

1.0 Introduction

As part of the Minerals Management Service (MMS) program, *Sediment Quality in Depositional Areas of Shelikof Strait and Outermost Cook Inlet*, this sampling and logistics plan is provided for the field survey and specific sample collections to be conducted from June 27 through July 6, 1998. This is the second summer of a two-year field program initiated in 1997.

This 1998 Field Logistics and Sampling Plan includes a cruise track; station locations; exact numbers, types, and locations of samples to be collected; sampling procedures; quality assurance and quality control guidelines; and a health and safety plan.

The objectives of the MMS program are to:

- Examine the sediments from depositional areas of the Shelikof Strait and outermost Cook Inlet for oil industry-related contaminants - metals and organics.
- Determine whether the contaminant concentrations in these areas pose an environmental risk.
- Determine whether contaminants in these areas have accumulated relative to pre-oil industry activities by geochronology analyses, and whether any increases can be correlated to specific discharge events or activities.

The objectives will be accomplished through several components, including the 1997 and 1998 field sampling surveys; chemical analyses of sediment samples for target organic and inorganic parameters; geochronology of sediment cores; and biological measurements designed to detect exposure to contaminants and potential effects.

The chemical measurements in sediments for 1998 will include: trace and major metals, grain size, total organic carbon (TOC), saturated hydrocarbons (SHC), polynuclear aromatic hydrocarbons (PAH), and steranes and triterpanes (S/T). In addition, selected sediments will be used for amphipod toxicity tests, reporter gene system (RGS) P-450 response, and oil degrading bacteria counts.

During 1998 one hundred twenty (120) bottom fish (a target of 30 adults each from Zones 0, 1, 2, and 3 - see Figure 1) will be collected by long-line for P-450 analysis, with a subset of liver composites analyzed for metals, organics, and RGS P-450. Arrowtooth flounder, Pacific cod, black cod, skate, and halibut are the potential target species in all four study zones. The numbers of individuals and species will be dependent on the catch from each station.

2.0 Cruise Plan

2.1 Research Vessel

The research vessel (R/V) *Alpha Helix* was contracted again for the 1998 field survey. The *Alpha Helix* is a University National Oceanographic Laboratory System (UNOLS) vessel, owned by the National Science Foundation (NSF) and operated by the University of Alaska Fairbanks, Institute of Marine Science. The ship is based in Seward, which will serve as the base of operations for the field survey. The ship's operational center is:

Seward Marine Center
101 Railway Avenue
Seward, AK 99664
(907) 224-5261

The *Alpha Helix* is an open-ocean vessel capable of 24-hour operation in offshore Alaskan waters. Its sole charter is the support of scientific research. It is equipped with an A-frame and open stern, crane, electronic navigation systems (SATNAV/GPS and Loran C), wet and dry laboratory space, and can accommodate a 15-member field team.

The *Alpha Helix* is also equipped with modern communications equipment, including Marine Operator VHF (coastal), High seas Operator (single side-ban), and INMARSAT (both voice and fax). Messages can be relayed to members of the scientific crew through the Seward Marine Center; they maintain daily communication with the vessel while under operation. The Marine Center telephone number is 907.224.5261, fax is 907.224.3392. The INMARSAT number is 011.872.150.6216. INMARSAT costs are approximately \$10 per minute, so use should be kept to a minimum. Scientific crew may use the INMARSAT to make outgoing calls and send faxes. A credit card is necessary to place the call.

The *Alpha Helix* will supply the following equipment to be used in sampling or serve as back-up equipment:

- 1 MK III box core w/ 2 SS boxes (primary)
- 1 Soutar box core (backup)
- 1 Benthos gravity corer w/20 ft of acrylic core liner (backup)
- 2 Seabird CTD (1 as backup)
- 2 Van-Veen grab samplers (backup for ADL Young grab)
- 1 Shipek grab sampler (backup for ADL Young grab)
- Long-line gear (400 m long lines[2], anchors [4], surface floats [4], float line[800 m], Black cod hooks [250], monofilament line [200 m])
- Bait - frozen herring (4 cases)
- 1 Fish Holding Tank w/hinged plywood lid
- Fish gaffs and harpoon
- Freezers (walk-in and chest)
- Acoustic Doppler current profiler

2.0 Cruise Plan

17-foot Boston Whaler skiff (with 2 tanks of gasoline)

2.2 1998 MMS Field Team

The 1998 MMS field team consists of staff members from Arthur D. Little (ADL), Florida Institute of Technology (FIT), Applied Marine Sciences (AMS), and Minerals Management Service (MMS):

John Brown - Chief Scientist (ADL)
George Naughton - Chemist/Shift Leader (ADL)
Ted Coogan - Chemist/CTD/GIS (ADL)
Cherie Howell - Chemist (ADL)
Bob Trocine - Chemist (FIT)
Robert Rember- Chemist (FIT)
Renee Gray- Chemist (FIT)
Joel Nichols - Chemist (FIT)
Jordan Gold - Biologist (AMS)
Dick Prentki - Oceanographer (MMS)
Caryn Smith - Geologist (MMS)

John Brown (ADL) is the chief scientist for the field survey; he will be responsible for coordinating all activities related to the conduct of the survey. George Naughton (ADL) will serve as a shift leader and chemist, overseeing sample collection at individual stations as a shift leader and otherwise assisting in collection of sediment samples for organics analyses. Ted Coogan (ADL) is a chemist, who will primarily collect conductivity, temperature, and depth (CTD) data and record data in a geographic information system (GIS) during the survey, but will also assist in sediment and fish sample collection. Cherie Howell (ADL) is a chemist who will collect sediment grab samples and assist in fish sample collection for organics analyses.

Bob Trocine (FIT) is the inorganic chemistry leader who will collect sediment samples for metals analyses, and coordinate core subsampling and geochronology. Renee Gray (FIT), Robert Rember (FIT), and Joel Nichols (FIT) are inorganic chemists who will collect sediment grab samples for metals analyses and assist in geochronology sampling of sediment cores.

Jordan Gold is a biologist from AMS who will lead the collection of fish samples and conduct tissue dissection on-board for P-450, metals, and organics analyses.

Dick Prentki, the project Contracting Officer's Technical Representative (COTR), is an oceanographer from MMS who will accompany the survey to supervise and assist during station selection and sampling. Caryn Smith (MMS) is a researcher who will assist the field team in sediment sample collection.

2.3 Cruise Operation Plan

2.0 Cruise Plan

The cruise track will begin with a transit to the outermost sampling areas, Zones 3 and 4 of the Shelikof Strait (see Figure 1 for a map of the study area). As work is completed, the cruise will progress through Zones 2, 1, 0 (outermost Cook Inlet), and to the station in the Alaska Coastal Current (ACC) area. The backbone schedule in each Zone will be to sample the required fixed and random stations, in order of proximity, starting with the southernmost stations first. Long-line fish sampling will be performed concurrently with the sediment station sampling. Long-line fishing will take place in areas where historical data (including the 1997 catch results) indicate that target species may be collected within each zone, and may not necessarily be conducted at specified sediment stations. A complete list of the random and fixed sampling stations for all zones is included in Table 1 and shown in Figure 1.

