July 23, 2008

CRUISE INSTRUCTIONS

NPCREP

R/V Melville
August 24-September 11, 2008
Chief Scientist – Nancy B. Kachel, NOAA/PMEL

1.0 CRUISE INSTRUCTIONS

1.1 Cruise Title – Ecosystem and Fisheries-Oceanography Coordinated Investigations (Eco-FOCI).

1.2 Cruise Numbers:

1.2.1 Cruise Number – MEL0823
1.2.2 Eco-FOCI Number – 1ME08

1.3 Cruise Dates: August 24 –September 11, 2008

1.3.1 Departure –August 24 from Dutch Harbor, AK
1.3.2 Arrival – September 11, at Dutch Harbor

1.4 Operating Area - Bering Sea shelf.

2.0 CRUISE OVERVIEW

Cruise Objectives - Cruise Objectives –
Ecosystems & Fisheries-Oceanography Coordinated Investigations (Eco-FOCI) is an effort by National Oceanic and Atmospheric Administration (NOAA) and associated academic scientists. Eco-FOCI's goal is to understand the effects of abiotic and biotic variability on ecosystems of the North Pacific Ocean and Bering Sea This cruise is in support of research sponsored by NOAA's North Pacific Climate Regimes & Ecosystem Productivity Program, the North Pacific Research Board (NPRB), the Alaskan Ocean Observing System (AOOS), and PMEL/AFSC base.
The primary purpose of this cruise is to observe the ecosystem of the eastern Bering Sea. Operations will primarily consist of hydrographic measurements (with samples for oxygen, chlorophyll, nutrients, and salinity); and zooplankton sampling using MARMAP bongo tows.

2.1 Applicability - These instructions, with ***FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN***, dated March 1, 2007, present complete information on our standard methods of operations for this cruise.

2.2 Participating Organizations

NOAA - Pacific Marine Environmental Laboratory (PMEL)
7600 Sand Point Way N.E., Seattle, Washington 98115-6439

NOAA - Alaska Fisheries Science Center (AFSC)
7600 Sand Point Way N.E., Seattle, Washington 98115-0070

2.3 Personnel

2.3.1 Chief Scientist

Name	Gender	Nationality	Affiliation	E-mail Address
Nancy Kachel	F	USA	PMEL/UW	Nancy.Kachel@noaa.gov

2.3.2 Other Participating Scientists

Name	Gender	Nationality	Affiliation	E-mail Address
Dave Kachel	M	USA	PMEL	Dave.Kachel@noaa.gov
Colleen Harpold	F	USA	AFSC	Colleen.Harpold@noaa.gov
Khue Duong	M	USA	AFSC	Khue.Dong@noaa.gov
Morgan Busby	M	USA	AFSC	Morgan.Busby@noaa.gov
Dr. Peter Proctor	M	USA	PMEL	Peter.proctor@noaa.gov
David Stausz	M	USA	PMEL	david.strausz@noaa.gov
William Floering	M	USA	PMEL	Dylan.Righi@noaa.gov
Kathy Kuletz	F	USA	US F&W	Kathy_Kuletz@fws.gov
Carol Dewitt	F	USA	PMEL	Carol.DeWitt@noaa.gov
Darin Jones	M	USA	AFSC	darin.jones@noaa.gov

2.4 Administration

2.4.1 Scientific Operations

Dr. Phyllis J. Stabeno, PMEL
Telephone: (206) 526-6453
E-mail: Phyllis.Stabeno@noaa.gov

Dr. Jeffrey Napp, AFSC
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3.0 OPERATIONS

3.1 Responsibilities

3.1.1 Master – The ship's Master shall be in sole command of the vessel and shall be responsible for the welfare of all personnel on board. The Master shall be the final authority in matters relating to the safety, proper navigation, stability, and sailing condition of the vessel and shall execute each voyage with the utmost dispatch.

The Master 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 Master from taking the most effective action, which in the Master's judgment, will rectify the situation causing the emergency, and; thereby, safeguard life, property, and the ship.

