FISHERIES-OCEANOGRAPHY COORDINATED INVESTIGATIONS (ECOFOCI) STANDARD OPERATING INSTRUCTIONS (SOI) FOR

NOAA SHIP *MILLER FREEMAN*

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NOAA SHIP *MILLER FREEMAN*

1.0 STANDARD OPERATING INSTRUCTIONS – These instructions are a basis for Ecosystems & Fisheries-Oceanography Coordinated Investigations (EcoFOCI) field operations aboard **NOAA Ship *MILLER FREEMAN***. They describe usual and customary procedures for shipboard scientific investigation of the marine ecosystem. The Standard Operating Instructions plus the specific instructions for each individual cruise constitutes a complete directive of the science mission. Any changes to procedures described in the Standard Operating Instructions are set forth in the specific instructions for that individual cruise.

2.0 PROGRAM OVERVIEW – EcoFOCI is a broad effort by National Oceanic and Atmospheric Administration (NOAA) and associated academic scientists. EcoFOCI's goals are to understand relationships between the marine ecosystem, climate and the survival of commercially valuable fish, shellfish and threatened and endangered species of the North Pacific Ocean, Gulf of Alaska and Bering Sea; and to develop tools and products to aid the management of marine ecosystems of those regions. At present, EcoFOCI supports several NOAA, Alaska and national projects. NOAA projects are Fisheries-Oceanography Coordinated Investigations (FOCI) and North Pacific Climate Regimes and Ecosystem Productivity (NPCREP). FOCI research centers on Shelikof Strait (western Gulf of Alaska) walleye pollock. NPCREP relates climate variability to marine productivity in the Bering Sea, Aleutian Islands and Gulf of Alaska. EcoFOCI also collaborates on associated projects, such as those of the United States Global Ocean Ecosystems Dynamics (GLOBEC), the North Pacific Marine Research Board (NPRB), the Alaska Ocean Observing System (AOOS), the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC), the Study of Environmental Arctic Change (SEARCH) and the National Science Foundation’s Bering Sea Ecosystem Study (BEST), that address scientific issues related to EcoFOCI's mission.

3.0 OPERATIONS

3.1 Responsibilities

3.1.1 Commanding Officer – The Commanding Officer shall be in sole command of the vessel and shall be responsible for the welfare of all personnel on board. The Commanding Officer shall be the final authority in matters relating to the safety, proper navigation, stability, and sailing condition of the vessel.

The Commanding Officer shall inform the Chief Scientist as soon as possible of any changes in the program necessitated by events. In the case of emergency, nothing in these instructions shall be construed as preventing the Commanding Officer from taking the most effective action which, in the Commanding Officer’s judgment, will rectify the situation causing the emergency, and; thereby, safeguard life, property, and the ship.

The Commanding Officer will have the authority to abort operations temporarily on the basis of clear and present danger to life and property at sea, and will inform the Chief Scientist as soon as safe conditions permit. Full details of the action taken, rationale, and recommendations will be provided at the earliest opportunity. Under normal operating conditions, the Commanding Officer shall not take any mission-aborting action without consultation with the Chief Scientist.

3.1.2 Chief Scientist – The Chief Scientist is responsible for executing the technical portion of the scientific mission specified by these Standard Operation Instructions and by specific instructions for each cruise. Responsibilities also include:

1. Comportment of visiting scientists and technicians.
2. Disposition of data, feedback on data quality, and archiving of data and specimens collected.
3. Administration and physical handling of all scientific party hazardous materials.
4. Assignment of berthing for the scientific party.
5. Cleanliness of all berthing, laboratory, and storage spaces used by the scientific party.
6. Delivery of medical and emergency contact forms for the scientific party.
7. With the Commanding Officer, safe, efficient, and economical use of shipboard resources to support the embarked mission.

The Chief Scientist has the authority to revise or alter the technical portion of the instructions as work progresses provided that, after consultation with the Commanding Officer, it is ascertained that the proposed changes will not:

1. Jeopardize the safety of personnel or the ship,
2. Exceed the overall time allotted for the project,
3. Result in undue additional expenses, or
4. Alter the general intent of these project instructions.

3.1.2.1 Deemed Exports The chief Scientist shall ensure that all the requirments associated with the participation of foreign nationals in the science party shall be met in a timely manner before the cruise. These requirements are enumerated in the appended document NAO 207-12 contained in Section 9.0, "Technology Controls and Foreign National Access".

3.1.3 Scheduling – Scheduling of individual activities will depend upon weather conditions and progress of scientific work. Therefore, firm advance scheduling of events will not be possible, and a continual dialogue between scientific and ship's personnel will be important. To insure fulfillment of all scientific objectives, the ship is asked to steam at maximum cruising speed allowable by weather and sea state whenever time in transit, or between stations, is greater than one hour.

3.1.4 Pre and Post-cruise Meetings

3.4.1.1 Pre-cruise Meeting – A pre-cruise meeting between the ship's representative and the Chief Scientist will be held before the start of the cruise. Its purpose is to identify the day-to-day requirements of the project in order to best utilize shipboard personnel resources, to include safety procedures, and to identify overtime requirements. A brief meeting of all scientific personnel, the Operations Officer, Chief Boatswain, survey department, and other relevant ship's personnel should be held before the vessel reaches the operations area for the purposes of:

1. Introducing new scientific personnel to ship's procedures, proper channels, etc.,
2. Discuss operating procedures for deploying various pieces of sampling equipment, and

3. Coordinating scientific watch assignments.

3.4.1 <u>Post-cruise Meeting</u> – If necessary, a debriefing will be held between the Chief Scientist and the Commanding Officer. If serious problems are identified, the Commanding Officer shall notify the Marine Center by the most direct means available. The Chief Scientist shall document identified problems in the Ship Operations Evaluation Form.

3.1.5 <u>Ship Operations Evaluation Form</u> – One ***<u>Customer Satisfaction Survey</u>*** should be completed for each cruise or leg within 30 days of cruise completion. The Chief Scientist will complete the form and submit it through the Laboratory or Center Director for forwarding to NOAA Marine and Aviation Operations (NMAO). An Adobe Acrobat Portable Document Format version can be downloaded from:

http://www.omao.noaa.gov/pdffiles/customer_survey_moc.pdf.

3.2 <u>Procedures for Operations</u> – The following is a comprehensive list of EcoFOCI operations including gear and procedures for collecting data. A listing of specific operations to be conducted on each cruise is listed in the ECOFOCI Cruise Instructions. Changes or alterations to these standard procedures will be noted in the Cruise Instructions.

3.2.1 <u>CTD/Water Sample Operations</u> – A Sea-Bird Electronics' SBE 911*plus* Conductivity, Temperature, and Depth (CTD) profiler with dual thermistors and conductivity cells will be the primary system. The primary system will be provided and maintained by Pacific Marine Environmental Laboratory (PMEL). A backup SBE 911*plus* CTD is required and will be provided by the vessel. When available, and where possible, EcoFOCI's fluorometer,dual oxygen sensors, PAR sensor (light meter), and altimeter should be mounted on the CTD stand for all casts; however, these instruments cannot exceed the following depths:

- WET Labs' WETStar fluorometer cannot exceed 600 meters,
- Biospherical Instruments' QSP-200L4S light meter cannot exceed 1,000 meters, and
- ECOFOCI's Sea-Bird Electronics SBE 911*plus* CTD cannot exceed 3,000 meters.

On selected casts, water samples will be collected. Water for microzooplankton samples will be collected using 10-liter Niskin bottles equipped with internal silicone springs; however, when only nutrient or chlorophyll water samples are required, smaller Niskin bottles may be used.

Once the CTD has been deployed, it should be lowered to 10 meters, and then the deck unit should be turned on. After one minute when the pumps have turned on, the CTD can be returned to just below the surface. (If the bottom of the CTD breaks the surface of the water, then we will need the CTD to be lowered to 10 meters again for approximately one minute.) Then the data acquisition program should be started. The CTD should descend at a rate of 30 meters per minute for the first 200 meters and 40-45 meters per minute below that. The ascent rate should be 40-45 meters per minute. One exception to the descent rates occurs on the Bering Shelf in water less than 150 meters. In this case, the CTD should descend at 10-20 meters per minute during the entire cast. An entry in the Electronic Marine Observation Abstract (E-MOA) should be made for each CTD cast at the maximum cast depth. After every cast, the cast data should be backed up onto another computer. It is best if the initial SeaBird data processing be done on a different computer than the data collection.

CTD data will be acquired on a PMEL provided computer using SBE's SEASOFT application. Survey technicians and scientists will keep the ***CTD Cast Information / Rosette Log***.

3.2.1.1 CTD Calibration – Salinity samples will be taken on every cast, or as specified by the Chief Scientist. If requested, a Survey Technician will run Autosal salinometer analyses during the cruise and record the readings on an Autosal log.

3.2.2 MARMAP Bongo Tows – A 60-cm aluminum Bongo frame with 505-µm mesh nets, or 333-µm, flow meters, hard plastic cod-ends, and a 40-kg lead weight for a depressor will be used in standard Marine Assessment Monitoring and Prediction (MARMAP) Bongo tows.

Upon arrival at station, the Bridge will report that they are ready for operations. The Bridge will need to maintain the ship's speed between 1.0 to 2.5 knots – depending on weather conditions – so that the wire angle of the gear during the descent and retrieval is as close to 45 degrees as possible to maximize the fishing capacity of the gear. The Survey Technician will relay wire angles to the Bridge via radio. The nets will be deployed at a constant wire speed of 40-45 meters per minute to a maximum depth of 100 meters, or 200 meters before mid-May, or 5-10 meters off bottom in shallower waters. For operations on Lines 8, 16, and 17 in Shelikof Strait and for egg collections, the gear will be towed 10 meters off bottom to the surface. In addition, one side of the 60-cm Bongo will be changed to 333-µm mesh net and the 20-cm Bongo with 150-µm mesh nets will be attached to the wire one meter above the 60-cm Bongo frame at stations selected by the Chief Scientist.

Wire retrieval rate will be 20 meters per minute. The winch should be one of the ship's Markey oceanographic winches equipped with slip rings and at least 2,000 meters of 0.322", 2-layer, 3-conductor oceanographic wire. A Sea-Bird Electronics SBE 19 SEACAT Profiler will be attached to the wire above the Bongo frame(s) to provide real-time tow data. A scientist is stationed in DataPlot to monitor the SEACAT and to inform the Survey Technician and Winch Operator when the desired gear depth is reached. The Bridge will then be instructed either by the scientist in DataPlot or by the Survey Technician to enter the position in the Electronic Marine Observation Abstract (E-MOA). The winch operator will then be instructed from DataPlot to retrieve the nets at a wire speed of 20 meters per minute.

