

NORTH PACIFIC RESEARCH BOARD PROJECT FINAL REPORT

**Response and Intervention System for Climate Change Induced Paralytic Shellfish Poisoning (PSP)
in Aleut Communities
(Paralytic Shellfish Poison Monitoring in Aleut Region)**

NPRB Project 644 Final Report

**Bruce A. Wright¹, Ray RaLonde²
Victoria Gofman³, Michele Harmon⁴, and Kabir Khanna⁴**

¹ Aleutian Pribilof Islands Association, 1131 E. International Airport Rd., Anchorage, AK 99518-1408. (907) 222-4260, brucew@apiai.org

² Alaska Sea Grant, Alaska Sea Grant, 1007 W. 3rd Ave. 100, Anchorage, AK 99501. (907) 274-9697, afrrl@uaa.alaska.edu

³ Aleut International Association, 333 W 4th Ave., Ste. 301, Anchorage, AK 99501. (907) 332-5388, victoriag@alaska.net

⁴Westat, 1650 Research Blvd., Rockville, MD 20850

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ABSTRACT

The project was developed to address the increased risks of paralytic shellfish poisoning (PSP) due to the toxin range expansion as a result of the warming of sea water in the Arctic and the shift of species distribution, including harmful algal blooms that cause paralytic shellfish poisoning. The absence of PSP testing of subsistence harvests combined with local and traditional knowledge on safe harvesting practices perceived as being insufficient at a time of rapid environmental change created urgency for this research in the Aleut communities in Alaska and Russia (Commander Islands.)

The main objective was to develop methods for communities to monitor occurrence and distribution of toxin. Research efforts included educating residents about PSP, training local coordinators to use Jellett Rapid Test (JRT) kits, an inexpensive qualitative analysis tool approved by FDA, compiling data on spatial distribution of toxins and on local and traditional knowledge about shellfish harvesting.

Specimens were collected and analyzed from 21 communities extending the length of the Aleutian Islands where little baseline data is available on the prevalence of PSP toxin. Low levels of paralytic shellfish toxin were found. The field tests were confirmed by the Jellett Biotek laboratory, the Alaska Department of Environmental Conservation, and NOAA Marine Biotoxins Program. Comparative analysis showed JRT as an efficient method for rapid screening in order to eliminate shellfish containing low levels of toxin but this technique had a high percentage of false positives.

Two communities, Sand Point in Alaska and Nikolskoye in Russia, participated in the traditional knowledge survey. The data were analyzed by sociologists from Westat Inc., Rockville, MD. The current understanding by the communities of safe practices of shellfish harvesting does not provide them with the means to determine the presence or absence of toxin.

Employing chemical analyses and sociological surveys, the project established a baseline for PSP occurrence and harvesting practices that led to recommendations for setting up PSP monitoring by the communities. This is the first time such baseline study has been accomplished in the Aleut region in Alaska and on Bering Island in Russia. The findings of this project support the need for long-term monitoring for PSP in the region.

KEY WORDS

climate change, paralytic shellfish poisoning, PSP, Jellett rapid test kit, paralytic shellfish toxin, PST, harmful algal blooms, red tide, toxic algae blooms, harmful algal blooms, HAB, *Alexandrium cantenella*, Aleut traditional knowledge, local knowledge, shellfish traditional harvesting

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PART 1: GENERAL INFORMATION

STUDY CHRONOLOGY

Project funded May 2006. Write protocols, obtain supplies (Jellett test kits), train in use of kits, prepare community presentation and secure visa and Russian permits in June-August 2006. Travel to Nikolskoye, Russia August 3-17, 2006 to give community presentations, train technicians and collect PSP samples. Travel to PICES meeting in Japan to give PSP presentation, October 13-17, 2006. Give PSP presentations at AIA Board of Director's meeting, November 26-December 1, 2006. Give PSP presentation at Aleut Marine Mammal Commission meeting December 1, 2006. Travel to Unalaska and Sand Point to give community presentations, train technicians and collect PSP samples. Give PSP presentation to the APIA Board of Directors December 11-13, 2006. Attend Alaska Marine Sciences meeting January 21-24, 2006. Give PSP presentation at the Alaska Forum on the Environment meeting February 12-16, 2007. Give PSP presentation at Regional Teleconference March 1, 2007. Give PSP presentations at AIA workshop in Anchorage, April 3-5 and APIA Board of Directors meeting April 22-25, 2007. Continue to monitor PSP sample collections in Akutan, Nikolskoye, Sand Point and Unalaska. Arrange for additional collection sites, Adak, Atka, False Pass, King Cove, Nelson Lagoon, Nikolski, St. George and arrange for sample collections and technician training for control sites at Craig, Old Harbor, Ouzinkie, Port Lions and Tenass Pass. Continue to archive samples and sub-sample for DEC mouse bioassay analyses and HPLC analyses at NOAA lab. Continue updating and sending out monthly PSP reports to interested parties. Collect PSP samples in Prince William Sound on a trip of opportunity (shark research effort) on July 27-August 11, 2007. Get no-cost-extension for PSP project to allow for HPLC analyses results to be included in final report. Give PSP presentation at Alaska Public Health Summit, December 5, 2007. Attend Alaska Marine Science Symposium January 19-23, 2007 and give PSP presentation at APIA Board of Director's meetings December 28-30, 2007. January 2008, received NOAA HPLC data. QA/QC NOAA data and provide blind test spreadsheets to NOAA. Give PSP project update at APIA Board of Director's meeting January 28-February 1, 2008. Give presentations at the Alaska Forum for the Environment meeting February 11-15, 2008. Submit PSP final report end of May 2008.

Local and Traditional Knowledge Survey:

Winter 2006-2007 – Design survey concept

April 2007 – Questionnaire design and coordinators training workshop

May 2007 – Design of the Manual

Fall 2007 – Spring 2008 – Conduct interviews in the communities

May 2008 – Compile survey data for analysis

INTRODUCTION

Paralytic shellfish poisoning originating from toxic algae blooms of the dinoflagellate *Alexandrium cantenella* has been a threat to public health of shellfish consumers in Alaska for centuries (Fortuine 1989). The potential for PSP occurrence, as a result of climate change is a growing health concern to the coastal Alaska Natives, particularly Aleut communities where the problem is known to occur. One Aleut elder said of climate change, “It’s like forced ubiquitous catastrophic kaleidoscopic environmental destruction, and everyone just calls it warming!” As subsistence users, Aleut people rely on their local knowledge to determine whether it is safe to consume shellfish. Local knowledge presumes that PSP occurrence is a summer event and can be identified by a red color in the water termed a “red tide.” Local and traditional knowledge may assist in reducing the health risk, but in Alaska PSP illness occurs off season and toxic blooms may be colorless. Climate change also increases variability of weather and extreme events, especially in the transition months in spring and fall making it difficult to correctly identify any time frame for gathering shellfish. The net result is that traditional knowledge that people rely on for subsistence harvest, in the context of climate change, is insufficient to protect public health. The Alaska Department of Epidemiology documents that Alaska Natives are 11.6 times more likely to encounter PSP than the general population (Gessner 1996). In the absence of any state sponsored PSP monitoring program to protect subsistence harvesters, supplementing traditional knowledge with conventional scientific research through a complementary approach is necessary to further reduce the PSP risk and increase communities’ adaptive capacities to climate changes. The approach used in this project was to educate residents about the causes of PSP and train them to monitor shellfish toxicity in addition to traditional observations. The combined effort should help them to identify the potential threat and reduce the threat of PSP poisoning.

This project developed methods for communities to monitor occurrence and distribution of toxins in connection with climate change observations that increased communities’ capacities in devising a mechanism to better respond to the threat and minimize the risks of poisoning. The results improved communities’ abilities to adapt to the climate change impacts.

OBJECTIVES

The project developed methods for communities to monitor occurrence and distribution of toxins in connection with climate change observations that increased communities' capacities in devising a mechanism to better respond to the threat and minimize the risks of poisoning by incorporating monitoring information to local and traditional knowledge. The specific objectives of the project were to:

1. Educate the citizens of selected communities in the Aleutian and the Commander Islands on the oceanography processes that produce PSP plankton blooms, associated toxicity and their relation to climate change and traditional observations.
2. Educate bivalve harvesters about the relative risk of encountering PSP from their harvest and how species identification, harvesting practices and processing can reduce the risk of illness.
3. Train tribal/village environmental coordinators and health clinic staff in use of the Jellett Rapid PSP test and identification of risks and symptoms of PSP.
4. Perform baseline assessment at selected locations in the Aleutian and Commander Islands to determine occurrence and potential range expansion as a result of climate change and to compare collected data with information based on traditional knowledge.
5. Confirm field test results with the Jellett Biotek laboratory.
6. Provide Alaska Department of Environmental Conservation and Health Department of the Kamchatka Regional Administration with collected PSP monitoring data that may encourage these government agencies to develop additional surveillance programs and advisories to consumer of traditional foods.
7. Develop and distribute informational materials for community outreach that will provide practical recommendations for protection against PSP.

During the project, these original objectives were supplemented by collaboration with the NOAA Fisheries Science Center Marine Toxin Testing Program that conducted high performance liquid chromatography with fluorescence detection (HPLC) and receptor binding assay (RBA) tests on selected samples. HPLC and RBA testing can detect PSP at values below 40 ug/100 grams of shellfish tissue, the lower limit of the Jellett Rapid PSP test. In addition, HPLC determines the concentration of PSP for analogues of the toxin.

In addition, the Survey of Local and Traditional Knowledge about Paralytic Shellfish Poisoning in

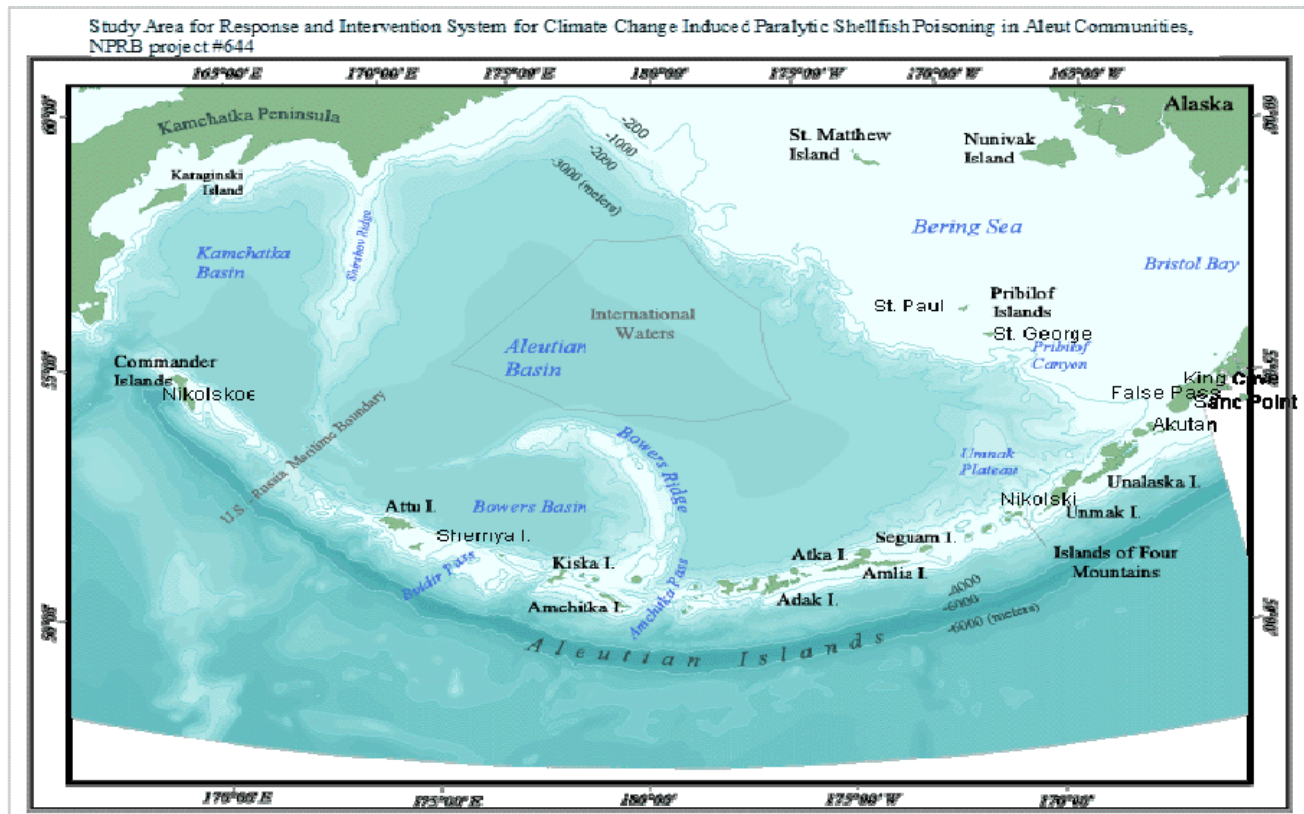
Alaskan and Russian Aleut Communities was designed in collaboration with Westat Inc, Rockville, MD. The survey was conducted in Sand Point (Alaska, United States) and Nikolskoye (Commander Islands, Russian Federation) and addressed the following questions:

- What traditional knowledge exists in the community regarding the safety of shellfish and how this knowledge is transmitted?
- What indicators people use to determine when to collect and consume shellfish?
- What people observed and took notice of PSP in recent history?

PART 2: PARALYTIC SHELLFISH POISON MONITORING IN ALEUT REGION

This portion of the project was conducted by Bruce A. Wright, MS, of the Aleutian Pribilof Islands Association and Ray RaLonde, MS, of the Alaska Sea Grant.

Figure 1: Map of the Study Area



METHODS

The geographical area for the project was selected because little baseline data is available on toxin occurrence and distribution in this region. The participating communities were Sand Point, King Cove (Eastern Aleutians), Nikolski, Atka (Western Aleutians), Nikolskoye (Commander Islands, Westernmost Aleutians) and St. George (Pribilof Islands, central Bering Sea). Additional opportunistic control sites were added for comparison (Southeast Alaska, Kodiak and Prince William Sound).

Testing and monitoring the intertidal bivalves for the presence of PSP was conducted in a systematic sampling program, standard operational procedure (SOP) at multiple locations for a variety of species

to determine PSP extent and distribution. Wright and RaLonde visited the communities and trained technicians the sampling and testing methodologies following the SOP, (see sampling protocols and testing protocols below).

Several species were tested throughout the year (where possible) and across the Aleutian, Commander and Pribilof Islands including surf clams (*Mactromeris polynyma*) for which there has been previous limited testing. Since only 10 ml of at 150 ml samples were used for the Jellet Rapid PSP test, the remainder was frozen for potential future use. Some samples from some communities were shipped frozen to Anchorage for testing by Wright or RaLonde. In addition, some QC samples were sent to Jellett Bioteck and the Department Of Environmental Conservation for confirmation of test results using the American Association of Analytical Chemist approved extraction procedure with the mouse bioassay test. A total of 105 blind tests for selected samples were tested at the NOAA Fisheries Science Center.

Four HBO water temperature data loggers were deployed: Two deployed near Nikolskoye, Commander Islands, Sand Point and Unalaska.

1. Sampling and Shipping Protocols

Standard Operational Practice (SOP) for Collection and Shipping of Shellfish for PSP Testing

This SOP provides the procedure to be used when collecting, storing, and shipping shellfish for PSP testing. The collection and storage practices apply to on-site monitoring and also for preparing shellfish for shipment. Shipping procedures apply only to samples that are freighted or mailed to another location (e.g. Anchorage or Dutch Harbor). The data sheet accompanying this SOP must be completed and placed in the plastic storage bag with the shellfish at the time the shellfish are collected.

Collection Procedure

1. Fill out the collection portion of the data sheet.
2. Harvest shellfish as follows". (The general rule is that you will need at least 150 grams (about 2/3 cup) of meat to conduct the PSP test)
 - a. Blue mussels – 30 mussels per sample
 - b. Littleneck clams – At 1.5" size 20 clams per sample
 - c. Butter clams -
 - i. If they are greater than 3" in size 5 per sample

- ii. If they are less than 2” in size at least 10 per sample
 - d. Surf clams – At least three if larger than 3” size
 - e. Other shellfish – At least 20
3. Be sure the data sheet is completed after sampling
4. Place shellfish into zip-lock bag along with the data sheet.

Storage Procedure

- For on-site testing within two days, store the shellfish in standard refrigeration, 40°F or cooler. Icing shellfish is also a good substitute for refrigeration
- Freeze samples if a longer storage time is required. NOTE: Freezing shellfish can be used instead of refrigeration if you do not know when you will be testing
 - Freezing does not affect the PSP results
 - Freezing may also cause the shellfish to gap open, making them easier to shuck

Shipping Procedure

1. Notify the intended receiver of the shipment prior to shipping to ensure the package will be picked up. If you are shipping to Anchorage call Ray RaLonde at 907-274-9697 or 9691, or Bruce Wright at 907-222- 4260 or 1-800-478-2742. Please, no shipments on the weekends.
2. Sample must be at least 300 ml of frozen tissue and one shellfish shell.
3. Package shipment in an insulated seafood shipping box, insert label.
4. Notify the receiver when the shipment is sent, the name of the shipping Co., and the approximate time of arrival. If you have questions call Ray RaLonde.

2. Jellett Testing Protocols

Standard Operational Procedure, Jellett Rapid Test Kit for 40µg level

The Jellett Rapid Test Kit comes with a set of instructions enclosed in packet of 5 tests. The instructional details are essential for you to follow. This SOP repeats the instructions enclosed with the kit plus additional suggestions learned from experience. Follow the instructions exactly.

Pre-Preparation

1. Check the dates on the buffer solution (the dark colored vials) and the packet containing the test strips to determine if the kits have not expired. If the kits have passed their expiration

date, contact Jellett Biotek immediately to see if the dates have been extended. The Jellett Biotek phone number is: (902) 275 5104.