The Master 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 Master 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 instructions. 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, and
7. With the Master, 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 Master, 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. Resulting undue additional expenses, or
4. Alter the general intent of these project instructions.

3.2 Data To Be Collected – This cruise will primarily be a hydrographic cruise, collecting CTD data and zooplankton samples using a MARMAP Bongo nets along 5 transects on the Bering Sea shelf. Details on the transects are provided in section 3.4 below. We will use the ship's CTD but will bring our own bongo nets. The bongo uses a SeaCat profiler in real-time mode to determine depth and measure hydrographic properties and therefore needs to be on conducting cable.

We will take nutrient and chlorophyll samples from the CTD casts. Nutrient samples will be analyzed aboard the ship, and chlorophyll samples will be frozen for analysis in Seattle. We will also take water samples to calibrate the conductivity and oxygen sensors.

We will use the flow-through system data and take samples to calibrate values from it.

In addition, we may deploy two ARGOS-tracked drifters sometime during the cruise.

We request the ship's computer files of the following data:

- ADCP data
- Navigation data on position, speed and heading, and water depth
- Weather observations
    - Sea-chest measurements of salinity, temperature, and chlorophyll fluorescence.
    - We will try to bring an oxygen sensor and and ISUS to put into the flow-through system

All the ship data will be burned to disk and handed to you after the cruise. The ships uncontaminated salt water pumps through the MET system which records salinity, temperature, fluorescence and oxygen. I am unfamiliar with an ISUS but you can probably plug it in.

3.3 Staging Plan – We plan to use the ship's CTD and salinometer (if one is available) for the hydrographic measurements and salinity calibration.

We plan to load the following gear while the ship is in Dutch Harbor on August 23, 2008.

1) Bongo nets and sample jars (3-4 pallets)
2) Bongo net frames.
3) Formaldehyde and sodium borate used to preserve samples from net tows
4) SeaCat and deck unit to be used with the bongo nets
5) ARGOS floats,
6) Chlorophyll filtering rig, and supplies.
7) 2 crates (~4.5x4.5x3') containing items such as office supplies, float coats, boots, and foul-weather gear.
8) 3 crates (~4.5x4.5x3') with autoanalyzer, oxygen titration system chemicals, and chem, lab materials
9) Personal and data processing computers (~10)

In the event that the volcanic eruption intensifies, we will work out an alternative boarding port for the science personnel. In that case, one member of the science party will board in Hawaii, and transit to Dutch Harbor to supervise the onload of equipment. The ship would then for to St. Paul Is. to pick up the other scientists. For now, we will hope that Dutch Harbor remains open to air travel.

De-staging Plan –
We plan to offload all equipment, including hazardous material such as unused chemicals will offloaded in Dutch Harbor. We will need to remove two coolers of frozen samples, to fly with us back to Seattle. There is no dry ice in Dutch Harbor. We would like to make arrangements for delivery of some dry ice to the ship in Honolulu, HI. It that dry ice were put in one of the –80°C freezers, we could use it for the flight back to Seattle.

Cruise Plan – See Table 1 for a list of stations and Figure 1 for a plot of their locations.. Also see Table 2; a list of the present positions of the moorings we will be near during the cruise. We will not deploy or recover any moorings; the list is included so we will avoid unintentionally snagging one of them.

The cruise will depart Dutch Harbor on August 24. As stated above, the focus of the cruise is the collection of CTDs along 5 transects. Four of the transects run from depths offshore near 180 m to depths onshore near 30m. The longest transect runs along the 70m depth contour, starting at 62N, just south of St. Lawrence Island and ending at Mooring 2 just south of 57N. We plan to occupy the CTD stations in the order listed in Table 1. We will do a CTD at every station and we will collect water samples at every CTD. Along most transects, we will do a bongo at every other station, with additional bongos to ensure we sample at the ends of the lines. However, we will do a bongo at every station along the 70m contour. See Table 1 for sites where we will do bongos. We may also do a few vertical (CalVet net) tows, but none are yet scheduled.

