oto <input type="checkbox"/>	QTowS <input type="checkbox"/>	sample <input type="checkbox"/>
J-Gut <input type="checkbox"/>	J-Wght <input type="checkbox"/>	Pred <input type="checkbox"/>	RCountE <input type="checkbox"/>	sample <input type="checkbox"/>
			RCountJ <input type="checkbox"/>	
			RCountL <input type="checkbox"/>	

Gear MOC1 Net \_\_\_\_\_ Mesh \_\_\_\_\_ µm

<b>Performance</b> good fail quest lost (explain if not good)	<b>Purpose</b> gridpre diel plnksurv adult grid drift juvsurv gear gridpost phys other (explain)	<b>Depth</b> min. _____ m max. _____ m	<b>Volume Filtered</b> recorded after processing Total _____
--	---	--	--

### Samples Collected

*circle all samples collected PLUS fill in ProjectCode(s) (in the box) and NumberSampled (on the line when applicable)*

Discard <input checked="" type="checkbox"/>	J-Length <input type="checkbox"/>	L-Gut <input type="checkbox"/>	QTowF <input type="checkbox"/> fish removed Y / N	sample <input type="checkbox"/>
J-Genet <input type="checkbox"/>	J-Oto <input type="checkbox"/>	L-Oto <input type="checkbox"/>	QTowS <input type="checkbox"/>	sample <input type="checkbox"/>
J-Gut <input type="checkbox"/>	J-Wght <input type="checkbox"/>	Pred <input type="checkbox"/>	RCountE <input type="checkbox"/>	sample <input type="checkbox"/>
			RCountJ <input type="checkbox"/>	
			RCountL <input type="checkbox"/>	

Gear MOC1 Net \_\_\_\_\_ Mesh \_\_\_\_\_ µm

<b>Performance</b> good fail quest lost (explain if not good)	<b>Purpose</b> gridpre diel plnksurv adult grid drift juvsurv gear gridpost phys other (explain)	<b>Depth</b> min. _____ m max. _____ m	<b>Volume Filtered</b> recorded after processing Total _____
--	---	--	--

### Samples Collected

*circle all samples collected PLUS fill in ProjectCode(s) (in the box) and NumberSampled (on the line when applicable)*

Discard <input checked="" type="checkbox"/>	J-Length <input type="checkbox"/>	L-Gut <input type="checkbox"/>	QTowF <input type="checkbox"/> fish removed Y / N	sample <input type="checkbox"/>
J-Genet <input type="checkbox"/>	J-Oto <input type="checkbox"/>	L-Oto <input type="checkbox"/>	QTowS <input type="checkbox"/>	sample <input type="checkbox"/>
J-Gut <input type="checkbox"/>	J-Wght <input type="checkbox"/>	Pred <input type="checkbox"/>	RCountE <input type="checkbox"/>	sample <input type="checkbox"/>
			RCountJ <input type="checkbox"/>	
			RCountL <input type="checkbox"/>	

Gear MOC1 Net \_\_\_\_\_ Mesh \_\_\_\_\_ µm

<b>Performance</b> good fail quest lost (explain if not good)	<b>Purpose</b> gridpre diel plnksurv adult grid drift juvsurv gear gridpost phys other (explain)	<b>Depth</b> min. _____ m max. _____ m	<b>Volume Filtered</b> recorded after processing Total _____
--	---	--	--

### Samples Collected

*circle all samples collected PLUS fill in ProjectCode(s) (in the box) and NumberSampled (on the line when applicable)*

Discard <input checked="" type="checkbox"/>	J-Length <input type="checkbox"/>	L-Gut <input type="checkbox"/>	QTowF <input type="checkbox"/> fish removed Y / N	sample <input type="checkbox"/>
J-Genet <input type="checkbox"/>	J-Oto <input type="checkbox"/>	L-Oto <input type="checkbox"/>	QTowS <input type="checkbox"/>	sample <input type="checkbox"/>
J-Gut <input type="checkbox"/>	J-Wght <input type="checkbox"/>	Pred <input type="checkbox"/>	RCountE <input type="checkbox"/>	sample <input type="checkbox"/>
			RCountJ <input type="checkbox"/>	
			RCountL <input type="checkbox"/>	