2. Mix the isopropyl alcohol/vinegar reagent 5 parts alcohol to 2 parts vinegar. The reagent can be stored at room temperature in a tightly capped container included in the kit.
3. Prepare your workspace by laying out all of the equipment you will need. You should have close access to fresh water and if you are processing multiple samples, have a 10% bleach solution on hand to wash equipment between tests. The equipment to lay out includes:
 - a. Cover table with plastic table cloth and place metal cookie sheet on the table
 - b. 600 milliliter plastic beaker for grinding the shellfish tissue sample
 - c. Grinder
 - d. Shucking knife
 - e. Strainer
 - f. Hammer
 - g. Test tube with cap place in the test tube rack
 - h. 150 ml plastic container with lid
 - i. 5 ml plastic jar with lid
 - j. Alcohol/vinegar reagent
 - k. Paint or coffee filter (Paint filter preferred)
 - l. Vial of buffer solution (dark plastic vial)
 - m. Plastic pipette (eye dropper)
 - n. Jellett test strip
4. Label containers that will be used for testing and the Jellett test strip with the sample number and any information required on the label. Label the: 150 ml plastic jar, 5 ml plastic jar, test tube, and the Jellett test strip
5. If shellfish for the test have been frozen, be sure the sample is thawed.
6. If you have any questions, please call Ray RaLonde at 907-274-9697 or Bruce Wright at 907-222- 4260 or 1-800-478-2742.

Sample Preparation

1. Thoroughly wash the outside of the shellfish with fresh water to remove any mud or sand.
2. Open the shellfish with the shucking knife. HINTS: to opening shellfish.
 - a. If the shellfish have been previously frozen, they may be easier to open since the shells will likely be gaped open

- b. Clam and mussel shells are held shut by two adductor muscles located on each side of the hinge. To open a tightly closed clam, place the clam hinge side down on the table, then position the edge of the shucking knife as shown below. The sample procedure can be used for mussel shells, but the shells tend to shatter



3. Open the shellfish and rinse to remove any grit or fragmented shell
4. Remove the desired tissue and place in 150 ml plastic jar. Fill the jar to the rim.
5. Transfer the tissue to the strainer to form a single layer and let drain for five minutes.
6. Discard the draining and pick out any pieces of broken shell from the tissue.
7. Transfer shellfish tissue to 600 ml beaker and puree with hand blender for about 1 minute until all the tissue is ground.
8. Transfer 10 ml of sample to test tube with screw cap. Fill the 150 ml jar with the remainder of the sample, screw on the cap, and freeze the sample for later use.
9. Add 10 ml of the extraction solution to the test tube, making the total volume of sample plus extraction solution 20 ml. Screw on the cap and shake the sample for 30 seconds.
10. Filter the shellfish puree and extraction solution through the painter filter into a clean 150 ml plastic jar.
11. Pour the filtered solution into the 5 ml vial and cap. This is the extract that will be used for testing.
12. This sample can be tested immediately or stored in refrigeration at 4°-5° C (39°-41°F)

Testing the Sample

Testing for 40 µg

Now that the extract has been prepared, it needs to be tested using the Jellett Rapid Test procedure.

The procedure is as follows:

1. Prepare your area with
 - a. The extract
 - b. Plastic eye dropper
 - c. A vial of the buffer (dark vial)
 - d. Jellett test strip removed from its packet and the sample number written on the top.
2. Tap the lid of the buffer solution three times to loosen any buffer that might have been attached to the inside of the lid.
3. Open the extract solution
4. With the plastic eye dropper, take a sample of the extract to the black line on the eye dropper.
5. Empty the extract into buffer solution
6. Mix the buffer and extract by partially filling and emptying the mixture into the buffer vial.
(Do this at least 3 times)
7. Take a sample of the extract buffer mixture and fill the oval well on the Jellett test strip.
8. Allow the test development by letting the test strip sit undisturbed for 20 minutes
9. Read the results as indication on the kit instruction packet.
10. Record the results.

Testing for 80 µg

The test above develops results at the 40 µg level, one-half of the FDA limit. You can alter the test slightly to test at the 80 µg level, by adding an additional step (step six). To perform this procedure you will need a known negative extract that you have saved under refrigeration from a previous test.

1. Prepare your area with
 - a. The extract
 - b. Plastic eye dropper
 - c. A vial of the buffer (dark vial)
 - d. Jellett test strip removed from its packet and the sample number written on the top.
2. Tap the lid of the buffer solution three times to loosen any buffer that might have been attached to the inside of the lid.
3. Open the extract solution
4. With the plastic eye dropper, take a sample of the extract to the black line on the eye dropper.
5. Empty the extract into buffer solution
6. Fill the plastic eye dropper to the black line with a known negative extract from a previous sample and empty the contents into the vial.

7. Mix the buffer and extract by partially filling and emptying the mixture into the buffer vial.
(Do this at least 3 times)
8. Take a sample of the extract buffer mixture and fill the oval well on the Jellett test strip.
9. Allow the test development by letting the test strip sit undisturbed for 20 minutes
10. Read the results as indication on the kit instruction packet.
11. Record the results

Reading the Results

The test results are based on the intensity of the red color development of two lines (T and C) on the test strip. With each set of 5 tests, a test interpretation guide is included. The major points to remember when interpreting the results are:

- The C line must always develop and be equal to or more intense than the red color of the T line. No C line development or a faded development indicates that the test is invalid.
- The more toxic the sample, the more the red T line is faded.
- When the T line reaches development to a color intensity that is 50% less than the C line, the test fails and the toxin level is above 40µg or 80µg, depending on which test you are running.
- If a line (whether C or T) does not have uniform color development along the line, read use the least intensive part of the line to interpret the results.
- If you are not sure if the test fails at the 40µg level, using the same extract, run the test at the 80µg level.

3. The HPLC Method

A liquid chromatographic method with fluorescent detection after a precolumn oxidation was developed by Lawrence et al (2005) and was validated by the AOAC for PST determination in shellfish. The suite of PSTs in six shellfish species was determined using HPLC.

4. HOBO Temperature Data Loggers

Data on ocean temperature was collected at each sampling location using HOBO water temperature loggers. Ocean temperature data may be a useful indicator of climate change at the regional level and may correlate to PSP events. In Nikolskoye, Commander Islands, data collection was supervised by Nikolai Pavlov, a Russian researcher.

5. Community-Based Monitoring

Technicians were trained in several communities to collect and ship samples and some were trained to

analyze samples using the Jellett test kits. The technicians were (Akutan) Antone Shelikoff, (Atka) Andrew Zaochney, (False Pass) Per Jonsson, (King Cove) Desirae Roehl and Charly Bendixen, (Nelson Lagoon) Mike Nemeth, (Nikolski) Scott Kerr, (Nikolskoye) Ivan Vozhikov and Natalia Tatarenkova, (Port Lions) Amanda Squartsoff and Yvonne Lukin, (Sand Point) Dana Osterback and Joanna Karlsen, (St. George) Chris Mercurief and Karen Holser, (St. Paul) Aquilina Lestenkof and Phil Zavadil, and (Unalaska) Reid Brewer and Anfesia Tutiakoff.

Table 1: Sample sizes and dates for each community

Community	# of Samples	Dates Collected	
		From	To
Adak	4	7/9/2007	7/15/2007
Aiktak Island	1	9/26/2007	9/26/2007
Akutan	19	7/23/2006	9/7/2007
Amchitka	1	7/2/2007	7/2/2007
Atka	11	2/8/2007	9/7/2007
Attu	1	6/25/2007	6/25/2007
Chowiet Island	1	9/5/2006	9/5/2006
Craig	1	9/4/2006	9/4/2006
False Pass	3	9/26/2006	7/14/2007
Juneau	2	5/6/2006	9/15/2006
King Cove	12	4/22/2006	12/17/2007
Nelson Lagoon	1	5/28/2007	5/28/2007
Nikolski	1	4/1/2007	4/1/2007
Nikolskoye	14	8/10/2006	5/6/2007
Old Harbor	2	8/9/2006	8/9/2006
Ouzinkie	3	3/14/2007	3/16/2007
Port Lions	14	3/14/2007	7/31/2007
Prince William Snd.	3	7/31/2007	8/12/2007
Sand Point	25	6/22/2006	5/24/2007
Shemya	2	9/4/2006	9/5/2006
St. George	4	2/14/2007	3/13/2007
St. Paul	1	5/16/2007	5/16/2007
Tenass Pass	6	7/29/2006	10/2/2006
Unalaska	13	7/18/2006	7/22/2007
Unga	1	5/27/2007	5/27/2007

RESULTS

The data from this project was compiled by Wright at each location and checked for accuracy and

precision. The PSP data is housed with the APIA Community Services Department and Alaska Department of Environmental Conservation (ADEC), the public health decision-maker responsible to protect human health and Health Department of the Kamchatka Regional Administration. The temperature data is available in this report and from the APIA Community Services Department. The data will be available to a wider audience by including it in ADEC's Alaska PSP and marine water temperature database.

The data collected from this project will be useful at local, regional, national and international levels. Thus local expertise will provide valuable contributions to the state and national decision-makers in addition to the communities directly affected by a potential outbreak of PSP.

Blind Test – NOAA Fisheries Science Center Toxin Testing Program

The blind test samples sent are seen in Table I. Samples 18 was not sent so it was removed from the study, and sample 57 is an outlier and was also excluded.

Jellett Rapid PSP Test Strip Results, APIA

Reading the results

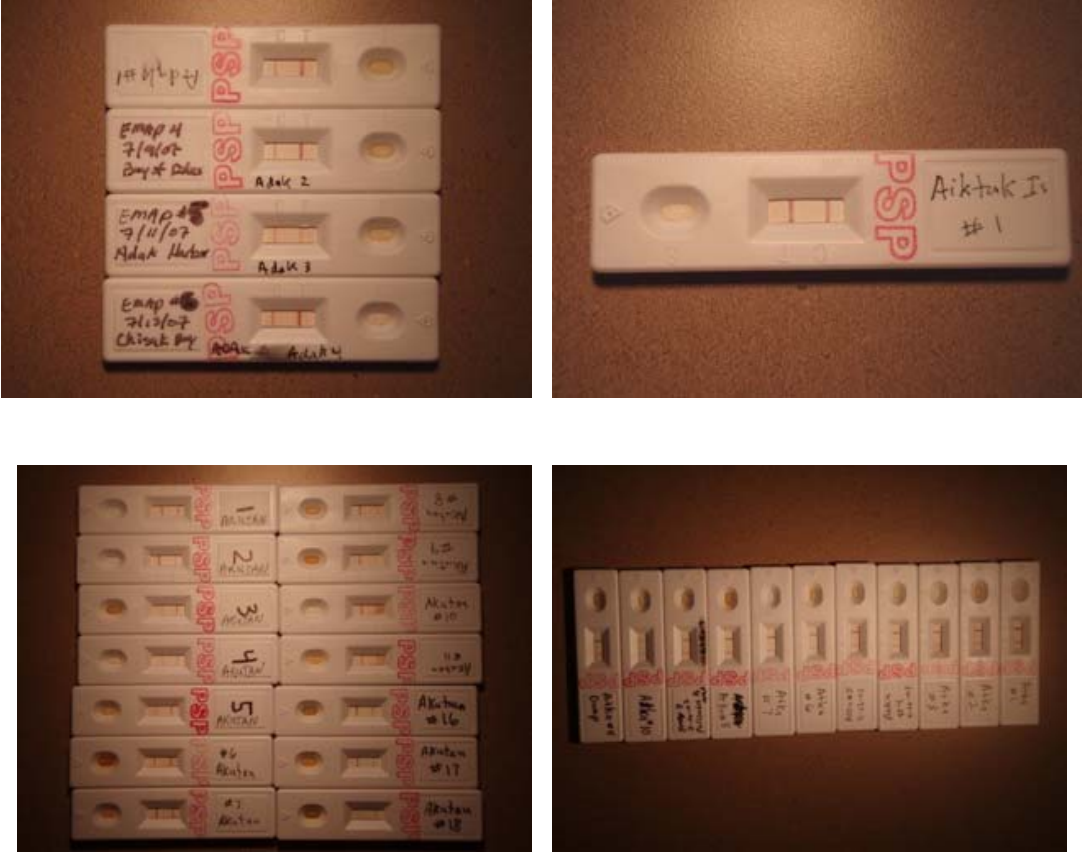
The test results are based on the intensity of the red color development of two lines (T and C) on the test strip. With each set of 5 tests, a test interpretation guide is included. The major points to remember when interpreting the results are:

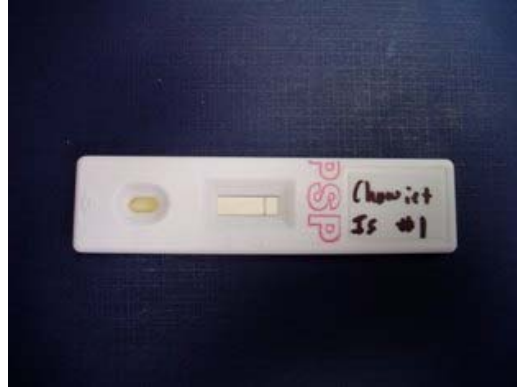
- The C line must always develop and be equal to or more intense than the red color of the T line. No C line development or a faded development indicates that the test is invalid.
- The more toxic the sample, the more the red T line is faded.
- When the T line reaches development to a color intensity that is 50% less than the C line, the test fails and the toxin level is above 40µg or 80µg, depending on which test you are running.
- If a line (whether C or T) does not have uniform color development along the line, read use the least intensive part of the line to interpret the results.
- If you are not sure if the test fails at the 40µg level, using the same extract, run the test at the 80µg level.

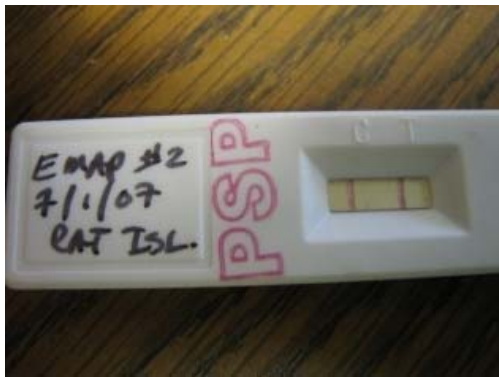
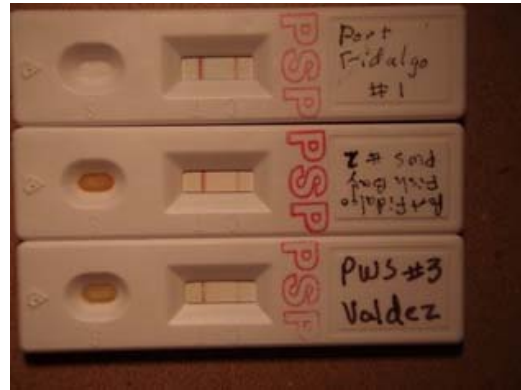


Figure 2. Jellett test strip line interpretation card used to determine if test results are positive or negative.

Figure 3. Test strip images from PSP study sites.









HOBO temperature data loggers

Data on ocean temperature was collected at several sampling locations using HOBO water temperature loggers. Ocean temperature data may be a useful indicator of climate change at the regional level and may correlate to PSP events. Four HOBO temperature data loggers were deployed. The two deployed near Nikolskoye, Commander Islands were lost in rough weather and seas. The Unalaska data logger was recovered, data logged in early March 2007 and redeployed. The Unalaska data logger was recovered again in early March 2008.

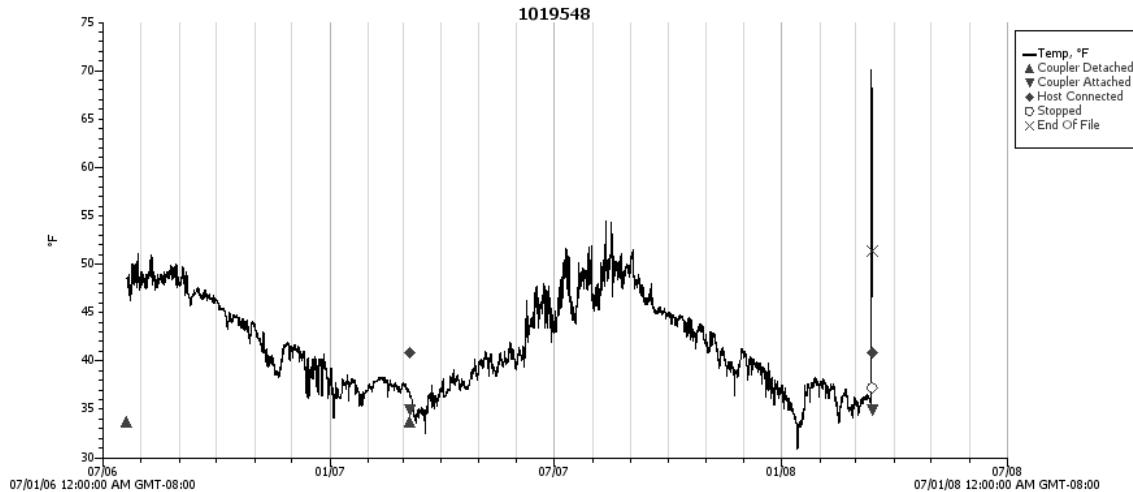


Figure 4. Marine water temperature in Unalaska small boat harbor at 5 meters below the surface using HOBO temperature data logger for the period July 20, 2006 to March 13, 2008.

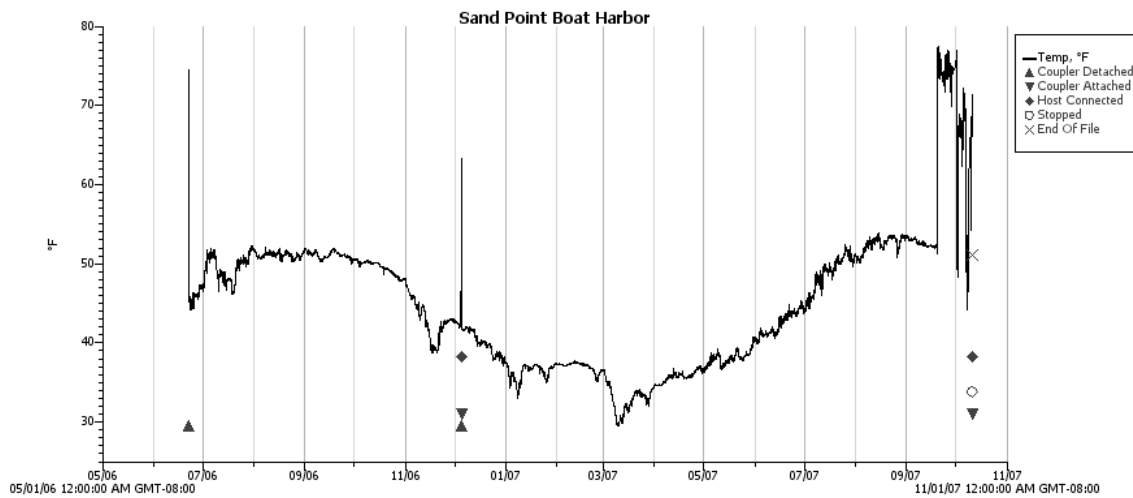


Figure 5. Marine water temperature in Sand Point boat harbor at 5 meters below the surface using HOBO temperature data logger for the period May 1, 2006 to November 1, 2007.

