

**M/V Selendang Ayu Oil Spill
Unalaska, Alaska
Public Health Evaluation of Subsistence
Resources Collected During 2005**

**Appendix A
Methods Used for Collection of
Subsistence Fishery Samples and
Survey of Subsistence Food Consumption**

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March 13, 2006

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1.0 Introduction

Representative samples of subsistence foods were initially collected in Unalaska Bay in June and July 2005, in areas identified by subsistence users. These locations were chosen because they are widely used by local people, they are believed to be safe areas for harvesting (although some tarballs were noted in the area), and they are close to town and easily accessed for sampling.

Sampling was expanded into areas of heavier oiling on the southwest side of Unalaska Island in August and September 2005. The sampling program in Skan and Makushin Bays was implemented after the oil spill cleanup was largely completed, since these areas were the most heavily impacted by the spill.

2.0 Objective

The objective of the sampling activity was to gather data to determine whether or not the M/V Selendang Ayu spill adversely impacted the safety of subsistence foods from these areas. A side-benefit is the ability to provide food safety information to local people who consume subsistence resources from the area. By completing a testing plan and communicating the information back to subsistence harvesters and scientists, we can inform other subsistence food harvesters and consumers, as well as the larger Unalaska community.

3.0 Sampling teams

Sampling teams consisted of a scientific advisor and a subsistence harvester. The scientific advisor provided sampling jars, foil, coolers, and other equipment and supplies necessary for collecting uncontaminated samples. The subsistence harvester supplied ecological and seasonal knowledge of the harvest areas as well as information on the specific use of particular resources. The scientific advisor ensured that appropriate sampling methods were followed to ensure that samples are not contaminated.

Subsistence harvesters recommended by the Qawalangin Tribe teamed with scientists who had spill-related experience to collect samples from areas of concern.

4.0 Sampling methods

Subsistence seafood samples were collected in June, July, August and September 2005 following protocols contained in a sampling plan developed by members of the Selendang Ayu Subsistence Fishery Core Group in consultation with members of the Subsistence Advisory Group (Subsistence Core Group, 2005a). Sampling teams including representatives of the Qawalangin Tribe, the Ounalashka Corporation, Polaris Applied Sciences, Chumis Cultural Resource Services, NOAA, and the University of Alaska Marine Advisory Program collected the samples at locations identified by subsistence users and through review of relevant SCAT (Shoreline Cleanup Assessment Technique) survey documentation (Figure 1; Table 1). Intertidal samples were collected during suitable periods of low tides that allowed collection of target species, and other species were harvested on an ad-hoc basis.

On June 23, 25 and 26, 2005, samples of black chitons (*Katharina tunicata*), green sea urchins (*Strongylocentrotus droebachiensis*), and blue mussels (*Mytilus trossulus*) were collected for chemical analysis at locations in Humpy Cove and Captains Bay in Unalaska Bay accessed by land and boat. Blue mussel samples were also collected at Humpy Cove for organoleptic and PSP testing.

On July 20 and 21, 2005, additional samples of chitons, sea urchins and mussels were collected at five locations in Unalaska Bay accessed by land: at Morris and Humpy Coves, and Summer and Iliuliuk Bays. Samples of mussels were also collected for organoleptic and PSP testing at Morris Cove and Iliuliuk Bay, but results are not available due to a laboratory handling error.

On August 2, 2005, three pink salmon (*Oncorhynchus gorbuscha*) were netted in Summer Bay during Camp Qungaayux (the Qawalangin Tribe's cultural camp) and frozen for chemical analysis. In addition, a sample of harbor seal (*Phoca vitulina*) blubber was obtained for chemical analysis from a harbor seal harvested in Wide Bay by a tribal member for the camp.

On August 27, 28 and 29, 2005, samples of mussels, chitons, and sea urchins were collected from seven locations accessed by a skiff launched from a fishing vessel. The sampling sites were located in south Skan, Makushin, Anderson and Cannery Bays. Mussels were also collected for organoleptic and PSP testing. In addition, on August 28, 2005 three pink salmon were caught by rod and reel in a creek entering north Skan Bay and a Pacific cod (*Gadus macrocephalus*) was caught on a handline in Naginak Cove. On August 31, 2005, mussels and chitons were collected at four locations in Kismaliuk and Kashega Bays accessed by helicopter.

On September 23, 2005, mussel samples were collected at four locations in south and north Skan Bays, and at two locations in Cannery and Makushin Bays, all accessed by

helicopter. On September 25, 2005, chiton and mussel samples were collected at three locations in Humpy and Morris Coves, and Summer Bay accessed by land. Samples of mussels were also collected in Morris Cove and Summer Bay for organoleptic and PSP testing.