VESSEL				PROJECT & LEG				DSDB I.D.				STATION DESIGNATION											
CONSC CAST #	LATITUDE			LONGITUDE			DATE JD=			TIME (GMT)		DRY BULB	WET BULB	PRESSURE	SEA STATE	VISIBILITY	WIND DIRN.	WIND SPD.	CLOUD (amt)	TYPE	WEATHER	BOTTOM DEPTH	STA. NAME/ID
	DEG	MIN		DEG	MIN		DAY	MO	YR	HR	MIN	(°C)	(°C)	(mb)	*	*	(deg)	(m/s)	*	*	*	(m)	
			N				W																
SBE 9+		TIMES		JD/TIME		DATA LOCATION						REMARKS											
PRESS SN		DATA ON		_____		Tape/Diskette ID		File Name/Header															
PRI TEMP SN		START DOWN		_____		_____		_____															
SEC TEMP SN		AT DEPTH		_____		_____		_____				<input type="checkbox"/> Cleaned air bleed valve											
PRI COND SN		AT SURFACE		_____		_____		_____				MAX. DEPTH =											
SEC COND SN		<input type="checkbox"/> PAR S/N _____		<input type="checkbox"/> FLUOR S/N _____		<input type="checkbox"/> D.O. 1 S/N _____		<input type="checkbox"/> D.O. 2 S/N _____															
POS.	TRIP DEPTH	CTD CONVERTED MONITOR VALUES										SAMPLE BOTTLE DATA		SAMPLE BOTTLE NUMBER									
		PRESSURE		PRI. TEMP.		SEC. TEMP		SALINITY		SALINITY		m											
												SAL.		NUTR.		CHL.		WHIT'S NUTR.					
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							





# FOCI - TRAWL FORM

CRUISE: \_\_\_\_\_

VESSEL: \_\_\_\_\_

NAME (OOD): \_\_\_\_\_

TIME (GMT): \_\_\_\_\_

STATION-HAUL: \_\_\_\_\_

DAY (GMT): \_\_\_\_\_

GEAR TYPE: \_\_\_\_\_

MONTH (GMT): September

DOORS + ACCESS.: \_\_\_\_\_

YEAR (GMT): \_\_\_\_\_

GMT TIME STANDARD USED

NET IN WATER: \_\_\_\_\_

DOORS OUT: \_\_\_\_\_ LATITUDE: \_\_\_\_\_ LONGITUDE: \_\_\_\_\_

EQUILIBRIUM: \_\_\_\_\_ LATITUDE: \_\_\_\_\_ LONGITUDE: \_\_\_\_\_

WIRE OUT (M): \_\_\_\_\_ GEAR DEPTH (M): \_\_\_\_\_

NET HEIGHT (M): \_\_\_\_\_ BOT. DEPTH (M): \_\_\_\_\_

SURF. TEMP (°C): \_\_\_\_\_ GEAR TEMP (°C): \_\_\_\_\_

HAUL BACK: \_\_\_\_\_ LATITUDE: \_\_\_\_\_ LONGITUDE: \_\_\_\_\_

DOORS IN: \_\_\_\_\_ LATITUDE: \_\_\_\_\_ LONGITUDE: \_\_\_\_\_

NET ON DECK: \_\_\_\_\_

HAUL DIST. (NM, EQ-DOORS IN): \_\_\_\_\_

SEA CONDITIONS DURING HAUL:

WIND \_\_\_\_\_

HAUL PERFORMANCE: \_\_\_\_\_

SEA \_\_\_\_\_

REMARKS:  
oblique / targeted (circle one)

SWELL \_\_\_\_\_

TIME	W/O	H/R	V/O	DEPTH	REMARKS

# Jar Label Examples

## Inside Jar Label

(do not use for microzooplankton samples)

**\* fill out labels in pencil only\***

Cruise #: 8MF97 Date: 2 JUNE 97

Station #: 25 Gear: 60 BON

Net #: 1 Haul #: 1 Mesh: 505  $\mu$ m

## Outside Jar Labels

**\*fill out labels in pen only\***

Plankton Sample Label (top of jar lid only)

NMFS/FOCI Seattle	
Cruise: <u>8MF97</u>	
Date: <u>2JUNE97</u>	
Station: <u>25</u>	
Haul No: <u>1</u>	
Gear: <u>60 BON</u>	
Net: <u>1</u>	Mesh: <u>505 <math>\mu</math>m</u>

Microzooplankton Sample Label (one on top of lid and one on side of jar)