When the nets reach the surface, they are brought aboard and hosed with saltwater to wash the sample into the cod-end. The sample is preserved as specified in the ***FOCI Field Manual*** or sample collection request forms. The scientists on watch are responsible for recording station information, tow times, maximum depth, wire-out, and flow meter counts on the Cruise Operations Database (COD) forms. Tows not meeting specifications (i.e., hit bottom, poor wire angles, nets tangled, etc.) will be repeated at the discretion of the scientific watch.

The ship will provide the primary SEACAT, and EcoFOCI will provide a backup SEACAT. Before the SEACAT is terminated on the wire by the ship's Electronic Technician and the Survey Technician, a PMEL scientist will note the identification number of the unit and provide the proper calibration file for the computer when the SEACAT from PMEL is used; however, if the ship's equipment is used, current calibrations should be available from the Survey Technician. Personnel from PMEL will provide the acquisition computer and monitor. There is no requirement for the SEACAT data to be displayed on the Scientific Computer System (SCS).

3.2.3 Bongo Larval Condition Tows – A larval condition tow is conducted to obtain live larvae. The 60-cm Bongo will be equipped with either 333-µm or 505-µm mesh nets, flow meters, and taped cod-ends so that water and organism are retained. The gear is launched by the ship's Survey Technician and a scientist on watch. The mesh size will be selected by the Chief Scientist and depend upon the time of field collections, larval size, amount of algae, etc.

This is a vertical tow, with the ship's speed used to maintain as near a vertical wire angle as possible. The Bongo is lowered 25-30 meters per minute to the gear depth of 70 meters or 10 meters off bottom using the starboard Markey oceanographic winch outfitted with a 0.322", 2-layer, 3-conductor oceanographic wire. A telemetering Sea-Bird Electronics SBE 19 SEACAT is used on the wire to determine the depth and to obtain environmental data that will be saved for each haul. A scientist is stationed in Data Plot to monitor the SEACAT and to inform the ship's Survey Technician and Winch Operator when the desired gear depth is reached. During retrieval, the wire haul back speed will be 10 meters per minute. The timing of the tow begins when the net retrieval starts. The nets will not be rinsed when they return to the deck to prevent damage to live larvae. Each cod-end should be held vertical in a clean 5-gallon bucket so that when the cod-ends are detached from the bongo net the water and larvae will spill into the buckets. The contents of the cod-ends and buckets are then carefully poured into a bowl over ice and sorted quickly for live larvae. The larvae are then preserved immediately, as specified in the ***FOCI Field Manual*** or sample collection request forms.

The ship will provide the primary SEACAT, and EcoFOCI will provide a backup SEACAT. Before the SEACAT is terminated on the wire by the ship's Electronic Technician and the Survey Technician, a PMEL scientist will note the identification number of the unit and provide the proper calibration file for the computer when the SEACAT from PMEL is used. Personnel from PMEL will provide the acquisition computer and monitor. There is no need for the SEACAT data to be displayed on the SCS.

If there are few or no live larvae found in the cod-ends, then the Chief Scientist may request another live tow. Once the required number of larvae is obtained, the nets and cod-ends will be rinsed to prevent contamination of a quantitative bongo tow. At the end of the survey, the Chief Survey Technician will provide the Chief Scientist with a copy of the data from the SEACAT. The scientists on watch are responsible for recording station information, tow times, and maximum sample depth on the Cruise Operations Database (COD).

3.2.4 Neuston Net Tows

Description - Neuston nets are used for sampling the upper few centimeters of the water column. There are many frame styles that may be used; however, we typically use a Sameoto sampler made of stainless steel. The mouth opening is 30-cm x 50-cm and is designed to fish half in and half out of the water. A rope tagline is attached to the frame to assist recovery.

Rates/Fishing - The neuston net is fished from the starboard aft crane and is attached with a 4 point bridle. A winch or crane operator is required for deployment. The vessel should be moving slowly ahead, about 1.5 to 2.0 knots, so that the net is fishing half in and half out of the water. The exact speed is a learning process and may vary with sea conditions. The crane operator lowers the neuston net to the surface. It may be necessary to adjust the ship's speed to maintain the proper skimming action. Alternatively, the neuston net can be deployed from the port aft crane or by hand with a rope run through a block on the port oceanographic winch boom while lowering it and paying out 10 to 15 meters of rope. The rope should be tied to a cleat during the tow. Start the stopwatch when the net starts to fish and tow the net for approximately 9.75 minutes, unless otherwise instructed. After 9.75 minutes, the crane operator brings the neuston net onboard. If retrieving the neuston net by hand with a rope, decrease vessel speed after 9.50 minutes to retrieve the net. Stop the stopwatch when the net is completely out of the water. Read and record flow meter revolutions, actual duration of tow, and any comments on the COD form. Immediately after the tow, the net should be washed down with seawater and the codend removed. Material in the codend should then be preserved.

3.2.5 **Live Zooplankton Net Tows** – Tows to collect experimental animals for secondary productivity experiments will be taken during large-scale surveys and patch studies. These collections use a 0.8-meter diameter ring net with a 150-µm or 200-µm mesh net and a large polycarbonate cod-end that minimizes damage to the organisms. The net will be deployed using the ship's starboard Markey oceanographic winch equipped with at least 200 meters of 0.322", 2-layer, 3-conductor oceanographic wire.

The ship will be asked to keep station and maintain a near vertical wire angle during the tow. The ring net and cod-end are "book clamped" to the wire and the Sea-Bird Electronics SBE 19 SEACAT is shackled to the wire. The net will be lowered at a rate of 20 meters per minute to near the bottom. It is important that the winch be able to maintain a slow, constant retrieval speed, less than or equal to 10 meters per minute. Upon recovery the contents of the cod end are gently poured into a cooler or buckets before the net is washed.

The ship will provide the primary SEACAT, and EcoFOCI will provide a backup SEACAT. Before the SEACAT is terminated on the wire by the ship's Electronic Technician and the Survey Technician, a PMEL scientist will note the identification number of the unit and provide the proper calibration file for the computer when the SEACAT from PMEL is used. Personnel from PMEL will provide the acquisition computer and monitor. There is no need for the SEACAT data to be displayed on the SCS.

3.2.6 **MOCNESS Tows**

3.2.6.1 **Deck Machinery** – The Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS) is deployed whenever possible from the stern platform using the A-frame and the ship's Rowe winch equipped with 600 to 1,500 meters of Rochester 7H314, 7-conductor wire. In addition, a set of slip rings is requested for the winch. The manufacturer states that the maximum drag observed on a 1-m^2 MOCNESS system is 3,000 pounds.

3.2.6.2 **Electronics** – The MOCNESS telemeters, in real time, conductivity, temperature, depth, and flow meter data to the surface. The system consists of two 4-inch OD pressure cases that sit in the same cradle on the MOCNESS frame and telemeter data to the ship as fast as one frame per second. The signal is received in DataPlot by a serial modem and is routed to a Pentium-based personal computer located under the bench on the starboard bulkhead. The MOCNESS acquisition station shares a monitor with the Sea-Bird Electronics SBE 19 SEACAT data acquisition system. Serial input of GPS data is required – NEMA String GPGLL. The data acquisition software runs under Windows.

3.2.6.3 **<u>Launch, Fishing, and Recovery</u>** – The movable MOCNESS support frame (cart) will be used, as in the past. On cruises not using trawl gear, the MOCNESS is launched and recovered from the stern grating. On these non-trawl cruises, the support frame will be secured to the deck near the net reel when not in use. On cruises where trawling occurs, the MOCNESS is launched just forward of the trawl ramp and stored off the trawl way between the crane and sorting table.

For safe, efficient launch and recovery of the MOCNESS, the Survey Technician is asked to lead those events, giving orders to the trawl house while the Scientific Watch handles the tag lines. When the weather is rough, a member of the fishing crew may be requested to assist in the deployment and recovery. The MOCNESS is deployed and recovered while under way cruising at 1.5 knots.

A Scientist designated as the MOCNESS pilot in the ship's DataPlot compartment will relay instructions to the winch operator and the bridge to control the descent and ascent rate of the net system. It is essential that the ship maintain a constant speed through the water during the tow. Wire payout and haul back rates must be available to the winch operator and should be displayed in DataPlot as well. Height off the bottom should be 10 meters. Wire is paid out at a rate of 10-20 meters per minute and is retrieved at 5-15 meters per minute under the direction of the MOCNESS pilot.

The MOCNESS pilot will inform the bridge as each net is closed and requests that the bridge record the position in the Electronic Marine Observation Abstract (E-MOA). After recovery, the MOCNESS nets are washed down on the aft deck using a seawater hose. It may be necessary to remain on a course that minimizes waves coming up the stern trawl ramp during net washing.

3.2.7 **<u>CalVET Net Tows</u>** – California Cooperative Oceanic Fisheries Investigation (CalCOFI) Vertical Egg Tow (CalVET) collects microzooplankton and free-floating copepod eggs. These net tows will be conducted by themselves or in conjunction with Conductivity, Temperature, and Depth (CTD) profiler and Niskin water bottle casts. Scientists will require the assistance of the ship's survey technician for deploying and recovering the CalVET net. The CalVET is clamped to the 0.322", 2-layer, 3-conductor oceanographic wire on the starboard Markey oceanographic winch. A "book clamp" is placed on the wire where the cod-ends hang to keep the net taut. When used with a Sea-Bird Electronic SBE 19 SEACAT, the SEACAT is placed below the cod-ends.

The ship is requested to maintain a near constant vertical wire angle during the entire cast. After descent to the desired depth (usually 60 meters) at 60 meters per minute, the net is then retrieved at a rate not to exceed 60 meters per minute. The samples are washed into the cod-ends, and then preserved in 32-ounce jars with Formalin for later analysis.

3.2.8 **Methot Trawls** – The Methot trawl is deployed off the stern of the vessel, with the stern platform removed, using the Marco winch equipped with at least 1,000 meters of 7/16” wire rope with a Safe Working Load (SWL) of 2 tons. A ScanMar Model S40 acoustical depth sensor with readout in the trawl house will be used to receive real-time depth information. The ScanMar transducer is mounted on the ship's centerboard. A scientist or survey technician in the trawl house will relay orders for stopping and starting the winch to the winch operator based on trawl depth; otherwise, deployment and retrieval will be the responsibility of the ship’s crew.

The ship's speed should be 2.5 to 3.0 knots through the water. This trawl will be deployed at 30-40 meters per minute and retrieved at 20 meters per minute. Tows will be either oblique or stepped oblique, generally from 100 meters to the surface. Methot trawls may be conducted in daytime or at night with little or no advanced warning. Where and when the trawl will be conducted depends on plankton catches or acoustic sign. Therefore, the trawl will need to be activated quickly with little time lost. Location and time of tows is at the discretion of the Chief Scientist or Scientific Watch Leader.

