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1.0 Introduction

As part of the Minerals Management Service (MMS) program entitled “Sediment Quality in Depositional Areas of Shelikof Strait and Outermost Cook Inlet,” the second and final field survey of the two-year program was conducted from June 27 to July 5, 1998. The scientific crew, on board the Research Vessel (R/V) *Alpha Helix*, collected samples for biological, chemical, and toxicological analyses from the program study area. This cruise report summarizes the activities and samples collected during the 1998 field survey.

During the 1998 Shelikof Strait and Outermost Cook Inlet field sampling survey, the following components were successfully completed:

- 19 fixed stations and 18 random stations in Shelikof Strait and Outermost Cook Inlet were occupied and sampled. In addition, fish were collected from three stations and one fixed sediment source station in the Alaska Coastal Current was sampled.
- Surface sediment, sediment cores, one gravity core, fish samples, and conductivity, temperature and depth (CTD) data were collected from the specified stations
- Optional samples collected included toxicity reference sediment, selected AVS/SEM samples, a grain size station, core samples (Station Z1-R3b), surface sediment for foraminiferan analysis, and sediment cores for fish scale analysis.
- Source samples of coal, seep oil, volcanic ash, and river water and sediment were collected before, during, and following the cruise
- Field samples were delivered to analytical laboratories for appropriate analyses

2.0 Schedule

The 1998 cruise was conducted from June 27 to July 5, 1998, and coincided with favorable tidal and current conditions in the program study area. The field team arrived in Seward, Alaska on June 25. Mobilization of the field team and the R/V *Alpha Helix* took place on June 26, and the R/V *Alpha Helix* departed Seward on June 27, 1998. Sediment and fish sampling was conducted from June 27 through July 5. The *Alpha Helix* returned to Seward on July 5 for demobilization at the Seward Marine Center (one day ahead of schedule). Field sampling personnel from Arthur D. Little, Inc. (ADL), Florida Institute of Technology (FIT), Applied Marine Sciences (AMS), and MMS participated in the survey. The scientific team and ship’s crew conducted the work on a 24 hour-a-day shift schedule.

3.0 Cruise Track and Samples Collected

The cruise track began with a transit to a source sediment station in the Alaska Coastal Current, offshore of Kenai Peninsula (Attachment 1: cruise track chart of the study area). After sampling this location (sampling gear shake-down), the cruise continued with a transit to the outermost sampling area, Zone 4 of Outer Shelikof Strait. During this second day of transit, one fixed station in Zone 1 was successfully sampled. Zone 4 was reached on June 28, and sampling was initiated. As the sampling in Zone 4 was completed, the cruise progressed through Zone 3 (South Shelikof Strait), to Zone 2 (Mid-Shelikof Strait), to Zone 1 (North Shelikof Strait), and then to Zone 0 (Outermost Cook Inlet). A complete list of the random and fixed sampling stations that were occupied and sampled for all zones of the study area is included in Table 1. Table 1 also provides the station identification, station type, latitude and longitude, depth, date and time of sampling, and the type of chemical, biological, toxicological, and geophysical analyses for each sample. Attachment 1, the cruise track chart, shows the 1998 cruise track and the locations of fixed, random, alternate, and optional sampling stations.

During the field survey, one additional grain-size sample was collected outside of Kukak Bay, while soaking the long-line fishing gear at station Z2R14a, to further delineate grain-size distributions in the Mid-Shelikof Strait. A supplementary box core was collected in Zone 1 at station Z1R3b and the resulting core samples were archived. In addition, a toxicity reference sediment sample was collected at a station near Holgate Glacier (Kenai Peninsula). This sample will be analyzed for toxicity to determine if fine grain size (i.e., glacial flour) is a contributing variable to sediment toxicity results.

The R/V *Alpha Helix* Ship Bridge Logs, which provide detail of all activities during the 1998 cruise, are included in Appendix A. Each log includes entries with date and time, ship's position and course, oceanographic station data (e.g., station name, wind speeds, and weather), and remarks, as recorded by the ship's master.

Source Sample Collection

Before, during and after the 1998 field survey cruise, source samples were collected, including coal, river water and sediment, seep oil, and volcanic ash (Table 1).

Sediment source samples were collected from one location in the Alaska Coastal Current, offshore of the Kenai Peninsula, during the 1998 R/V *Alpha Helix* cruise. A volcanic ash source sample was collected from the beach at St. Augustine Island for metals analysis only. Offshore of St. Augustine Island, additional sediment samples were collected by Van-Veen grab for grain size and chemistry (optional).

In May and June 1998, surface water samples were collected from the Matanuska, Susitna, and Knik Rivers. Two separate sampling rounds were conducted to look at the difference between spring runoff contributions of metals and average flow contributions. In May 1998, Copper River surface water was also sampled for metals analysis and a

Copper River sediment sample was collected for organics analysis. Matanuska River sediment samples were also collected for both metals and organics analysis.