The sampling stations and cruise track have taken into consideration a 3-mile exclusion zone that has been imposed around Sugarloaf Island in the Barren Islands because of a sensitive Stellar sea lion haul-out area located there.

Several contingencies have been incorporated into this plan. They include backup equipment and parts, the scheduling of an additional 12 - 18 hours of weather contingency, a scientific and ship crew capable of performing 24 hours a day, and the selection of alternate station locations in each Zone.

Cruise Schedule

The preliminary schedule for the 1998 cruise is provided below. The actual cruise track and schedule may change depending on the weather conditions encountered during the cruise.

June 25 (PM)

Field Team arrives in Seward, Alaska.

June 26

Mobilization of R/V *Alpha Helix*.

June 27

Depart Seward Alaska (9:00 AM) and transit to Shelikof Strait Region Zone 3 or Zone 4 (see attached chart), weather permitting. The alternate destination is Kachemak Bay/Zone 0 if severe weather is encountered.

2.0 Cruise Plan

June 27 - 29

Sediment and Fish Sampling in Shelikof Strait Zone 3 and Zone 4. Collect surface sediment samples at 6 random stations and 2 fixed stations in Zone 3 by grab sampler. Collect surface sediments and one box core sample from the three fixed stations located in Zone 4. CTD measurements will be performed at each station. Deploy long line for collection of 30 bottom fish at a maximum of two stations in Zone 3. Target species include true cod, arrowtooth flounder, halibut, black cod, and skate.

Option - to be determined by Chief Scientist, weather and schedule permitting: Collect surface sediment for grain size from two stations to the East of Z3-R7 on the “shelf” of Kodiak Island. Shore party to collect river sediment samples from the mouth of Oil Creek, in Puale Bay.

June 30 - July 1

Sediment and Fish Sampling in Shelikof Strait Zone 2. Transit to Zone 2. Collect surface sediment samples at 6 random stations and 2 fixed stations in Zone 2 by grab sampler. Collect sediment cores from the center of Zone 2 (Z2-R16) - one box core and one gravity core. In addition, collect “shelf” sediment from one fixed station in Uganik Bay and one fixed station in Uyak Bay. CTD measurements will be performed at each station. Deploy long line for collection of 30 bottom fish at a maximum of two stations in Zone 2. Target species include true cod, arrowtooth flounder, halibut, black cod, and skate.

Option - to be determined by Chief Scientist, weather and schedule permitting: Collect additional gravity core samples at Z2-R16 for fish scale analysis. Collect surface sediment for grain size from the West “shelf” of Shelikof Strait.

July 1 - 2

Sediment sampling in Shelikof Strait Zone 1. Transit to Zone 1. Collect surface sediment samples at 6 random stations and 2 fixed stations in Zone 1 by grab sampler. CTD measurements will be performed at each station. Deploy long line for collection of 30 bottom fish at up to two stations. Target species include true cod, arrowtooth flounder, halibut, black cod, and skate.

July 3 - 4

Sediment Sampling in Outermost Cook Inlet Zone 0. Transit to Zone 0. Collect sediment samples at 8 fixed stations in Zone 0 by grab sampler, collect sediment core samples, three by box core in Kamishak Bay (Z0-F8), and one by gravity core in Kachemak Bay (Z0-F1). CTD measurements will be performed at each station. Deploy

2.0 Cruise Plan

long line for collection of 30 bottom fish at a maximum of two stations. Target species include true cod, arrowtooth flounder, halibut, black cod, and skate.

Options - to be determined by Chief Scientist, weather and schedule permitting: Shore trips to Oil Bay to collect Bowser Creek sediment samples, and to Augustine Island to collect volcanic ash samples.

July 5

Transit to Seward. Collect surface sediment from one fixed station within the ACC, south of Resurrection Bay (Station AC1).

Arrive Seward. Demobilization of R/V *Alpha Helix*.

Weather Contingency: If down-time is required due to weather or equipment problems, the Seward arrival will be pushed back to 9:00 AM on July 6.

Preparation of equipment, supplies and samples for shipment (at Seward Marine Center).

July 6

Field Team departs Seward Marine Center (AM/PM).

Source Sample Collection - to be performed by land-based field teams (to be determined) after the cruise: coal sample collection from Homer, Ninilchik, and Beluga (ADL), seep oil collection from Bowser Creek and Iniskin Peninsula areas (ADL), Susitna River water source sample collection (FIT).

2.0 Cruise Plan

Table 1: 1998 MMS Shelikof Strait and Outermost Cook Inlet Station Locations

2.0 Cruise Plan

Figure 1:

5.0 Safety Considerations

3.1 Field Methods

The basic goals of this survey are to collect surface sediments, sediment cores, and fish tissue samples, and to provide sufficient sample volumes for laboratory analysis. In addition, ambient water CTD measurements will be collected at each station using the Seabird CTD.

Throughout the survey, field notes will be maintained by the scientists in log books and in field forms, including a daily/shift report and station logs for sediment and fish sampling. Fish sample dissection and compositing information will also be recorded on field forms. Where any exceptions to the procedures provided in this plan are made, they will be recorded.

Photodocumentation will be conducted during the survey using a 35 mm camera and a video camera. Field activities will be photographed and videotaped to record specific samples, sampling procedures, and unusual sediment types.

3.2 Station Selection

Stations for sediment sampling are composed of random and fixed stations. The positions of the random and fixed stations in each zone, as well as alternate station positions, are included in Table 1. The two fixed stations in each of Zones 1, 2, and 3 (Shelikof Strait), and the eight fixed stations in Zone 0 sampled in 1997 will be re-sampled in 1998. The fixed stations in Zones 1, 2, 3, and 0 were selected in deep “holes” or other areas likely to contain depositional areas and were identified as containing “depositional” sediment based on the 1997 survey results. **Three** new fixed stations will be sampled in the new Zone 4, which represents a potential deep water depositional area to the south of Shelikof Strait. **Two** new fixed stations have also been established for sampling in depositional basins at the mouths of Uganik Bay and Uyak Bay in Zone 2.

In addition, **six** new random stations were selected for sampling in each of Zones 1 and 2, and **four** new random stations were selected in Zone 3 (two of the 1997 random stations are being re-sampled to confirm the 1997 toxicity results). The new random stations in Zones 1, 2, and 3 were selected by the same method used for the 1997 random stations, i.e., random station selection from a 5-kilometer grid within the 50-fathom depth contour of each zone was used (Arthur D. Little, 1997). Alternate stations have been established and will be selected if, based on field observations, one of the primary random or fixed stations does not contain silt/clay sediment. The nearest alternate station will be selected to replace an unacceptable random or fixed station.