Note that the spike in early December 2007 was a result of the data logger being removed from the water, taken to a local hotel room where the data was downloaded. After downloading the data, the logger was returned to the same marine location until it was removed November 1, 2007.

DISCUSSION

The Marine Biotoxins Program, Northwest Fisheries Science Center, NOAA Fisheries, Seattle, WA analyzed the samples using a variety (See Appendix C) and prepared the summary (See Appendix D)

of the data. Sample 18 was not sent so it was removed from the study. They checked (QA/QC) the data for numbers 57 and 99 and determined the data are correct in the spreadsheet according to their analyses. Sample 99 can be explained by the toxicity factor difference between Quilliam and Oshima methods. The toxicity factor (converting dcGTX to STX equiv.) is higher according to Oshima compared to Quilliam. That is why they get a different result. Sample 57 is a strange case. The Marine Biotoxins Program, Northwest Fisheries Science Center double and triple checked the RBA data and according to their analyses, that is a correct number (analyzed several times). However, this outlier was left out of the comparison study. So the study consists of a total of 104 samples (106 minus #18 & #57). The brief overview from Marine Biotoxins Program, Northwest Fisheries Science Center is included (Appendix H) and a subsequent draft publication will be available for review within a year.

CONCLUSIONS

Education and Outreach

The objective of educating the community residents about the risk of encountering PSP from their harvest and the difference in species of bivalves and harvesting and processing methods to reduce risk of illness was achieved through series of public workshops, newsletters, web pages and regional teleconferences. At the community workshops, processes that produce PSP plankton blooms, associated toxicity and their relation to climate change and traditional observations were discussed. See “*Outreach*” section of this report below.

Community-based Monitoring

Tribal/village environmental staffs were trained in use of the Jellett PSP test kit and identification of risks and symptoms of PSP. In the training and monitoring process, technicians also learned the stringent requirements necessary for designing a monitoring program, the importance of following clear and concise standard operational procedures, maintenance of data quality, archiving samples and data and reporting results. In the primary communities these technicians performed baseline assessment at selected locations in the Aleutian and Commander Islands to determine occurrence and potential range expansion as a result of climate change and to compare collected data with information based on traditional knowledge. Field test results were confirmed with the Jellett Biotek laboratory, the DEC lab using mouse bioassay and the Marine Biotoxins Program, Northwest Fisheries Science Center, NOAA Fisheries, Seattle, WA., using a liquid chromatography (HPLC) method was validated by the AOAC for PST determination in shellfish.

Testing Methods

The Jellett Rapid Test (JRT) is a valuable screening tool that gives a fast and qualitative result. However, the test results in a high percentage of false positives. The Jellett test kit tests for 40 ug without proceeding to the special procedures. So, a false positive would be a positive at 40 ug with Jellett while the HPLC or other tests would indicate levels below 80 ug. Based on this there were a total of 60 positive Jellett tests out of 104 samples included in the study. Of these 11 tested positive by the other methods. So, 81.67% of the Jellett positives were proven to be false. However, there is an extremely low rate of false negative Jellett tests (none reliably recorded). This would suggest that the Jellett test is an excellent first screening method, and that a negative Jellett test virtually assures safety of the tested sample. However, there is a good probability that samples which test positive with Jellett are still safe to consume based on the present maximum allowable toxin levels. In this case collected specimens would need to be stored while additional testing using the other method was performed, and then if the results were negative the stored shellfish could be consumed. The receptor-binding assay (RBA) is useful for monitoring purposes. This method gives a measurement of the biological activity of the toxins present in a sample, but does not discriminate the suite of toxins. Mouse bioassay tests the measure only to a lower level of 32 ug/100 grams of shellfish tissue. The HPLC method is technical and time-consuming but has the advantage of determining the suite of toxins present in a sample, which can be used to more accurately estimate the potential toxicity of the sample than other biochemical methods. It is also very useful for research purposes.

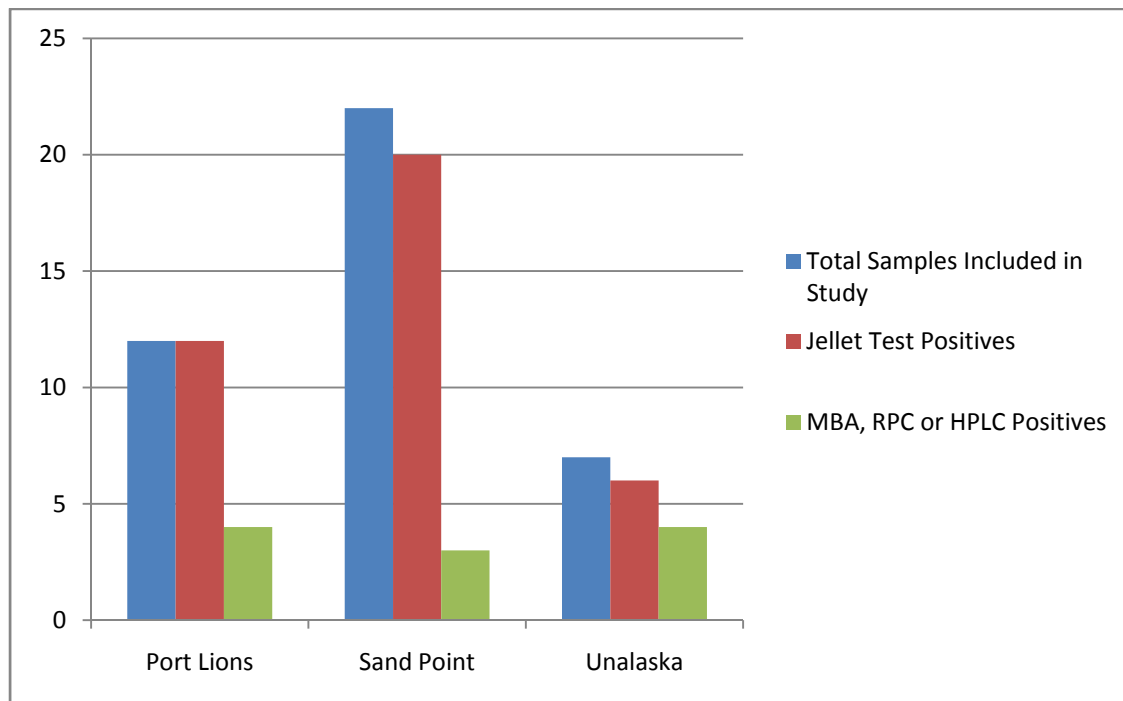
Knowing the composition and concentrations of the various PSP toxin analogs is useful in assessing the level of potential health risk. As an example, the butter clam contains a larger proportion of the highly toxic carbamate toxins (STX, GTX) as compared with littleneck clams that convert toxins to lower toxic decarbamoyl toxins (dcSTX, dcGTX_{1,2}). When found in the same location and date, butter clams are consistently more toxic than littleneck clams.

Distribution of PSP

Finding low levels of paralytic shellfish poison toxin in shellfish of the Bering Sea is a significant finding. With the HPLC test procedure, we found PSP levels of 8.36 and 8.66 ug/100 grams of mussel tissue in the Pribilof Islands indicating widespread presence of the toxin. The date of the toxin measurement being in mid-April is also significant because PSP would not be expected to be in blue mussels this early in the season. Although the current levels of PSP are low, climate change could affect future concentrations.

Finding PSP in the Bering Sea, even at low values, is significant since the study also found that the surf clam, *Mactromeris polynyma*, can reach toxin conditions at Sand Point, south of the Aleutian Peninsula, and HPLC analysis reveal the predominant PSP analog in surf clams as the highly toxic saxitoxin. Surf clams are a predominant food item for Pacific walrus (*Odobenus rosmarus*) in the Bering Sea, and we are discussing with USGS marine mammal program staff whether they would like surf clam samples tested from a sample harvest or from the stomach of harvested walrus.

Table 2: Communities with significant positive tests for PSP



Outcomes

King Cove has established a locally-controlled and funded PSP testing/monitoring program to help insure that their clams are safe to eat. Several people in the region have expressed their increased caution of eating bivalves. A PSP monitoring program is continuing in Port Lions and a proposal is being reviewed for the Native Villages of Ouzinkie and Old Harbor on Kodiak Island. These programs are using the SOP for this project to design their monitoring plan. Future public education, training, and monitoring designs will have access to the educational and training materials developed from the program. Locally trained PSP project technicians continue to offer local expertise about bivalve species and PSP.

Distribution of Information

The project provided Alaska Department of Environmental Conservation and will provide Health Department of the Kamchatka Regional Administration with PSP monitoring data and it is recommended that these government agencies develop additional surveillance programs and advisories to consumers of traditional foods.

PUBLICATIONS

One publication is in the queue and should be available within a year. That effort is being led by Pedro Costa, Keri Baugh, Shelly Nance and Kathi Lefebvre, Marine Biotoxins Program, Northwest Fisheries Science Center, NOAA Fisheries, Seattle, WA.

UNANSWERED QUESTIONS

This project has established a baseline for PSP in Alaska, but how will the distribution change with warming oceans? Is PSP playing a part in selecting for top predators in Alaska's oceans? Is there a relationship with Alexandrium and other harmful algal bloom species?

OUTREACH

1. Monthly Reports

APIA: Monthly reports were provided to the APIA administration and the PSP reports were provided to the APIA and AIA Boards of Directors. These reports were brief and typically looked like the example in Appendix I.

Community Reports:

Communities and Agencies: Periodic reports were sent via e-mail to community and agency staff and people interested in the PSP project. Updated reports were sent about every 5 weeks to approximately 500 recipients. The 10-8-07 report is included as Appendix I.

2. Community workshops

We had community workshops throughout the region to explain to community members the goals of the PSP project and educate people about PSP. The community notice for Sand Point is included as Appendix J.

3. Web sites (AIA, APIA, CSI, NPRB, University of Alaska)

<http://seagrant.uaf.edu/features/PSP/psp_page.html>

<<http://www.aleut-international.org/files/Download/2006%204th%20Quarter%20newsletter%20Final.pdf>>

<<http://www.aleut-international.org/files/Download/2007%201st%20Quarter%202007%20newsletter%20final.pdf>>

<<http://project.nprb.org/view.jsp?id=c974307d-3e90-4f56-adb3-d6c370d38dd0>>

<http://www.pices.int/publications/annual_reports/Ann_Rpt_06/2006%20HAB-S_f.pdf>

The APIA PSP front page is included as Appendix K.

4. Presentations to AIA and APIA boards.

Each quarter reports are provided to the boards at APIA and AIA about the PSP project. Several presentations about the PSP project have been given to the APIA Board of Directors. One of the written board reports is included as Appendix L:

5. Scientific meeting presentations:

PICES, Japan – resulted in collaboration with NOAA

Alaska Forum for the Environment

Panel Presentation at the Alaska Public Health Summit (abstract included as Appendix M)

6. Newsletters:

<http://seagrant.uaf.edu/features/PSP/psp_page.html>

<<http://www.aleut-international.org/files/Download/2006%204th%20Quarter%20newsletter%20Final.pdf>>

<<http://www.aleut-international.org/files/Download/2007%201st%20Quarter%202007%20newsletter%20final.pdf>>

<<http://project.nprb.org/view.jsp?id=c974307d-3e90-4f56-adb3-d6c370d38dd0>>

http://www.pices.int/publications/annual_reports/Ann_Rpt_06/2006%20HAB-S_f.pdf

http://www.apiai.com/apia_newsltr_april08_web.pdf

7. Shared data with regulatory agencies.

The PSP data and regular updates were provided to the State of Alaska agency responsible for regulating safe shellfish harvest, Alaska Department of Environmental Conservation and the public health decision-maker responsible to protect human health and Health Department of the Kamchatka Regional Administration.

8. Media.

<http://thedutchharborfisherman.com/news/show/2302>

PART 3: LOCAL AND TRADITIONAL KNOWLEDGE SURVEY

The traditional knowledge component of the project was led by Victoria Gofman, MA. The survey data analysis was performed by Michele Harmon, PhD, and Kabir Khanna, MA, Westat, Rockville, MD. They prepared a report entitled “Survey of Local and Traditional Knowledge about Paralytic Shellfish Poisoning in Alaskan and Russian Aleut Communities” to address the following questions:

- What traditional knowledge exists in the community regarding the safety of shellfish, toxins, and paralytic shellfish poisoning (PSP), and how is this knowledge transmitted?
- What indicators do people use to determine when to collect and consume shellfish?
- Have people observed and taken notice of PSP in recent history?

METHODS

Participants

All Aleut communities (See Map (Figure 1)) involved in collection and testing of samples for this project were invited to take part in the local and traditional knowledge survey. The intent was to conduct the survey at least in two communities, one Alaskan and one Russian. Four Alaskan villages and the participating Russian Aleut community expressed interest. A training workshop was held in Anchorage in April, 2007, for the four Alaskan villages. Four participants, one project coordinator each from Akutan, King Cove, St. George, and Sand Point were trained at the workshop. The Russian coordinator in the village of Nikolskoye was trained long distance.

For various personal reasons coordinators in Akutan, King Cove, and St. George left the project and it was not possible to train new people due to financial limitations and time constraints.

Whereas it is disappointing, the two remaining communities, Nikolskoye in Russia and Sand Point in Alaska, were a good match as they have some commonalities, such as the population size and in the level of assimilation with predominant cultures.

Sand Point (Qagun Tayagungin in Aleut) is a fishing community with approximately 950 residents, about half of whom are Aleut. Sand Point has one of the largest commercial fishing fleets in the Aleutian region. The first residents were Aleuts from nearby villages and Scandinavian fishermen. Sand Point can be accessed by either plane or boat. Traditional harvest includes fish, marine mammals, terrestrial mammals, invertebrates, birds and eggs, as well as edible plants. Several Aleut communities are located nearby, including King Cove, Nelson Lagoon, False Pass, and Akutan.

Nikolskoye has a population of 800 people, 300 of whom are Aleut. Nikolskoye is the only Aleut settlement in Russia. Subsistence and small commercial fishing are important for local residents but many are also employed by the local government to provide services to the village. Nikolskoye can be accessed by boat or plane, but neither is reliable. Traditional harvest includes fish, salmon roe (caviar), fur seal, birds and eggs, marine invertebrates, seaweed and mushrooms.

Both communities rely on subsistence and family commercial fishing for their wellbeing, though in Nikolskoye the scale of commercial fishing is much more modest. Both villages have been experiencing a substantial loss of the Aleut traditional culture: only English and Russian are spoken and just a few Elders are left who know the Aleut language.

Survey Instrument

The survey instrument was developed by the researchers and representatives from four Alaska Aleut communities at a workshop in Anchorage in April 2007. (See Appendix P) Four coordinators from the Alaskan villages of Akutan, St. George, King Cove, and Sand Point collaborated on the design of the questionnaire to ensure that the questions were relevant to their communities. After the draft was developed, they practiced administering the survey during a training session. Coordinators first interviewed each other and then took turns interviewing an Aleut Elder from False Pass who was in Anchorage during the workshop. The interviews were recorded and discussed with the coordinators. A survey manual was also developed at the workshop. All recommendations were incorporated in the final questionnaire, which was then translated into Russian. A Russian researcher from Nikolskoye Natalia Tatarenkova, the project coordinator, reviewed and commented on the questions. A test interview was conducted with a Russian respondent from Nikolskoye. The survey manual went through final editing and was translated in Russian (See Appendix T.)

Thirteen “high harvesting” residents were surveyed in Sand Point, Alaska, and 30 were surveyed in the village of Nikolskoye in Russia. All surveys but one were administered by researchers in an interview format. The efforts in both villages were similar but it was more difficult to recruit respondents in Sand Point than in Nikolskoye. One of the explanations could be that in Alaska villagers are inundated with various surveys while in Russia this type of projects is still a novelty thus more interesting and attractive for participation.

The final survey (See Appendix N) asked about the following topics:

- Respondent Demographics
- Learning and Teaching about Shellfish
 - *How Respondents Were Taught About Shellfish (Question 6)*
 - *How and What Respondents Teach Their Children (Questions 2, 7, 8, 9)*
 - *Traditional Stories and Tales Heard About Shellfish (Questions 10, 11)*
- Indicators of Shellfish Safety
 - *Shellfish Season (Questions 13, 20, 21)*
 - *Weather Conditions (Questions 14, 15, 16, 17, 19, 42, 43, 44, 46)*
 - *Perceptions of Shellfish Quality (Questions 26, 27, 28, 29)*
- Shellfish Collection and Preparation Habits
 - *Collecting Habits (Questions 41, 49, 51)*
 - *Favorite Shellfish and Traditional Foods (Questions 22, 23, 30, 31, 32, 39, 40)*
 - *Shellfish to Avoid (Questions 5, 24)*
 - *Shellfish Preparation (Questions 4, 33, 34, 35, 37, 38, 39)*

Survey Administration

In Sand Point, Alaska, the Tribal Administrator helped recruit participants for the study. She compiled a list of “high harvesting” individuals who were available for an interview and made preliminary telephone calls. Only after that the local project coordinator, Dana Osterback, scheduled appointments with people on the list. In Russia, the local project coordinator recruited participants for the study. The Alaskan respondents were all men but the Russian respondents were made up of men and women. Educational background varied among the respondents, with some having college degrees, mostly among Russian respondents, and others not.

In March 2008, Gofman and the local coordinator conducted 13 interviews in Sand Point, Alaska. Most of these interviews were conducted in Tribal Offices but a few elders were interviewed at home. In Russia, the local coordinator, Tatarenkova, who has lived in the village of Nikolskoye for approximately 15 years, conducted the 30 Russian interviews. These interviews took place in the respondents’ homes in the village of Nikolskoye, on Bering Island. All of the English and Russian surveys were administered in an interview format, except for one in Sand Point, where a respondent wanted to complete the questionnaire by himself.