Two coal source samples were collected in May 1998 from the Matanuska coal field. One sample was collected from a small coal “pocket” in the cliff surrounding Coyote Lake (Sutton, Alaska) and one sample was collected from a large coal seam exposed by recent mining activity in the hills northwest of Sutton.

Following the R/V *Alpha Helix* cruise, coal source samples from Ninilchik bluff and Coal Bay beach, Homer, were collected (Kenai coal field). The Ninilchik coal samples were taken from an exposed coal seam (approximately 100 feet up) in an approximately 200-foot-high bluff along a beach just outside of Ninilchik. In Homer, a coal sample was collected at Coal Bay from the beach itself where coal was scattered along the shore.

Additional coal samples from Ninilchik bluff, Tracy’s bluff (north of Homer), and the Beluga coal field were collected by Cook Inlet Regional Citizen’s Advisory Council (CIRCAC) in June 1998 as part of a separate project. Several of these samples (the Beluga coals) will also be analyzed as part of the MMS Shelikof Strait Program.

In July 1998, also after the cruise, oil (seep) source samples were collected from Well Creek, which drains into Oil Bay on the Iniskin Peninsula. Helicopter transportation was used to reach the creek where fresh seep oil was found. The samples of seep oil were collected from the surface water of a pond adjacent to the creek.

4.0 Sampling Procedures

Standard sampling procedures were followed at each sampling station according to the Field Logistics and Sampling Plan for the 1998 Minerals Management Service Field Survey (ADL, 1998). Typical sampling procedures included: collection of conductivity, temperature, and depth (CTD) measurements with the Seabird CTD; surface sediment grab sample collection using a modified Van-Veen Grab; and sediment cores using a MK III boxcore or a gravity core (at specified fixed and random stations). Long-line gear was deployed at three stations for the collection of fish samples, and successful fish collections were made. Fish dissections were conducted on-board the vessel to subsample liver, gill, kidney, and heart tissues for Cytochrome P-450 (CYP1A) and chemistry analyses (liver only). Sediment cores were subsampled on-board the vessel for subsequent geochronology, grain size, and chemistry analyses.

Photodocumentation, station logs, field notes, and shift forms were recorded during the field survey. The station logs for each sediment or fish sampling station are included in Appendix B. Each station log includes a description of the sampling location, observations, number and type(s) of samples collected, and comments. Daily/shift logs (not included in this report) were completed by the chief scientist or shift leader to summarize the stations visited and sampled during each shift, as well as any other comments.

5.0 Technical Issues

In this section, we describe any technical issues that arose during the 1998 field survey.

Only three of the four fish stations were sampled during the 1998 field survey. By the end of the third long-line deployment, the maximum number of fish designated on the collection permits was nearly met (116 of the 120 fish permitted were collected). As a result, the chief scientist cancelled the deployment of the long-line gear at the fourth station in Zone 0, which likely would have resulted in a substantial over-catch. Even though the number of fish proposed for the 1998 field sampling was doubled compared to 1997, the expansion of target fish species to include Pacific cod and skate allowed the fish catch limit to be met after only three stations. Fish species collected included: Pacific cod, halibut, sablefish, skate, and Arrowtooth flounder (Table 1).

Prior to the field survey, the Van-Veen Grab sampler was modified by adding an adjustable foot system to support the grab frame from overpenetration. This improvement worked well; the foot height was adjusted as coarser-grain sediments were encountered in Zones 1 and 0. The grab sampler also required a shock cord dampener (similar to that used in 1997) to successfully collect samples at deep stations when heavy seas were encountered during the survey.

The selection criteria for alternate stations was defined so that the next-closest alternate station was selected if sampling at any random or fixed station was unsuccessful. Only in one instance was an alternate station chosen when inappropriate bottom substrate was encountered at Z4F3. In this case, station Z4F4 was selected as the closest alternate. Furthermore, because of deteriorating weather conditions and the desirable substrate found at Z4F4, a box core was taken at this location instead of at Z4F1. The alternate station sampled is identified in Table 1.

Oil degrading bacteria samples were collected at all surface sediment stations. Two gravity cores were attempted in order to obtain a “deep” sediment profile; however, only one gravity core was successfully collected at Z0F1 (Table 1). Sediments were collected by Van-Veen Grab and box core at station Z1R3a (close to the 1997 fish location Z1R3a), as an alternate station to substitute for the unsuccessful gravity core in Zone 2 (station Z2-R16). The sediments were collected for reference archive only.

6.0 References

Arthur D. Little, Inc. 1998. *Field Logistics and Sampling Plan for the 1998 Minerals Management Service Field Survey, Sediment Quality in Depositional Areas of the Shelikof Strait and Outermost Cook Inlet*. Prepared for Minerals Management Service. June 8.

Attachment 1: 1998 R/V *Alpha Helix* Cruise Track Chart

Appendix A

R/V *Alpha Helix* Ship Bridge Logs

Appendix B

Station Logs