Four fish stations (fixed stations) have been designated in the survey area. The three fish stations in Zones 0, 2, and 3 correspond to the stations where successful fish collections

5.0 Safety Considerations

were made in 1997. The fish station in Zone 1 (Z1R23) was selected as a potential location for successful fish collection based on Fish and Game trawl catch data.

3.3 Source Sample Selection

Based on the literature and historical data review for outermost Cook Inlet and Shelikof Strait (Boehm et al., 1998), a number of potential contamination sources for the depositional sediments were identified. These sources include oil and gas activities, oil seeps, municipal discharges, boat harbors, and riverine inputs. Several samples representative of these sources were collected in 1997 as part of the overall study. Targeted source samples for the 1998 survey include the following (in order of priority):

- Depositional sediment from the East of Cook Inlet and Shelikof Strait has been identified as a key target source sample for 1998. Surface sediment will be sampled from a depositional area within the influence of the ACC to the south of Seward (new station AC1).
- Bowser Creek seep oil and other seep oils from the Iniskin Peninsula (tentatively collection is to be performed by helicopter after the cruise)
- Homer, Ninilchik, Matanuska, and Beluga coal samples (the Homer and Ninilchik coals will be sampled by ADL, the Beluga coal will be provided by the Cook Inlet Regional Citizens Advisory Committee (CIRCAC), and the Matanuska coal was collected by ADL in May 1998)
- Additional Cook Inlet crude oil and produced water to be collected from a non-Trading Bay production platform (sampling to be scheduled)
- Susitna and Copper River sediments and water (metals only - collected by FIT in May 1998 - additional samples to be collected by FIT from the Susitna River after the cruise)
- Weather and schedule permitting, additional source samples for the 1998 field survey include shore trips to Oil Bay to collect Bowser Creek sediment samples, and to Augustine Island to collect volcanic ash samples.

3.4 Sample Identification Scheme

Each sediment or tissue sample collected will be assigned a unique sample tracking number. The sample identification will provide some basic information about the sample and allow the sample to be uniquely identified throughout the program.

The basic index for the sample identification is as follows: year-zone-station-replicate-depth interval -analysis-matrix, for example, 97-1-01-01-01-HC-S. A description of the data fields in sample identification is provided below.

5.0 Safety Considerations

Field	Acceptable inputs
Year	98
Zone	0, 1, 2, 3, 4
Station	Random = 01- 28 Fixed = F1-F8
Replicate	01-99
Depth Interval	01-200
Analysis	MET (metals), PHC (hydrocarbons), TOC (total organic carbon), GRS (grain size), RGS (reporter gene), TOX (sediment toxicity), 450(P450), GEO (geochronology, Cs ¹³⁷ and Pb ²¹⁰)
Matrix	S (sediment), T (tissue), Other (list: coal, water, oil, etc.), FB (field blank), EB (equipment blank)
Fish Type (optional)	H (halibut), AF (arrowtooth flounder), BC (black cod), PC (Pacific cod), S (skate)

3.5 Station Plan and Field Sampling Procedures

The sequence of events at each sampling station will follow specific procedures, described in detail below, including:

- Identify station (latitude and longitude)
- Navigate to station position within 0.2 nautical miles (nm) radius of location
- Review the acoustic bottom profile for depositional sediments (if necessary)
- Deploy Seabird CTD and collect CTD measurements
- Collect Van-Veen grab samples
- Deploy box core or gravity core, where appropriate, and collect sediment cores

Equipment decontamination procedures will be followed during sampling, as described in Section 3.7. Decontamination typically includes a physical scrub, rinses with seawater and distilled water, and a rinse with isopropanol.

Replicate samples will be collected as part of the field sampling design at several locations. At these locations, sediment samples will be collected in triplicate, and reproducibility and range of results will be demonstrated by analysis of replicate samples.

A summary of the type of samples to be collected at each station is provided in Table 2. A station log for sediment sampling or fish sampling (see attachments) will be completed for each station occupied. In addition, a daily/shift report (see attachments) will be completed by the shift leader to summarize the sampling activities completed and any health and safety issues.

5.0 Safety Considerations

3.5.1 Navigation

Station positions (latitude and longitude) are provided in Table 1. A “station” is defined as a 0.2 nm radius around a nominal station position. The actual latitude and longitude of the station will be recorded from satellite transmissions using the global positioning system (GPS) position when a station has been successfully sampled. Two key considerations will be the acoustic bottom profile, which can assist in the identification of unconsolidated muds good for sediment sampling, and the results of a Doppler current profile. The presence of strong bottom currents will be evaluated to determine if sampling gear can be successfully deployed.

The *Alpha Helix* will be navigated by the ship’s crew to each station. At each station, the vessel will be positioned at the sampling location and held on station using bow thrusters if necessary.

3.5.2 Conductivity, Temperature, and Depth

At each station, the Seabird CTD will be deployed to collect data on conductivity, temperature, and depth. The CTD measurements will be taken only after the sediment sampling station has been determined to be acceptable.

For most stations, the CTD will be deployed to a depth of 2 m above the ocean floor or to a maximum depth of 200 meters, whichever is shallower.

The data collected will be downloaded by a data logger to a computer system on-board the *Alpha Helix*. The CTD data will be recorded in hard copy and digital format and provided to Minerals Management Service.

3.5.3 Sediment Sampling

Sediment sampling will include the collection of surface sediments and sediment cores. During the collection and handling of sediment samples from the grab sampler and box core, extreme care will be taken throughout the subsampling process to avoid contact with metals and hydrocarbon sources. Samples will be taken away from the metal sides of the box core and no metal spatulas will be used for the trace metal samples. The grab sampler and box core will be protected from stack smoke, grease drips from winches and wire, and other potential airborne contamination during the sampling process.

Initial Van-Veen Grab/Acceptable Sedimentology/Alternate Station Selection

An initial Van-Veen grab sample will be collected using the Van-Veen grab sampler to determine if the sediment is acceptable for sampling (e.g., if it contains greater than 50 percent silt/clay [i.e., “mud”]). The percent silt/clay will be estimated by visual observation of the sediments. If the sediment sample is not acceptable, repeat grabs may be attempted at the station, but no more than three attempts are recommended. If after repeated grab attempts the station is deemed unacceptable, the next closest alternate station will be selected from the list in Table 1.