All respondents were compensated for their participation. Alaskan respondents received a \$20 gift certificate for gas, and Russian respondents received money.

Data Analysis

The survey included several different types of items such as yes/no questions, categorical scales, Likert-type ratings, and questions with open-ended quantitative and qualitative response options. Thus, various types of data analysis were conducted to summarize findings. Yes/no responses are reported as percentages of yes responses, no responses, and other responses (e.g., do not know). These data are often accompanied by pie charts embedded in the text. Categorical scales and Likert-type ratings are often reported in tables as means, with the minimum and maximum values shown for all respondents. In addition to being reported in the text, some of these results are also represented by bar graphs. For the open-ended qualitative questions, we report the prototypical responses or common themes that emerge from the answers provided. When we observed important differences between the Alaskan and Russian responses, we noted these differences in the report.

RESULTS

Respondent Demographic Profile

Based on the year of birth, the average respondent was 52 years old (born in 1956). The youngest respondent was 25 years old and the oldest was 86 years old. The average length of time spent in the location where the interview took place was 43 years and ranged from 13 years to 81 years. The average length of time spent in the region - Western Alaska for Alaskan respondents and the Commander Islands for Russian respondents - was 50 years and ranged from 15 to 86 years. Many respondents reported having lived in their current location and in the broader region throughout their entire life. The average length of time gathering shellfish was 31 years and ranged from 7 to 61 years with most respondents reporting that they had gathered shellfish since childhood.

Learning and Teaching about Shellfish

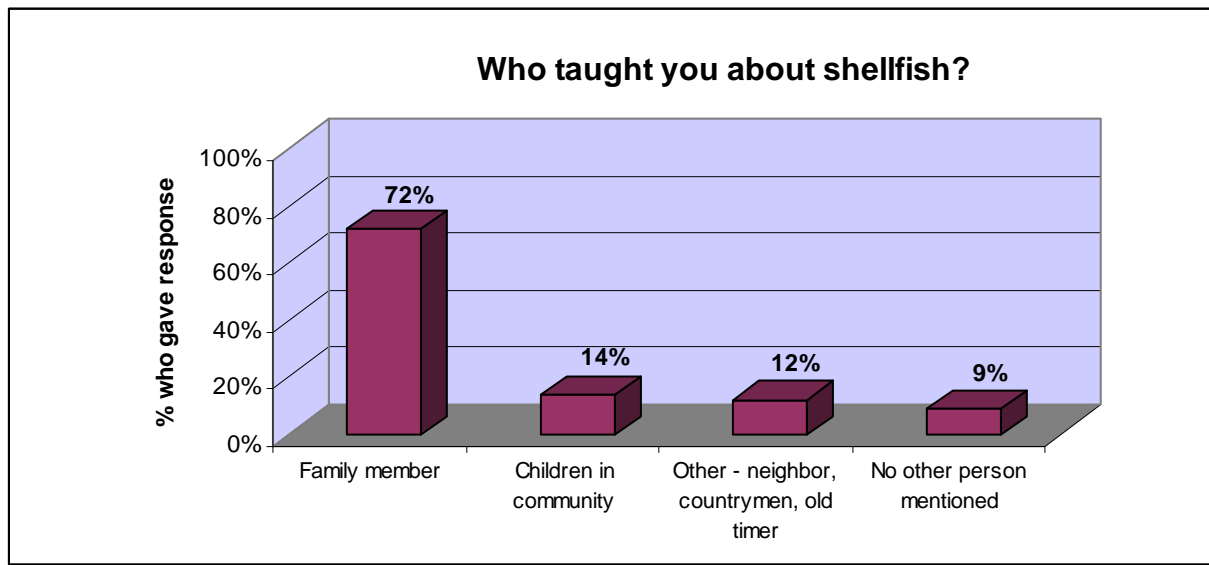
The following section describes the transmission of cultural knowledge about shellfish.

How Respondents Were Taught About Shellfish (Question 6)

As Figure 6 illustrates, when asked, “Who taught you about shellfish?” the majority (72%) of the 43 people who answered this question said they were taught about shellfish by a family member. Of the survey respondents who mentioned they were taught by family, slightly more than half (53%) were taught by a parent while others were taught by a grandparent (14%), an aunt or uncle (14%), and/or a sibling (6%).

Some (14%) of the 43 respondents learned from other children and a smaller proportion (12%) reported that they learned by some other means such as from older community members. Although the Russian respondents reported learning about shellfish from other children none of the Alaskan respondents reported that they learned about shellfish in this way.

Figure 6. Who taught you about shellfish?



Some of the 31 respondents that reported learning about shellfish from a family member reported learning from multiple sources, for example, a parent and a grandparent. Most of the respondents learned about shellfish from firsthand experience by going to the coast and collecting them, often with family members. One respondent reported learning solely about the shellfish preparation process, but not about how to collect them. Several of the Alaskan respondents learned about shellfish at Sand Point and in King Cove, while most of the Russian respondents learned at Nikolskoye or Preobrazhenskiy, an Aleut village on the Medny (Copper) Islands that existed until middle of the 20th century when its population was consolidated in Nikolskoye.

How and What Respondents Teach Their Children (Questions 2, 7, 8, 9)

Ninety percent of respondents reported having children. Of those who reported having children, 79% reported teaching their children about shellfish. The vast majority (89%) reported that their children enjoyed clam digging but one respondent said his/her children did not enjoy this activity and two reported that their children have never dug for clams. Of the respondents that said their children enjoy clam digging, nearly half (48%) made a comment about the shellfish being small, not alive, or hard to find. However, it should be noted that only the Russian respondents made these types of statements.

Qualitative comments indicate that most respondents think children should be taught about shellfish at an early age and the earlier children learn about shellfish, the better. When asked specifically at what age they should be taught, responses ranged from 2 to 10 years old. Some of the things that

respondents reported teaching their kids where to find shellfish, how to tell if they are okay to eat, and how to prepare them. Many respondents teach their kids by taking them along when they go to collect shellfish.

In addition, several Alaskan respondents thought that it was important to share information about PSP and red tides with kids. One respondent pointed out that although he/she wanted his/her child to understand that a tingling sensation when chewing on the shellfish indicates it is not good to eat, this person warned that people should not let kids do this type of testing, which is dangerous and ineffective even though it is still practiced.

Even though they did not explicitly mention PSP or red tides, several Russian respondents indicated that it was important to teach kids which shellfish are safe and which are unsafe with a few succinctly reporting that it was important to tell children when to gather, what to gather, and where to gather.

Traditional Stories and Tales Heard About Shellfish (Questions 10, 11)

When asked, “Have you heard any traditional stories/tales about shellfish?” approximately one quarter (26%) reported that they had but most (74%) said they had not. Qualitative findings show that most respondents had heard stories from family members while some learned from others in the community. Most of the Alaskan stories concerned cases of PSP, while only a few of the Russian stories did. Most Russian respondents did not know anything about Red Tides or cases of PSP, according to the interviewer notes. However, a couple of the Russian respondents mentioned PSP-related deaths occurring several decades ago. Two other Russian respondents also mentioned a news story about Red Tides from three or four years ago, suggesting a limited amount of local knowledge about the subject.

Almost all respondents (93%) indicated that they thought the Aleut people had always eaten shellfish, while only one did not (2%), and two people (5%) reported that they didn’t know. When respondents said they thought Aleut people had always eaten shellfish, they were then asked, “What makes you think so?” Many respondents thought so because shellfish are a good, nutritious, source of food for communities living by the sea, while three of the 13 Alaskan respondents pointed to archaeological evidence.

Indicators of Shellfish Safety

The following section describes what kind of information respondents use to determine the safety of collecting and eating shellfish.

Shellfish Season (Questions 13, 20, 21)

The survey items on shellfish season ask open-ended qualitative questions about the best season and months to collect shellfish, when the season begins and ends, and what environmental differences (if any) are observed during the months when shellfish are gathered compared to the months when shellfish are not gathered.

Most of the Alaskan respondents indicated that winter was the best season for collecting shellfish, whereas most of the Russian respondents said that spring, was in fact, the best month. There was some variability in the length of the indicated shellfish season. A few Alaskan respondents included fall in the season, but those that mentioned actual months mentioned winter months, such as, “December and January” with a few reporting, “months with r.” Several Russian respondents said that the season starts in the winter but ends in summer, and all respondents except for one felt that the season included spring. When asked about specific months, many of the Russian respondents mentioned the spring and summer months of, “March through May,” and “May through June.” Clearly, the Alaskan and Russian respondents think of the shellfish season differently.

Respondents were also asked whether they would ask kids to collect shellfish in the current month. Alaskan respondents, for whom the month in question was March, mostly said that they would (80%). Almost all of the Russian respondents, who were administered the survey in the winter months, from late November to early February, said that they would not (97%).

PSP testing performed in this project showed positive results for the presence of PSP in Sand Point in March of 2007 (No testing was performed in 2008). In this case, the local knowledge and scientific data converge.

While all PSP results from November to February were negative, most of the respondents in Nikolskoye on Bering Island stated that these were not good months for shellfish gathering. Some of the qualitative information in respondents’ comments provided explanation for this divergence. Winter weather in Nikolskoye can be brutal with strong winds and storms and some respondents sited

more difficult access to the harvesting areas and dangerous conditions in winter rather than concern about poisoning.

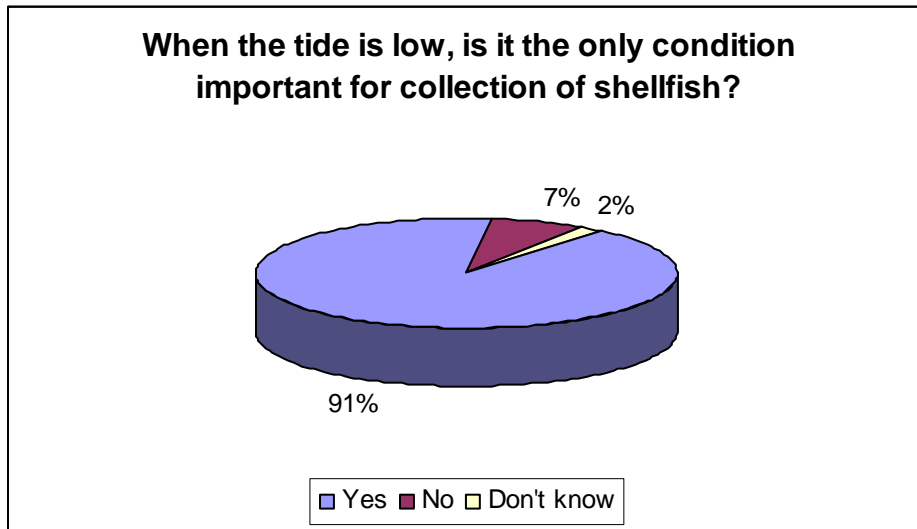
Considering that the presence of PSP or PSP poisoning has never been documented on Bering Island (Tatarenkova), it is interesting that local residents showed any knowledge of PSP at all. The LTK survey was conducted after Wright's visit to Nikolskoye in summer of 2006 when he presented information about the project and educated about PSP. According to Tatarenkova, some respondents who attended the presentation applied this information to their answers during LTK survey. She also explained that the absence of PSP on the island was likely due to the topography of the shoreline and the local climate: the local ocean currents are strong and there are no protected bays where water could get warm in summer. At the same time, the traditional knowledge about seasonal bans on shellfish harvest existed in the community. That was demonstrated in the answers of elders (age 80 or older) participating in the survey. These individuals are descendants of the Aleuts from Attu, Atka and other villages relocated by the Russian American Company to the Commanders to harvest Fur seals in the first quarter of the 19th Century. They still remember what they learned from their ancestors about shell harvest ban in late spring and summer when in the the Eastern Aleutians and other areas in Alaska PSP illness and death were known to occur.

For about 180 years, there have been very few interactions between the Aleuts from the Commanders that remained part of Russia after the sale of Alaska in 1867 and the Aleuts from other islands that became part of the U.S. The significance of this is in that that it proves that the Aleut knowledge on seasonal outbreaks of PSP goes back at least several centuries.

Weather Conditions (Questions 14, 15, 16, 17, 19, 42, 43, 44, 46)

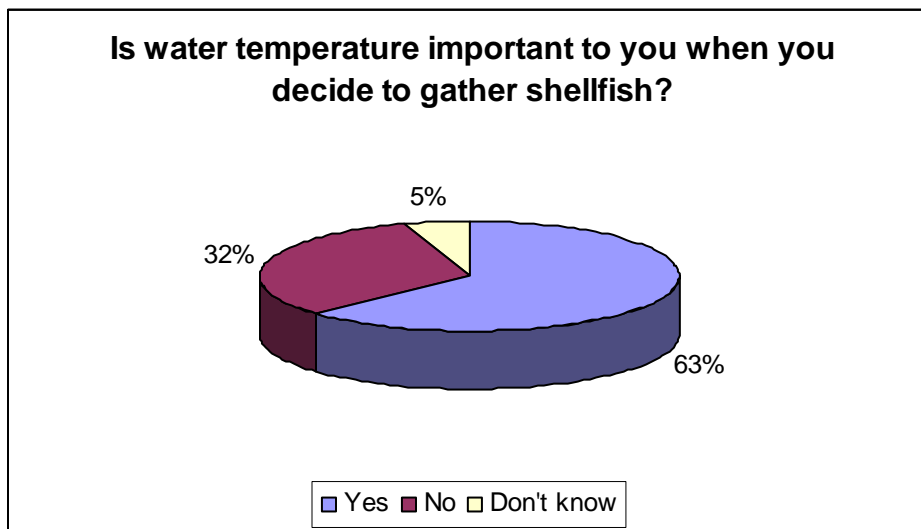
As shown in Figure 7, when respondents were asked if a low tide is the only important condition for collection of shellfish, 91% said yes, 7% said no, and 2% did not know.

Figure 7. When the tide is low, is it the only condition important for collection of shellfish?



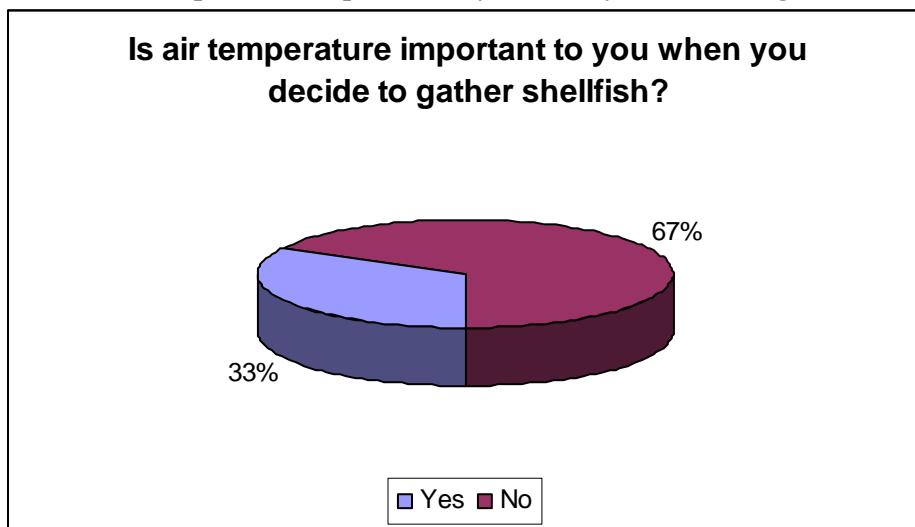
However, when respondents were asked if water temperature is an important consideration for collection of shellfish, 63% said yes, 32% said no, and 5% did not know (See Figure 8.)

Figure 8. Is water temperature important to you when you decide to gather shellfish?



Respondents were also asked if air temperature is an important consideration for collection of shellfish. As Figure 9 shows, 33% said yes and 67% said no. Thus, there is a high degree of inconsistency in the responses to these questions, as many of the respondents who reported that low tides were the only important condition went on to say that water temperature and air temperature were also important things to consider.

Figure 9. Is air temperature important to you when you decide to gather shellfish?



Respondents were also asked to indicate ideal, “cool”, and “warm” temperature ranges for water and air. Most of the Alaskan respondents answered these questions but almost none of the Russian respondents gave an answer. In other words, the data show that nearly all of the Russian respondents gave “no response” to items asking their opinion on what they consider a “cool,” “warm,” or ideal temperatures for air and water when gathering shellfish.

Among the few respondents that provided an ideal water temperature range, the overall range was 30° F to 45° F. “Cool” water temperatures ranged from 32° F to 40° F, and most respondents considered water temperatures above 40° F as “warm”. Several respondents indicated that the air temperature should be cold but not freezing. “Cool” air temperatures varied greatly from 30° F or below to above 50° F. “Warm” air temperatures also varied greatly from 30° F to 65° F.

Respondents were asked what the weather should be like when gathering clams and mussels and were provided with the following response options: clear and calm, clear with wind, cloudy and calm, cloudy with wind, raining, snowing, and other. Many respondents chose multiple options, and many indicated that there should *not* be strong winds. Table 3 lists the frequency of each response category:

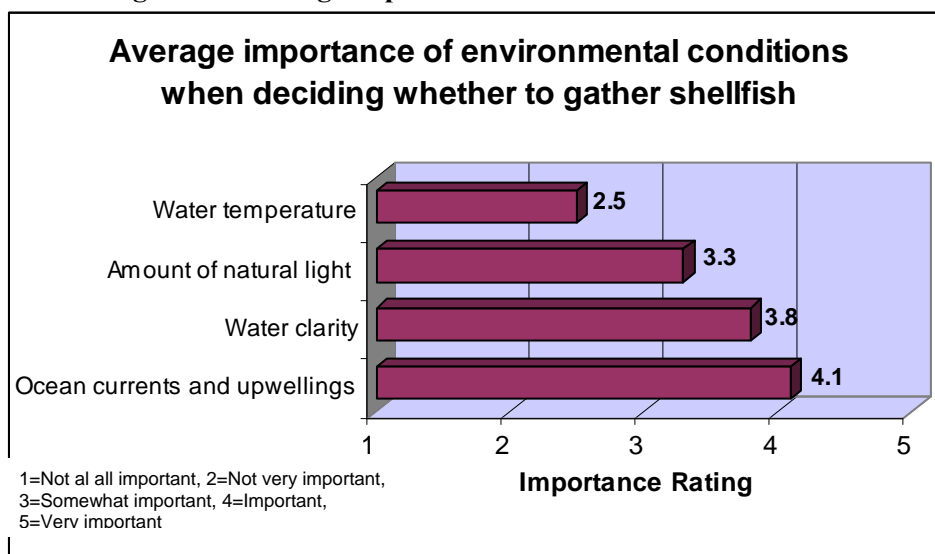
Table 3: Weather conditions for gathering clams and mussels

Weather conditions	Percent of respondents providing this response
Clear and calm	85%
Cloudy and calm	79%
Clear with wind	62%
Cloudy with wind	31%
Raining	21%
Snowing	18%

Respondents were also asked an open-ended qualitative question about when children should avoid gathering shellfish. Common responses were that children should not gather shellfish when the weather is stormy or windy, because children can slip and fall or become ill from, for example, frostbite or hypothermia.