3.2.9 **Midwater Trawls** – Marinovich, Rope, or Stauffer midwater trawls may be requested for collecting fish. Midwater trawls will be deployed using standard shipboard procedures. The Chief Scientist or Watch Chief will decide trawl locations, times and depths. Midwater trawls will be conducted day or night, and may depend upon the results of other sampling, such as plankton catches or acoustic sign seen on the SIMRAD EK500 Scientific Echosounder.

When requested, the ship’s crew will need to be activated quickly, with little time lost. Aside from orders relayed from a scientist, deployment and retrieval of each trawl is the responsibility of the ship’s crew. A Furuno wireless netsonde for real-time monitoring of the headrope height is provided by the ship and is usually mounted on the center of the headrope. A Sea-Bird Electronics SBE 19 SEACAT, provided by the scientists, is mounted alongside the netsonde to provide a record of time, net depth, and ambient temperature.

3.2.10 Beam Trawls

Description – Beam trawls are used for sampling demersal fauna over the upper few centimeters of the bottom. The trawl has a rigid 3 m steel beam in front of the net to maintain a fixed opening. The body of the net is constructed on 14 mm square knotless nylon, and the cod-end is lined with 5.5 mm mesh. The headrope and footrope are 5.1 m and 4.1 m respectively. The 3-m beam is constructed of 3.8 cm aluminum stock. A beam bridle is attached to the trawl warp for towing. The trawl does not need a conducting cable and can be deployed from the Marco winch.

Rates/Fishing – A Furuno net sounder is attched to the top of the net to monitor depth and to ensure that the net is on the bottom. The vessel should be moving slowly ahead, about 1.5 knots. Deployment is initiated by carefully paying out the net, cod end first, off the stern. The trawl is towed on the surface for a short distance to ensure proper tow configuration. The trawl warp is then released at the same speed at the ship and the trawl sinks. The tow begins when the net has reached the bottom, ship’s speed approximately 1-1.5 kts. Start the stop watch when the net is on the bottom, and stop it at the end of the tow when the net is no longer towing along the bottom. Tow time on the bottom should be 10 minutes, though shorter tows (5 minutes) may be necessary if catch is significant. Ancillary towing through the water column during deployment and retrieval is considered negligible. Vessel position during retrieval should be maintained or moving slightly forward. Marks for beam trawls should be surface (in), at-depth, haulback, and surface (out). Once the net is on board the vessel, the cod end is opened and the catch is removed and sorted.

3.2.11 Tucker Trawls

The Tucker trawl may be used as the primary gear for late-larval surveys, as a backup for the Multiple Opening/Closing Net & Environmental Sensing System (MOCNESS), or for dedicated predator studies. When used for late-larval surveys, the Tucker will be equipped with 0.505-mm mesh netting and be towed in a smooth oblique fashion with one net open. If the Tucker is to be used as a backup MOCNESS sampler, it will have 0.333-mm mesh netting. However, four Tucker tows are required to substitute for one oblique MOCNESS tow. When used for predator studies, it will have 0.505-mm mesh with a 1-mm cod-end bucket. When used for discrete depth sampling, a Sea-Bird Electronics SBE 19 SEACAT will be attached on the main cable above the bridle. The messenger release is positioned on the cable above the SEACAT.

The winch should be one of the ship's Markey oceanographic winches equipped with slip rings and at least 2,000 meters of 0.322", 2-layer, 3-conductor oceanographic wire. A Sea-Bird Electronics SBE 19 SEACAT Profiler will be attached to the wire above the Tucker frame(s) to provide real-time tow data. The ship will provide the primary SEACAT, and EcoFOCI will provide a backup SEACAT. Before the SEACAT is terminated on the wire by the ship's electronic technician and the survey technician, a PMEL scientist will note the identification number of the unit and provide the proper calibration file for the computer when the SEACAT from PMEL is used; however, if the ship's equipment is used, current calibrations should be available. Personnel from PMEL will provide the acquisition computer and monitor. There is no requirement for the SEACAT data to be displayed on the Scientific Computer System (SCS).

After the bridge gives permission, the Survey Technician and one or two scientists will deploy the Tucker trawl. A scientist will be stationed in the ship's DataPlot compartment to monitor the SEACAT and to inform the ship's Survey Technician and Winch Operator when each desired gear depth is reached. While holding at depth, the first messenger is sent, usually by a scientist, closing the drogue net and opening the first net. Then at the next desired depth, a second messenger is sent, closing the first net and opening the second. It is important the bridge attempt to maintain proper speed while messengers are being deployed to maintain net target depth.

The Winch Operator will be instructed by the scientist from DataPlot to retrieve the nets at a wire speed of 20 meters per minute. The ship's speed should be adjusted to maintain a wire angle of 45° during the entire tow, which is accomplished by the Survey Technician relaying wire angles to the bridge by radio. When the nets reach the surface, they are brought aboard and hosed with saltwater to wash the sample into the cod-end. The sample is preserved as specified in the ***FOCI Field Manual*** or sample collection request forms. Flow meters in the nets record the amount of water filtered, and the SBE 19 SEACAT, records the depth history of the tow. The scientists on watch are responsible for recording times, maximum depth, wire outs, and flow meter counts on the Cruise Operations Database (COD) forms. Tows not meeting specifications (i.e., hit bottom, poor wire angles, nets tangled, etc.) may be repeated at the discretion of the scientific watch.

3.2.12 Continuous Underway Fish Egg Sampler (CUFES)

Description – The CUFES is used to map the distribution of fish eggs in the surface waters. The intake of the CUFES system on the **NOAA Ship *MILLER FREEMAN*** is about three meters below the surface. In this system, water is continuously pumped at ca. 600-700 liters per minute from 4-m depth to the concentrator. Particles are concentrated by an oscillating net – 500 micron Nitex mesh – in approximately 3% of the flow. The filtrate is discharged overboard. The concentrate passes to the sample collector where particles are retained over sequential sampling intervals (e.g. 5-30 min) on a cod end of the same size mesh as used in the concentrator. Particles are concentrated into a 0.505-mm mesh cod end. The sample will be preserved in formalin. Simultaneously, ancillary data are continuously collected for date, time, position, temperature, salinity, and chlorophyll *a* fluorescence.

Methods – A track line in the area of high abundance of fish eggs and larvae should be established. The ship speed should be at 10 knots (18.5 km/hr). The sampling frequency may need to be modified depending on the amount of plankton retained by the mesh. During the sampling, the Data Acquisition System (DAS) will acquire time and GPS position from the ship's GPS signal fed to the DAS.

Preservation – Each CUFES egg sample should be preserved immediately with 1.8% formaldehyde and labeled according to methods to be supplied before the cruise.

Maintenance – The sample cups should be checked after each use for holes. In addition the shaker apparatus should be checked frequently for clogging.

3.2.13 Chlorophyll Sampling Operations – Chlorophyll samples will be collected from the 10-liter Niskin bottles filled during Conductivity, Temperature, and Depth (CTD) profiler casts. The scientists are responsible for collection, filtration, and preservation of samples. Sampling depths depend on the fluorescence profile. A typical strategy would be samples at 0, 10, 20, 30, 40, and 50 or 60 meters, depending upon which of the latter two depths is closest to the fluorescence or chlorophyll maximum. If the maximum is deeper than 60 meters, sampling should be moved deeper with fewer samples in the mixed layer.

When microzooplankton samples are to be collected from the same Niskin bottle, 500 milliliters of water is first removed from the water bottle using a graduated cylinder. Chlorophyll and nutrient samples are obtained from the 500 milliliters in the graduated cylinder. See the ***FOCI Field Manual*** for sampling collection, filtration, and preserving details. The -70° Celsius freezer is required for sample storage.

3.2.14 SIMRAD ER60 Scientific Echosounder Monitoring – When requested, the SIMRAD ER60 Scientific 38-kHz and 120-kHz echosounding system in the acoustics lab will be turned on during scientific operations and should be monitored regularly for the presence of unusual acoustic signals or heavy fish sign. In deeper water depth a 12khz transducer , the ES-60, is to be used. The bridge should notify the scientific watch on duty if any unusual sign appears on the bridge echo sounder.

A trained scientist should be available on each watch to begin logging data and to record station data and file names in the notebook provided. Files should be backed up onto compact disks before the end of the cruise following instructions in the ***Acoustic Lab Instructions***. The Simrad ER60 settings will be set at the beginning of the cruise and remain the same throughout the cruise. If data are printed in real time, the printers need to be checked every hour at a minimum.

3.2.15 ARGOS Satellite-Tracked Drifter Buoy Deployments – Two to three working days before deployment, the Chief Scientist, or designee, will secure the drifter on the back deck. The drifter buoy is then turned on, usually by removing the magnet, and an e-mail message will be sent by the Chief Scientist, or designee, to Dr. Phyllis Stabeno at Phyllis.Stabeno@noaa.gov , stating the serial number that is stamped on the drifter and the time that it was turned on. This lead-time is necessary to ensure that telemetry from the buoy is being received and transmitted by the Advanced Research and Global Observation Satellite (ARGOS). The method of deployment of the drifter is dependent upon the particular make of drifter and is to be directed by the Chief Scientist, or designee.

3.2.16 Acoustic Doppler Current Profiler (ADCP) Operations

3.2.16.1 ADCP Observations – The purpose of the 150-KHz vessel mounted ADCP is to measure the ocean current velocity continuously over the upper 300 meters of the water column, usually in 8-meter depth increments. Current velocities relative to the earth at this spatial and temporal resolution cannot be measured by other methods: CTD sections, current-meter moorings, or drifting buoys. Additionally, ADCP data are used to estimate the abundance and distribution of biological scatterers over the same depth range and in the same depth increments.

3.2.16.2 ADCP Data Collection – ADCP measurement requires four instruments working in concert:

1. The ADCP,
2. The ship's gyrocompass,
3. A Global Positioning System (GPS) receiver, and
4. A GPS Attitude Determination Unit (ADU), presently the TSS Position and Orientation System for Marine Vessels (POS/MV).

The ADCP is connected to a dedicated Personal Computer (PC) and controlled by RD Instruments' (RDI) Data Acquisition System (DAS) version 2.48 software. DAS shall be configured to use the user-exit programs AGCAVE.COM and UE4.EXE. **Separate written instructions detailing the ADCP setup and configuration files are kept in the large, black ADCP notebook in a filing cabinet drawer of the ship's DataPlot compartment**.

The ADCP PC is interfaced to the ship's gyrocompass, primary scientific GPS receiver, and ADU. The navigation GPS receiver shall be configured to send NMEA-0183 $GPGGA and $GPVTG sentence sets to the PC's COM2 serial port at the maximum fix update rate for that receiver – usually a 1 or 2-second rate – and with the maximum number of decimal places for position precision, optimally 4. The ADU shall be configured to send the NMEA-0183 $PASHR sentence set to the PC's COM1 serial port once per second. The user-exit program UE4.EXE shall be configured to control acquisition and processing of GPS and ADU sentence sets, and to synchronize the PC clock with the time reported by the primary GPS receiver.