5.0 Safety Considerations

5.0 Safety Considerations

Table 2: 1998 MMS Shelikof Strait and Outermost Cook Inlet Summary of Samples to be Collected

5.0 Safety Considerations

Table 2: 1998 MMS Shelikof Strait and Outermost Cook Inlet Summary of Samples to be Collected (continued)

5.0 Safety Considerations

It is possible that locating stations with greater than 50 percent silt/clay may not be feasible in Zone 0 due to the dynamic sedimentological and oceanographic regime of this area (i.e., sand waves, cobble, and rock bottom predominate in much of the area). Thus, it may be necessary to reduce the percent silt/clay criteria for acceptable depositional sediment in Zone 0. Any modifications to acceptable depositional sediment will be based on field observations during the cruise.

Surface Sediments

The modified Van-Veen grab sample will be the primary equipment for surface sediment sampling. Sediment samples will be collected using the modified Van-Veen grab sampler at all stations except where sediment cores are collected, in which case a box core will be used. At each station, it may be necessary to repeat grabs to collect a greater volume of sediments depending on the number of replicates needed or the analyses to be conducted for that station. For example, when sediment toxicity samples are collected, up to 4 grabs may be needed to collect enough sediment for the 2-liter toxicity sample.

The modified Van-Veen grab sampler is constructed of stainless steel and the bucket is Kynar coated. The grab is designed to be deployed from a vessel equipped with a power winch and an A-frame or boom system and to collect undisturbed “surface” sediment samples to a maximum depth of approximately 15 cm. The operation of the grab sampler for collection of a “bulk” sediment sample (SOP ADL-1018) and collection and handling of subtidal sediment chemistry samples from the Van-Veen grab sampler (SOP ADL-1019) are summarized below.

In preparing the grab sampler for deployment, the bucket is cocked open by collapsing down the scissors and hooking the cocking arms in place. In order to remain cocked, light tension is maintained on the lifting wire, which is secured to the top of the scissors mechanism. The grab is enclosed in a frame that provides stability and durability and makes it easier to handle while deploying and retrieving. It is important to maintain light tension on the lifting wire while maneuvering the grab aboard the support vessel, with or without a sample in it, as the tension keeps the grab jaws open when cocked or closed when not cocked (e.g., with a sample in it).

Weights are added to the frame to ensure vertical deployment in deep water or in conditions with strong currents. Vertical deployment is particularly important in ensuring collection of an undisturbed sample. Shoes are added to the frame to allow it to touch down lightly on the ocean floor and prevent over penetration. The grab has a wooden stand to support it up off the deck, and to facilitate subsampling of the sediment and cleaning of the grab. Other modifications, which were encountered during the 1997 field survey, might include adding a shock cord dampener and extra wooden feet during heavy seas. In addition, the order of gear deployment was modified at some stations due to limitations in the crane wire length (i.e., the grab sampler and CTD were deployed consecutively from the hydrowire winch at many stations).

5.0 Safety Considerations

When the grab is returned to the deck of the vessel, the sample is visually inspected; the bucket should be closed and the scissors extended upright. The doors are opened and the sample is visually inspected: there should be sediment and overlying water in the bucket. If the grab has been successful, proceed with sample collection; if not, discard the grab contents and re-deploy the grab. Overlying water indicates that the sediment sample is undisturbed and that surface sediments remain intact (e.g., there has been no leakage of water and hence fine sediment from the grab). If there is overlying water and the sediments are undisturbed proceed with sample collection.

Subsamples are removed from the grab sampler through the hinged doors on the top of the bucket. Overlying water is removed from the grab by carefully opening the jaws of the grab a few millimeters or by siphoning through a precleaned Tygon/Teflon® tube. It is important that the siphon tube be cleaned following each use and stored in solvent-cleaned aluminum foil or other decontaminated storage container.

Sediment samples are collected from the top 2 cm of the grab to represent recent accumulation. Unconsolidated sediment 2 cm deep is removed from the grab with a stainless steel scoop coated with Kynar. The scoop is 2 cm in depth to facilitate accurate depth collection of the sediment. The top 2 cm will be collected by several scoops up to the volume needed for subsamples and placed directly in appropriate sample containers (Table 3). At stations where toxicity samples are needed, four to six grabs may be necessary to obtain enough sediment volume for toxicity subsamples. Toxicity sediments from multiple grabs will be composited in a Kynar-coated bowl. When the appropriate volume is reached, the sample is homogenized in the bowl and then transferred into appropriate precleaned containers. Specific subsamples are collected from each grab into their individual containers and stored as indicated in Table 3.

After the desired subsamples have been removed, an open basin is placed beneath the grab on the grab stand. The grab jaws are then opened by releasing tension on the lifting wire and collapsing the scissor mechanism. Any remaining sediment will fall into the basin and can be discarded. The grab should be rinsed with clean seawater, then decontaminated prior to re-deployment at a station.

Sediment Cores

After grab samples and CTD measurements are collected, an MK II box core or 1 meter gravity core will be deployed at selected stations to obtain subsurface sediments cores (see Table 1). These cores will represent a picture of sediment accumulation over time. By sectioning the cores, discrete layers can be examined to determine the chemistry and geochronology of the sediments and characterize any unusual sediment types. Additional archive cores may be collected from some stations if sediment type is favorable.

The box core and gravity core will be deployed by a remotely operated winch system to the ocean floor. Prior to deployment, the box coring device will be decontaminated according to procedures described in Section 3.7.

5.0 Safety Considerations

Table 3: Sample Handling, Storage, and Shipment Information

Sample Type	Analysis	Precleaned Container	Storage/ Preservative	Shipping Address
Sediment	SHC, PAH, biomarkers	250 mL glass	Frozen -20°C	<i>Arthur D. Little, Inc.</i> Attn: Linh Tong-Le 20 Acorn Park Cambridge, MA 02140-2390 (617) 498-5197 fax -7296
Sediment/ Sediment cores	Metals, TOC, grain size	Plastic jar/ core liner	Frozen -20°C	<i>Florida Institute of Technology</i> Attn: John Trefry 150 West University Blvd. Melbourne, FL 32901
Sediment	Toxicity	2L plastic	Refrigerated 4°C	<i>Pacific Eco-Risk Laboratory</i> Attn: Dr. Scott Ogle 827 Arnold Way, Ste. 100 Martinez, CA 94553 (510) 313-8080 fax -8089
Sediment	RGS	250 mL glass	Frozen -20°C	<i>Columbia Analytical Services</i> Attn: Lynda Huckestein 1317 South 13th Ave. Kelso, WA 98626-2845 (360) 577-7222
Sediment	Oil degraders	125 mL glass	Refrigerated 4°C	<i>University of Alaska Fairbanks</i> Attn: Joan Braddock Institute of Arctic Biology Fairbanks, AK 99775-7000 907-474-7991
Fish Tissues	SHC, PAH, biomarker	250 mL glass	Frozen -20°C	<i>Arthur D. Little, Inc.</i>
Fish Tissues	Metals	Plastic	Frozen -20°C	<i>Florida Institute of Technology</i>
Fish Tissues	RGS	125 mL plastic	Frozen -20°C	<i>Columbia Analytical Services</i>
Fish Tissues	P450	Plastic	Formalin	<i>Woods Hole Oceanographic Institute</i> Attn: Dr. John Stegeman 45 Water Street Woods Hole, MA 02543 (508) 548-1400 x232 fax 457-2195
Source Samples	SHC, PAH, biomarkers		Frozen -20°C	<i>Arthur D. Little, Inc.</i>
Source Samples	Metals		Frozen -20°C	<i>Florida Institute of Technology</i>
Equipment Blanks	SHC, PAH/ metals	1 L glass and/or plastic	Frozen -20°C/ Refrigerated 4°C	<i>Arthur D. Little, Inc./ Florida Institute of Technology</i>
Field Blanks	SHC, PAH/ metals	250 mL glass and/or plastic	Frozen -20°C	<i>Arthur D. Little, Inc./ Florida Institute of Technology</i>