Sea-bird watchers have asked to come on the cruise. There operations are opportunistic, and will not interfere with the hydrographic and net operations, which are the prime activity.

ON the July USCG Healy cruise, an expensive package of optical instruments was lost as it was being deployed at a station in 40m water depth near Nunivak Is. If an ROV and operator can be borrowed, we plan to devote 24hrs to searching for the lost package and recovering it. These operations are just starting to be arranged as of this date

3.4 **Station Operations** - The following are operations to be conducted on this cruise. The location of the net towing operations needs to be negotiated with the ship, and is dependent on location and number of conducting wires and winches (To be discussed).

3.5.1 CTD/Water Sample Operations:

We request the ship's Sea-Bird Electronics' SBE 911plus Conductivity, Temperature, and Depth (CTD) profiler with dual temperature and conductivity sensors for the CTD system. We request that the CTD be additionally equipped with a 4-pi Photosynthetically Active Radiation (PAR) sensor and fluorometer and oxygen sensor. If the ship cannot provide these sensors, then FOCI will provide the fluorometer and PAR light meter to be mounted on the CTD stand for all casts. FOCI's fluorometer and PAR instruments cannot exceed the following depths:

- WETLabs' WETStar fluorometer cannot exceed 600 meters, and
- Biospherical Instruments' QSP-200L4S light meter cannot exceed 1000 meters.

Ship's personnel will operate the winch. The scientists aboard can operate the CTD deck unit and computer, if that is standard operations for this ship. Scientists will help deploy and recover the CTD, and will keep the CTD Cast Information/Rosette Log. Pressure, primary salinity, secondary salinity, primary temperature, secondary temperature, fluorescence, oxygen concentration and light levels will be recorded on the CTD Cast Information/Rosette Log for all water bottle samples. Scientists will also take water samples once the CTD is on deck. We will take a sample to calibrate the oxygen sensor from oneor two bottle(s) on every cast, and a salinity calibration sample from one bottle every other cast, unless we find we need more frequent samples.

The Sci party is responsible for the operation of the CTD computer/deck unit along with assisting with launch and recoveries.

The CTD should be deployed and then lowered to 10 meters and held at that depth while the technician and scientists return to the computer lab. The deck unit should be turned on and the CTD held at 10m until the pump starts up. Then the CTD can be brought up to just below the surface, and the data acquisition program started. The CTD should descend at a rate of 30 meters per minute for the first 200 meters and 45-50 meters per minute below that. The CTD should stop at 5m above the bottom. The ascent rate should be 50 meters per minute.

Typically we go down to a 100 M at 30 then increase to 60m per min. We slow with in a 100m of the bottom to 30 m per min. Depending on the altimeter reading we stop at around 5m to 10m of the bottom. If the altimeter is not working we will try stop at around 20 m off the bottom. Our assent is 60 m per min.

3.5.2 Oxygen, salinity, Chlorophyll and Nutrient Sampling Operations

The oxygen sample should be the first sample drawn from the bottles. Attach a length of tygon tubing to the spigot of the Niskin bottle, hold the tube so the end is below the spigot, and let water flow until you no longer see bubbles in the tube. Then rinse the sample bottle and completely fill it. Immediately add the two fixing agents, (they will sink and water will be displaced and flow out the top of the bottle), make sure there are no air spaces left in the bottle, and stopper it. Invert the bottle several times to mix the fixing agents throughout the sample.

A salinity sample will be drawn from one bottle on every other cast, unless circumstances warrant more frequent sampling. The scientist who has watched the cast will have chosen the best depth for the salinity sample; a depth where there is little or no vertical change in salinity.

Chlorophyll 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 last two depths is closest to the fluorescence maximum. If the maximum is deeper than 60 meters, sampling should be moved deeper with fewer samples in the mixed layer. Chlorophyll samples will be collected in 125 or 250 ml bottles by scientists from the Niskin bottles after CTD casts. They will then filter the samples, place them in labeled vials, and then wrap all the vials from the cast in a labeled piece of aluminum foil. It is desirable to flash-freeze nutrient samples in an -80° Celsius freezer, if available, if they are not to be analyzed with 24 hours. The -80° Celsius freezer is required for sample storage of the chlorophyll & HPLC filters.