Samples of marine invertebrates and fish used as subsistence food resources were collected using tissue sampling methods found in the National Oceanic and Atmospheric Administration (NOAA), Natural Resource Damage Assessment (NRDA) protocols (NOAA, 1977), Puget Sound Water Quality Action Team protocols (PSWQAT, 1997), and in subsistence seafood studies conducted after the Exxon Valdez oil spill (Field, 1999). Clean nitrile gloves and decontaminated sampling utensils were used between samples at each sampling site. At each site, one composite sample consisting of approximately 10-20 individual intact shellfish (or urchins) were collected (depending on size), rinsed with site water and wrapped in two layers of clean aluminum foil. Enough individuals were collected to obtain at least 30 to 100 grams of tissue for analysis. The foil-wrapped shellfish were placed inside two sets of clean Ziplock bags with a rite-in-the-rain label placed between the two bags. The samples were then placed on ice in a cooler and kept at 4° C in the field and frozen prior to shipment to Woods Hole Group Analytical Laboratory in Raynham, Massachusetts. At the laboratory, edible portions of shellfish and fish tissue and sea urchin roe were dissected out from the samples, and the tissues subjected to chemical analysis.

Fish samples were handled in the same manner, with the same objective of obtaining 30 to 100 grams of tissue for analysis. To avoid contamination, collected fish were kept intact, wrapped in two layers of foil and placed in plastic bags. Three individual fish were collected at each location, if possible.

An approximately fist-sized sample of harbor seal blubber was obtained at Camp Qungaayux in August 2005, frozen and shipped to the laboratory for chemical analysis. A sample split of at least 30 to 100 grams of the blubber was taken at the Woods Hole Group Lab and sent to the Alaska Native Harbor Seal Commission (ANHSC). The resulting samples were handled and shipped as per methods detailed above.

All subsistence samples were analyzed for polycyclic aromatic hydrocarbons (PAHs). The analyses were conducted using gas chromatography with mass spectrometry as per modified EPA method 8270C with PAHs plus alkylated homologs.

Additional blue mussel samples were also collected and submitted for organoleptic and Paralytic Shellfish Poisoning (PSP) testing to the ADEC laboratory in Palmer, AK. Approximately two pounds of mussels were collected for each sample, and were kept at 4° C (not frozen) for shipment to the lab. Samples of mussels were also collected for chemical analysis at the same locations.

5.0 Subsistence consumer survey

A survey of local wild food consumption by Unalaska Residents was conducted for the *Selendang Ayu* oil spill response on behalf of the Unified Command (US Coast Guard, State of Alaska, and IMC Shipping) in order to determine how much subsistence food local residents are consuming. For the purpose of assuring food safety, the Unified Command was interested in answering two important questions:

- 1) How much of each group of subsistence foods is consumed in the community of Unalaska? The reason for finding this out is to determine: what is the highest level of consumption for particular subsistence foods and,
- 2) Are those foods, if consumed at the rate reported by the heaviest user, affected by the *Selendang Ayu* oil spill to a level that might pose a risk to human health?

A questionnaire was developed and reviewed by the Selendang Ayu subsistence fishery core and advisory groups to address the above questions (Subsistence Core Group, 2005b). The Alaska area Institutional Review Board (IRB) evaluated the questionnaire and concluded that IRB approval was not necessary.

The questionnaire was modeled after the Aleutian Pribilof Islands Association (APIA) *Alaska Traditional Diet Project Nutrition Questionnaire* of August 2003 (APIA, 2003). The questionnaire consisted of a total of 31 questions about consumption rates of fish (including salmon, cod and halibut), marine mammals (harbor seal and sea lion), invertebrates (including shellfish, crabs, chitons, and sea urchins), and wild birds and nearshore plants. Questions about the harvester's ethnic identity, subsistence harvest gear and harvest locations were also included in the survey.

With assistance from members of Qawalangin Tribal Council and the Ounalashka Corporation, a group of native and non-native individuals representing the heaviest subsistence food users on Unalaska Island was identified. Representatives of the University of Alaska Marine Advisory Program and Polaris Applied Sciences conducted the survey in late September and early October of 2005 in Dutch Harbor and Unalaska, Alaska. The targeted individuals were either interviewed personally or invited to fill out the questionnaire following written instructions. Daily seafood consumption rate data (grams per day) was calculated from the responses to questions asking the number of 3-ounce (85.05 grams) serving portions consumed per week, month or year. A plastic model representing a 3-ounce serving portion (or a pack of playing cards, which is the same size) was used during the interviews for visual reference. A total of twenty completed questionnaires were obtained, representing a total of 23 individuals (three couples were interviewed together). Data on the mean, maximum and 95% confidence limit consumption rates (in grams per day) for each subsistence food was compiled from the questionnaires for use in the risk analysis portion of this project.