The ADCP PC logs data from the profiler to Iomega Zip disks. No more than one Iomega Zip disk will be required for each cruise. At the end of the cruise, a backup of the Iomega Zip disk should be made to a unique subdirectory on another disk, maintained by the ship for this purpose, until the original data are certified at PMEL.

3.2.16.3 Scientific Computer System (SCS) Data Logging – Detailed post-cruise processing of ADCP data can take advantage of a larger quantity of navigation data than is retained by the ADCP acquisition software. Thus, the ship's SCS is relied on to log GPS and ADU navigation data at high rates. An SCS ADCP Event Log should be set up to do this.

ADCP analysis requires the input from navigation, heading, and ADCP electronics box sensors on **NOAA Ship *MILLER FREEMAN***. SCS parent sensors, only, need be logged; SCS child sensor logging is not required for ADCP analysis. The required SCS parent sensors and logging rates are as follows:

SCS Sensor	Logging Rate
Trimble P-code GPS $GPGGA	1 sec
Trimble P-code GPS $GPVTG	1 sec
Northstar DGPS $GPGGA	10 sec
Northstar DGPS $GPVTG	10 sec
Ship’s Gyrocompass $HEHDT	10 sec
Raw RDI box temperature	60 sec
Raw RDI box voltage	60 sec
POS/MV $PASHR	10 sec
MX-412 DGPS $GPGGA	10 sec
MX-412 DGPS $GPVTG	10 sec

For ADCP analysis, no other SCS sensors need be logged, but other users may have their own SCS logging needs. If those conflict with the ADCP needs for the above sensors, then SCS should be configured to record these at the fastest logging rate required by all users.

In the above table it is assumed that for ADCP purposes, the primary position sensor is the Trimble P-code GPS receiver, and that the Northstar and Leica MX-412 DGPS receivers are secondary. If the primary GPS receiver should malfunction during a cruise, then the Northstar should be made the primary ADCP navigation device. This is accomplished by connecting the Northstar to the ADCP’s COM2 serial port, and setting SCS to record the Northstar’s $GPGGA and $GPVTG sentence sets at 1-second rates.

If the Northstar also fails, then the Leica MX-412 would be made the primary sensor in an analogous manner. Changes in the availability of GPS equipment shall be communicated to Pacific Marine Environmental Laboratory (PMEL) to allow the above list to remain current. It is the responsibility of the ship to install and enable the appropriate encryption key for use in the P-code receiver should GPS Selective Availability be turned on again by the Department of Defense (DoD).

3.2.16.4 **ADCP Underway Operations** – The ADCP operates continuously during the entire cruise. At the start of a cruise, the system shall be configured and started according to the provided checklists ***Before Leaving Port*** and ***Underway to Operations Area***. The ADCP and its interface to the gyro and navigation must be checked daily by completing the ***ADCP Daily Log*** and at the end of the cruise with the ship tied to the pier.

The centerboard height affects the depth of sampling; therefore, the centerboard shall be lowered as soon as practical upon leaving port and remain lowered throughout the cruise. If it is necessary to raise the centerboard during the cruise, the times of raising and lowering must be logged in the Electronic Marine Operations Abstract (E-MOA).

In case of problems, please describe the problem, error message numbers, flashing lights, etc., on the log sheets. Also, contact Dr. Ned Cokelet at PMEL by telephone, (206) 526-6820, or by e-mail, Edward.D.Cokelet@noaa.gov , as soon as possible.

3.2.16.5 **ADCP Configurations** – Several ADCP DAS configuration (.CNF) files are provided in the C:\ADCP248 directory on the ADCP PC. For system checkout before acquiring current data, use *CHECK02.CNF* or *CHECK02X.CNF*. (The X-suffix is appended to all configurations that enable the ADCP to be controlled by an external trigger pulse as required when the ADCP is used in conjunction with an Alaska Fisheries Science Center (AFSC) hydroacoustics fish-stock assessment echosounder such as the SIMRAD EK500 Scientific Echosounder. External triggering makes the ADCP and the echo sounder ping and listen in concert, reducing interference.

For ADCP current measurements, use *02WBT.CNF* (or *02WBTX.CNF*) when the water depth is less than 500 meters for over two hours. WBT stands for With Bottom Track, which means the ADCP alternately measures the water and sea-bottom velocities and produces the best accuracy. If working in water depths greater than 500 meters for more than two hours, use *02NBT.CNF* (or *02NBTX.CNF*) where NBT stands for No Bottom Track. This suspends bottom searching and concentrates all pings in the water for the best reduction in variance.

3.2.16.6 **Data Dispensation** – At the end of each cruise, a copy of the ADCP ping data logged by the ADCP's PC and the SCS files for the **above sensors only** should be sent to:

Dr. Edward D. Cokelet
NOAA/PMEL
7600 Sand Point Way N.E.
Seattle, Washington 98115

Telephone: (206) 526-6820

E-mail: Edward.D.Cokelet@noaa.gov

3.2.16.7 Dedicated ADCP Transects – One or more dedicated ADCP transects may be requested during a cruise. Each should be run at constant heading (not constant course-over-ground) if practical, thus minimizing gyrocompass lag. However, transects along lines of current-meter moorings should remain on the line with the ship's heading gradually adjusted to accomplish this. Sharp turns should be avoided and the ship's speed should be constant. A speed of twelve knots is often satisfactory, but the ship may have to slow down if the ADCP's "percent good pings" decreases below 75% in the upper 200-250 meters due to sea state.

3.2.16.8 ADCP Backtrack-L Calibration – Occasionally, the ship may be requested to execute a backtrack-L calibration maneuver to test the instruments and to calibrate the transducer misalignment angle for which a 0.5° error can seriously bias the measurements. The "misalignment angle" may change with the ship's trim as well as with remounting the ADCP transducers. The basic idea is to measure the current twice on closely spaced parallel tracks of opposite heading when the ADCP and GPS are working well. The maneuver consists of four legs (north, south, east and west headings) connected by simple U-turns forming an L shape. Each leg should be 30 minutes long; the first 10 minutes are to allow the ship and instruments to stabilize on the new heading. The entire calibration should require about 2 1/2 hours with 5 minutes allowed for each turn. The following should be considered:

1. Negligible currents are best; however, stronger currents are acceptable as long as they are reasonably uniform and steady. Avoid regions of strong horizontal shear due to topography, flow through passes, eddies, and current boundaries. In tidal currents, calibrate when the current is steadiest, often at maximum flood and ebb rather than at slack water.
2. Calibration legs can be done in any order provided opposite-headed legs are sequential.
3. Opposite-headed legs should be parallel and closely spaced, but not retraced. Use U-turns to minimize gyrocompass oscillations. Avoid Williamson and hairpin turns.
4. The ADCP's PC screen should show at least 75%-good pings down to 250 meters.
5. The ship should go fast enough to detect a misalignment error – over five knots, but slow enough to satisfy condition 4. This depends on sea conditions; however, ten to twelve knots is often satisfactory.
6. Choose a time when GPS is navigating and is expected to remain so over the next two hours.

3.2.16.9 ADCP Absolute Backscatter Calibration – A test to calibrate the absolute backscatter strength and to determine the background noise level of the ship's ADCP system may be performed once per cruise at the discretion of the Chief Scientist. Specific instructions in such event will be provided by PMEL personnel aboard, and cannot be anticipated in advance of the cruise. Typically, such a test will be attempted in conditions when weather is relatively calm and the water depth exceeds 250 meters. This test may require that the main power plant, pumps, sonars, and other sources of acoustic and electronic noise be shut down. If conducted in the course of normal operations, the work will require about one hour. There may be opportunities for variations of the test at other times when the ship is at anchor, requiring the cooperation of the ship's officers and engineering watch.

3.2.17 <u>Ice Coring Operations</u>

Operations necessary to conduct ice measurements and coring on ice floes over the eastern Bering Sea continental shelf are based upon PMEL's limited experience on the *Thomas G. Thompson* Cruise TN193, 13 April-12 May 2006, on the Bering Sea continental shelf. We anticipate that these procedures will need to be modified as we gain more experience.

3.2.17.1 <u>Sampling locations</u> - Sampling locations are chosen based upon observations from the research vessel's bridge. The goal is to find a typical ice floe, with clean ice, near the ice edge, flat enough and with enough freeboard to hold 3 or 4 ice scientists. Often ice sampling is done in the same area as marine mammal tagging operations, usually after them.

3.2.17.2 <u>Small boat operations</u> - Personnel are transported to and from ice floes in small boats, usually operated by a member of the ship's crew. In 2006, the NOAA National Marine Mammal Laboratory (NMML) provided helmsmen and 14-foot Zodiac inflatable boats with hard floors and powered by 25 hp Honda four-stroke outboard motors. Their experience shows these are lightweight, tough, maneuverable and safe with lots of reserve buoyancy in independent chambers. Boats are lowered over the side with gear in them. Personnel transfer to the boats by climbing down a Jacob's ladder. The ice team typically consists of 3 or 4 ice scientists in 2 boats, each with 1 helmsman. The boat approaches a candidate floe and disembarks 1 ice-team member to probe the flow for sampling suitability. If the floe is suitable, remaining team members debark and off-load the sampling gear. The boats stand by at the ice-floe edge as a safety precaution. The Zodiacs have enough flotation that in an emergency, one boat could hold and transport all 6 people. If conditions warrant, one small boat can return to the research vessel on a brief errand, as long as the small boat remains in the water and manned. The research vessel maintains a rapid-deployment boat on standby to assist in rescue efforts, if required. All personnel wear float suits or float coats for safety. Ice-sampling personnel typically wear Mustang suits and bunny boots. NMML helmsmen may choose to wear the Mustang coats, insulated pants and pac boots which they use during seal-tagging operations. On-ice operations require about 1 hour. Small boat launching and recovery requires 1-2 hours.

Depending on the location and conditions, the captain or chief scientist may insist that a polar bear watch be kept.

<u>A polar bear watch</u> has 2 components: one on the bridge, the other on the ice or small boat. The bridge watches for polar bears, particularly when the ship is north of St. Matthew Island. The Bridge will notify scientists on the ice via VHF radio if they spot a bear. The Bridge will provide the bear's distance from the work area and its direction of travel. Scientists will quickly abandon the work site if a bear comes within 1 mile from the site, leaving their scientific equipment behind, if necessary. Each work group (ice team) will also include an armed person trained in the safe use of firearms around polar bears.