\* using a 10 liter Niskin bottle\*

NMFS/FOCI Seattle	
Cruise: <u>8MF97</u>	
Date: <u>2JUNE97</u>	
Station: <u>25</u>	Haul No: <u>2</u>
Gear: <u>CTDB</u>	
Depth: <u>10 m</u>	Volume: <u>9.5L</u>
Net:	Mesh: <u>41<math>\mu</math>m</u>
MICROZOOPLANKTON	

LENGTH FREQUENCY FORM

<b>FOCI Cruise:</b>		<b>Length</b>	<b>Frequency</b>	<b>Length</b>	<b>Frequency</b>
<b>GMT Date:</b>		(____)		(____)	
<b>Station-Haul:</b>		7		6	
<b>Gear:</b>		8		7	
<b>Species:</b>		9		8	
<b>Sample Type:</b>		0		9	
<b>Length Type:</b>		1		0	
<b>Preserv.:</b>		2		1	
<b>Comments:</b>		3		2	
		4		3	
		5		4	
		6		5	
		7		6	
		8		7	
		9		8	
		0		9	
		1		0	
		2		1	
		3		2	
		4		3	
		5		4	
		6		5	
		7		6	
		8		7	
		9		8	
		0		9	
		1		0	
		2		1	
		3		2	
		4		3	
		5		4	
		6		5	
		7		6	
		8		7	
		9		8	
		0		9	
		1		0	
		2		1	
		3		2	
		4		3	
		5		4	
		6		5	



# **SAMPLE REQUEST FORM**

This is intended to assist at-sea personnel correctly perform sample collection efficiently and in a consistent manner. If a **Net** tow, complete for each net. **MOCNESS** and CTD/Rosette samples use back page. Refer to the Field Manual and COD form for specific definitions, procedures, and format for abbreviations. If any sample, gear, or record keeping requirements differs in any way than what is described in the Field Manual, instructions should be noted here. Submit completed forms to \_\_\_\_\_ who will check them for completeness, etc. and forward them to the Chief Scientist.

**Cruise :** \_\_\_\_\_ **Requestor's Name:** \_\_\_\_\_  
 Chief Scientist: \_\_\_\_\_ Checked by : \_\_\_\_\_

**Stations/Area to be Sampled:** \_\_\_\_\_

**Chemicals (include volume to be used):** \_\_\_\_\_

**Net Tows** **GEAR** \_\_\_\_\_ **Towing Target Depth:** \_\_\_\_\_

Haul Comments (if Gear is **Bioother** or **Phyother**): \_\_\_\_\_

<b>Net 1:</b> Net Mesh _____ Cod-end Mesh _____ Purpose Code _____ Samples Collected _____ Net Saved? <b>Y / N</b> Net Comments (if Purpose is <b>spE</b> or <b>other</b> ; if Sample is <b>Bioother</b> or <b>Phyother</b> ): _____
<b>Net 2:</b> Net Mesh _____ Cod-end Mesh _____ Purpose Code _____ Samples Collected _____ Net Saved? <b>Y / N</b> Net Comments (if Purpose is <b>spE</b> or <b>other</b> ; if Sample is <b>Bioother</b> or <b>Phyother</b> ): _____
Electronic Gear: CAT _____ EBKG _____ ScanMar _____ Furuno _____ Netfluor _____ Videonet _____ Electronic Samples: CAT _____ EBKG _____ ScanMar _____ Furuno _____ Netfluor _____ Videonet _____

**GEAR** \_\_\_\_\_ **Towing Target Depth:** \_\_\_\_\_

Haul Comments (if Gear is **Bioother** or **Phyother**): \_\_\_\_\_

<b>Net 1:</b> Net Mesh _____ Cod-end Mesh _____ Purpose Code _____ Samples Collected _____ Net Saved? <b>Y / N</b> Net Comments (if Purpose is <b>spE</b> or <b>other</b> ; if Sample is <b>Bioother</b> or <b>Phyother</b> ): _____
<b>Net 2:</b> Net Mesh _____ Cod-end Mesh _____ Purpose Code _____ Samples Collected _____ Net Saved? <b>Y / N</b> Net Comments (if Purpose is <b>spE</b> or <b>other</b> ; if Sample is <b>Bioother</b> or <b>Phyother</b> ): _____
Electronic Gear: CAT _____ EBKG _____ ScanMar _____ Furuno _____ Netfluor _____ Videonet _____ Electronic Samples: CAT _____ EBKG _____ ScanMar _____ Furuno _____ Netfluor _____ Videonet _____