Respondents were asked to rate the importance of water temperature (question 42), water clarity (question 43), ocean currents and upwellings (question 44), and the amount of natural light (question 46) to their decision to gather shellfish. Respondents used a 5-point scale with the following response options: 1=Not at all important, 2=Not very important, 3=Somewhat important, 4=Important, and 5=Very Important. The mean response for each condition is displayed in Figure 9. This figure shows that water temperature is the least important with an average rating among respondents of 2.5 (between “not very important” and “somewhat important”) and ocean currents and upwelling’s is the most important with an average rating of 4.1, indicating that overall, or on average, respondents rated this environmental condition as “important” when deciding whether to gather shellfish.

Figure 10. Average importance of environmental conditions



This graph (Fig. 10) helps in understanding an array of indicators used by local residents in their decisions on shellfish harvest. These indicators mostly converge with the conventional scientific knowledge and are confirmed as some of the factors influencing growth of Algae blooms. Whereas no respondents provided an explanation on how these indicators effect the growth of Algae and presence or absence of toxin, correlation of rating of importance of the shown indicators with conventional science is significant.

Perceptions of Shellfish Quality (Questions 26, 27, 28, 29)

Question 26 asks respondents if shellfish are different today than they were 20 years ago. Responses to this question were quite mixed with 48% saying yes, 38% saying no, and 15% indicating they did not know. Among Alaskan respondents, 73% said yes, 18% said no, and 9% said they did not know (see Figure 10A). Among Russian respondents, 56% said yes, 17% said no, and 27% said they did not know (see Figure 10B). Thus, Alaskan respondents were more likely to indicate a change in shellfish quality over the past 20 years. Among all respondents, those that said, “yes” were then asked how shellfish were different. Many felt shellfish are now smaller, some felt they are now also scarcer, and a few felt that they have accumulated more toxins. Respondents were also asked to indicate, in question 27, how clams are different today from when they were a child. Most respondents indicated that clams are now smaller; however, a few respondents said they are bigger and still others responded that they are the same or talked about their relative scarcity rather than their size (see Figure 10C). Regardless of their age, Alaskan and Russian respondents were most likely to

mention that clams are smaller nowadays.

The range of answers to these questions can be explained by the way the questions were formulated. The intention was to avoid any “lead on” answers. The word “different” is neutral but can lead to a variety of answers. Despite these variations, most of the respondents indicated that they have noticed some change in regards to shellfish and the change is perceived as negative (smaller size and/or scarcity).

Figure 11A. Are shellfish different today than 20 years ago? (Alaskan Respondents)

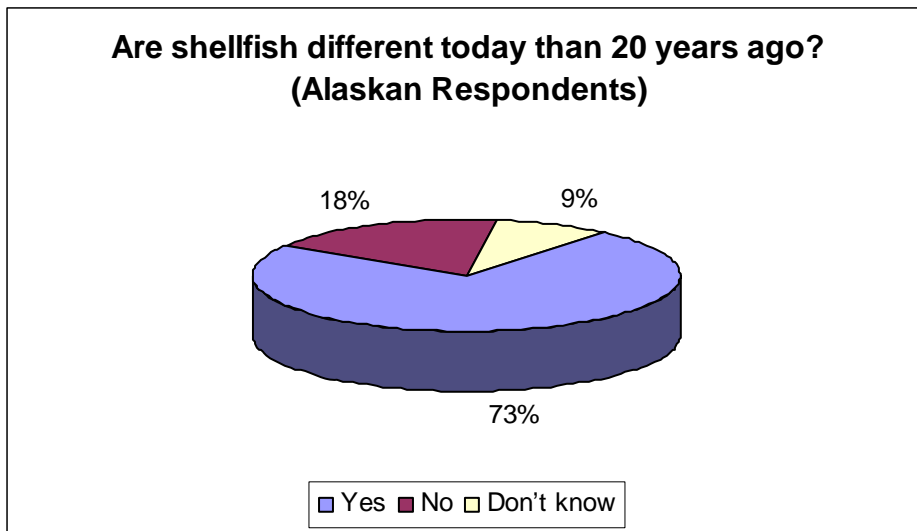


Figure 11B. Are shellfish different today than 20 years ago? (Russian Respondents)

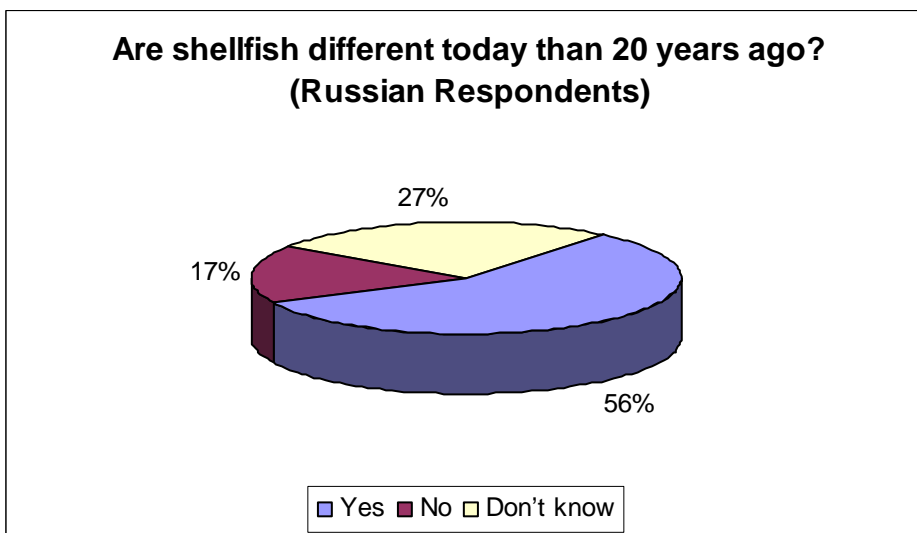
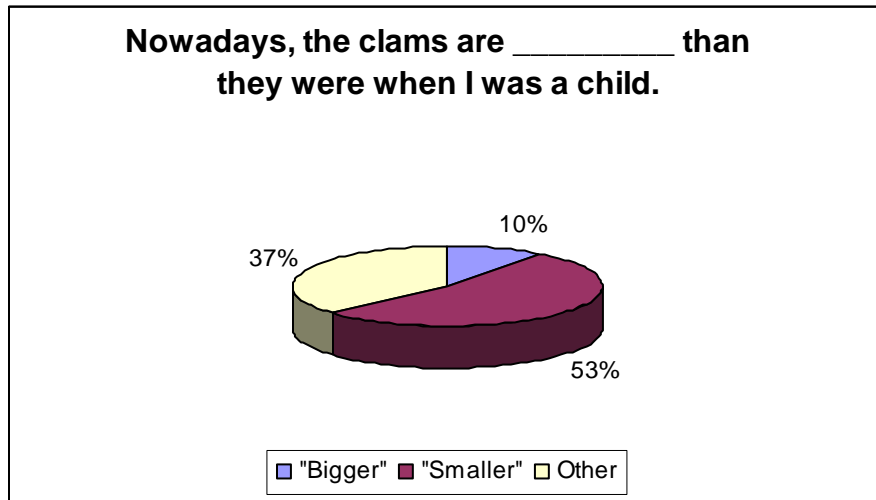


Figure 11C. Nowadays, the clams are _____ than they were when I was a child.



Respondents were also asked to list the three most important things to remember when deciding if a clam *is not* good to eat (question 28) and the three main qualities that indicate that a clam *is* good to eat. Respondents reported several indicators of shellfish safety, including time of collection, location of collection, its smell and visual appearance (size, color), and whether or not it is alive. In addition, four out of 13 Alaskan respondents (31%) pointed to Red Tide warnings as a reason not to eat shellfish. None of the Russian respondents mentioned Red Tides as a reason.

Shellfish Collection and Preparation Habits

The following section describes where respondents go to collect shellfish, their favorite dishes, which shellfish respondents avoid, and common methods of preparing shellfish.

Collecting Habits (Questions 41, 49, 51)

Question 49 asks respondents which beach they go to for collecting shellfish. Among Alaskan respondents, Spit Beach was the most common response while Gavanka Creek, Ladyginkoy Creek, and Kitovy Bay were the most common responses from the Russian respondents. When asked which shellfish they thought they would find if they went out today and where to look for them, several respondents thought they would find butter clams, and a few mentioned cockle shells, and mussels. Alaskan respondents who disclosed a location mainly pointed to Spit Beach, while Russian respondents mainly said they would look near their settlement or at Kitovy Bay.

Respondents were also asked, "If your community were not able to gather shellfish any more for

some reason, how big an impact do you think that would have on the community?” Respondents rated the potential impact using the following 5-point scale: 1=None, 2=Not much, 3=Somewhat big, 4=Pretty big, and 5=Very big. The mean (average) response was 2.95 (Somewhat big), and responses ranged from None (i.e., no impact) to Very Big (i.e., a very large impact). When broken out by type of respondent, the average impact was slightly greater among Alaskan residents (3.23) than among Russian residents (2.83). However both of the averages generally represent a response of “Somewhat big” for the two groups.

Favorite Shellfish and Traditional Foods (Questions 22, 23, 30, 31, 32, 39, 40)

Respondents were asked to rate how much shellfish they eat compared to other food that they eat on a 5-point scale with the following response options: 1=None, 2=Not much, 3=Some, 4=Quite a bit, and 5=A lot. The mean response for all respondents was 2.0, or “Not much.” The mean response was slightly greater among Alaskan respondents (2.23) than among Russian respondents (1.9), but the average amount of shellfish each group eats compared to other foods is still considered to be “Not much.”

In response to a fill-in-the-blank question (question 22) that read, “My favorite shellfish are....,” respondents reported a variety of favorite shellfish, of which clams, mussels, and chimigi were especially popular. Respondents were also asked (question 23) to specify which species of shellfish they would always let their family eat and why. Again, clams, mussels, and chimigi were repeated, but there were many other responses as well. In terms of why they would always let their family eat a particular shellfish species, individuals often reasoned that they have always eaten these species and/or know them to be safe.

Question 32 asked respondents to report the best traditional foods that come to mind. While many respondents associated fish, seal, and other non-shellfish dishes with traditional foods, a few respondents mentioned shellfish in their answer. Question 30 asked respondents to complete the sentence, “When I eat our traditional food it makes me feel...” Responses to this question were overwhelmingly positive, with some people reporting that it made them feel closer to their culture and traditions, and others simply saying it made them feel satisfied. Many respondents also indicated that people say a person who eats a lot of shellfish will be happy and healthy.

Shellfish to Avoid (Questions 5, 24)

One of the qualitative questions (question 24) asked respondents which species of shellfish they

would *not* let their family eat and why. Some of the Alaskan respondents said they would not let their family eat mussels due to safety concerns, but the data show none of the Russian respondents listed any species of shellfish to avoid, suggesting that they would let their family eat any type of shellfish. When asked if they know anyone who still eats mussels, 81% of all respondents said yes, and 19% said no.

Shellfish Preparation (Questions 4, 33, 34, 35, 37, 38, 39)

One of the early survey questions (question 4) asked respondents how they prepare their clams. A variety of methods were mentioned, including frying, steaming, baking, chowder, stewing and eating them raw. Many Russian respondents reported cooking clams and baking them in an oven or on an open fire, while Alaskan respondents were more likely to fry them or make chowder. Differences between Russian and Alaskan responses also conveyed the complexity of the dishes (or cuisine) for the Russian residents. In discussing their preparation methods, for example, they used local words that described specific ingredients, such as “glazki” (meaning “little eyes”). Finally, in their responses to question 4, none of the respondents mentioned that the way they prepared their clams was intended to eliminate toxins.

A series of questions that asked about storing and eating shellfish revealed only 12% of respondents reported having shellfish in their freezer at the time of the interview, while the other 88% said they did not. None of the Russian respondents reported having shellfish in their freezer. Thus, the overwhelming majority (88%) of respondents reported using only fresh shellfish. Respondents were also asked how often they prepare shellfish for their family (question 35). Alaskan respondents tend to prepare shellfish for their family on a weekly or monthly basis, while Russian respondents do so less often, reporting yearly or never.

The majority of Alaskan respondents (92%) reported getting shellfish from other areas. King Cove was the most common area from which they reported getting shellfish. Almost half (46%) of the Alaskan respondents reported sending shellfish to other areas, and most of those who did, said they sent it to Anchorage. None of the Russian respondents reported sending shellfish to other areas, which makes sense since Nikolskoye is an isolated community with poor transportation.

As Figure 15 shows, when respondents were asked whether they eat more store bought food or traditional food, 80% said store bought, 12% said traditional, and 7% said both. Alaskan respondents

were less likely to eat store bought food than Russian respondents (64% vs. 87%) and more likely to eat traditional food (36% vs. 3%). Qualitative responses to question 39 showed common reasons for eating more store bought food included convenience and the fact that there is not a sufficient amount of traditional food available. Several respondents thought traditional foods were healthier and would prefer them were they more readily available. The most common reason given for eating more traditional food was its affordability.

Figure 12. Do you eat more store bought food or more traditional food?



Below are three tables summarizing answers of all respondents. The answers are segregated by the main topics of the survey: 1.) Learning and Teaching about Shellfish; 2.) Indicators of Shellfish Safety; and 3.) Shellfish Collection and Preparation Habits.

Table 4: Summary of responses - Learning & Teaching about Shellfish

Learning and Teaching about Shellfish Survey Item	Most Frequent Response		
	Alaskan respondents	Russian respondents	All respondents
2. Do your kids enjoy clam digging (yes/no)?	Yes (90%)	Yes (86%)	Yes (89%)
6. Who taught you about shellfish?	Family member (77%)	Family member (70%)	Family member (72%)
7. Do you have kids (yes/no)?	Yes (85%)	Yes (93%)	Yes (90%)
8. Have you taught kids about shellfish (yes/no)?	Yes (91%)	Yes (71%)	Yes (79%)
9. What information do you think would be important to share with kids learning about shellfish?	Red Tides (31%)	Where/when to gather (60%)	Where/when to gather (39%)
10. Have you heard any traditional stories/tales about shellfish (yes/no)?	No (50%)	No (83%)	No (74%)

11. Do you think Aleut people have always eaten shellfish (yes/no)?	Yes (83%)	Yes (97%)	Yes (93%)
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Table 5: Summary of Responses – Indicators of Shellfish Safety

Indicators of Shellfish Safety Survey Item	Most Frequent Response		
	Alaskan respondents	Russian respondents	All respondents
13. The best season to collect shellfish is:	Winter months (100%)	Spring months (90%)	Spring months (71%)
14. When the tide is low is it the only condition important for the collection of shellfish (yes/no)?	Yes (75%)	Yes (97%)	Yes (91%)
15. Is water temperature important to you when you decide to gather shellfish (yes/no)?	Yes (75%)	No (85%)	No (63%)
16. Is air temperature important to you when you decide to gather shellfish (yes/no)?	Yes (53%)	No (76%)	No (67%)
19. I don't think that kids should be gathering shellfish when the weather is _____.	Cold (40%)	Bad (45%)	Bad (44%)
20. In a month like this I _____ ask kids to collect shellfish (would/would not).	Would (80%)	Would not (97%)	Would not (78%)
21. What are the months that you collect shellfish?	October to May/Months with "r" (30%)	-	-
26. Are shellfish different today than 20 years ago?	Yes (73%)	Yes (56%)	Yes (48%)
27. Nowadays the clams are _____ than they were when I was a child.	More scarce (27%)	Smaller (74%)	Smaller (57%)
28. The three most important things to remember when deciding if a clam is not good are:	Time of year (54%)	Size/Location of collection (75%)	Size/Location of collection (49%)
29. What are the three main qualities that would tell you that the clam is good to eat?	Time of year (46%)	Size (64%)	Size (45%)

Table 6: Summary of Responses – Shellfish Collection & Preparation Habits

Shellfish Collection and Preparation Habits Survey Item	Most Frequent Response		
	Alaskan respondents	Russian respondents	All respondents
4. How do you prepare your clams?	Fried (62%)	Baked (50%)	Baked (35%)

5. Do you know of anyone who still eats mussels (yes/no)?	No (62%)	Yes (100%)	Yes (81%)
22. My favorite shellfish are _____.	Clams (90%)	Mamai (33%)	-
23. I would always let my family eat _____ because _____.	Butter clams (60%)	Mussels (53%)	Mussels (37%)
24. I would not let my family eat _____ because _____.	Mussels (30%)	-	-
30. When I eat our traditional food it makes me feel _____.	good/great (38%)	that it is delicious (29%)	that it is delicious (20%)
31. People say that a person who eats a lot of shellfish will or is _____.	happy/healthy (18%)	healthy (33%)	healthy (29%)
32. What is the best traditional food that comes to mind first?	fish (46%)	seal (27%)	seal (19%)
33. Do you have shellfish in your freezer (yes/no)?	No (62%)	No (100%)	No (88%)
34. Do you use only fresh shellfish (yes/no)?	Yes (62%)	Yes (100%)	Yes (88%)
35. How often do you prepare shellfish for your family?	Monthly (54%)	Yearly (48%)	Yearly (40%)
37. Do you get shellfish from other communities/areas (yes/no)?	Yes (92%)	No (97%)	No (70%)
38. Do you send shellfish from here to other places (yes/no)?	No (54%)	No (100%)	No (86%)
39. Do you eat more store bought food or more traditional food?	Store bought (64%)	Store bought (87%)	Store bought (80%)
40. Compared to other food that you eat, how much shellfish do you eat?	Not much (62%)	A little/Not much (57%)	A little/Not much (58%)
41. If your community were not able to gather shellfish any more for some reason, how big an impact do you think that would have on the community?	Somewhat big (31%)	Somewhat big (77%)	Somewhat big (63%)
49. What beach do you go to collect [shellfish]?	Spit Beach (62%)	Gavanka/Ladyginkoy (87%)	-

DISCUSSION

This project aimed at development of complementary relationships between scientific research and traditional knowledge and between natural and social sciences that would improve understanding of the risks of Paralytic Shellfish Poisoning to human health in the Aleut communities and would help devise a better response system than if the conclusion had been based exclusively on the findings of one knowledge system or one discipline.