3.2.17.3 Gear - Sampling gear consists of the following:

1. Ice probes (ski poles)
2. GPS and compass
3. Camera
4. Ice corer with gasoline engine
5. Meter stick
6. Ice-thickness gauge
7. In-air and in-water PAR radiometers with deployment shafts
8. Ice-core cutting board
9. Ice saw
10. Zip-Loc bags, 1 gallon size, for ice and slush samples
11. Ice auger (hand-powered)
12. Slurp gun
13. Ice chest
14. Thermometer
15. Electric drill and bits
16. Surface water sample bottle
17. Log sheets, pens, pencils, etc.

3.2.17.4 Sampling procedure

I. Approach Floe - Take photos
Approach from North if possible (not South) – keep southern areas of a floe pristine until PAR measurements have been taken.
Secure Scientific and safety gear on ice floe.

II. Physical Description
Observe GPS position and orientation of floe.
Measure (estimate) ice floe size.
Snow depth, presence or absence of snow, other characteristics.

III. Set up Sampling Area with the following equipment:
Cutting Board and Ice Saw.
Sampling bags.
Black drape for shading.

IV. Core 1: Chlorophyll Core – Green Color Code
Drill core. Place on cutting board.
Photograph with a core label. Observe banding, visuals, add remarks to log.
Cut core into 10 cm segments from bottom.
Label bags by distance from top (e.g. A2C 63-73 cm), place each segment into labeled bag, then put that into unlabeled bag.
Place in ice chest or keep in dark for ice chest later.
Measure ice thickness and freeboard in core hole.
To make PAR sensor measurements:
Thread surface PAR cable through tube;
Connect to LC1 port on reader unit;
Thread subsurface PAR cable through white PAR flange.
Connect to LC2 port on reader unit;
Insert rig into hole drilled through the ice.

Rotate and raise rig to 5 cm beneath ice.
Secure the flange.
Take 3 readings over time for each sensor.

V. Brine holes
Auger 4 holes: 20, 40, 60, 80 cm deep.
Drill and sample cores 2, 3 and 4 (if applicable) while waiting for hole to fill.

VI. Core 2: Salinity/Nutrient core – Color Code
Drill core. Place on cutting board
Photograph with a core label in view.
Observe banding, visuals, add remarks to log sheet.
Cut core into 10 cm segments from bottom.
Label bags by distance from top (e.g. A2S 63-73 cm), place each segment into labeled bag, then put that into an unlabeled bag.
Place in ice chest or keep in dark for ice chest later.
Measure ice thickness and freeboard in core hole.

VII. Core 3: Temperature and Productivity core– Yellow Color Code
Drill core. Place on cutting board
Photograph with a core label in view.
Observe banding, visuals, add remarks to log sheet.
Drill holes for Temperature probe and measure temperature at 5, 15, 25, … cm, starting from bottom.
Cut bottom 5 cm from core for productivity sample.
Continue cutting the core up from the bottom in 10 cm increments.
Label bags by distance from top (e.g. A2P 68-73 cm), place each segment into a labeled bag, then put that into an unlabeled bag.
Place in ice chest or keep in dark for putting into the ice chest later.
Measure ice thickness and freeboard in core hole.
PAR: Take above- and under-ice readings in this hole.

VIII. Sample brine holes:
Use bilge pump to acquire brine sample from holes.
Write **Blue** labels (20, 40, 60, 80 cm); place samples in bags.

IX. Physical Measurements-
Take sea surface water sample with volume of at least 2 L.
Measure surface water temperature with the temperature probe.
Take a final GPS reading.

3.2.18 U-TOW Operations - The U-Tow is an undulating towed oceanographic sampling vehicle built by EnviroTech LLC. It requires a 7-8 conductor cable and is currently towed from the aft Rowe winch on the Miller Freeman. This same winch/wire combination has an interchangeable plug termination that is also used to tow the MOCNESS.
The U-Tow is deployed off the stern through a minimum 16 inch diameter rubber coated sheave on the A frame. The vehicle can be deployed with or without the stern platform in place. Launching and towing speeds will vary with weather conditions, instrumentation and desired operational results. In general, the vehicle should be deployed and recovered underway at approximately 3 knots. Once deployed wire is spooled from the winch at 20-30 meters per minute and the vessel speed is gradually increased to a speed of 8 to 12 knots. The status of the vehicle is monitored in Data-Plot, radio communication between Data-Plot, the winch operator

and the bridge are necessary. The vehicle also requires a GPS feed to the U-Tow computer in data plot and a bottom depth display to watch for significant changes in depth or obstacles. For standardization a 911plus CTD cast will be completed prior to and at the end of each diving transect.
Transects can last several minutes to several hours depending on the objectives of the sampling protocol. Presently the U-Tow is equipped with 2 SeaBird FastCats, a fluorometer and the LOPC, but there is some flexibility in the instrumentation package and this could change.

4.0 DISPOSITION OF DATA AND REPORTS

4.1 Data Responsibilities – The Chief Scientist is responsible for the disposition, feedback on data quality, and archiving of data and specimens collected on board the ship for the primary project. The Chief Scientist will be considered the representative of the Directors of PMEL and AFSC for purpose of data disposition. A single copy of all data gathered by the vessel shall be delivered to the Chief Scientist upon request for forwarding to the EcoFOCI Coordinator, acting as representative for the Laboratory Directors. The EcoFOCI Coordinator will be responsible for data archival and distribution of data to other investigators desiring copies.

4.2 Electronic Marine Observation Abstract (E-MOA) – The ship is requested to maintain an E-MOA form using the Scientific Computer System's Event Logger during the cruise. The critical information recorded at each station is:

- Coordinated Universal Time (UTC) date,
- UTC time,
- Position,
- Station number,
- Haul number,
- Gear type, and
- Bottom depth.

4.3 Electronic Navigation Plot – The ship will use the electronic navigation suite's file system to maintain the position of each operation and station. If requested, a diskette of the export file will be given to the Chief Scientist.

4.4 Navigation – Observations and reliable fixes shall be plotted and identified by date/time group, or equivalent by ship's officers. Fixes shall be evaluated for course and/or speed made good. Global Positioning Satellite (GPS), radar range and bearing, and/or visual fixes shall provide primary navigational control.

5.0 FACILITIES AND EQUIPMENT

5.1 Definition – A complete list of equipment to be provided by the ship and program is contained in the EcoFOCI Cruise Instructions for each cruise. Sufficient consumables, back-up units, on-site spares, and technical support must be in place to assure that operational interruptions are minimal. All measurement instruments are expected to have current calibrations, and all pertinent calibration information shall be included in the data package.

5.2 Scientific Computer System – The ship's Scientific Computer System (SCS) shall operate throughout the cruise, acquiring, and logging data from navigation, meteorological, oceanographic, and fisheries sensors. The SCS data acquisition node will provide project scientists with the capability of monitoring sensor acquisition via text and graphic displays. A data processing node will be available to project scientists throughout the cruise, configured according to the specifications agreed upon by the Chief Scientist and the ship's SCS manager. In addition, scientists will provide any calibration information applicable for their instruments connected to the ship's SCS.

Sensor identification, data acquisition, and logging parameters are specified in the system file *SENSOR.DAT*. The ship's SCS manager shall maintain this file in a current state throughout the cruise. Changes to the *SENSOR.DAT* specifications may be made by the ship's SCS manager on a cruise-by-cruise basis at the request of the Chief Scientist.

The ship's SCS manager will work with the Chief Scientist to setup special sampling of SCS data through the Event Logger built into SCS. Event Logger data requirements will be specified in the cruise instructions. Data files generated by the Event Logger will be given to the Chief Scientist upon departure from the vessel.

NOAA Ship *MILLER FREEMAN* will run the backup SCS machine at the same interval as the primary SCS machine. In the event that either SCS machine breaks down the SCS manager will commence routine backups of the SCS at intervals not to exceed twelve hours. At the end of the cruise, the ship's SCS manager will archive data from disk files to recordable compact diskettes (DVD or CD-R) for delivery to the project representative. Additional recording of processed data may be requested of the ship's SCS manager. If so, specific instructions will be found in the Cruise Instructions. The ship's SCS manager will ensure data quality through the administration of standard SCS protocols for data monitoring. If requested by the Chief Scientist, standard SCS daily quality assurance summaries will be prepared for review. During the cruise, the scientific party may require the assistance of the ship's SCS manager to determine if all sensors are functioning properly and to monitor some of the collected data in real time to make sampling strategy decisions.

The EcoFOCI SCS administrator is:

David G. Kachel
NOAA/PMEL
7600 Sand Point Way N.E.
Seattle, Washington 98115-6349

Telephone: (206) 526-6195
E-mail: Dave.Kachel@noaa.gov

5.3 Sea Chest and Uncontaminated Seawater – Sea surface temperature, conductivity, and a program provided fluorescence will be continuously monitored. Data from the Sea-Bird Electronics (SBE) thermosalinograph installed in the sonar void sea chest shall be sent to the Scientific Computer System (SCS). Uncontaminated seawater from this chest will be continuously pumped to the Chemistry Laboratory and through a fluorometer, when requested.

The ship's Electronic Technician will be responsible for inspecting, and when required, cleaning the sea chest and conductivity cells monthly, or at other times requested by the chief scientist. The scientists will be responsible for regularly cleaning the cuvette, inside the fluorometer, and obtaining and processing the calibration samples. Cleaning of the fluorometer needs to occur every 1-2 days, depending on the amount of phytoplankton production in the water. Calibration samples will be taken wice each day, or more frequently at the request of the chief scientist.

A standard template file specifying these data types shall be maintained for all EcoFOCI cruises by the ship's SCS manager. American Standard Code for Information Exchange (ASCII) logger files will be included in the periodic backup of SCS data for distribution at the end of the cruise. The Chief Scientist should request that these data be made available on CDs or DVD at the completion of the cruise.

During the cruise, the ship's complement will be responsible for ensuring that data streams from the instruments are correctly logged by the SCS, checking the logger status display once per watch to determine that the instruments are functioning, and for taking salinity calibration samples every other day for thermosalinograph corrections.

The ship's SCS ASCII-Logger feature shall be configured to log one-minute averaged data throughout each ECOFOCI cruise. This data will be loggd to the filename *TSG* and should include:

- GPS Time,
- GPS Latitude,
- GPS Longitude,
- Water Depth, in meters,
- Seawater (sea chest) Temperature,
- Seawater (sea chest) Salinity, and
- Laboratory Fluorometer Voltage

5.4 Ultra-Cold Freezer Requirements – The scientific ultra-cold freezer will remain on the ship in operating condition from the beginning of the first EcoFOCI cruise until the ship returns to Seattle, Washington, and the samples within can be unloaded. Since valuable samples will be in the unit, operation must be continuous without interruption. Therefore, the unit should be hardwired into the ship's electrical system or connected with a threaded plug. The unit must be securely fastened to a bulkhead or counter, easily accessible, with a minimum of four inches clearance on each side around the bottom. The location, fastening, and wiring should be similar to the configuration that EcoFOCI has used in the past.