**Special Instructions:** \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_





## Common Formulas

### Calibration Factor (Y)

$$Y = a + b(X) \quad \text{where : } X = \text{revolutions / seconds}$$

$$Y = \text{meters / revolution}$$

a = Intercept

b = Slope

i. e. :  $Y = .275 + (-0.006) X$

### Standard Haul Factors (SHF)

$$\text{SHF - A} = \frac{(10 \times \text{Depth Fished})}{(\# \text{ revs})(\text{mouth area})(\text{calib. Factor Y})}$$

$$\text{SHF - B} = \frac{(1000)}{(\# \text{ revs})(\text{mouth area})(\text{Calib. Factor Y})}$$

### Catch (C)

$$C / 10 \text{ m}^2 = (\text{SHF-A}) \times (\# \text{ caught})$$

$$C / 1000 \text{ m}^3 = (\text{SHF-B}) \times (\# \text{ caught})$$

### MISC.

$$\text{Mean Density} = \frac{\sum (C / 1000 \text{ m}^3 / \text{tow})}{\# \text{ of hauls}} = \frac{\text{Arithmetic Mean}}{\# \text{ of hauls}}$$

$$\text{Volume Filtered} = (\# \text{Revs}) \times (\text{Mouth area}) \times (\text{Calibration factor})$$

$$\text{Geometric Mean} = \text{antilog} \frac{\sum \log ((C / 1000 \text{ m}^3 / \text{tow}))}{\# \text{ of positive hauls}}$$

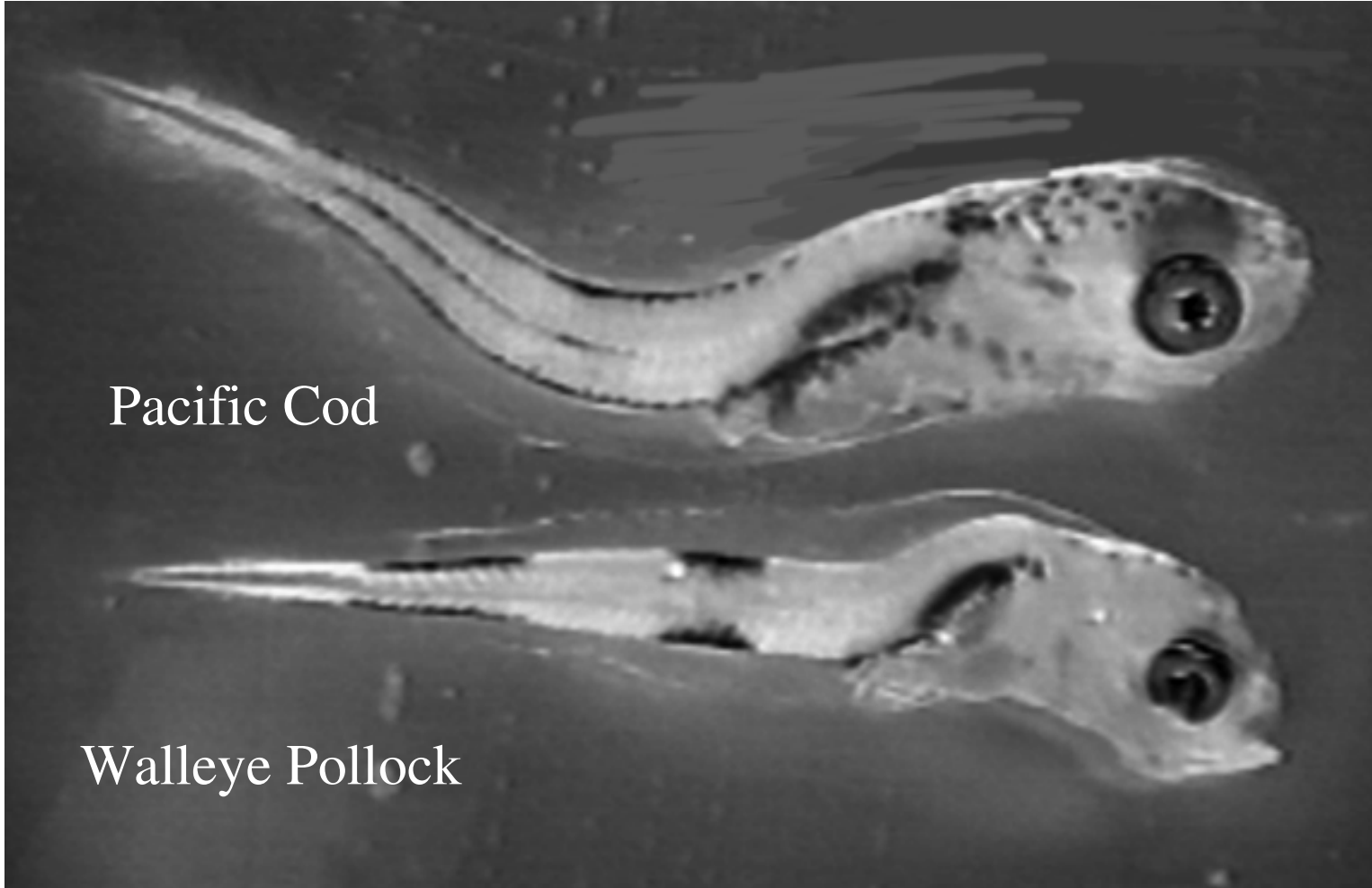
$$\text{Number in Area} = \sum ((C / 10 \text{ m}^2) \times (\text{station area}))$$