5.0 Safety Considerations

During the deployment and return of the box core, operations will be designed to minimize the mixing of water and sediment within the box core. Various methods to minimize sediment disturbance will be utilized, such as dampening the movement of the box core by keeping it submerged during operations to secure the winch system. Personal safety and sea conditions will also dictate operational procedures.

After retrieval of the box core, the overlying water will be siphoned off as quickly as possible without disturbing the surface sediment layer. The inner “box” containing the sediment will be moved into a covered deck area to further reduce contamination. The outer box can then be cleaned in preparation for the next deployment.

Sediments for chemical analysis will be subsampled using a 3-inch inner-diameter cellulose-acetate-butyrate (CAB) precleaned core liner of approximately 60 cm. Duplicate subcores will be taken for both geochronology and chemical analysis. The duplicate subcores will be collected as close together as possible to ensure consistency between the two cores. An additional archive core may be collected at some stations where deemed appropriate.

The precleaned core liner will be slowly inserted vertically into the sediments. The length of the core liner used will be longer than the deepest depth of the box core (the dimensions of which are approximately 50 cm deep x 50 cm wide x 80 cm tall), to be able to completely penetrate the box core. The air space left at the top of the subcore will allow for expansion during freezing. The liner will be inserted slowly with a continuous oscillating motion to minimize disturbance and maximize the depth of penetration. Once the liner is in place, the top will be capped immediately to minimize potential contamination by stack gases from the survey vessel. One hand will slide down along the side of the liner to the base of the core and will be firmly placed on the bottom of the core. The core liner will be lifted from the sediment until the bottom can be capped. The outside of the core liner will then be rinsed with seawater, the caps will be secured first with Teflon® tape, then with electrical tape, and the core will be labeled with identifying numbers and measured. The top of the core will be marked, then stored refrigerated in the vertical position until subsampled on the ship.

After subsampling, the remaining sediment will be discarded and the inner box will be decontaminated (Section 3.7).

After retrieval of the gravity core, the nose cone of the gravity core will be unscrewed from the gravity core barrel, the bottom of the inner CAB core liner will be capped, and the inner liner with sediment will be carefully removed. The core liner will be moved to a vertical position with as little motion and disturbance as possible. Any overlying water will be siphoned off, and the top of the core marked and capped prior to storage (refrigeration) and/or subsampling.

5.0 Safety Considerations

If subsampling on the ship is not possible due to adverse weather conditions, the cores will be frozen and subsampled at the FIT laboratory. Any sediment cores for archival will be frozen in the field and shipped to FIT.

Sediment Toxicity Sample Collection

Sediments for toxicity analysis will be collected with either the Van-Veen grab or box core samplers. Multiple grabs will be required to obtain the sufficient volume of two liters of surficial (top two cm.) sediments from each toxicity testing station. The aliquots of sediment from each grab will be held in a Kynar-coated stainless-steel bowl, which will be covered with aluminum foil between grabs. Once the appropriate volume (2 L) is reached, the sample will be mixed and aliquoted into a pre-cleaned, pre-labeled wide-mouth polyethylene jar. Each sample will be documented (see Sediment Toxicity Collection Data Sheet) with all important ancillary data. Samples will be stored refrigerated at 4°C while onboard the ship, then will be shipped with blue ice to the analytical laboratory (Pacific Eco-Risk Laboratory).

A field blank sample will be created by opening a sample container for the period of one sediment sampling event, sealing it, and shipping it along with the sediment samples for analysis.

Chain-of-custody (COC) forms will be completed for all samples and will accompany the samples when shipping. Sediment toxicity analysis will be conducted following U.S Environmental Protection Agency (EPA) guidelines, with the amphipod *Eohaustorius estuarius*.

3.5.4 Fish Collection

A minimum of 30 fish will be collected to represent a station sample. A total of 120 fish will be collected over the course of the survey. In each of Zones 0, 1, 2, and 3, 30 fish will be collected at selected stations.

Prior to the field event, permit requests were filed with the Alaska Department of Fish and Game (ADF&G) and the International Pacific Halibut Commission (IPHC). Copies of these permit requests are attached. When fish samples are shipped, a copy of the ADF&G permit must accompany the samples in the cooler. If the fish samples are halibut, then the IPHC permit must accompany the shipment as well.

The target species for this study are Arrowtooth flounder, Sablefish (Black cod), Pacific cod, Big skate, Longnose skate, Sandpaper skate, Starry skate, Alaska skate, and Pacific halibut. Though multiple species will likely be captured, attempts will be made to sample the same species at all four fish capture locations. A maximum of 60 of each of the target species will be collected.

Fish capture will be undertaken through the use of long lines with herring-baited hooks. Sets will be of short duration (approximately 6 hours) to ensure that the fish will be

5.0 Safety Considerations

brought aboard ship alive. Fish will be removed from the hooks rapidly and in a manner which avoids contact with potentially contaminating surfaces (e.g., the ship deck). Attempts will be made to keep the fish alive until shortly before dissection by placing them in a tank filled with running seawater. Dissections will begin as soon as possible following the collections.

3.6 On-Board Processing of Samples

3.6.1 Subsampling Core Samples

Sediment cores will be subsampled by extruding aboard ship. Subsamples will be taken using a Teflon® spatula. Assuming sediment accumulation rates of as low as 0.1 cm/y, sample sections of about 0.5 cm thick (or less) will need to be sampled and analyzed. This is because the recent record of potential sediment contaminants and recent geochronometers will be restricted to the topmost layers. For example, the ^{137}Cs signal is visible back in time to about 1950 and this 45 years of deposition will occur (without mixing) over only 4.5 cm of sediment. Such careful subsampling will be achieved by placing plastic disks into the sediment at 0.5-cm intervals and removing the intervening sediment. A special rack with meter sticks on each side of the open core barrel helps to facilitate this delicate processing. All processing will be carried out in a clean area of the laboratory to avoid introduction of metal contaminants. Sediment from each layer will be placed in wide-mouth polyethylene bottles (pre-cleaned/acid washed) for geochronology, metals, grain size and TOC. Samples for organics analyses will be placed in wide-mouth glass jars.