The central question for general discussion is how local and traditional knowledge can inform scientific research to help formulate new hypotheses, prove or disapprove the existing ones, and to

point to new research needs. The research on local and traditional knowledge in this project will be explored in relation to this question.

The hypotheses tested by the investigators were:

1. Local and traditional knowledge on safe harvesting of bivalves in the Aleut region is not accurate or sufficient due to climate change impacts
2. Local residents will change their harvesting behavior if educated on the causes and qualities of PSP
3. A low cost monitoring system can be established and run by the communities

It was assumed that local and traditional knowledge existed in the communities and that climate change affected application of this knowledge.

The main project objectives were:

1. Educate local residents about causes, characteristics, and environmental conditions, including possible impacts of climate change, for occurrence of PSP in bivalves and associated health risks
2. Perform baseline assessment on occurrence and distribution of PSP at selected locations in the Aleutian and Commander Islands by trained local technicians using Jellett Rapid Test kit, a commercial antibody-based qualitative test, and confirm test results with Jellett Biotek laboratory, as well as compare its accuracy with three other methods: Mouse bioassay, Receptor Binding Assay, and High Performance Liquid Chromatography with Fluorescence Detection
3. Conduct a survey on local and traditional knowledge to determine a baseline knowledge existing in Aleut communities and assess its efficiency in protecting local harvesters from paralytic shellfish poisoning
4. Develop a community-based monitoring system based on the recommendations derived from the findings of objectives 1 and 2.

The uniqueness of this project is in its effort to combine biological testing and sociological survey to achieve the stated objectives. Reaching a symbiotic relationship was not easy and the traditional knowledge part had to be re-designed several times. Such multidisciplinary research is an emerging trend and some flexibility is important as there is not much prior experience that can be drawn upon.

This project was invaluable in developing a successful program on establishing a community-based monitoring network in six coastal villages of Alaska, Kamchatka and Chukotka (the Bering Sea Sub-Network: International Community-based Observation Alliance for Arctic Observing Network (BSSN) National Science Foundation Award # 634079, PI: V. Gofman.) Two communities that participated in Paralytic Shellfish Poisoning monitoring project, Sand Point (U.S.) and Nikolskoye (Russia) joined BSSN.

The experience and findings from both projects will be shared with BEST- BSIERP Traditional Knowledge Project (NPRB, PI: H. Huntington.)

With this in mind, the following will explain how the hypotheses were investigated.

The first hypothesis stating that local and traditional knowledge on safe harvesting of shellfish in the Aleut region is not accurate or sufficient due to climate change, was not possible to prove with the type of data collected. The accuracy of predictions based on traditional knowledge is impacted by many factors, including the overall loss of traditional knowledge in communities, human industrial activities in the area, and other environmental changes. Both surveyed communities, Sand Point and Nikolskoye, have experienced substantial interferences from other cultures. While traditional knowledge still exists in these communities, it is highly fragmented. To fully explore this hypothesis one would need to investigate the occurrence of PSP 200-300 years ago when the indigenous knowledge of Aleuts was more complete. This would require additional historical and archeological data that this project did not intend to collect or compile. Supposedly, Aleuts today possess the same wealth of traditional knowledge they had 200-300 years ago, would this be sufficient to reasonably protect them from PSP? Should the answer be positive, efforts to rehabilitate Aleut traditional knowledge could be considered as part of the response system.

The project findings did prove that the existing knowledge and practices of shellfish gathering in two surveyed communities point to a likely increase in the risk of poisoning due to wide-spread distribution of toxins. While the survey results disapproved the statement that local and traditional knowledge on the safest time to harvest shellfish is based strictly on seasons, other indicators that people use may not provide sufficient information to predict the presence of toxin.

The second hypothesis was based on the notion that local residents will change their harvesting behavior if educated on the causes of PSP. The survey gave a glimpse on how this behavior is formed. The overwhelming majority of respondents reported learning about shellfish harvesting from

family members at a very young age. They also stated that children should be taught about this at a young age. These findings should be considered when education is designed. As with many other subsistence activities, a science lecture in a classroom or an office for a handful of individuals will not likely to make a change in local behavior. Tribal organizations and local health clinics should be involved in developing culturally relevant means for communicating risks of PSP. A 1996 health study on Kodiak Island pointed out that individuals who knew nothing about the lethal potential of PSP had the same frequency of reporting symptoms of PSP as those who were aware of deadly qualities of PSP. (Gessner, Schloss, 1996) This finding proves that education may not necessarily lead to the change in behavior if it is not relevant to cultural values.

The third hypothesis tested was a possibility of a cost effective community-based monitoring system that could be established to monitor PSP. Jellett Rapid Test kit was successfully used by local technicians in Sand Point and Nikolskoye. Unfortunately, it can be used only for limited screening as was discussed in Part I of this report.

LESSONS LEARNED

While the project successfully accomplished all objectives, it had to overcome some difficulties that could have been avoided. The following recommendations could be useful for future projects employing local and traditional knowledge and involving rural communities in scientific research.

1. Regardless of budget constraints, consideration should be given to training and hiring at least two local coordinators per community. That would assure that if one person leaves the project there would be a back up. Family needs in rural communities always take a precedent over a project commitment.
2. Natural/physical and social science research components' schedules should be coordinated as appropriate, so the collected data could be compared and both components could logically complement each other.
3. Communication between all project scientists is important in all stages of the study.
4. Any research involving lengthy population surveys requires well defined and funded promotional work in the community with active involvement of local organizations, such as tribal councils, in recruiting participants.

CONCLUSIONS

The findings of the survey point to the following conclusions:

- The existing knowledge and practices of shellfish gathering in two surveyed communities coupled with the changes in the environment that have an effect on the distribution of PSP Toxin due to climate change impacts, such as loss of sea ice, changes in storms and currents, just to name a few, will lead to a likely increase in the risk of poisoning from paralytic shellfish toxins in the future if no testing program is made available for communities. While the survey sample was rather small, especially in Sand Point, the selected respondents represented the most active and presumably the most knowledgeable part of population and the knowledge that they demonstrated was fragmented and inconsistent and could be rendered increasingly unreliable with progression of climate change effects.
- Culturally relevant outreach and education programs need to be developed in cooperation with tribal councils and health clinics. This education should not undermine the traditional knowledge but rather promote traditional ways of learning about the environment complemented by additional knowledge. Special attention should be paid to teaching young children.
- In the communities with high harvest of shellfish and proven elevated levels of PSP Toxin, a monitoring system should be established as soon as possible utilizing established quantitative testing methods. The Jellett Rapid Test kit could be recommended as an inexpensive screening tool for obtaining fast qualitative results in the areas where no toxin has been found, such as Nikolskoye, and as a first step screening but due to its limitation in the accuracy of positive readings (82% of false positive but almost no false negatives), other testing methods need to be employed if any levels of PSP are detected by initial screening by JRT. Improvement of JRT or development of another rapid test that could provide more accurate reading is desirable as it would provide effected communities with an inexpensive and easy to use safety tool.
- Shellfish is an important subsistence resource that has been part of the Aleut diet for millennia. Any efforts to make this harvest safer will not only protect human health but also will help preserve their traditional culture.

The survey conducted in two villages exceeded the scope of work originally planned in the proposal. However, it would have not been possible to arrive at any meaningful conclusions without developing a survey tool and conducting at least the minimum quantity of interviews, which was limited by the

available resources and the time line. Overall, the questions related to local and traditional knowledge of shellfish in Aleut communities were investigated and results were summarized.

PUBLICATIONS

N. Tatarenkova, "Survey Results of the Aleut Traditional Knowledge on Subsistence Use of Bivalves in the Commander Islands" in "Krashennikov Reading, Kamchatka: Events, People", Issue XXV, Petropavlovsk-Kamchatsky, 2008 (Publication is expected in July, 2008)

OUTREACH

- Presented project information and updates in Aleut International Newsletters: June 2007, Volume/Year 2, Issue 2; September 2007, Volume/Year 2, Issue 3; December 2007, Volume/Year 2, Issue 4
- Press release in Nikolskoye Newspaper, 2006, (Appendix O)
- Project information in Protected (zapovednaya) Territory, October 2006 issue, UNDP publication for the Russian Far East
- Presentations and Conference Proceeds (Tatarenkova) " Monitoring for Paralytic Shellfish Toxin on Bering Island" at the VII International Conference " Preservation of Biodiversity of Kamchatka and Adjacent Seas" organized by the Kamchatsky Branch of the Pacific Geography Institute, Petropavlovsk-Kamchatsky, November 2006
- A newspaper article by project participant Charly Wilson "PSP in Motion" (Appendix R)
- Presentation and Conference Proceeds (Taterenkova) "Results of the Survey of the Aleut Traditional Knowledge on Subsistence Use of Bivalves in the Commander Islands" at the Young Scientists Conference " Far East and Asia Pacific Region in the Changing World" organized by the Institute of History, Archeology and Ethnography of the Indigenous Peoples of the Far East", May 2008
- Presentation and Conference Proceeds (Gofman, V, Osterback, D.) on the project findings at IASC/SCAR IPY Conference "Polar Research – Arctic and Antarctic Perspectives in the International Polar Year", Session "The Role of Indigenous Knowledge in Modern Polar Science", St. Petersburg, Russia, July 2008, travel funded by National Science Foundation

PART 4: OVERALL CONCLUSIONS

The project findings made an important contribution to our knowledge on distribution of paralytic

shellfish toxins and on reliability of local and traditional knowledge in the Aleut region. It was found that low levels of paralytic shellfish poison toxin are spread throughout the region in Alaska but not on Bering Island in Russia. The toxin was detected in the season (April) when it would not be normally expected. This indicated that climate change is a likely driver of the increase of occurrences of PSP in the Bering Sea region. These profound environmental changes have a great impact on subsistence harvesting, including gathering of shellfish. Local and traditional knowledge, especially in its current fragmented form, cannot equip local residents with sufficient knowledge on safe harvesting of shellfish. This project, for the first time, provided baseline information for communities to advocate for comprehensive monitoring for paralytic shellfish toxins.

ACKNOWLEDGMENTS

The North Pacific Research Board was the primary funder of this project. Other agencies donated to this study including NOAA and ADEC. We would like to express our gratitude to Trident Seafood Corporation, Sand Point Facility for donating fuel certificates for traditional knowledge survey participants. We would like to thank the following who made this research and education effort possible: Keri Baugh, Charly Bendixen, Craig Bendixen, Reid Brewer, Mike Brubaker, Vernon Byrd, Pedro Costa, Peter Devine, Lucretia Fairchild, Connie Fredenberg, Jim Gamble, Steve Gilbertson, Daniel Gould, Arlene Gundersen, Joel Helm, D. Boone Hodgins, Karen Holser, Elena Ivchenko, Lorraine Jonsson, Per Jonsson, Joanna Karlsen, Tina Kasaeva, Scott Kerr, Delores Kochuten, Ray Kochuten, Chris Krenz, Kathi Lefebvre, Aquilina Lestenkof, Mandy Lindeberg, Yvonne Lukin, Chris Mercurief, Shelly Nance, Anne Morris, Mike Nemeth, Nikolai Pavlov, Dana Osterback, Peggy Osterback, Karen Pletnikoff, Desirae Roehl, Mike Schwitters, Antone Shelikoff, Art Sowls, Amanda Squartsoff, Natalia Tatarenkova, Anfesia Tutiakoff, Ivan Vozhikov, Janice Walton, Paula Williams, Andrew Zaochney, Tyra Zeman, Phil Zavadil and the AIA and APIA Boards of Directors.

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- Fortuine, R. 1989. *Chills and Fever: Health and Disease in the Early History of Alaska*. University of Alaska Press. Fairbanks, Alaska. 395 pages.

APPENDIX A: PSP TESTING DATA ENTRY SHEET

The data is entered on the following table. Note the instructions at the bottom of the table.

**PARALYTIC SHELLFISH POISON
MONITORING PROGRAM
DATA ENTRY SHEET**

Location (Town, village etc) _____

Sample Number	Date Collected	Species	Tissue Tested	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name

Instructions for Completing the Data Sheet

- **Location** – This is site location by town, island, village name, or other appropriate identifying location name.

- **Sample Number-** This is simply sample number 1, 2, 3 ...etc. The sample number must be written on each plastic container used in the testing procedure and on the test strip prior to processing the sample.
- **Date Collected** – This is the date the sample was actually collected from the beach.
- **Species** – Shellfish species being tested.
- **Tissue Tested** – The types tissues for testing are:
 - Whole – the entire shellfish are ground up (A minimum of 3 shellfish will be used for larger shellfish even though only 150 grams will be used for testing).
 - Gut ball – Digestive gland.
 - Body – The meat tissue after all the internal organs have been removed.
- **Sample Location** – Actually site where the shellfish were collected (Local name, GPS information if available)
- **Frozen** – Was the sample frozen prior to testing, Yes or No? (If time is not available for testing, freezing the sample in a standard zip-lock bag is acceptable, but perform the test as soon as time is available)
- **Date Tested-** This is the actual date the test is being performed.
- **Results 40 µg** – The test results run at the standard 40 µg level.
 - If the test results are less than 40 µg, put a - in the box.
 - If the test results are greater than 40 µg, put a + in the box.
 - If the test results are invalid, put a 0 in the box.
- **Results 80 µg** – The test results run at the 80 µg level (Run the 80 µg only if the first test results are above 40 µg).
 - If the test results are less than 80 µg, put a - in the box.
 - If the test results are greater than 80 µg, put a + in the box.
 - If the test results are invalid, put a 0 in the box.
- **Tester Name** - Print the first and last name of the sample tester.

IMPORTANT NOTE: Following the test, freeze the unused sample and extract in a single Ziploc bag. Be sure the sample town location and sample number are on the bag. (Discard the small dark plastic vial) Save the Jellet test strip in a dry secure location.

APPENDIX B: PSP Test Data by Species

Test data by species and including location, blind test sample number, dates and tester's name and including results from mouse bioassay, Jellett Rapid Testing Kit, Receptor Binding Assay (RBA) and High Performance Liquid Chromatography with Fluorescence Detection (HPLC).

Sample Location and Number	Blind Test No.	Date Collected & tested	Species	Jellett Results 40 µg	Tester Name	Mouse bioassay µg STX	ELISA µg STX Abraxis	RBA µg STX NOAA	HPLC µg STX Qilliam	HPLC µg STX Oshima	HPLC % GTX1, 4	HPLC % NEO	HPLC % dcGTX 2,3	HPLC % dcSTX	HPLC % GTX2, 3	HPLC % B1	HPLC % STX	HPLC % C1,2
Adak #1, Clam Lagoon	85	7-15-07 7-17-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 33		3.82	1.60	1.22	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Adak #2, Bay of Isles		7-9-07 7-9-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer													
Adak #3, Harbor, central		7-11-07 7-11-07	blue mussel <i>Mytilus trossulus</i>	positive	Reid Brewer													
Adak #4, Chisak Bay		7-13-07 7-13-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer													
Aiktak Island #1	31	9-2-06 10-11-06	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	none		2.72	4.44	3.30	0.00	0.00	0.00	0.00	39.64	0.00	0.00	60.36
Akutan #3, between	22	7-23-06 8-19-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	33		26.75	67.31	49.94	50.77	0.00	0.00	0.00	28.28	0.00	1.92	19.02
Akutan #5, 1/4 mile west	24	7-23-06 8-19-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 32	9.8	18.45	47.83	34.96	58.32	0.00	0.00	0.00	21.45	0.00	0.00	20.23
Akutan, #6 between	25	10-6-06 11-5-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	none		3.84	3.25	2.47	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00

Akutan #7, west of Trident	26	10-6-06 11-5-06	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32			0.00	0.00	0.00								
Akutan #8, West of Trident	62	2-7-07 2-16-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none			0.00	0.00	0.00								
Akutan #9, between	64	2-7-07 2-16-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32			0.00	0.00	0.00								
Akutan #10, between	63	3-12-07 3-14-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32			0.00	0.00	0.00								
Akutan #11, West of Trident	65	3-12-07 3-14-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 31			0.00	0.00	0.00								
Akutan #12, between	79	4-17-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 31			0.00	0.00	0.00								
Akutan #13, west of Trident	80	4-17-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 31			0.00	0.00	0.00								
Akutan #14, west of Trident	81	5-18-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 32			0.00	0.00	0.00								
Akutan #15, between	82	5-18-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 31			0.00	0.00	0.00								
Akutan #16, between	88	6-6-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32			0.00	0.00	0.00								
Akutan #17, west of Trident	89	6-6-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 33			0.00	0.00	0.00								
Akutan #18, between	90	8-2-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 31			10.64	20.38	15.47	43.14	0.00	0.00	0.00	27.12	0.00	5.54	24.21

Akutan #19, west of Trident Amchitka #1	91	8-2-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample	B. Wright	none		11.97	16.05	11.77	72.61	0.00	0.00	0.00	27.39	0.00	0.00	0.00
Atka #1	50	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.00	0.00	0.00								
Atka #2	51	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.00	0.00	0.00								
Atka #3	52	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.70	0.00	0.00								
Atka #4, Old Village	66	4-23-07 4-30-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 33		0.00	0.00	0.00								
Atka #5, Dump Beach	67	4-23-07 4-30-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								
Atka # 6, Martin Bay	69	5-17-07 5-21-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
Atka #8, Korovin Bay	83	6-14-07 ?	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 31		0.00	0.00	0.00								
Adka #9		7-16-07 7-16-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer													
Atka #10, Dump Bay	86	8-31-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
Atka #11, Dump Bay	87	7-29-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 31		0.00	0.00	0.00								