The freezer has an alarm, but ship's personnel are requested to check the analog temperature display twice daily to insure that the operating temperature is below -60°C and ignore the alarm, which is set off by the digital display. The unit will be locked between cruises, and a key left with the Chief Survey Technician. In the event that the unit fails, the temperature will maintain for about twelve hours if the lid is not opened. If the unit fails and cannot be fixed on the ship, the scientific blast freezer should be pre-cooled to its minimum (-38°C), and all frozen specimens should be transferred to it immediately, without thawing.

Kevin Bailey must be notified by either telephone or e-mail. A daily record of the temperature – analog readout – on the scientific ultra-cold freezer will be submitted to Kevin Bailey upon the ship's return to Seattle, Washington.

Kevin M. Bailey
NOAA/AFSC
7600 Sand Point Way N.E.
Seattle, Washington 98115-6349

Telephone: (206) 526-4243
Facsimile: (206) 526-6723
E-mail: Kevin.Bailey@noaa.gov

6.0 HAZARDOUS MATERIALS – In accordance with ***Environmental Compliance and Guidance Manual, Rev. 0***, dated October, 2001, all NOAA ships will operate in full compliance with all NOAA hazardous materials (HAZMAT) requirements. All hazardous materials and substances needed to carry out the objectives of the embarked science mission, including ancillary tasks, are the direct responsibility of the embarked designated Chief Scientist, whether or not that Chief Scientist is using them directly. The ship's Environmental Compliance Officer will work with the Chief Scientist to ensure that this management policy is properly executed.

6.1 Hazardous Material Management – This section discusses the general precautions and safe handling practices for hazardous materials as required by Occupational Safety and Health Administration (OSHA). It also provides specific instruction for the safe handling of some of the more common hazardous materials such as flammable and combustible liquids, corrosives (acids and bases), compressed gases, mercury, pesticides, and asbestos. When hazardous materials are required for Marine Operations Center base or ship use, they will be maintained at the lowest quantity necessary to accomplish the mission. The hazardous materials will be inventoried biannually. The inventories, showing the type and amount of hazardous material, will be kept for a period of three years. The inventories will be used by a Marine Operations Center director or Commanding Officer in determining if their respective command is holding hazardous materials at excessive levels.

6.2 Requirements for Visiting Scientific Parties – Visiting scientific parties pose unique challenges for NOAA Marine and Aviation Operations (NMAO) to comply with applicable environmental regulated related to hazardous materials and hazardous waste. This section provides general and specific requirements for visiting scientific parties working aboard NOAA vessels.

6.2.1 General Requirements – Scientific parties will write the following information into their cruise instructions and provide it to the Commanding Officer of the respective ship 60 to 90 days before the departure date for the cruise:

- A list of hazardous materials by name and the anticipated quantity to be brought aboard,
- A list of the neutralizing agents, buffers, and/or absorbents required for these hazardous materials, if they are spilled, and
- A chemical hygiene plan.

Scientific parties will supply neutralizing agents, buffers, and/or absorbents in amounts adequate to address spills of a size equal to the amount of chemicals brought aboard. This spill response material must accompany the chemicals when they come aboard. Hazardous materials brought aboard NOAA ships by visiting scientific parties will be accompanied by an inventory list showing the actual amount and a manufacturer's Material Safety Data Sheet (MSDS) for each hazardous material. This information will be provided to the Commanding Officer upon embarkation. Any inconsistency between anticipated and actual inventories may result in a Commanding Officer’s disapproval for any amount of actual materials in excess of anticipated amounts to be brought aboard.

The Commanding Officers will then make the MSDS available to the ship's complement. Upon departure from the ship, visiting scientific parties will provide the Commanding Officer an inventory of hazardous materials showing that all hazardous materials brought aboard have been depleted or removed as an unused but usable product. The visiting scientific party is responsible for the off loading and disposal/transportation of all hazardous waste or unused but usable product unless otherwise arranged with the Commanding Officer materials other than waste can be off loaded by visiting scientists at any port other than home port as long as they manifest, label, and transport the hazardous material in compliance with United States Department of Transportation (DOT) regulations.

6.2.2 <u>General Precautions</u> – It is the responsibility of the individual to read and understand the MSDSs for all materials they work with on a routine and non-routine basis. The following general procedures will help to maintain a safe working environment and to protect the health of individuals when handling hazardous materials:

- Know the general properties associated with the materials you are using. Always use the MSDS to determine chemical properties.
- Know the location of safety equipment such as the emergency shower, eye wash, fire extinguisher, fire alarm, and evacuation routes.
- Know the emergency phone numbers and have them posted near the telephone.
- Do not eat, drink, smoke, apply cosmetics, chew gum, or store food, beverages, tobacco, cosmetics or medications in areas where laboratory chemicals are used or stored.
- Confine long hair and loose clothing when using chemicals.
- Always wear shoes. Do not wear sandals or open-toed shoes.
- Always wash hands and other exposed skin areas after using chemicals and before eating or drinking.

6.2.3 <u>Safe Storage and Use Practices</u> – Areas where hazardous materials are stored or used are required to be free from the accumulation of materials that create a hazard, such as leaking containers, or the placement of containers in a manner that would create hazards such as tripping or fire. These requirements can be met with good housekeeping practices as follows:

- Keep work areas clean and uncluttered. Make sure hazardous materials and equipment are properly labeled and stored. Good housekeeping prevents accidents.
- Ensure that when hazardous materials are transferred into other containers, the new containers are properly labeled using the NFPA or a hazardous material identification system.
- Place drip pads or absorbent materials under containers.
- Do not store materials on top of high cabinets where they will be hard to see or reach.
- Provide a definite storage place for each material, and return the material to that location after each use or at end of work day.
- Do not expose stored hazardous materials to heat or direct sunlight.
- Observe all precautions regarding the storage of incompatible materials.
- Separate materials into compatible groups, and store alphabetically within compatible groups.
- Dispense in areas away from floor drains.
- Report any spills to your supervisor.
- Additional storage information for specific materials can be found in the MSDSs. Aboard ships storage of hazardous material requires additional consideration when stabilizing shelving and containers. Shelving and other storage units should be secured, and shelving should contain at the very least, a frontedge lip to prevent containers from falling. Ideally, containers of liquid should be placed on a metal or plastic tray that could contain the entire contents of the container if it was to break or leak while on the shelf.

6.3 Safe Handling Practices of Specific Hazardous Materials – This section discusses recommended safe handing practices from OSHA and National Fire Protection Association (NFPA), 1996, for flammable and combustible liquids, corrosives, compressed gases, and mercury.

6.3.1 Flammable and Combustible Liquids – Flammables and combustibles are materials which, under standard laboratory or other work area conditions, can generate sufficient vapors to cause a fire in the presence of an ignition source. Materials which generate sufficient vapors to ignite at temperatures below 100° F (38° C) are "flammables," whereas materials which require temperatures above 100° F, but below 200° F, to provide sufficient vapors for ignition are "combustibles."

6.3.2 Flammables From Visiting Scientific Parties – Scientific parties can stage chemicals at the NMAO MOCs before loading onto ships. The two most common flammable chemical used are formalin solutions and ethanol. Requirements for the safe handling of these chemicals also apply aboard ship and will be repeated in the ships at sea section. Formalin (37 percent formaldehyde in water) is a combustible and a corrosive liquid that has special incompatibility restrictions. Formalin can be stored with other flammable liquids in a flammable liquid storage cabinet, in a flammable storage room, or in the outside flammable storage locker. Formalin must not be stored with amines, acids, or strong oxidizers (including organic peroxides). Heated storage is required to prevent polymerization of the formalin.

Water and formalin solutions with less than 10 percent formalin are not considered a flammable or combustible liquid; however, these solutions should not be stored with amines, acids, or strong oxidizers.

Follow general storage requirements for these solutions. Ethanol is a highly flammable liquid (Class IA) and should be stored in either a flammable liquid cabinet or a flammable storage room. Ethanol should not be stored with acetaldehyde, barium perchlorate, chlorine, diethyl aluminum bromide, ethylene oxide, hexamethylene diisocyanate, hydrogen peroxide, or sulfuric acids. Mixtures of ethanol and any of these compounds can form explosive mixtures. Solutions of water and ethanol with less than 24 percent ethanol are not considered flammable liquids (International Air Transport Association 1991) and can be stored in normal storage areas as long as they are isolated from the compounds listed above that form explosive mixtures with ethanol.

6.3.3 General Practices – The following general practices should be adhered to for flammable and combustible liquids:

- Secure caps on containers immediately following dispensing.
- Do not dispense into containers and allow to remain uncovered for longer than necessary.
- Dispense flammable and combustible materials in a hood or outside, and use them up in a reasonable time normally allotted for the particular activity.
- Do not allow flammable liquids to evaporate in a fume hood as a means of disposal. This is a form of illegal treatment.
- Eliminate ignition sources such as open flames, hot surfaces, operation of electrical equipment, and static electricity from areas in which flammable or combustible materials are used or stored.
- Post conspicuous "No Smoking" signs in these areas.

• Segregate flammables from oxidizing acids and oxidizers.
• Store flammable and combustible liquids in refrigerators and freezers specifically designed and designated for the storage of these materials. Flammable liquid refrigerators and freezers must be placarded as such.
• Ensure that there is proper bonding and grounding when transferring between metal containers or dispensing a flammable liquid from a large container or drum.
• Store used flammable and combustible liquids in containers similar to the original with an appropriate label giving the exact contents of the container.

6.3.4 **<u>Storage Limits</u>** – The container size for storing flammable and combustible liquids is limited both by the NFPA and by OSHA. Limitations are based on the type of container and the flammability of the liquid.

6.3.5 **<u>Corrosives (Acids and Bases)</u> –** Corrosives are materials that destructively attack organic tissues (most notably the skin, but also mucous membranes or lungs if inhaled, or the stomach if taken internally). Corrosive chemicals are generally acids and bases, oxidizing agents, and some dehydrating agents. Examples of corrosives are phosphoric acid, hydrochloric (muriatic) acid, hydrofluoric acid, potassium hydroxide, nitric acid, sodium hydroxide, chlorine, bromine, and sulfuric acid. The following general practices should be adhered to for corrosives:

• Segregate acids from bases.
• Store large bottles of acids on a low shelf or in acid cabinets (non-metallic).
• Remember that corrosives react with the skin and are particularly damaging to the lungs and eyes; therefore, use personal protective equipment when working with corrosives. Consider neoprene gloves, faceshield, rubber apron, and rubber boots.
• Always add acid to water (never the reverse) to avoid violent reaction and splattering.
• Wherever corrosives are used or stored, ensure that a working safety shower and eyewash are readily accessible.
• Should there be contact between corrosives and any body tissue, particularly the eyes, immediately flush the area of contact with cool water for 15 minutes. Remove all affected clothing and immediately get medical assistance.