Nutrient samples will be collected from all Niskin bottles into 50 ml bottles. All samples will be filtered during the collection using a battery-powered caulking gun brought by the scientists. They will then be taken into the lab and refrigerated until they are analyzed.

The ship has 2 -80 on board. One in the main lab and one in the aft hold. There is also a standard refrigerator in the main lab. There are also 2 chest freezers in the aft hold.

3.5.3 MARMAP Bongo Tows

A 60-cm aluminum Bongo frame with 0.333-mm mesh and a 20-cm aluminum Bongo frame with 153-micron mesh, both with hard plastic cod-ends, and a 70-kg lead weight for a depressor will be used in standard Marine Assessment Monitoring and Prediction (MARMAP) Bongo tows. A Sea-Bird Electronics SBE 19 SEACAT Profiler will be attached to the wire above the top bongo frame to provide real-time instrument depth.

The nets will be deployed while the ship is steaming at 1.5 to 2.5 kts with the wind (and waves, whenever possible) on the starboard quarter. After the bridge gives permission, ship's personnel and one or two scientists will deploy the Bongo array. It is important that the wire angle during both deployment and recovery is not less than 40 degrees and not greater than 50 degrees. The ship's speed should be adjusted to maintain the wire angle within these specifications during the entire tow. This is accomplished, in part, by relaying wire angles from the starboard sampling station to the bridge by radio, so that the bridge personnel can speed up or slow down the vessel's speed to increase or reduce the towing angle. The net frames are lowered at a constant wire speed of 40meters per minute to a maximum depth of 300 meters, or 5-meters off bottom in shallower waters. A scientist will monitor the depth of the Bongo nets using SeaCat software and inform the ship's winch operator when the desired gear depth is reached.

At that time, the winch operator will be instructed by the scientist to retrieve the nets at a wire speed of 20 meters per minute. When the nets reach the surface, the SeaCat, and nets will be recovered. After the nets are brought aboard, they are washed with saltwater from a nearby deck hose to remove the sample into the cod-end. In some cases, fish larvae are sorted and separately preserved. 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-out, and flow meter counts on the Cruise Operations Database (COD) forms. Tows not meeting specifications) may be repeated at the discretion of the scientific watch (i.e. hit bottom, wire angles less than 40 or more than 50 degrees, nets tangled, etc.).

3.5.4. CalVET Net Tows

We have not presently scheduled any CalVET tows, but this information is provided in case we need to do one.

CalVET (California Cooperative Oceanic Fisheries Investigation (CalCOFI) Vertical Egg Tow) 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 marine technician for deploying and recovering the CalVET net. 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.

3.5 Underway Operations - The following are underway operations to be conducted on this cruise.

- Acoustic Doppler Current Profiler (ADCP) Operations
- Flow-through system data monitoring

3.6 Applicable Restrictions We will not be in foreign waters, although the western ends of two transects lines are close to the international border.

3.7 Small Boat Operations – We do not anticipate needing small boat operations.

4.0 FACILITIES

4.1 Equipment and Capabilities Provided by Ship

- Oceanographic winch and meter block with 0.322" electro-mechanical cable with slip rings terminated for CTD operations and MARMAP bongo tows with an attached SeaBird 25 SeaCat. Termination kits and ship support personnel to do the terminations to allow the cable to be switched between the CTD and SeaCAT, as well as a device to allow the signal from the sea cable to be split, so it can be fed into the deck units for the CTD and SeaCat (SeaCat deck unit and computer supplied by PMEL)
  If we use different winches this won't be necessary. If we have to we can.