3.6.2 Fish Dissection and Compositing

A collection/dissection data sheet will be started for each fish to potentially be dissected (capture of non-target species will be documented separately).

Approximately 30 minutes prior to dissection, one fish at a time will be removed from the live tank, sacrificed with a blow to the head, enclosed in a numbered plastic bag, and placed in the walk-in freezer. The fish will be removed before becoming frozen, but will be chilled enough to diminish muscular activity to a point where they can be safely dissected.

Prior to initiating each dissection, the dissection surface, dissecting tools, and any other surface which the sampled tissues will contact will be thoroughly cleaned with Liquid detergent, followed by 1% HCl, followed by Optima-grade isopropanol. The isopropanol will be allowed to evaporate, as it may interfere with the P-450 analyses.

One fish at a time will be removed from the freezer, and several ancillary measurements (length, weight, etc.; see fish collection/dissection sheet) will be taken prior to starting the dissection. If available, two researchers will conduct the dissection in the wet lab: one individual to dissect and one to document the information, label sample containers,

5.0 Safety Considerations

weigh the samples, and aid the dissector. The dissections can be accomplished by a single researcher if necessary, though they will be far more efficiently conducted utilizing two (or more) individuals.

Fish will be dissected using stainless-steel filleting knives to open the peritoneal cavity, thus exposing the liver. Liver samples will be removed for RGS, metals, organics, and P-450 analyses, by slicing off sections with a stainless-steel scalpel blade (pre-cleaned with isopropanol). The samples will be placed in clean, pre-weighed, labeled containers appropriate for the analyses to be conducted, and then weighed. The remaining liver will then be removed from the fish and weighed, thus allowing the total weight of the liver to be calculated. The liver tissue samples (for RGS, metals and organics analyses) will be frozen.

The kidney sample for P-450 analysis will be removed from the (now exposed) kidney, weighed, and placed with the liver sample, and then a section of gill arch will be cut out with stainless-steel scissors, weighed, and placed with the liver and kidney samples. A portion of the filleted musculature will be removed for metals (mercury [Hg]) analysis, placed in an appropriate, labeled container, and frozen.. In addition to the liver, gill, and kidney samples for P-450 CYP1A analysis, an optional sample of heart tissue may be dissected as well. Additionally, other tissues may be added or substituted, depending on the species composition of captured fish. The P-450 samples will be fixed in 10 percent formalin buffered with seawater. The dissection data sheet will be checked for completeness, and the dissection equipment will be cleaned and readied for the next fish.

Fish liver tissues from 3 to 5 individual fish of one species type (e.g., all halibut) will be composited for RGS, metals, and organics analysis. A fish tissue composite sheet will be completed for each composite sample. The composite liver samples will be frozen.

Pacific halibut can be over 2 meters in length and 200-plus kilos in weight, and will therefore require significant changes to the protocols to be used as study animals. If they are used in this study, dissections will most likely need to be conducted (at least partially) on deck. In this eventuality, the dissections will be done in the fish, by cutting away the ventral (blind-side) musculature to expose the peritoneal cavity. This will be accomplished in a manner which avoids trace metal/organics contamination by avoiding contact with contamination surfaces, and fallout from the ship's exhaust.

Chain-of-custody forms will be filled out onboard ship, and will accompany the samples to the analytical laboratories. Tissue sample blanks will be created and analyzed for metals and organics.

3.7 Equipment Decontamination

5.0 Safety Considerations

All sampling equipment must be decontaminated prior to use at each sampling station following the procedure outlined below:

- Physically scrub equipment with brushes and liquid soap-and-water mixture to removed any accumulated sediment, if necessary. Wipe clean with a sorbent pad, paper towel or rag, if necessary.
- Rinse with seawater (from hose or buckets, as appropriate)
- Rinse with distilled water.
- Rinse with isopropanol solvent.
- Optional rinse with deionized water.

Decontaminated sampling equipment must never be allowed to become recontaminated prior to sampling. To avoid this, either decontaminate equipment immediately prior to use or protect decontaminated equipment by wrapping it securely in aluminum foil that has been decontaminated by the above procedure. Never allow “clean” equipment to come in contact with anything other than the sample, air, or other “cleaned” equipment. This precludes contact with the ground (except for the actual sampling area), hands, clothing, plastic bags, buckets, trays, etc.

Note: When aluminum foil is used, the “shiny” side is machined and is thus subject to machine oil contamination which this procedure may not remove. Only the “dull” side of aluminum foil should be placed facing sampling equipment.

Specific requirements for each type of equipment are described below.

3.7.1 Van-Veen Grab

Following the collection of sediment chemistry samples, the grab will be emptied into a basin as discussed above and then rinsed in seawater prior to the next deployment at a station. The grab must be decontaminated prior to sampling at each discrete station. The grab must be cleaned inside and out as described above. Scrub brushes must be used that can fit inside the buckets of the grab.

3.7.2 Siphoning Tube

If a siphon tube is used, it will be decontaminated with detergent and water and then deionized water. No solvent will be used on the siphoning tube.

3.7.3 Spoons, Scoops, and Bowls

The spoons, scoops, and bowls used to subsample the sediment sample will be physically scrubbed with soap-and-water mixture, then rinsed by solvents, according to the above procedure. If necessary, the scoops and bowls will be wrapped in solvent-cleaned aluminum foil.

3.7.4 Box Core

5.0 Safety Considerations

The box core will be rinsed in seawater following each use at a station. Prior to use at the next station, the box core will be rinsed with distilled water and decontaminated further if necessary. The CAB core liners will be washed with soap and water and distilled water rinsed prior to use.

3.7.5 Gravity Core

The nose cone and barrel of the gravity core will be washed with soap and water and rinsed with distilled water prior to each use. The CAB core liner will be washed with soap and water and distilled water rinsed prior to placement in the gravity core barrel.

3.7.6 Fish Dissection Equipment

Dissection tools, such as stainless-steel scalpels, tweezers, thongs, and a nylon cutting board will be decontaminated prior to use at each sampling station and after dissection of each fish. Decontamination procedures will include washing with soap and water followed by rinsing with distilled water and isopropanol.

3.8 Handling of Samples

All sediment, fish, and quality control samples for chemical analysis will be inventoried and stored in a secure area immediately after collection. Inventory includes counting all the samples to ensure that all samples were collected and safely returned to the custody area on board, documenting all samples, and preparing a COC form (Attachment) for all samples. Sediment samples and sediment cores will be secured and frozen in an upright position on the ship to ensure their vertical integrity. The sediment samples will remain frozen prior to transportation and shipped with dry-ice via overnight service. At all times after collection, sample integrity and custody must be maintained (SOP ADL-1017). Custody seals are used on all shipping containers (i.e., coolers) to maintain custodial security while the samples are in the possession of a third party (e.g., air freight courier).