### Mouth Areas

Gear	Area (m <sup>2</sup> )	Gear	Area (m <sup>2</sup> )
Neuston	0.075	MOCNESS	1.0
60 cm Bongo	0.283	Large CB	0.051
1 m Tucker	1.0	Methot	5.168
IKMT	1.0	3 m Tucker	3.0
Sled	1.0	CalVET	0.049
20 cm Bongo	0.031		





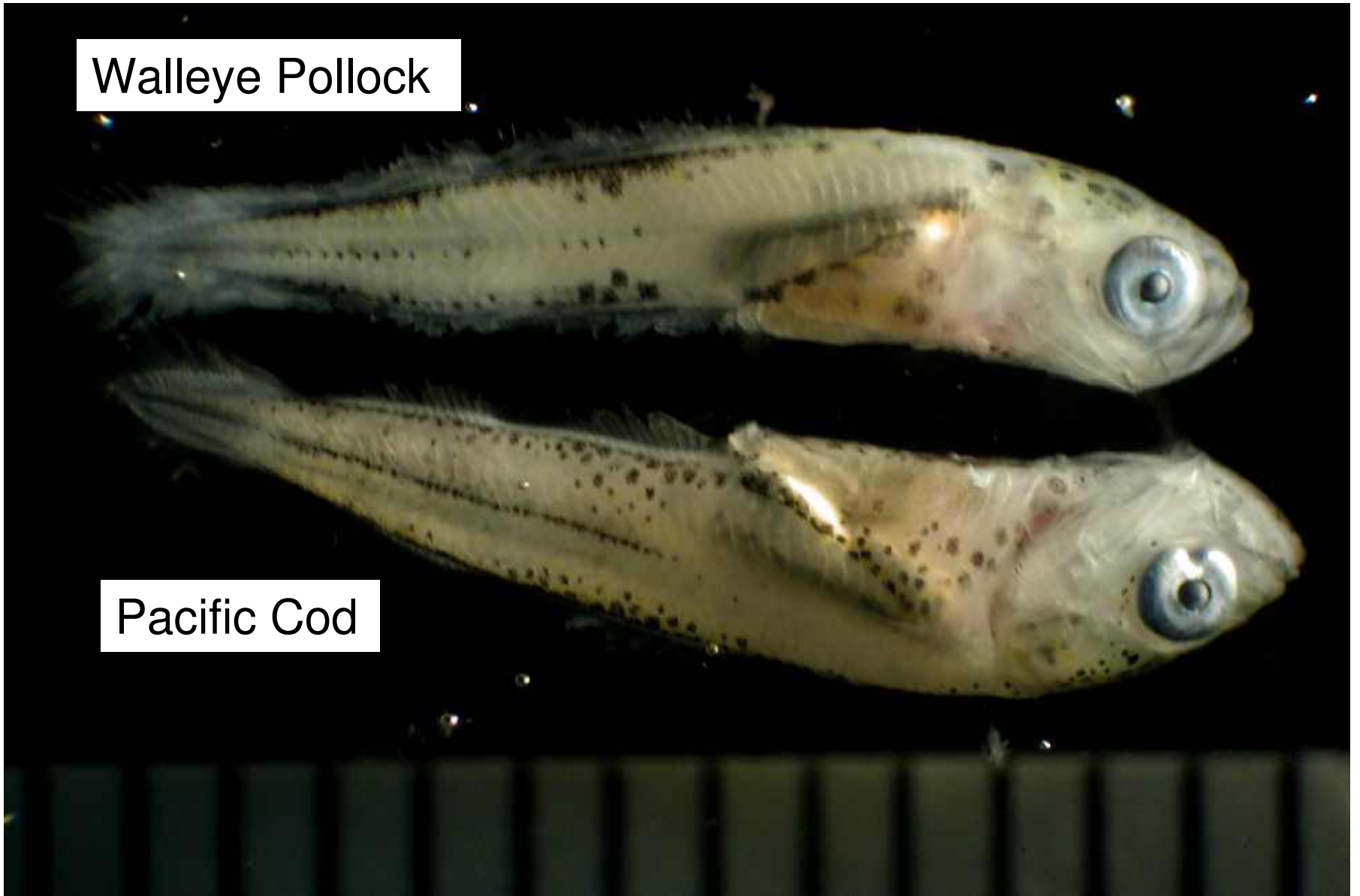


Pacific Cod

Walleye Pollock

Walleye Pollock

Pacific Cod



On-Deck Sampling Info.							
<b>Gear Type</b>	<b>Survey</b>	<b>Sample Type</b>	<b>Gear Depth</b>	<b>Wire Out Rate</b>	<b>Wire In Rate</b>	<b>Wire Angle</b>	<b>Ship Speed</b>
60 cm bongo	grid - egg	QTowF (505 um)	10 m off bottom	40 m/min	20 m/min	45	1.5 -2.0 knots
60 cm bongo	grid - larvae	QTowF (333 um)	10 m off bottom	40 m/min	20 m/min	45	1.5 - 2.0 knots
60 cm bongo	grid - larvae	QTowF (505 um)	100 m	40 m/min	20 m/min	45	1.5 - 2.0 knots
60 cm bongo	special	Live larvae	50 - 70 m	40 m/min	10 m/min	0	maintain wire angle
20/60 cm bongo	Fox (Line 8, 16, etc.)	QTowF	10 m off bottom	40 m/min	20 m/min	45	1.5 - 2.0 knots
CalVET	special	QTowF (53 um)	60 m	40 - 50 m/min	see manual	0	maintain wire angle
methot	special	QTowF/Special	by request	40 m/min	20 m/min		2 - 3 knots
ring 0.8	special	Live MZ	by request	40 - 50 m/min	10 m/min	0	maintain wire angle