- A-Frame,
- Shipboard ADCP,
- Ability to connect a PAR, fluorometer, oxygen sensor, and transmissometer(?) and altimeter, provided by the ship, or by PMEL, to the CTD,
- Wire speed indicators and readout for winches,
- Electrical connection between winch and Deck computer systems,
- Sea-Bird Electronics' SBE 911plus CTD system with dual sensors, 12 bottle rosette, stand, deck unit, and weights, X clean technique Niskin bottles,
- Refrigerator and freezer space for storage of biological and chemical samples, +4° C (4-cu ft) for nutrients and **-20°C** (~12-16-cu ft) for frozen nutrients, respectively, **plus a –80°C** freezer for chlorophyll samples, and dry ice.
- For meteorological observations: Anemometers, calibrated air thermometer – wet-and dry-bulb – and a calibrated barometer and/or barograph, interfaced to the data logger, if possible,
- A salinometer for analysis of salinity samples (arranged).
- Bench space for PCs, monitors, and printers,
- Laboratory space with exhaust hood, sink, lab tables, and storage space,
- Sea-water deck hoses and nozzles to wash nets,
- Adequate deck lighting for night-time operations,
- Navigational equipment including GPS and radar,
- Depth sounder good to at least 3,000 meters,
- Ship's crane(s) used for loading and/or deploying
- Hand-held radios for shipboard scientific/winch/bridge communications
- VHF radio at CTD computer station,
- Thermosalinograph and fluorometer interfaced with the data logger,

- Continuous uncontaminated seawater sampling system with debubbler piped from bow into labs,
- MilliQ de-ionized water source – projected use of <50-L/day for, and. The ships water is distilled to start with but we want to run it through the e-pure system. (its slow)
- Capability to transfer ship's data to CD-ROM or DVD disks.

4.2 Equipment and Capabilities Provided by Scientists

- Sea-Bird Electronics' SBE-19 or 25 SEACAT system, with its own deck unit and data-collection computer
- 60-cm MARMAP Bongo sampling arrays,
- 20-cm MARMAP Bongo arrays,
- Nutrient analysis equipment and chemicals,
- Winkler Oxygen titration equipment and chemicals
- PMEL PC with SEASOFT software for CTD processing,
- Spare oxygen sensor for CTD,
- IAPSO standard water,
- Wire angle indicator, for Bongo tows
- CalVET net array,
- Salinity sample bottles,
- Fluorometer (spare) to be mounted to the Uncontaminated Scientific Seawater System (USSS),
- Debubbler for the fluorometer,
- Filtration rig for chlorophyll samples,
- (2) Hand-held radios for scientific/winch/bridge communications,
- Miscellaneous scientific sampling and processing equipment,
- Cruise Operations Database (COD) and forms,
- Marine Observation Abstract (MOA) log,
- PMEL CTD and Weather Observation Logs,
- CTD Cast Information/Rosette Log,
- Spill kits for scientists' HazMat,
- Miscellaneous laboratory and sampling equipment (NMFS),
- Miscellaneous laboratory and sampling equipment (FOCI).
- Float coats, mustang suits, rubber gloves (lined and unlined)

5.0 DISPOSITION OF DATA AND REPORTS

5.1 The following data products will be included in the cruise data package:

- Ship's Data Acquisition files,
- Calibration Sheets for all ship's instruments used,
- CTD Cast Information/Rosette/Weather Log (filled out by scientists),
- Autosalinometer Logs,
- ADCP Log Sheets,
- ADCP CD (CD-RW) data,
- Ultra-cold Freezer Temperature Daily Log (SOI 5.4).

6.0 ADDITIONAL PROJECTS

6.1 **Definition** - Ancillary and piggyback projects are secondary to the objectives of the cruise and should be treated as additional investigations. The difference between the two types of secondary projects is that an ancillary project does not have representation aboard and is accomplished by the ship's force.

6.2 **Ancillary Projects** - Any ancillary work done during this project will be accomplished with the concurrence of the Chief Scientist and on a not-to-interfere basis with the programs described in these instructions.

7.0 HAZARDOUS MATERIALS

7.1 **Definition** – Hazardous scientific materials are any substance, which because of its chemical properties can cause the deterioration of the materials or injury to living organisms. Rules for the stowage, labeling, and protection of flammables and other hazardous scientific stores on inspected vessels are given in Subchapter U, Title 46 CFR, Part 194.