Table 1. Subsistence samples collected on Unalaska Island; June to September 2005. Samples analyzed using modified EPA method 8270, except where noted.

Collection date	Location ID	Species + Sample No.	Sample ID	Comments
23 June 2005	Humpy Cove 1	Chitons 1	CH-SMB7-062305-01	
23 June 2005	Humpy Cove 1	Chitons 2	CH-SMB7-062305-02	
23 June 2005	Humpy Cove 1	Chitons 3	CH-SMB7-062305-03	
23 June 2005	Humpy Cove 1	Sea urchins 1	UR-SMB7-062305-01	
23 June 2005	Humpy Cove 1	Sea urchins 2	UR-SMB7-062305-02	Sample archived
23 June 2005	Humpy Cove 1	Sea urchins 3	UR-SMB7-062305-03	Sample archived
25 June 2005	Captain's Bay	Chitons 1	CH-CBW01-06-25-05-01	
25 June 2005	Captain's Bay	Chitons 2	CH-CBW01-06-25-05-02	Sample archived
25 June 2005	Captain's Bay	Chitons 3	CH-CBW01-06-25-05-03	Sample archived
25 June 2005	Captain's Bay	Sea urchins 1	UR-CBW01-06-25-05-01	
25 June 2005	Captain's Bay	Sea urchins 2	UR-CBW01-06-25-05-02	Sample archived
25 June 2005	Captain's Bay	Sea urchins 3	UR-CBW01-06-25-05-03	Sample archived
25 June 2005	Captain's Bay	Mussels 1	MU-CBW01-06-25-05-01	
25 June 2005	Captain's Bay	Mussels 2	MU-CBW01-06-25-05-02	Sample archived
25 June 2005	Captain's Bay	Mussels 3	MU-CBW01-06-25-05-03	Sample archived
26 June 2005	Humpy Cove 1	Mussels 1	MU-SMB07-06-26-05-01	
26 June 2005	Humpy Cove 1	Mussels 2	MU-SMB07-06-26-05-02	Sample archived
26 June 2005	Humpy Cove 1	Mussels 3	MU-SMB07-06-26-05-03	Sample archived
26 June 2005	Humpy Cove 1	Mussels 1	MU-OR-SMB07-06-26-05-01	Organoleptic / PSP
26 June 2005	Humpy Cove 1	Mussels 2	MU-OR-SMB07-06-26-05-02	Organoleptic / PSP
26 June 2005	Humpy Cove 1	Mussels 3	MU-OR-SMB07-06-26-05-03	Organoleptic / PSP
20 July 2005	Morris Cove	Mussels	ML-SMB10-7-20-05	
20 July 2005	Morris Cove	Mussels	ML-SMB10-7-20-05	Organoleptic / PSP n/a – lab error
20 July 2005	Morris Cove	Chitons	CH-SMB10-7-20-05	
20 July 2005	Morris Cove	Sea urchins	UR-SMB10-7-20-05	
20 July 2005	Humpy Cove 2	Mussels	ML-SMB6/7-7-20-05	
20 July 2005	Humpy Cove 2	Chitons	CH-SMB6/7-7-20-05	
20 July 2005	Humpy Cove 2	Sea urchins	UR-SMB6/7-7-20-05	

Table 1 (continued).