sled	special	QTowF	by request	40 m/min	see manual	see manual	see manual
Tucker 1M	special	QTowF/Special	by request	40 m/min	20 m/min	45	1.5 - 2.0 knots

<b>Tucker trawl messenger trip times</b>				
<b>Wire out (m)</b>	<b>Time (mm:ss)</b>		<b>Wire out (m)</b>	<b>Time (mm:ss)</b>
40	0:14		410	2:21
50	0:17		420	2:24
60	0:21		430	2:27
70	0:24		440	2:31
80	0:27		450	2:34
90	0:31		460	2:38
100	0:34		470	2:41
110	0:38		480	2:45
120	0:41		490	2:48
130	0:45		500	2:51
140	0:48		510	2:55
150	0:51		520	2:58
160	0:55		530	3:02
170	0:58		540	3:05
180	1:02		550	3:09
190	1:05		560	3:12
200	1:09		570	3:15
210	1:12		580	3:19
220	1:15		590	3:22
230	1:19		600	3:26
240	1:22		610	3:29
250	1:26		620	3:33
260	1:29		630	3:36
270	1:33		640	3:39
280	1:36		650	3:43
290	1:39		660	3:46
300	1:43		670	3:50
310	1:46		680	3:53
320	1:50		690	3:57
330	1:53		700	4:00
340	1:57		710	4:03
350	2:00		720	4:07
360	2:03		730	4:10
370	2:07		740	4:14
380	2:10		750	4:17
390	2:14		760	4:21
400	2:17		770	4:24
410	2:21		780	4:27

## Use of -80°C Freezer

All samples to be stored in the -80°C freezer must be in either white freezer boxes or packaged such that small samples will not be found lying loose on the bottom of the freezer. Secure each box closed with rubber bands.