7.2 **Standards**

7.2.1 Storage Containers – Storage containers should be marked, labeled, and stored in a ventilated and protected area under the supervision of the Chief Scientist with the knowledge and approval of the Master. Consideration should be given to transporting and storing hazardous materials, normally shipped in glass containers, in special, non-breakable containers.

7.2.2 Working Quantities – Working quantities only should be stored in the laboratory. A reasonable working quantity would be a one-day supply, considering the hazard posed by the material. Containers should be marked with the material's chemical and common names, type, and classification, and person responsible.

7.2.3 Storerooms – Storerooms for chemicals and flammables, where practicable, should be protected by fixed CO2 or Halon systems, and used for no other purpose. Where it is not practical to provide such a storeroom, consideration should be given to a hazardous material locker appropriate for the type and quantity of material being stored.

7.2.4 Incompatible Materials – Because of the limited shipboard storage for hazardous materials, particular attention must be made to avoid storing incompatible materials together. A close review of the Material Safety Data Sheets (MSDS) will show if two chemicals are incompatible.

7.3 **Transportation and Disposal** – The Chief Scientist is responsible for the proper transportation, shipping, and disposal of hazardous materials, including empty containers, associated with their project. Transportation and disposal must be carried out in accordance with Federal, State, and Local regulations. In no case will this responsibility be passed to the ship's crew or operating institution unless specifically arranged in advance.

7.4 Chemical Spill Response – The scientific party is responsible for supplying neutralizing agents, buffers, and/or absorbents in the amounts adequate to address spills of a size equal to the amount of any chemicals brought aboard. This spill response material must accompany the chemicals when they come aboard.

7.5 Material Data Safety Sheets (MSDS) – All hazardous materials brought onboard will have accompanying MSDSs.

8.0 Communications

8.1 **Communications** – For scientific projects, the Chief Scientist, or designated representative, may have access to the ship's communications systems on a cost reimbursable basis.

8.2 **Satellite Communications** – INMARSAT (voice and facsimile) 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.

8.3 Electronic Mail (E-mail) – FOCI requests that R/V Melville transmit email as frequently as possible. We understand that, when the Hi SEAS Network is functioning, this means that email is available in real-time, most of the time. Each embarked personnel will have an e-mail account and address established in their name by the ship.

8.4 Internet - The scientists will have use of the internet access at times during the cruise for the purpose of accessing near real-time data to assists us in locating the oceanographic features of interest, and for transmitting figures and data between ship and shore.