Attu #1, Attu Island		6-25-07 6-25-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Reid Brewer														
Chowiet Is. #1, Semidi	18	9-5-06 10-11-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	none													
False Pass #1	19	9-26-06 10-3-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	none		10.07	7.46	6.61	0.00	0.00	0.00	0.00	64.48	0.00	35.52	0.00	
False Pass #2, Peter Pan dock	72	5-30-07 6-1-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	≤ 32		7.78	24.67	18.66	44.33	0.00	0.00	0.00	39.20	0.00	4.53	11.94	
False Pass #3, Peter Pan King	84	7-14-07 7-16-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	≤ 31		7.19	2.88	2.19	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	
Cove #10, Harbor King	58	3-29-07 4-5-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Charly Bendixen	none		10.77	43.04	32.23	51.78	0.00	0.00	0.00	35.37	0.00	3.27	9.58	
Cove #11, Harbor Nelson Lagoon #1, lagoon	78	5-25-07 5-27-07 5-28-07 6-12-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	Not enough sample			≤ 32		13.81	17.95	13.18	68.06	0.00	0.00	0.00	31.94	0.00	0.00	0.00
Nikolski #1, SW Umnak	49	4-1-07 4-5-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Bruce Wright		≤ 32		0.00	0.00	0.00								
Nikolskoy e #1, Russia,	27	8-10-06 8-10-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Ivan Vozhikov Natalia		≤ 33		0.00	0.00	0.00								
Nikolskoy e #3, Russia,	29	8-9-06 8-11-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative @ 40 µg	Ivan Vozhikov Natalia		≤ 32		3.54	0.00	0.00								
Nikolskoy e #4, Russia,	29 (same sample as Nikolskov	8-9-06 8-11-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative @ 80 µg	Ivan Vozhikov Natalia		≤ 32		3.54	0.00	0.00								

Nikolskoye #6, Gaup		9-19-06 9-19-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #7, Ryf Cape		9-21-06 9-21-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #8, Ryf Cape		11-9-06 11-9-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #9, Ryf Cape		12-21-06 12-22-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #10, Ryf Cape		1-19-07 1-21-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #11, Gaup		2-26-07 2-26-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #12, Ryf Cape		3-18-07 3-19-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #13, Ryf Cape		4-7-07 4-23-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #14, Gaup Old	4	5-6-07 5-6-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Harbor #1, Boat		8-9-06 9-26-06	blue mussel <i>Mytilus trossulus</i>	positive	Ray RaLonde	none		16.67	15.33	13.71	0.00	0.00	0.00	0.00	61.46	0.00	38.54	0.00
Ouzinkie #1, Sourdoug	55	3-14-07 3-16-07	blue mussel <i>Mytilus trossulus</i>	negative	Ray RaLonde	none		5.86	4.27	4.27	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Prince William Sound #2	94	8-1-07 8-2-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 31		0.00	0.00	0.00								
Prince William Sound #3	93	8-12-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	none		0.00	0.00	0.00								

St. George #4		3-13-07 4-10-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32												
St. Paul #1, Seal Point, St. Unalaska #1, Summer	68	5-16-07 5-19-07	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 32		4.01	6.45	5.68	0.00	0.00	0.00	0.00	67.04	0.00	32.96	0.00
Unalaska #3, head of	33	7-18-06 7-18-06	blue mussel <i>Mytilus trossulus</i>	positive	Anfesia Tutiakoff	55		51.22	121.43	91.92	47.14	0.00	0.00	0.00	32.76	0.00	5.15	14.95
Unalaska #7, small boat	35	7-19-06 7-19-06	blue mussel <i>Mytilus trossulus</i>	positive	Anfesia Tutiakoff	none	134.4	301.70	832.66	628.67	35.65	2.96	0.00	0.00	27.36	1.35	1.79	30.90
Unalaska #10, Little South	57	3-6-07 3-8-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer	none	56.4	603.09	47.69	47.94	0.00	0.00	0.00	5.74	0.00	0.00	94.26	0.00
Unalaska #11, Summer's		4-20-07 4-20-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer													
Unalaska #12, Morris		5-15-07 5-15-07	blue mussel <i>Mytilus trossulus</i>	positive	Reid Brewer													
Unalaska #13, Chernofsk		6-18-07 6-18-07	blue mussel <i>Mytilus trossulus</i>	positive	Reid Brewer													
Unga #1, Unga Village	71	7-22-07 7-22-07	blue mussel <i>Mytilus trossulus</i>	positive	Reid Brewer													
Akutan #1, 1/4 mile west King Cove #1, Lagoon	20	5-27-07 5-30-07	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	38		17.65	110.52	83.27	52.82	0.00	0.00	0.00	31.24	0.00	4.69	11.25
King Cove #4, Lagoon	11	7-23-06 8-19-06	butter clam <i>Saxidomus giganteus</i>	positive	B. Wright	none		7.13	13.82	10.16	65.36	0.00	0.00	0.00	34.64	0.00	0.00	0.00
		4-22-06 6-23-06	butter clam <i>Saxidomus giganteus</i>	positive	Dana Osterback	none		44.59	46.65	47.14	0.00	0.00	0.00	11.40	0.00	0.00	88.60	0.00
		8-3-06 8-26-06	butter clam <i>Saxidomus giganteus</i>	positive	Ray RaLonde	43												

King Cove #5, Harbor	32	10-2-06 10-4-06	butter clam <i>Saxidomus giganteus</i>	positive	B. Wright	64													43.46	59.67	56.48	15.43	0.00	0.00	3.49	12.48	0.00	68.60	0.00	
King Cove #6, Lagoon	60	2-8-07 2-15-07	butter clam <i>Saxidomus giganteus</i>	positive	Bruce Wright	37													27.84	32.68	32.01	0.00	0.00	0.00	7.43	20.30	0.00	72.27	0.00	
King Cove #7, Lagoon	59	2-07 3-14-07	butter clam <i>Saxidomus giganteus</i>	positive	Bruce Wright	31													41.58	48.06	47.40	0.00	0.00	0.00	5.59	14.42	0.00	79.99	0.00	
King Cove #8, Lagoon	61	3-21-07 3-27-07	butter clam <i>Saxidomus giganteus</i>	positive @ 40 µg	Bruce Wright	65													49.60	52.98	53.12	0.00	0.00	0.00	4.75	0.00	14.14	81.10	0.00	
King Cove #9, Lagoon	61	3-21-07 3-27-07	butter clam <i>Saxidomus giganteus</i>	positive @ 80 µg	Bruce Wright	65													49.60	52.98	53.12	0.00	0.00	0.00	4.75	0.00	14.14	81.10	0.00	
King Cove #12, Harbor		12-17-07 12-17-07	butter clam <i>Saxidomus giganteus</i>	positive	Charly Bendixen	43																								
Ouzinkie #3, Sourdoug		3-13-07 3-16-07	butter clam <i>Saxidomus giganteus</i>	positive	Ray RaLonde	51																								
Port Lions #1, Airport	100	3-14-07 3-16-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff	68													60.86	77.84	77.65	0.00	14.74	0.00	4.80	0.00	0.00	80.47	0.00	
Port Lions #3, Airport	101	5-5-07 5-5-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff Yvonne	none													21.58	33.48	33.29	0.00	22.62	0.00	5.52	0.00	0.00	71.86	0.00	
Port Lions #6, Airport	103	6-18-07 6-24-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff Yvonne	≤ 30													20.07	39.09	33.59	42.17	0.00	0.00	2.90	17.87	0.00	37.06	0.00	
Port Lions #9, Airport	106	7-2-07 7-12-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff Yvonne	42													20.16	48.22	48.81	44.56	0.00	37.90	0.00	12.68	0.00	4.85	0.00	
Port Lions #12, Airport	97	7-31-07 8-5-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff Yvonne	none	84.4												121.43	257.19	198.29	39.86	2.43	0.00	0.38	23.66	2.44	5.80	25.42	
Prince William Sound #1.	92	7-31-07 8-2-07	butter clam <i>Saxidomus giganteus</i>	negative	B. Wright	≤ 32													8.39	4.32	4.32	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	

Sand Point, #1a & 1b	6	6-22-06 6-22-06	butter clam <i>Saxidomus giganteus</i>	Invalid then positive	Dana Osterback	34			17.69	32.66	27.48	0.00	0.00	0.00	0.00	22.91	29.71	9.00	38.38
Sand Point, #4, same as		4-22-06 4-23-06	butter clam <i>Saxidomus giganteus</i>	Positive (King Cove #1)	Dana Osterback														
Sand Point #16, Spit	48	12-4-06 12-5-06	butter clam <i>Saxidomus giganteus</i>	negative	Dana Osterback	≤ 33			13.30	5.69	5.69	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Sand Point #18, Spit	40	1-19-07 4-5-07	butter clam <i>Saxidomus giganteus</i>	positive	Dana Osterback	none			27.32	61.74	53.06	22.15	0.00	0.00	2.56	30.48	0.00	27.11	17.70
Sand Point #21, Spit	73	5-17-07 5-18-07	butter clam <i>Saxidomus giganteus</i>	positive	Dana Osterback	33			21.98	48.20	40.38	40.80	0.00	0.00	0.00	28.50	0.00	30.71	0.00
Sand Point #22, Spit	74	5-18-07 5-18-07	butter clam <i>Saxidomus giganteus</i>	positive	Dana Osterback	≤ 32			25.52	38.09	31.45	46.07	0.00	0.00	4.74	26.63	0.00	22.55	0.00
Unalaska #4, Priest Rock	36	7-20-06 7-20-06	butter clam <i>Saxidomus giganteus</i>	positive	Anfesia Tutiakoff	60			36.44	96.32	73.44	48.06	0.00	0.00	0.00	25.50	0.00	6.86	19.59
Unalaska #5, Little South	37	7-20-06 7-20-06	butter clam <i>Saxidomus giganteus</i>	positive	Anfesia Tutiakoff	218	98		139.40	321.42	251.27	39.43	4.89	0.00	0.00	23.44	2.90	6.91	22.42
Unalaska #8, Little South		4-17-07 4-17-07	butter clam <i>Saxidomus giganteus</i>	positive	Reid Brewer														
Unalaska #9, Little South		4-20-07 4-20-07	butter clam <i>Saxidomus giganteus</i>	positive	Reid Brewer														
Akutan #2, 1/4 mile west King	21	7-23-06 8-19-06	littleneck clam <i>Protothaca staminea</i>	negative	B. Wright	none			0.00	0.00	0.00								
Cove #2, Lagoon		8-3-06 8-26-06	littleneck clam <i>Protothaca staminea</i>	positive	Ray RaLonde														
Ouzinkie #2, Sourdoug	56	3-13-07 3-16-07	littleneck clam <i>Protothaca staminea</i>	negative	Ray RaLonde	none			4.38	2.46	2.88	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00

Port Lions #2, Airport		3-14-07 3-16-07	littleneck clam <i>Protothaca staminea</i>	negative	Yvonne Lukin													
Port Lions #5, Airport		5-5-07 5-5-07	littleneck clam <i>Protothaca staminea</i>	negative	Amanda Squartsoff Yvonne													
Port Lions #7, Airport	104	6-18-07 6-24-07	littleneck clam <i>Protothaca staminea</i>	positive	Amanda Squartsoff Yvonne	none		4.51	4.96	9.95	0.00	0.00	86.00	14.00	0.00	0.00	0.00	0.00
Port Lions #11, Airport	96	7-2-07 7-12-07	littleneck clam <i>Protothaca staminea</i>	positive	Amanda Squartsoff Yvonne	none		17.49	23.23	51.08	0.00	0.00	96.59	3.41	0.00	0.00	0.00	0.00
Port Lions #14, Airport	99	7-31-07 8-5-07	littleneck clam <i>Protothaca staminea</i>	positive	Amanda Squartsoff Yvonne	none		45.64	81.67	180.96	0.00	0.00	97.43	2.57	0.00	0.00	0.00	0.00
Sand Point #14, Spit	46	12-4-06 12-5-06	littleneck clam <i>Protothaca staminea</i>	positive	Dana Osterback	none		16.58	3.48	4.07	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Sand Point #17, Spit	39	1-19-07 4-5-07	littleneck clam <i>Protothaca staminea</i>	positive	Dana Osterback	none		8.34	13.04	26.85	0.00	0.00	78.91	7.41	0.00	0.00	0.00	13.68
Unalaska #2, head of Old Harbor #2, Boat	34 5	7-19-06 7-19-06 8-9-06 9-26-06	littleneck clam <i>Protothaca staminea</i> cockle <i>Clinocardium sp.</i>	positive	Anfesia Tutiakoff Ray RaLonde	69 none		32.81	5.84	5.63	0.00	0.00	0.00	48.75	51.25	0.00	0.00	0.00
Port Lions #4, Airport	102	5-5-07 5-5-07	cockle <i>Clinocardium sp.</i>	positive	Amanda Squartsoff Yvonne	<32	7.8	6.06	4.44	4.65	0.00	0.00	0.00	44.43	0.00	0.00	55.57	0.00
Port Lions #8, Airport	105	6-18-07 6-24-07	cockle <i>Clinocardium sp.</i>	positive	Amanda Squartsoff Yvonne	none		15.74	35.09	36.02	43.26	0.00	39.75	0.00	13.75	0.00	3.24	0.00
Port Lions #10, Airport	95	7-2-07 7-12-07	cockle <i>Clinocardium sp.</i>	positive	Amanda Squartsoff Yvonne	none		40.70	101.58	116.13	31.53	3.40	48.54	2.49	12.22	0.00	1.82	0.00

Port Lions #13, Airport Sand	98	7-31-07 8-5-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Amanda Squartsoff , Yvonne Dana	295 57	58 23.6	146.42	271.28	323.23	26.75	3.94	50.77	5.02	11.02	0.00	2.50	0.00
Point #3, Sand	8	6-22-06 6-22-06	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Osterback			19.57	50.06	40.19	44.89	0.00	0.00	10.07	35.99	0.00	9.05	0.00
Point #24, Ivanoff Sand	76	5-23-07 5-24-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Dana Osterback	≤ 31		34.11	36.23	30.66	42.71	0.00	0.00	13.81	23.45	0.00	20.03	0.00
Point #25, Ivanoff Sand	77	5-24-07 5-24-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Dana Osterback	35		23.34	42.15	35.99	41.22	0.00	0.00	18.55	22.79	0.00	17.43	0.00
Tenass Pass #1, sea farm		7-29-06 12-2-06	cockle <i>Clinocardium</i> <i>sp.</i>	negative @ 40 µg negative	Ray RaLonde													
Tenass Pass #2, sea farm		8-15-06 12-2-06	cockle <i>Clinocardium</i> <i>sp.</i>	positive @ 40 µg positive	Ray RaLonde													
Tenass Pass #3, sea farm		9-25-06 12-2-06	cockle <i>Clinocardium</i> <i>sp.</i>	positive @ 40 µg positive	Ray RaLonde													
Tenass Pass #4, sea farm		9-19-06 12-2-06	cockle <i>Clinocardium</i> <i>sp.</i>	positive @ 40 µg positive	Ray RaLonde													
Tenass Pass #5, sea farm		10-22-06 12-2-06	cockle <i>Clinocardium</i> <i>sp.</i>	positive @ 40 µg negative	Ray RaLonde													
Tenass Pass #6, sea farm		10-2-06 12-2-06	cockle <i>Clinocardium</i> <i>sp.</i>	positive @ 40 µg positive	Ray RaLonde													
Nikolskoye #2, Russia.	28	8-9-06 8-10-06	Alaska razor clam <i>Siliqua alta</i>	negative	Ivan Vozhikov Natalia	≤ 33		0.00	0.00	0.00								

Nikolskoye #5, Russia, Sand	30	8-9-06 8-11-06	Alaska razor clam <i>Siliqua alta</i>	negative	Ivan Vozhikov Natalia	≤ 33		0.00	0.00	0.00									
Point #8, Sand		6-23-06 6-23-06	Alaska razor clam <i>Siliqua alta</i>	positive	Dana Osterback														
Point #13, Spit	45	11-6-06 12-6-06	Alaska razor clam <i>Siliqua alta</i>	positive	Dana Osterback	none		220.12	332.05	322.27	12.27	4.71	5.63	8.87	16.50	0.00	52.02	0.00	
Akutan #4, 1/4 mile west	23	7-23-06 8-19-06	soft-shell clam <i>Mya sp.</i>	positive	B. Wright	≤ 33		4.78	8.81	6.40	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Atka #7, Martin Bay	70	5-17-07 5-21-07	soft-shell clam <i>Mya sp.</i>	negative	B. Wright	≤ 33		0.00	0.00	0.00									
Craig #1, Baseball Field		9-4-06 9-26-06	soft-shell clam <i>Mya sp.</i>	positive	Ray RaLonde														
King Cove #3, Lagoon		8-3-06 8-26-06	Soft-shell clam <i>Mya sp.</i>	positive	Ray RaLonde														
Unalaska #6, Little South	38	7-20-06 7-20-06	soft-shell clam <i>Mya sp.</i>	positive	Anfesia Tutiakoff	371		79.50	225.92	172.36	43.15	3.86	0.00	0.00	21.98	3.34	3.57	24.10	
Juneau #1, Youngs	16	5-06 9-15-06	surf clam <i>Mactromeris polynyma</i>	negative	B. Wright	≤ 33		3.03	0.00	0.00									
Juneau #2, Eagle Beach	17	4-29-06 9-15-06	surf clam <i>Mactromeris polynyma</i>	negative	B. Wright	≤ 33		0.00	0.00	0.00									
Sand Point #5, Sand	9	6-23-06 6-23-06	surf clam <i>Mactromeris polynyma</i>	positive	Dana Osterback	≤ 33		7.23	3.91	3.91	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	
Sand Point #6, Sand	10	6-23-06 6-23-06	surf clam <i>Mactromeris polynyma</i>	positive	Dana Osterback	329	55.2	139.90	202.59	188.08	15.91	0.00	0.00	1.35	15.41	6.20	55.97	5.16	

Sand Point #9, Sand	14	7-13-06 7-13-06	surf clam <i>Mactromeris polynyma</i>	invalid	Dana Osterback	55			45.51	41.99	41.39	0.00	0.00	0.00	6.00	15.14	0.00	78.86	0.00
Sand Point #7, Sand		6-23-06 6-23-06	great tillin clam <i>Tellina lutea</i>	positive	Dana Osterback														

APPENDIX C: BLIND TEST DATA

Blind test data by blind test sample number and including results from **MBA**: Mouse bioassay, **JRT**: Jellett Rapid Testing Kit, a commercial antibody-based qualitative test developed and manufactured by Jellett Rapid Testing Ltd, Canada., **RBA**: Receptor Binding Assay, which measures binding of STX to rat sodium channels by the displacement of radio labeled STX, **HPLC**: High Performance Liquid Chromatography with Fluorescence Detection (HPLC).