Storage requirements for analytical sample types are provided in Table 3. Sediment samples for chemical analysis have a limited holding time. Every effort is made to deliver samples to the analytical laboratory in a timely manner. The Chief Scientist, his designee, and subcontractors are responsible for arranging sample pickup.

3.9 Shipping of Samples

Following completion of the cruise, samples will be packed in coolers for overnight shipment from the Seward Marine Center, using Federal Express air freight courier. Depending on the chemical analysis, samples may be shipped to different laboratories. Table 3 indicates where specific samples will be transported to for chemical analysis. Each team of field personnel is responsible for shipping its samples to the pre-arranged laboratories for analysis. Samples will be shipped to the appropriate analytical

5.0 Safety Considerations

laboratories either frozen packed on dry ice, or refrigerated packed with frozen blue ice. When shipping samples with dry ice, the container must be vented (coolers should have a vent at the bottom on one end) and must bear a label clearly stating that the cooler contains dry ice and how many pounds. Any materials that are considered hazardous must be shipped with the appropriate paperwork and labeling, following federal regulations.

For Federal Express pickup in Seward (zip code: 99664), the dispatch office may be contacted at (800) 238-5355. *For same-day pickup and shipment, the pickup call must be made prior to 8:30 am.* No Saturday pickup or shipment by Federal Express is available from Seward or Kenai, Alaska. Therefore, if necessary, the samples may be packed in coolers and arrangements may be made for them to be held in the Seward Marine Center walk-in refrigerator to be picked up for overnight shipment. The appropriate labels and paperwork must accompany any sample coolers held at Seward Marine Center.

Quality assurance/quality control (QA/QC) samples will be collected in the sampling program to assess data quality. Each survey team will be briefed by the Chief Scientist prior to the conduct of the first sampling on quality assurance measures of the sampling activities. All field personnel will be briefed on the potential for contamination and cross-contamination of samples and will be given guidance on techniques to avoid such problems. This includes the use of pre-cleaned sample containers; use of clean sampling equipment; use of the decontamination protocol described above; and good laboratory practices in general. It also includes following specified sampling procedures and protocols in accordance with SOPs as referenced above.

Several types of field quality control samples will be collected during the survey, including equipment blanks, field blanks, and replicate samples. For both equipment blank and field blank samples, two jars will be used to be analyzed for metals and organics respectively. Field quality control procedures should include the collection of equipment blanks. The project-specific requirements are detailed in Table 4 and described as follows. Equipment blanks are collected when sampling involves use of collection equipment that comes into direct contact with the sample (i.e., the modified Van-Veen grab) during or following the collection of sediment chemistry samples. The equipment blank is representative of potential contamination associated with the equipment. To collect the equipment blanks, the grab is first decontaminated according to the procedure outlined above. Then the inside of the bucket is rinsed with high-purity, deionized water and the rinsate is collected directly into a clean, pre-labeled water sample container. A stainless-steel funnel can be used to assist in the collection; the funnel must be decontaminated prior to use by the same procedure used for the grab sampler. The rinsate is the equipment blank and is refrigerated at 4°C. For each equipment blank sample, two jars will be collected, one for metals analysis and one for organics analysis.

4.1 Field Blanks

5.0 Safety Considerations

Field blanks are also collected, which are representative of any atmospheric or other contamination that the field samples may be subject to and also of any potential contamination associated with the glassware. A clean, pre-labeled sample jar of the same batch used for sample collection is carried into the field, opened during the collection of one sample, and returned to the laboratory with the field samples. For each field blank, two sample containers will be used to be analyzed for metals and organics, respectively. This blank will be stored under the same conditions as the field samples it is representative of. Field blank samples will be taken during the collection of sediment samples as well as in the onboard laboratory during the dissection of fish.

Table 4: Quality Control/Quality Assurance Samples

Sample Type	Number of Samples	Description	Analysis	Sample Container
Field Blank	1	Sediment sample collection (deck)	Metals and organics	Precleaned 250 mL glass and/or plastic
Field Blank	1	Fish dissection lab (deck)	Metals and organics	Precleaned 250 mL glass and/or plastic
Equipment Blank	2	Van-Veen grab rinsate	Metals and organics	Precleaned 1 L glass and/or plastic
Equipment Blank	1	Box core/core liner rinsate	Metals and organics	Precleaned 1 L glass and/or plastic
Equipment Blank	1	Fish dissection tools rinsate	Metals and organics	Precleaned 1 L glass and/or plastic
Ship's Fuel Sample	1	<i>Alpha Helix</i> diesel	Metals and organics	Precleaned 250 mL glass and/or plastic
Trip Blank	1	Empty sample container	Metals and organics	Precleaned 250 mL glass and/or plastic
Optional Field QC Sample	1	Ship's seawater	Metals and organics	Precleaned 1 L glass and/or plastic

4.2 Ship's Fuel Sample

An additional QC sample of the *Alpha Helix* diesel fuel will be taken in the field. This sample will characterize any contamination believed to originate from the shipboard fuel. It is recommended, but not required, that all field personnel have safety training which conforms to federal (Occupational Safety and Health Administration [OSHA]) regulations for working at hazardous sites.

All personnel will adhere to health and safety precautions as described in the R/V *Alpha Helix* Users' Manual. Specific safety requirements include the following:

5.0 Safety Considerations

- Learn the location of all fire equipment, life rings, life preservers, and survival suits; and know their proper use.
- In the event of an emergency, know where to go and what your duties are. Emergency drills are held once a week.
- Smoking in bunks is strictly prohibited.
- No open-toed shoes or sandals will be worn when working on the deck.
- No equipment will be deployed over the side without permission from the deck watch officer. All gear must be aboard and secured before moving between stations.
- When working on deck at night, use the buddy system. During rough weather do not go out unless necessary, and always tell someone if you must go out.

Field procedures require the use of several hazardous chemicals. These include isopropanol, hydrochloric acid, and dry ice. All field personnel will be briefed by the Chief Scientist before the conduct of the first sampling on the hazards and safe handling of these and any other chemicals on board.