Please label boxes or other containers with the following:

- sample type
- year/cruise/station number(s)
- owner's name/office phone number

All properly packaged samples put into the -80°C freezer will be off-loaded and stored in the -80°C freezer at NOAA/AFSC/Bldg 4/RACE Shop.

Any loose samples found at the bottom of the -80°C freezer aboard the NOAA ship *Miller Freeman* or *Oscar Dyson* will stay there and wait for the owner to claim them. Often, the freezers aboard ship are shut down when not in use, so all samples left too long will be lost.

In an emergency (loss of main generator power), it is possible to have the freezer hooked up to the emergency power generator. If this situation arises, the Chief Scientist or Watch Chief should discuss the situation with the ship's FOO (Field Operations Officer). The freezer will be all right without power until the temperature reaches -50°C. If for some reason the -80°C freezer goes down due to mechanical difficulty, then the last resort taken to save the samples should be to transfer them to one of the other freezers on the ship (-20°C or 0°C). The samples should then be packaged in an insulated box of some sort (a cooler is best if available) and moved quickly. Make sure that a sign is posted on the -80°C freezer telling the new location of the samples.

Please do not store any chemicals in the freezer.

Amount of wire needed to reach a specified net depth with a wire angle of 45 degrees. All depths are in meters.

Desired Net Depth	Wire Out	Desired Net Depth	Wire Out	Desired Net Depth	Wire Out	Desired Net Depth	Wire Out
<b>5</b>	7	<b>155</b>	219	<b>305</b>	431	<b>455</b>	643
<b>10</b>	14	<b>160</b>	226	<b>310</b>	438	<b>460</b>	651
<b>15</b>	21	<b>165</b>	233	<b>315</b>	445	<b>465</b>	658
<b>20</b>	28	<b>170</b>	240	<b>320</b>	453	<b>470</b>	665
<b>25</b>	35	<b>175</b>	247	<b>325</b>	460	<b>475</b>	672
<b>30</b>	42	<b>180</b>	255	<b>330</b>	467	<b>480</b>	679
<b>35</b>	49	<b>185</b>	262	<b>335</b>	474	<b>485</b>	686
<b>40</b>	57	<b>190</b>	269	<b>340</b>	481	<b>490</b>	693
<b>45</b>	64	<b>195</b>	276	<b>345</b>	488	<b>495</b>	700
<b>50</b>	71	<b>200</b>	283	<b>350</b>	495	<b>500</b>	707
<b>55</b>	78	<b>205</b>	290	<b>355</b>	502	<b>505</b>	714
<b>60</b>	85	<b>210</b>	297	<b>360</b>	509	<b>510</b>	721
<b>65</b>	92	<b>215</b>	304	<b>365</b>	516	<b>515</b>	728
<b>70</b>	99	<b>220</b>	311	<b>370</b>	523	<b>520</b>	735
<b>75</b>	106	<b>225</b>	318	<b>375</b>	530	<b>525</b>	742
<b>80</b>	113	<b>230</b>	325	<b>380</b>	537	<b>530</b>	750
<b>85</b>	120	<b>235</b>	332	<b>385</b>	544	<b>535</b>	757
<b>90</b>	127	<b>240</b>	339	<b>390</b>	552	<b>540</b>	764
<b>95</b>	134	<b>245</b>	346	<b>395</b>	559	<b>545</b>	771
<b>100</b>	141	<b>250</b>	354	<b>400</b>	566	<b>550</b>	778
<b>105</b>	148	<b>255</b>	361	<b>405</b>	573	<b>555</b>	785
<b>110</b>	156	<b>260</b>	368	<b>410</b>	580	<b>560</b>	792
<b>115</b>	163	<b>265</b>	375	<b>415</b>	587	<b>565</b>	799
<b>120</b>	170	<b>270</b>	382	<b>420</b>	594	<b>570</b>	806
<b>125</b>	177	<b>275</b>	389	<b>425</b>	601	<b>575</b>	813
<b>130</b>	184	<b>280</b>	396	<b>430</b>	608	<b>580</b>	820
<b>135</b>	191	<b>285</b>	403	<b>435</b>	615	<b>585</b>	827
<b>140</b>	198	<b>290</b>	410	<b>440</b>	622	<b>590</b>	834
<b>145</b>	205	<b>295</b>	417	<b>445</b>	629	<b>595</b>	841
<b>150</b>	212	<b>300</b>	424	<b>450</b>	636	<b>600</b>	849