6.3.6 **<u>Compressed Gases</u>** – There are over 500 kinds of gases available in compressed gas cylinders. The Compressed Gas Association publishes monographs for all aspects of operation and safety related to the design, valves, gauge fittings, and labels. DOT regulations cover materials and transportation. The following general practices should be adhered to for compressed gases:

• Inspect all cylinders upon delivery for valve protection and hydrostatic test date. The cylinder should indicate testing within the past 5 years.
• Do not remove the cylinder cap until the cylinder has been secured at the point of use.
• Ensure that the valve and fixture assembly are not damaged.
• Securely strap full or empty cylinders in an upright position.
• Mark all empty cylinders as "empty."
• Do not roll cylinders or permit them to drop. Always transport them on a hand truck, firmly secured.
• Be especially careful with cylinders of corrosives (for example, hydrogen chloride) as the entire valve can come off if improperly maintained.

• Obtain proper training on the installation and use of fittings, valves, and regulator mechanisms.
• Should there be a suspected leak, close all regulator valves and tighten the packing nut.

If the leak continues, notify the supplier and initiate the following emergency procedures:

• If the leak is minor, secure the cylinder next to a fume hood (if accessible) or outside.
• Move away, notify others in the vicinity, and communicate with your emergency contact immediately

6.3.7 Mercury – Mercury is found in various system controls and scientific instruments. Absorbed mercury is a poison and affects the central nervous system. The poisoning can be progressive unless the mercury is removed from the environment. The following general practices should be adhered to for mercury:

• Do not use mercury-containing instruments or elemental mercury in carpeted areas. Spilled mercury on carpet cannot be vacuumed.
• Always keep mercury in tightly closed containers and stored in secondary containers.
• Occasionally, mercury compounds are used in fungicides. These mercury compounds are likewise a long term health risk and areas of application should be well ventilated before entrance.

7.0 COMMUNICATIONS – For scientific projects, the Chief Scientist, or their designated representative, may have access to the ship's communications systems on a cost reimbursable basis. Whenever possible, it is requested that direct payment be used as opposed to after-the-fact reimbursement, such as credit or calling card, etc. **NOAA Ship *MILLER FREEMAN*** has several types of communication systems available to communicate directly with shore-based facilities or other vessels at sea. Specific information on how to contact **NOAA Ship *MILLER FREEMAN*** and all other fleet vessels can be found at http://www.moc.noaa.gov/phone.htm .

7.1 Electronic Mail (E-mail) – EcoFOCI I requests that **NOAA Ship *MILLER FREEMAN*** transmits e-mail at least twice a day. At sea, electronic e-mail is sent and received by the onboard INMARSAT B and INMARSAT Mini-M systems. In recent years, the proliferation of e-mail and the reduction of INMARSAT costs have permitted the sending of nominal amounts of personal e-mail when transmitted with official ship's business. The availability of e-mail services is a valuable quality of life issue aboard ship. Accordingly, a complimentary amount of personal use will be permitted for all personnel aboard.

Each embarked personnel will have an e-mail account and address established in their name by the Lead Electronic Technician at the time of arrival. The general format for a user’s e-mail address is:

Firstname.LastName@mfnems.pmc.noaa.gov.

7.2 Satellite Communications – INMARSAT-B (voice and facsimile) and INMARSAT Mini-M (voice) communications are available aboard ship and may be used for personal or business related calls. Arrangements to pay for the calls must be made before calling. Credit card calls are the preferred method of payment. INMARSAT calls can be extremely expensive and the exact cost may not be known until you receive your bill. If you do not have a credit card and need to make an INMARSAT call, arrangements to pay by personal check may be arranged with the Executive Officer. Brevity is encouraged. See the Lead Electronic Technician (LET) for any questions regarding the use of these telephones. All requests for INMARSAT calls, whether for official or personal business, will require the approval of the Executive Officer or Commanding Officer.

7.2.1 **INMARSAT Mini-M** – The Nera Worldphone Mini M is used mainly as a back up to the INMARSAT B. It has voice, facsimile, and 2400-baud data communications terminal. Cost is approximately $2.30 per minute, which may be charged to a credit card or directly reimbursed. INMARSAT Mini-M service coverage is generally the same as INMARSAT-B.

7.2.2 **INMARSAT-B** – A Magnaphone MX-2464 INMARSAT-B is located in the Radio Room and interfaced with the ship's Private Branch Exchange (PBX) telephone system. The terminal provides voice, facsimile, data, and telex connectivity via the worldwide INMARSAT satellite system. Data speeds are 9600 and 56/64K baud. The ship's e-mail is usually sent via INMARSAT-B on either the low or high-speed data connection. Approximate costs range from $3.00 per minute (low speed) to $10.00 per minute (high speed).

7.2.3 **INMARSAT Standard-C** – The Trimble Galaxy Standard-C is used mainly for Telex type store and forward message service with approximately 500-baud message transfer rate. Because of the high expense and slow data transfer rate, the system is generally only used for ship's business, such as weather reporting and telex to shore based facilities.

7.2.4 **Iridium** – The Iridium telephone is tied into the ship’s PBX telephone system. While underway, the Iridium telephone should be the primary means of communication with the ship. Approximate costs for this system are $0.10 per minute.

7.3 **Cellular Telephone** – Routine incoming non-emergency telephone calls are discouraged. The Officer of the Deck (OOD) cellular telephone is a possible point of contact when in range of a cellular station. Personnel are encouraged to bring their own cellular telephones if the project will be in the area of land-based cells.

7.4 **Ship Telephone Services** – Routine incoming non-emergency telephone calls are discouraged. The ship's telephone is primarily used for ship's business. The individual making the call must pay for long distance personal calls.

7.5 **Ship’s Mail** – Incoming letters and packages can be sent to embarked members of the ship’s crew and scientific complement by addressing them to:

Name
NOAA Ship *MILLER FREEMAN*
1801 Fairview Avenue East
Seattle, Washington 98102-3767

Mail received at the marine center will be periodically forwarded to the ship’s next port of call. When the ship is on a foreign deployment, senders are encouraged to mail letters and packages early to ensure delivery. Some foreign customs authorities routinely open and inspect incoming mail. Arrangements for ship’s outgoing mail will be made on the morning of departure. In foreign ports, mail must have United States postage affixed as it will be boxed and shipped to Marine Operations Center, Pacific where it will enter the United States postal system. United States postal stamps are not routinely available aboard ship.

7.6 **<u>Methods and Progress Report</u> – NOAA Ship *MILLER FREEMAN*** does not maintain an exact Just File Transfer (JFT) radio schedule with Marine Operations Center, Pacific; however, the ship uses e-mail. Radio contact will be maintained when possible. The Chief Scientist will send a scientific progress report to their respective Field Operations Leader via International Maritime Satellite (INMARSAT) Voice, Fax, or e-mail at least once a week.

7.7 **<u>Receiving Scientific Status Reports</u> –** The Chief Scientist may anticipate the need for daily reports on the position of satellite drifters in the study area and on the status of biophysical mooring(s). These will be sent either by facsimile from PMEL over INMARSAT or over the Internet from PMEL to the Marine Operations Center, Pacific radio room and forwarded to the ship.

7.8 **<u>Use of Radio Transceivers</u> –** Because it is sometimes necessary for the scientific staff to communicate with other research vessels, commercial vessels, and shore based NOAA facilities, the Chief Scientist or designee may request the use of radio transceivers aboard the vessel.

7.9 **<u>Radio Interference</u> –** Some scientific equipment is sensitive to radio frequency interference. When interference occurs, it may be necessary to adjust operations and communications schedules if efforts to electronically isolate the equipment are unsuccessful.

8.0 MISCELLANEOUS

8.1 **<u>Scientific Berthing</u>** – The Chief Scientist is responsible for assigning berthing for the scientific party within the spaces approved as dedicated scientific berthing. The Operations Officer is requested to send stateroom diagrams to the Chief Scientist showing authorized berthing spaces. The Chief Scientist is responsible for returning the scientific berthing spaces in the condition in which they were received, for stripping bedding, for linen return, and for the return of any stateroom keys that were issued. Only one set of linen and towels are provided to embarked personnel; the scientific complement is responsible for laundering their own linen and towels during the cruise.

The Chief Scientist is responsible for the cleanliness of the laboratory spaces and storage areas used by the science party, both during the cruise and at its conclusion before departing the ship.

In accordance with ***<u>OMAO Drug and Alcohol Policies and Procedures, Rev 1</u>***, dated May 17, 2000, all persons boarding NOAA vessels give implied consent to conform to all safety and security policies and regulations, which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time.

8.2 <u>Medical Forms and Emergency Contacts</u>

8.2.1 **<u>Medical Forms</u> –** All scientific personnel must complete the ***<u>NOAA Health Services Questionnaire</u>*** (NHSQ) (April 2004 revision), and email it to the Marine Operations Health Services Office in Seattle at mop.health-services@noaa.gov. If email is not available, the questionnaire may be faxed to (206) 553-1112. OMAO policy requires the questionnaire must be received by the Health Services Office at least 7 days prior to the start of the cruise. If the Office requires clarification on a medical condition or a waiver is requested, more lead time will be required to grant clearance. Should an individual fail to be cleared, additional lead time to select a replacement may be required. Therefore, it is recommended that questionnaires be provided to the office 30 days prior to the commencement of cruises. A PPD (Tuberculosis) test is valid for 12 months and must be renewed on an annual basis. Except for the PPD test, NHSQ clearances are valid for 2 years for scientists under the age of 50 and 1 year for age 50 and over.

Personnel should bring any prescription medication needed and any over-the-counter medicine that is taken routinely.

A statement of conduct memorandum delineating the NOAA policy on sexual harassment and use of illegal drugs and alcohol will also be distributed to all scientific personnel, and an acknowledgment of the receipt of this memorandum will be required.

8.2.2 Emergency Contacts – Prior to departure, the Chief Scientist must provide a listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: name, address, relationship to member, and telephone number.

8.3 Shipboard Safety – Bare or stocking feet are not allowed outside staterooms because of the risk of injury from slipping on wet decks, other hazards, and hygiene. Open-toed shoes may be worn only in non-working, interior spaces. When conducting operations, personnel involved with the deployment and recovery of scientific equipment, or the launching and recovery of small boats, are required to wear hard hats and flotation devices. All employees are encouraged to wear safety shoes or boots. The following safety regulations will be observed when working on deck:

- Life vests or floats coats will be properly worn when handling equipment over the side, deploying equipment over the side, and on all launches (whether alongside the ship, launching, or recovering),
- Safety belts and lines will be worn by those handling equipment over the side,
- Hardhats will be worn by all those involved in recovery or deployment of equipment and boats,
- Proper footwear should be worn at all times, and
- Ship's equipment is to be operated only by qualified members of the ship's complement.