Personnel should avoid direct contact with all chemicals and avoid breathing fumes. Contact with solvents will cause irritation of eyes, nose, throat, and skin. Isopropanol is an extremely flammable organic solvent that will be used for equipment decontamination. Hydrochloric acid is a strong acid that can burn the skin if contacted. Special care should be taken and nitrile gloves should be worn when handling hydrochloric acid. Dry ice is extremely cold; handling it can cause severe burns within seconds. Material Safety Data Sheets (MSDS) will be available on the vessel for each hazardous material on board. MSDS describe chemical properties, health hazards, and protection and safety measures. Refer to MSDS if unsure of the characteristics of a chemical. Follow these general guidelines when handling chemicals:

1. Wear rubber gloves (household or laboratory latex if possible).
2. Wear safety glasses (most sunglasses and corrective glasses are not safety glasses).
3. Work in a well-ventilated area (on the open deck of ship, if possible).
4. Store chemicals securely and well padded.
5. Store chemicals away from living quarters and away from heat and ignition sources.

Waste solvents must be collected and disposed of separately from other waste streams. Waste streams may be generated by decontamination procedures. All waste solvents will be collected in a compatible container which is clearly labeled as waste solvents. Hazardous waste should be stored safely on board, just as the other chemicals are and can be offloaded and disposed of on shore. The decontamination solvent isopropanol may be disposed of at sea.

5.1 Personal Protection

5.0 Safety Considerations

Personal protection equipment will be used by all personnel during the survey. Personal protection equipment such as hard hats and work (flotation) vests will be provided by the ship. Work vests or float coats must be worn at all times while working on the deck of the ship and on small boats. Hard hats must be worn at all times on the deck of the ship whenever weights are suspended and moved by cranes or booms.

Safety glasses are to be worn during sampling activities, when launching or retrieving any equipment that contains hazardous materials, when decontaminating equipment, working in an on-board laboratory, or when using any chemicals. Nitrile gloves will be worn during sampling activities or when handling any samples. Nitrile gloves are brought with ADL equipment. Individuals may bring their own safety glasses with them. Only a few pair of safety glasses will be brought with ADL equipment.

Individuals are responsible for arranging for or bringing along their own rain gear and rubber boots. These items will be needed in case of foul weather or wet conditions.

Mustang (survival) suits are full-body flotation suits to be used in emergency situations. Survival suits are available on the ship for all personnel; if available, additional mustang suits will be brought with ADL equipment.

5.2 Shipboard Policies

For general shipboard policies for conduct, refer to the R/V *Alpha Helix* Users' Manual. Several policies are summarized in this section.

Prior to sailing, the ship's master will call a general meeting of all scientific personnel and ship's crew to discuss safety procedures and the scientific work to be performed. At this time, the Chief Scientist and chemistry leader will present an outline of the purpose of the work and problems that may be encountered. The Chief Scientist will discuss the chemicals to be used during the cruise, their inherent danger, and safety precautions.

Some guidelines are as follows:

- Water is limited and must be reasonably conserved.
- The use of any non-prescribed drugs or alcohol on-board is strictly prohibited.
- Boots and rain gear are not to be worn inside the vessel except in the wet and dry labs.
- The ship's radios may not be used without the permission of the ship's master or the chief mate.
- The washing machine may only be used at sea when permission is posted in the mess room.
- Scientific personnel may visit the bridge only after asking permission of the crew on duty.
- Scientific personnel are responsible for the cleanliness of their lab areas.

5.0 Safety Considerations

- The engine room is off-limits to non-crew members, unless on a pre-arranged tour.
- Deck hatches and portholes are not to be left open without obtaining permission from the deck watch officer. Watertight doors are marked and must be dogged *completely* at all times.
- Marine toilets (heads) are *only* for human waste and toilet paper.

5.3 Emergency Incident Command

If there is an emergency, the ship's emergency procedures are to be followed. UNOLS, who operates the R/V *Alpha Helix*, has a contract with Maritime Health Services (MHS). All of the ship's crew are first aid-trained. In addition, several of ADL's scientific staff are first aid- and CPR-trained. The ship has an infirmary with some medical supplies, and ADL equipment has a first aid kit that is available to all scientific personnel.

In the event of serious personal injury, follow these general emergency procedures:

1. Stabilize the patient.
2. Contact MHS.
3. Evacuation based on MHS recommendation.
4. Possible destinations would include Anchorage, Kenai, or Kodiak Hospitals.

5.4 Shipboard Rules of Behavior

Social conditions at sea are very different from those on land. Privacy is greatly reduced and constant interaction with others can be more intense. Everyone should be sensitive to the altered social conditions and atmosphere that is where they will work and live.

Quarters

The Chief Scientist will assign staterooms to the scientific party. Personnel are responsible for maintaining the cleanliness of their individual staterooms. Bed linens, soap, and towels are provided by the ship. Linens will be changed weekly. At the end of the cruise, individuals should strip their bunks and deposit soiled linens in hampers in the restrooms.

In the berthing areas, personnel should be quiet and considerate of their shipmates who may be sleeping. Socializing should be kept to the library and mess room.

Mess Deck/Galley

At sea, meal hours are normally as follows:

- Breakfast - 0520-0620
- Lunch - 1120-1220

5.0 Safety Considerations

- Dinner - 1720-1820

Instructions for meals are as follows:

- Clean up all dirty dishes and messes.
- If scientific work requires a change in meal hours or the number of people eating, the cook should be notified in advance.
- When not being used for meals, the mess deck may be used for lounge and recreational area. The galley must be vacated 20 minutes prior to meal hours for setup time

6.0 References

Arthur D. Little, Inc. 1997. *Field Logistics and Sampling Plan for the 1997 Minerals Management Service Field Survey*, Sediment Quality in Depositional Areas of the Shelikof Strait and Outermost Cook Inlet. Prepared for Minerals Management Service. July 3.

Arthur D. Little, Inc. Standard Operating Procedures:

- ADL 1016 - Documentation and Field Reporting Requirements for Marine Sampling
- ADL 1017 - Sample Labeling and Chain of Custody Requirements
- ADL 1018 - Operation of the Modified Van-Veen Grab Sampler
- ADL 1019 - Collection and Handling of Subtidal Sediment Chemistry Samples from the Modified Van-Veen Grab Sampler
- ADL 1021 - Collection and Handling of Chemistry Quality Control Samples

Boehm, P., J. Brown, J. Trefry, R. Spies, C. Howell, J. Gold, S. Metz, and C. Loreti. 1998. *Sediment Quality in Depositional Areas of Shelikof Strait and Outermost Cook Inlet, Final Literature Synthesis*. Prepared for Minerals Management Service. Arthur D. Little, Inc. February.

R/V *Alpha Helix* Users' Manual. Seward Marine Center, Institute of Marine Science University of Alaska, Seward, AK.

Attachments

- Daily/Shift Report Form
- Sediment Sampling Station Log Form
- Fish Sampling Station Log Form
- Fish Collection/Dissection Data Sheet
- Fish Tissue Composite Sample Data Sheet
- Sediment Toxicity Sample Collection Data Sheet
- Sample Chain-of-Custody Form
- Alaska Department of Fish & Game Permit
- Pacific Halibut Commission Permit