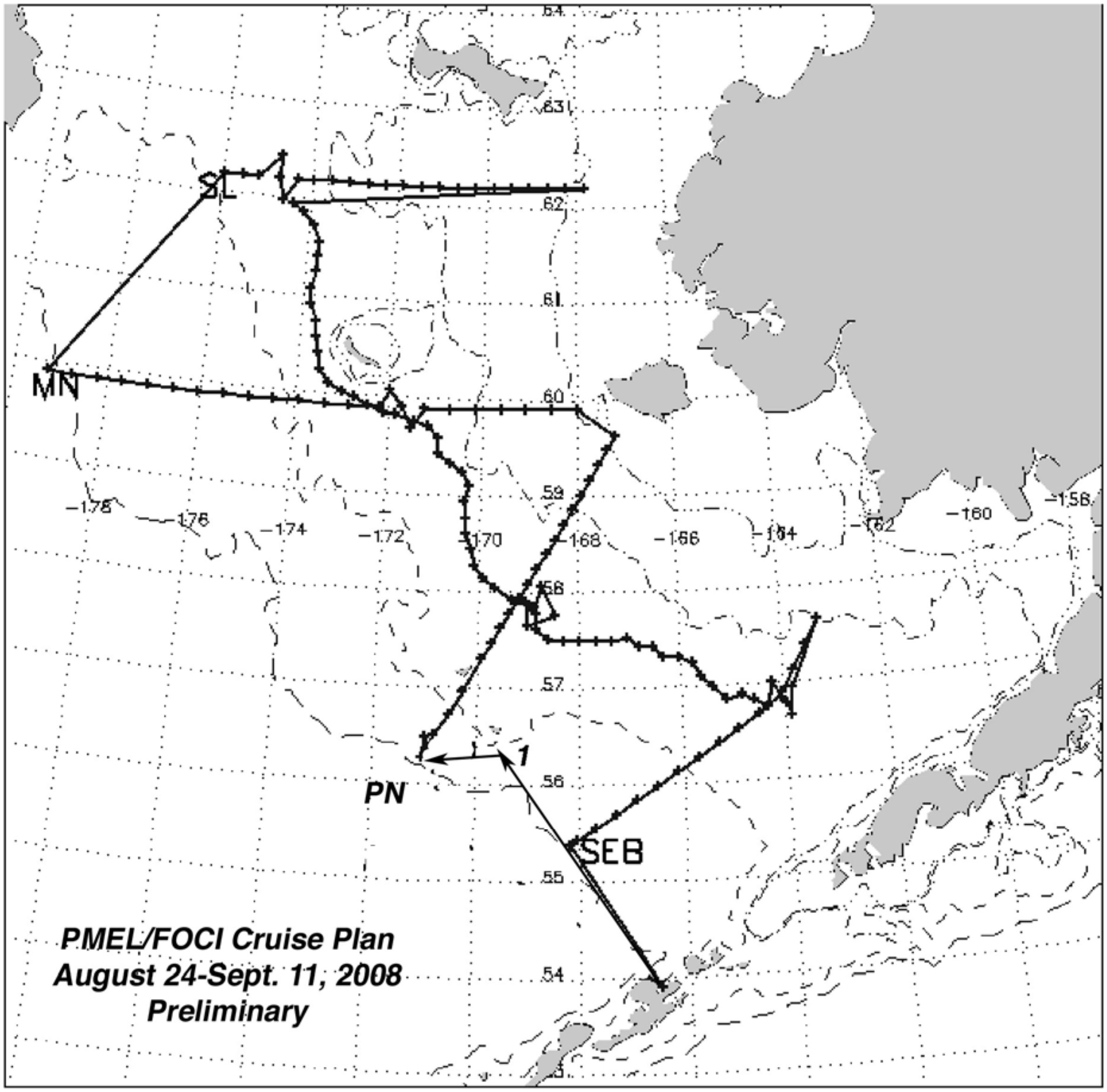
8.5 Important Telephone and Facsimile Numbers and E-mail Addresses

8.5.1 Pacific Marine Environmental Laboratory (PMEL)

FOCI – Ocean Environmental Research Division (OERD2):
• (206) 526-4700 (voice)
• (206) 526-6485 (fax)
Administration:
• (206) 526-6810 (voice)
• (206) 526-6815 (fax)

8.5.3 R/V *Melveile Phone numbers*

9.0 Figures Map of CTD/MARMAP Tow positions (Figure 1.gif)



9.1 Tables

Table 1: Positions of stations and estimated timing of operations

See Attached file.

Table 2: Locations of PMEL moorings in the area of the cruise

Mooring		Latitude	Longitude	Depth
Site 2	07BSM-2A	56° 51.936' N	164° 2.764' W	72.0 m

	07BST-2A	56° 51.942' N	164° 2.711' W	72.0 m
	07BSP-2A	56° 51.949' N	164° 3.215' W	73.0 m
Site 4	07BS-4A	57° 51.429' N	168° 52.432' W	71.0 m
	07BSP-4A	57° 51.650' N	168° 52.617' W	72.0 m
Site 5	07BS-5A	59° 54.58' N	171° 42.46' W	70.6 m
	07BSP-5A	59° 54.28' N	171° 42.28' W	70.9 m
Site 8	06BS-8A	62° 11.633' N	174° 40.059' W	73.0 m
	06BSP-8A	62° 11.727' N	174° 39.591' W	73.0 m