8.4 Port Agent Services/Billing – Contractual agreements exist between the port agents and the Commanding Officer for services provided to **NOAA Ship *MILLER FREEMAN***. Costs for any services arranged through the ship’s agents by the scientific program, which are considered to be outside the scope of the agent/ship support agreement, will be the responsibility of that program. Direct payment must be arranged between the scientific party and the port agent, as opposed to after-the-fact reimbursements to the ship’s account.

8.5 Wage Marine Working Hours and Rest Periods – The Chief Scientist shall be cognizant of the reduced capability of the ship’s operating crew to support 24-hour mission activities with a high tempo of deck operations at all hours. Wage marine employees are subject to negotiated work rules contained in the applicable collective bargaining agreement. All wage marine employees are supervised and assigned work only by the Commanding Officer or designee. The Chief Scientist and the Commanding Officer shall consult regularly to ensure that the shipboard resources available to support the embarked mission are utilized safely, efficiently and with due economy.

9.0 **Technology Controls and Foreign National Access (NAO 207-12):** Per the reference in Sec. 3.1.2.1, the NMAO guidance for ships (dated 11-14-06) regarding compliance with the policies of NAO 207-12 is herein incorporated for reference applicable to EcoFOCI individual cruise instructions:

Foreign National Access Guidance for NMAO Installations

All foreign national access must be in compliance with NAO 207-12. Any access to controlled technology by the foreign national must be in compliance with the facility/platform's Technology Access Control Plan and all export control regulations.

Specific requirements to be provided to the facility Commanding Officer for foreign nationals accessing NMAO facilities/platforms-

1. Written notification identifying the individual who is responsible for compliance with NOAA and export regulations by the foreign national. For scientific party members, the person identified must be from the Program and must be available to oversee the foreign nationals' visit; therefore, they must be on board when the platform is underway. NMAO (ship or shore based) personnel will not act in this capacity unless the foreign national is coming on board for NMAO, AOC or MOC reasons, e.g., MED or EED contractor, NMAO visitor. The responsible individual must be a U.S citizen NOAA employee or have been approved by the servicing security office as a foreign national escort.

2. A copy of the DOC/OSY clearance authorization for access by the foreign national. This isn't standardized and much of the time it comes in the form of an email stating that OSY has forwarded the name of the foreign national to the counter-intelligence (CI) staff and then advising you to proceed with the visit at your own risk. A foreign national who has been issued a NOAA ID badge can/may be considered as cleared; but the sponsor must confirm this with the servicing security office. All OSY badge/clearance issues and questions must be directed to the servicing security office.

3. A copy of the Appendix B of NAO 207-12 with the NOAA Chief Administrative Officer concurrence endorsement. (Certification of Conditions and Responsibilities for Departmental Sponsors of Foreign National Guests) The CAO concurrence on this document signifies that the foreign national's visit has been vetted and approved by the sponsoring Line or Corporate Office Controlled Technology Coordinator or designated senior official. DOC/OSY authorization is contingent upon approval of this certification

4. Written notification that the foreign national has been cleared against the DOC and Treasury Lists to Check. The clearance is required by NAO 207-12, Section 5.03 c, Responsibilities of the Departmental Sponsor/NOAA (DSN). (http://www.bis.doc.gov/ComplianceAndEnforcement/ListsToCheck.htm)

5. Provide the information required on the NOAA Foreign National Spreadsheet for each foreign national. A quarterly report of all foreign nationals accessing your facility is required in the NOAA Foreign National Spreadsheet format. The spreadsheet should be continually maintained.

Most of these requirements are set forth in RADM Debow's memo on Foreign National Access to NMAO Facilities, March 16, 2006. (http://www.omao.noaa.gov/foreign.html)

The written notification must be maintained in the facility's records. The form of this notification (email, memo, note, post it, etc) is up to the command.

Note: These are specific requirements so that you are able to determine and demonstrate compliance with NAO 207-12.

NMAO has implemented a specific policy for the default denial of access to NMAO installations and platforms by foreign nationals from specified countries controlled for anti-terrorism reasons and embargoes. The requirements necessary should you wish to allow access to these foreign nationals are outlined below.

Program Export Controlled Items - The Program is responsible for complying with NAO 207-12 and development of Technology Access Control Plans for items they bring aboard. The Program should notify you of any export controlled items they bring aboard and any access restrictions associated with these items. You should cooperate fully in implementing any needed access controls. You should notify the Program of any NMAO-sponsored foreign nationals with access to your facility when Program export controlled items are on board so that they can implement any necessary control measures.

Relationship to approved Cruise Instructions - The appearance of the foreign national's name on the scientific party list, even if the cruise instructions are signed by the lab and the marine center, ***in no way clears*** the foreign national for access to NOAA property. Access to NOAA property requires compliance with the NAO 207-12.

Relationship of DOC/OSY clearance and cruise instructions to export controls - Clearance by DOC/OSY for a foreign national to access NOAA property, and/or approval of cruise instructions, ***in no way*** authorizes access by the foreign national to controlled technology. All access to controlled technology must be in accordance with United States law, federal regulations, and Commerce and NOAA policies. Access to export controlled technology is subject to the requirements and limitations of the Export Administration Regulations (EAR), International Traffic in Arms Regulations (ITAR), and Office of Foreign Asset Controls (OFAC) regulations.

Relationship of DOC/OSY clearance to approval by the NOAA Chief Administrative Officer- Clearance by DOC/OSY for a foreign national to access NOAA property ***does not*** indicate that the foreign national's visit has been approved in accordance with NAO 207-12. A signed NAO 207-12 Appendix B with the NOAA Chief Administrative Officer concurrence is required. You must ensure that there is an approved Appendix B for each foreign national. Otherwise, your facility will be subject to an investigation by OSY for unauthorized release of controlled technology to or suspicious behavior by the foreign national.

Espionage Indicators Briefing - Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the servicing Regional Security Officer.

While directly a responsibility of the Departmental Sponsor/NOAA, you must confirm that all non-foreign national members of the scientific party receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the servicing Regional Security Officer.

Escort Requirements

Section 5.10 of NAO 207-12 requires "Foreign national visitors [and guests] must be escorted at all times by a U.S. citizen employee of NOAA while on NOAA property." (Also, see DAO 207-12 Section 5.08). DOC Security has stated that the "unescorted access" provision in 5.10 is unlikely to be approved.

Obviously, this requirement is problematic for vessel cruises where the foreign national will have access 24/7 for extended periods of time. ***DOC Security has stated that any alteration of the escort requirements of the NAO must be negotiated with your Regional Security Officer for each specific situation.*** The foreign national sponsor will be required to provide escorts to comply with the negotiated requirements.

Use of Personal Electronic Devices by Foreign Nationals – NAO 207-12 Section 5.11 prohibits the use of cell phones, computers, PDAs, cameras, etc. in areas where controlled technology is located. The general guidance is to prohibit the devices from being brought into DOC facilities. This guidance may prove problematic onboard ships. You should work with the servicing Regional Security Officer to establish acceptable restrictions to prevent the unauthorized release of controlled technology.

Foreign National Spreadsheet - The information required for the Foreign National Spreadsheet should be provided to you by the Program for the foreign nationals they sponsor. If the foreign nationals access any NOAA facilities, the information in the spreadsheet must be collected. In any case, the Program is required to clear with the Office of Security (OSY) the foreign nationals for whom they are requesting access to the ship, in accordance with the NAO 207-12, and must provide you with this information so that you, the platform manager, can determine if access is in accordance with NOAA regulations. It is hoped that for most Program foreign national "guests," a copy of the entries in the Program's Foreign National spreadsheet is all that will be needed, with appropriate alterations for access to the ship.

For NMAO sponsored foreign nationals, you must collect the information from the foreign national and their NMAO sponsor (Department Sponsor/ NOAA-DSN).

Unless you decide otherwise, you can enter the Cruise Instruction number in column L (Program under which the foreign national is working at NOAA) in the Foreign National spreadsheet for scientific party personnel. This will allow them to be tied to the specific cruise/program.

Foreign Nationals from Countries Controlled for Anti-Terrorism Reasons
NMAO facilities and platforms have not been fully assessed for items controlled solely for Anti-Terrorism (AT) reasons.

Access to NMAO facilities by foreign nationals from AT-controlled counties is denied.

If access by an AT controlled foreign national is critical to the accomplishment of mission, access may be permitted with:

1. NMAO headquarters approval
2. Full inventory of the facility for items controlled for AT reasons
3. Access Control Information Sheets prepared for each export controlled item on the facility including those controlled solely for AT reasons.
4. Development of a detailed Technology Access Control Plan for the facility that includes items controlled solely for AT reasons. All items other than items classified as EAR99, must be specifically addressed.
5. A Technology Transfer Control Plan for any controlled technology that will be released to the foreign national
6. Receipt of all required export licensed and compliance with all conditions of those licenses.

As of November 2006, countries controlled for AT reasons are: Cuba, Iran, North Korea, Sudan, and Syria. For the latest information consult the Commerce Country Chart at http://www.access.gpo.gov/bis/ear/pdf/738spir.pdf

Foreign Nationals from Countries or Individuals Subject to Embargo or Sanctions
See http://www.treas.gov/offices/enforcement/ofac/index.shtml for the latest information.

All access by foreign nationals subject to U.S. embargoes or sanctions shall be in full compliance with the Office of Foreign Asset Control (OFAC) regulations.

Individuals appearing on the Specially Designated Nationals List (SDN) are denied from access to NMAO facilities without approval from DOC Security and NMAO headquarters and compliance with any restrictions imposed by the SDN.

Access to NMAO facilities by foreign nationals from Cuba and Iran is denied.

If access by a foreign national from Cuba or Iran is critical to the accomplishment of mission, access may be permitted with:
1. Full compliance with the requirements listed above for AT controlled countries.
2. Development of a detailed Technology Access Control Plan for EAR99 items controlled for Iran or Cuba.
3. Full compliance with the Cuban Assets Control Regulations (31 CFR 515) and the Iranian Transaction Regulations (31 CFR 560).
4. Receipt of all required OFAC and export licenses and compliance with all conditions of those licenses.

Most other embargo/sanction programs do not impose onerous restrictions on ordinary citizens of those countries but should be reviewed for ensure access is in compliance with such programs. Note: Government officials and employees from sanctioned countries can be severely restricted.

For information regarding NOAA rules regarding foreign national access, deemed exports, and controlled technology:

http://deemedexports.noaa.gov