Collection date	Location ID	Species + Sample No.	Sample ID	Comments
21 July 2005	Summer Bay 1	Mussels	ML-SMB3-7-21-05	
21 July 2005	Summer Bay 1	Chitons	CH-SMB3-7-21-05	
21 July 2005	Summer Bay 1	Sea urchins	UR-SMB3-7-21-05	
21 July 2005	Iliuliuk Bay 1	Mussels	ML-SMB1-7-21-05	
21 July 2005	Iliuliuk Bay 1	Mussels	ML-SMB1-7-21-05	Organoleptic / PSP n/a – lab error
21 July 2005	Iliuliuk Bay 1	Chitons	CH-SMB1-7-21-05	
21 July 2005	Iliuliuk Bay 1	Sea urchins	UR-SMB1-7-21-05	
21 July 2005	Iliuliuk Bay 2	Mussels	ML-DTE37-7-21-05	
21 July 2005	Iliuliuk Bay 2	Chitons	CH-DTE37-7-21-05	
21 July 2005	Iliuliuk Bay 2	Sea urchins	UR-DTE37-7-21-05	
2 August 2005	Humpy Cove 3	Pink salmon 1	SMB7-PNK-8-02-05-01	
2 August 2005	Humpy Cove 3	Pink salmon 2	SMB7-PNK-8-02-05-02	
2 August 2005	Humpy Cove 3	Pink salmon 3	SMB7-PNK-8-02-05-03	
5 August 2005	Wide Bay	Harbor seal	SL-EIDER-8-5-05	Blubber sample
27 August 2005	South Skan Bay 1	Mussels 1	MU-SKS06-8-27-05-01	
27 August 2005	South Skan Bay 1	Mussels 2	MU-SKS06-8-27-05-02	Organoleptic / PSP
28 August 2005	South Skan Bay 1	Chitons	CH-SKS06-8-28-05	
28 August 2005	South Skan Bay 2	Sea Urchins	UR-SKS10-8-28-05	
28 August 2005	South Skan Bay 3	Chitons	CH-SKS17-8-28-05	
28 August 2005	South Skan Bay 3	Mussels 1	MU-SKS17-8-28-05-01	
28 August 2005	South Skan Bay 3	Mussels 2	MU-SKS17-8-28-05-02	Organoleptic / PSP
28 August 2005	Makushin Bay	Mussels 1	MU-MKS11-8-28-05-01	
28 August 2005	Makushin Bay	Mussels 2	MU-MKS11-8-28-05-02	Organoleptic / PSP

Table 1 (continued).

Collection date	Location ID	Species + Sample No.	Sample ID	Comments
28 August 2005	North Skan Bay 1	Pink salmon 1	PNK-SKN4-8-28-05-01	Male
28 August 2005	North Skan Bay 1	Pink salmon 2	PNK-SKN4-8-28-05-02	Male
28 August 2005	North Skan Bay 1	Pink salmon 3	PNK-SKN4-8-28-05-03	Female
28 August 2005	Naginak Cove	Pacific cod	CD-NGE7-8-28-05	
29 August 2005	Anderson Bay 1	Mussels 1	MU-AND2-8-29-05-01	
29 August 2005	Anderson Bay 1	Mussels 2	MU-AND2-8-29-05-02	Organoleptic / PSP
29 August 2005	Anderson Bay 2	Chitons	CH-AND3-8-29-05	
29 August 2005	Cannery Bay	Sea urchins 1	UR-CNB17-8-29-05-01	
29 August 2005	Cannery Bay	Sea urchins 2	UR-CNB17-8-29-05-02	
29 August 2005	Cannery Bay	Mussels 1	MU-CNB17-8-29-05-01	
29 August 2005	Cannery Bay	Mussels 2	MU-CNB17-8-29-05-02	Organoleptic / PSP
31 August 2005	Kismaliuk Bay 1	Mussels	MU-KMK7-8-31-05	
31 August 2005	Kismaliuk Bay 2	Chitons	CH-KMK28-8-31-05	
31 August 2005	Kismaliuk Bay 3	Chitons	CH-KMK32-8-31-05	
31 August 2005	Kashega Bay	Mussels	MU-KSB7-8-31-05	
23 September 2005	South Skan Bay 4	Mussels 1	MU-SKS-04-9-23-05-01	
23 September 2005	South Skan Bay 4	Mussels 2	MU-SKS-04-9-23-05-02	
23 September 2005	North Skan Bay 2	Mussels	MU-SKN-11-9-23-05	
23 September 2005	Cannery Bay	Mussels 1	MU-CNB-19-9-23-05-01	
23 September 2005	Cannery Bay	Mussels 2	MU-CNB-19-9-23-05-02	
23 September 2005	Makushin Bay	Mussels	MU-MKS-11-9-23-05	
25 September 2005	Humpy Cove 1	Chitons	CH-SMB-07-9-25-05	
25 September 2005	Humpy Cove 1	Mussels	MU-SMB-07-9-25-05	
25 September 2005	Morris Cove	Mussels 1	MU-SMB-10-9-25-05-01	
25 September 2005	Morris Cove	Mussels 2	MU-SMB-10-9-25-05-02	Organoleptic / PSP
25 September 2005	Summer Bay 2	Mussels 1	MU-SMB-01-9-25-05-01	
25 September 2005	Summer Bay 2	Mussels 2	MU-SMB-01-9-25-05-02	Organoleptic / PSP

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