Sample #	Species ID	Jellett			Mouse				
		Qualitative (+/-)			Bio-Assay	ELISA	RBA	HPLC	
		AK	NOAA (mini AOAC)	NOAA (Rapid Extract)	AK	Abraxis	NOAA	Qilliam	Oshima
1	Saxidomus giganteus	+			43		28.84	61.30	52.88
2	Mya sp.	+					31.66	28.95	29.10
3	Mya sp.	+					24.44	52.18	42.41
4	Mytilus trossulus	+	+	+			16.67	15.33	13.71
5	Clinocardium sp.	+				7.8	12.68	5.68	6.04
6	Saxidomus giganteus	+			34		17.69	32.66	27.48
7	Mytilus trossulus	+			33	35.8	52.25	42.36	42.12
8	Clinocardium sp.	+			57	23.6	19.57	50.06	40.19
9	Mactromeris polynyma	+			33		7.23	3.91	3.91
10	Mactromeris polynyma	+			329	55.2	139.90	202.59	188.08

11	Saxidomus giganteus	+				44.59	46.65	47.14	
12	Mytilus trossulus	-	-	-	< 33	0.00	0.00	0.00	
13	Mytilus trossulus	-				0.00	0.00	0.00	
14	Mactromeris polynyma	invalid			55	45.51	41.99	41.39	
15	Mactromeris polynyma	+	+	+	<32	30.66	92.81	71.21	
16	Mactromeris polynyma	-			<33	3.03	0.00	0.00	
17	Mactromeris polynyma	-			<33	0.00	0.00	0.00	
19	Mytilus trossulus	+				10.07	7.46	6.61	
20	Saxidomus giganteus	+				7.13	13.82	10.16	
21	Protothaca staminea	-				0.00	0.00	0.00	
22	Mytilus trossulus	+			33	26.75	67.31	49.94	
23	Mya sp.	+			<33	4.78	8.81	6.40	
24	Mytilus trossulus	+	+	+	<32	9.8	18.45	47.83	34.96
25	Mytilus trossulus	+				3.84	3.25	2.47	
26	Mytilus trossulus	-			<32	0.00	0.00	0.00	
27	Mytilus trossulus	-			<33	0.00	0.00	0.00	
28	Siliqua alta	-			<33	0.00	0.00	0.00	
29	Mytilus trossulus	-	-	-	<32	3.54	0.00	0.00	
30	Siliqua alta	-			<33	0.00	0.00	0.00	
31	Mytilus trossulus	-				2.72	4.44	3.30	
32	Saxidomus giganteus	+			64	43.46	59.67	56.48	
33	Mytilus trossulus	+	+	+	55	51.22	121.43	91.92	
34	Protothaca staminea	+			69	32.81	5.84	5.63	
35	Mytilus trossulus	+				134.4	301.70	832.66	628.67
36	Saxidomus giganteus	+			60	36.44	96.32	73.44	
37	Saxidomus giganteus	+			218	98	139.40	321.42	251.27

38	Mya sp.	+			371	79.50	225.92	172.36
39	Saxidomus giganteus	-				8.34	13.04	26.85
40	Saxidomus giganteus	+				27.32	61.74	53.06
41	Mytilus trossulus	+	+	+	<33	5.59	4.27	4.27
42	Mytilus trossulus	+			<32	11.78	11.31	10.40
43	Mytilus trossulus	+				8.30	8.64	7.94
44	Mytilus trossulus	+			<32	6.33	8.17	7.32
45	Siliqua alta	+				220.12	332.05	322.27
46	Protothaca staminea	+				16.58	3.48	4.07
47	Mytilus trossulus	+	+	+	<31	23.54	16.47	15.77
48	Saxidomus giganteus	-			<33	13.30	5.69	5.69
49	Mytilus trossulus	-			<32	0.00	0.00	0.00
50	Mytilus trossulus	-	-	-		0.00	0.00	0.00
51	Mytilus trossulus	-				0.00	0.00	0.00
52	Mytilus trossulus	-	-	-		0.70	0.00	0.00
53	Mytilus trossulus	+				4.72	4.69	8.36
54	Mytilus trossulus	+	+	+		8.66	6.75	5.96
55	Mytilus trossulus	-				5.86	4.27	4.27
56	Protothaca staminea	-				4.38	2.46	2.88
57	Mytilus trossulus	-	+	+	56.4	603.09	47.69	47.94
58	Mytilus trossulus	-				10.77	43.04	32.23
59	Saxidomus giganteus	+			31	41.58	48.06	47.40
60	Saxidomus giganteus	+			37	27.84	32.68	32.01
61	Saxidomus giganteus	+			65	49.60	52.98	53.12
62	Mytilus trossulus	-				0.00	0.00	0.00
63	Mytilus trossulus	-	-	-	<32	0.00	0.00	0.00

64	Mytilus trossulus	-			<31	0.00	0.00	0.00
65	Mytilus trossulus	-			<33	0.00	0.00	0.00
66	Mytilus trossulus	-	-	-	<32	0.00	0.00	0.00
67	Mytilus trossulus	-			<32	0.00	0.00	0.00
68	Mytilus trossulus	+			<32	4.01	6.45	5.68
69	Mytilus trossulus	-	-	-	<32	0.00	0.00	0.00
70	Mya sp.	-			<33	0.00	0.00	0.00
71	Mytilus trossulus	+			38	17.65	110.52	83.27
72	Mytilus trossulus	+			<32	7.78	24.67	18.66
73	Saxidomus giganteus	+			33	21.98	48.20	40.38
74	Saxidomus giganteus	+			<32	25.52	38.09	31.45
75	Mytilus trossulus	+				25.30	48.40	37.62
76	Clinocardium sp.	+			31	34.11	36.23	30.66
77	Clinocardium sp.	+			35	23.34	42.15	35.99
78	Mytilus trossulus				<32	13.81	17.95	13.18
79	Mytilus trossulus				<31	0.00	0.00	0.00
80	Mytilus trossulus				<31	0.00	0.00	0.00
81	Mytilus trossulus				<32	0.00	0.00	0.00
82	Mytilus trossulus				<31	0.00	0.00	0.00
83	Mytilus trossulus	-				0.00	0.00	0.00
84	Mytilus trossulus	+				7.19	2.88	2.19
85	Mytilus trossulus	-				3.82	1.60	1.22
86	Mytilus trossulus	-				0.00	0.00	0.00
87	Mytilus trossulus	-				0.00	0.00	0.00
88	Mytilus trossulus	-				0.00	0.00	0.00
89	Mytilus trossulus	-				0.00	0.00	0.00

90	Mytilus trossulus	+		10.64	20.38	15.47
91	Mytilus trossulus			11.97	16.05	11.77
92	Saxidomus giganteus	-		8.39	4.32	4.32
93	Mytilus trossulus	-		0.00	0.00	0.00
94	Mytilus trossulus	-		0.00	0.00	0.00
95	Clinocardium sp.	+		40.70	101.58	116.13
96	Protothaca staminea	+		17.49	23.23	51.08
97	Saxidomus giganteus	+	84.4	121.43	257.19	198.29
98	Clinocardium sp.	+	58	146.42	271.28	323.23
99	Protothaca staminea	+		45.64	81.67	180.96
100	Saxidomus giganteus	+		60.86	77.84	77.65
101	Saxidomus giganteus	+		21.58	33.48	33.29
102	Clinocardium sp.	+	<32	6.06	4.44	4.65
103	Saxidomus giganteus	+		20.07	39.09	33.59
104	Protothaca staminea	+		4.51	4.96	9.95
105	Clinocardium sp.	+		15.74	35.09	36.02
106	Saxidomus giganteus	+		20.16	48.22	48.81

APPENDIX D. BLIND TEST DATA BY BLIND TEST SAMPLE NUMBER

Results are from High Performance Liquid Chromatography with Fluorescence Detection (HPLC).

Blind Test #	HPLC		HPLC							HPLC								
	ugSTX eq./100g Shellfish	GTX1, 4	dcGT X2,3	dcST X	GTX2, 3	B1	STX	C1,2	GTX1, 4	dcGT X2,3	dcST X	GTX 2,3	B1	STX	C1,2			
	Qilliam	Oshima	% of toxin amount							% of the total toxicity (with values corrected by M. Quilliam)								
1	61.30	52.88	38.47	0.00	0.00	3.33	21.44	0.00	36.75	0.00	40.24	0.00	0.00	2.08	13.00	0.00	44.68	0.00
2	28.95	29.10	0.00	0.00	0.00	5.56	0.00	0.00	94.44	0.00	0.00	0.00	0.00	2.93	0.00	0.00	97.07	0.00
3	52.18	42.41	52.83	0.00	0.00	13.05	22.90	0.00	11.22	0.00	60.77	0.00	0.00	8.96	15.27	0.00	15.00	0.00
4	15.33	13.71	0.00	0.00	0.00	0.00	61.46	0.00	38.54	0.00	0.00	0.00	0.00	0.00	44.29	0.00	55.71	0.00
5	5.68	6.04	0.00	0.00	0.00	53.78	0.00	0.00	46.22	0.00	0.00	0.00	0.00	37.39	0.00	0.00	62.61	0.00
6	32.66	27.48	0.00	0.00	0.00	0.00	22.91	29.71	9.00	38.38	0.00	0.00	0.00	0.00	47.00	7.88	37.04	8.08
7	42.36	42.12	0.00	0.00	0.00	2.98	6.65	0.00	90.37	0.00	0.00	0.00	0.00	1.60	3.48	0.00	94.91	0.00
8	50.06	40.19	44.89	0.00	0.00	10.07	35.99	0.00	9.05	0.00	54.55	0.00	0.00	7.30	25.35	0.00	12.79	0.00
9	3.91	3.91	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
10	202.59	188.08	15.91	0.00	0.00	1.35	15.41	6.20	55.97	5.16	17.39	0.00	0.00	0.88	9.76	0.51	71.12	0.34
11	46.65	47.14	0.00	0.00	0.00	11.40	0.00	0.00	88.60	0.00	0.00	0.00	0.00	6.19	0.00	0.00	93.81	0.00
12	0.00	0.00																
13	0.00	0.00																
14	41.99	41.39	0.00	0.00	0.00	6.00	15.14	0.00	78.86	0.00	0.00	0.00	0.00	3.44	8.44	0.00	88.12	0.00
15	92.81	71.21	43.89	0.00	0.00	0.00	30.06	0.00	7.51	18.55	61.70	0.00	0.00	0.00	24.49	0.00	12.27	1.55
16	0.00	0.00																
17	0.00	0.00																
19	7.46	6.61	0.00	0.00	0.00	0.00	64.48	0.00	35.52	0.00	0.00	0.00	0.00	0.00	47.51	0.00	52.49	0.00
20	13.82	10.16	65.36	0.00	0.00	0.00	34.64	0.00	0.00	0.00	76.50	0.00	0.00	0.00	23.50	0.00	0.00	0.00

21	0.00	0.00																
22	67.31	49.94	50.77	0.00	0.00	0.00	28.28	0.00	1.92	19.02	71.98	0.00	0.00	0.00	23.24	0.00	3.17	1.60
23	8.81	6.40	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	47.83	34.96	58.32	0.00	0.00	0.00	21.45	0.00	0.00	20.23	81.05	0.00	0.00	0.00	17.28	0.00	0.00	1.67
25															100.0			
	3.25	2.47	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
26	0.00	0.00																
27	0.00	0.00																
28	0.00	0.00																
29	0.00	0.00																
30	0.00	0.00																
31	4.44	3.30	0.00	0.00	0.00	0.00	39.64	0.00	0.00	60.36	0.00	0.00	0.00	0.00	86.49	0.00	0.00	13.51
32	59.67	56.48	15.43	0.00	0.00	3.49	12.48	0.00	68.60	0.00	14.76	0.00	0.00	1.99	6.93	0.00	76.32	0.00
33	121.43	91.92	47.14	0.00	0.00	0.00	32.76	0.00	5.15	14.95	64.57	0.00	0.00	0.00	26.01	0.00	8.20	1.22
34	5.84	5.63	0.00	0.00	0.00	48.75	51.25	0.00	0.00	0.00	0.00	0.00	0.00	49.46	50.54	0.00	0.00	0.00
35	832.66	628.67	35.65	2.96	0.00	0.00	27.36	1.35	1.79	30.90	60.73	5.41	0.00	0.00	27.01	0.17	3.55	3.13
36	96.32	73.44	48.06	0.00	0.00	0.00	25.50	0.00	6.86	19.59	66.77	0.00	0.00	0.00	20.53	0.00	11.08	1.62
37	321.42	251.27	39.43	4.89	0.00	0.00	23.44	2.90	6.91	22.42	58.11	7.75	0.00	0.00	20.02	0.32	11.84	1.96
38	225.92	172.36	43.15	3.86	0.00	0.00	21.98	3.34	3.57	24.10	65.51	6.30	0.00	0.00	19.34	0.38	6.30	2.18
39	13.04	26.85	0.00	0.00	78.91	7.41	0.00	0.00	0.00	13.68	0.00	0.00	82.26	14.99	0.00	0.00	0.00	2.76
40	61.74	53.06	22.15	0.00	0.00	2.56	30.48	0.00	27.11	17.70	29.97	0.00	0.00	2.06	23.90	0.00	42.64	1.42
41	4.27	4.27	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
42	11.31	10.40	0.00	0.00	0.00	0.00	50.74	0.00	49.26	0.00	0.00	0.00	0.00	0.00	33.93	0.00	66.07	0.00
43	8.64	7.94	0.00	0.00	0.00	0.00	50.98	0.00	49.02	0.00	0.00	0.00	0.00	0.00	34.15	0.00	65.85	0.00
44	8.17	7.32	0.00	0.00	0.00	0.00	60.57	0.00	39.43	0.00	0.00	0.00	0.00	0.00	43.37	0.00	56.63	0.00
45	332.05	322.27	12.27	4.71	5.63	8.87	16.50	0.00	52.02	0.00	13.00	5.36	1.83	5.60	10.13	0.00	64.07	0.00
46	3.48	4.07	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
47	16.47	15.77	0.00	0.00	0.00	0.00	30.45	0.00	69.55	0.00	0.00	0.00	0.00	0.00	17.92	0.00	82.08	0.00
48	5.69	5.69	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
49	0.00	0.00																
50	0.00	0.00																
51	0.00	0.00																

52	0.00	0.00																
53	4.69	8.36																
54	6.75	5.96	0.00	0.00	0.00	0.00	41.79	0.00	25.11	33.09	0.00	0.00	0.00	0.00	43.73	0.00	52.71	3.55
55	4.27	4.27	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
56	2.46	2.88	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
57	47.69	47.94	0.00	0.00	0.00	5.74	0.00	0.00	94.26	0.00	0.00	0.00	0.00	3.03	0.00	0.00	96.97	0.00
58	43.04	32.23	51.78	0.00	0.00	0.00	35.37	0.00	3.27	9.58	67.55	0.00	0.00	0.00	26.75	0.00	4.96	0.74
59	48.06	47.40	0.00	0.00	0.00	5.59	14.42	0.00	79.99	0.00	0.00	0.00	0.00	3.18	7.98	0.00	88.83	0.00
60	32.68	32.01	0.00	0.00	0.00	7.43	20.30	0.00	72.27	0.00	0.00	0.00	0.00	4.42	11.74	0.00	83.84	0.00
61	52.98	53.12	0.00	0.00	0.00	4.75	0.00	14.14	81.10	0.00	0.00	0.00	0.00	2.89	0.00	1.08	96.03	0.00
62	0.00	0.00																
63	0.00	0.00																
64	0.00	0.00																
65	0.00	0.00																
66	0.00	0.00																
67	0.00	0.00																
68	6.45	5.68	0.00	0.00	0.00	0.00	67.04	0.00	32.96	0.00	0.00	0.00	0.00	0.00	50.35	0.00	49.65	0.00
69	0.00	0.00																
70	0.00	0.00																
71	110.52	83.27	52.82	0.00	0.00	0.00	31.24	0.00	4.69	11.25	68.55	0.00	0.00	0.00	23.50	0.00	7.08	0.87
72	24.67	18.66	44.33	0.00	0.00	0.00	39.20	0.00	4.53	11.94	60.71	0.00	0.00	0.00	31.11	0.00	7.21	0.97
73	48.20	40.38	40.80	0.00	0.00	0.00	28.50	0.00	30.71	0.00	43.86	0.00	0.00	0.00	17.76	0.00	38.38	0.00
74	38.09	31.45	46.07	0.00	0.00	4.74	26.63	0.00	22.55	0.00	50.88	0.00	0.00	3.12	17.05	0.00	28.95	0.00
75	48.40	37.62	59.03	0.00	0.00	0.00	28.44	0.00	12.53	0.00	65.53	0.00	0.00	0.00	18.30	0.00	16.17	0.00
76	36.23	30.66	42.71	0.00	0.00	13.81	23.45	0.00	20.03	0.00	48.63	0.00	0.00	9.38	15.48	0.00	26.51	0.00
77	42.15	35.99	41.22	0.00	0.00	18.55	22.79	0.00	17.43	0.00	48.07	0.00	0.00	12.90	15.40	0.00	23.63	0.00
78	17.95	13.18	68.06	0.00	0.00	0.00	31.94	0.00	0.00	0.00	77.80	0.00	0.00	0.00	22.20	0.00	0.00	0.00
79	0.00	0.00																
80	0.00	0.00																
81	0.00	0.00																
82	0.00	0.00																
83	0.00	0.00																

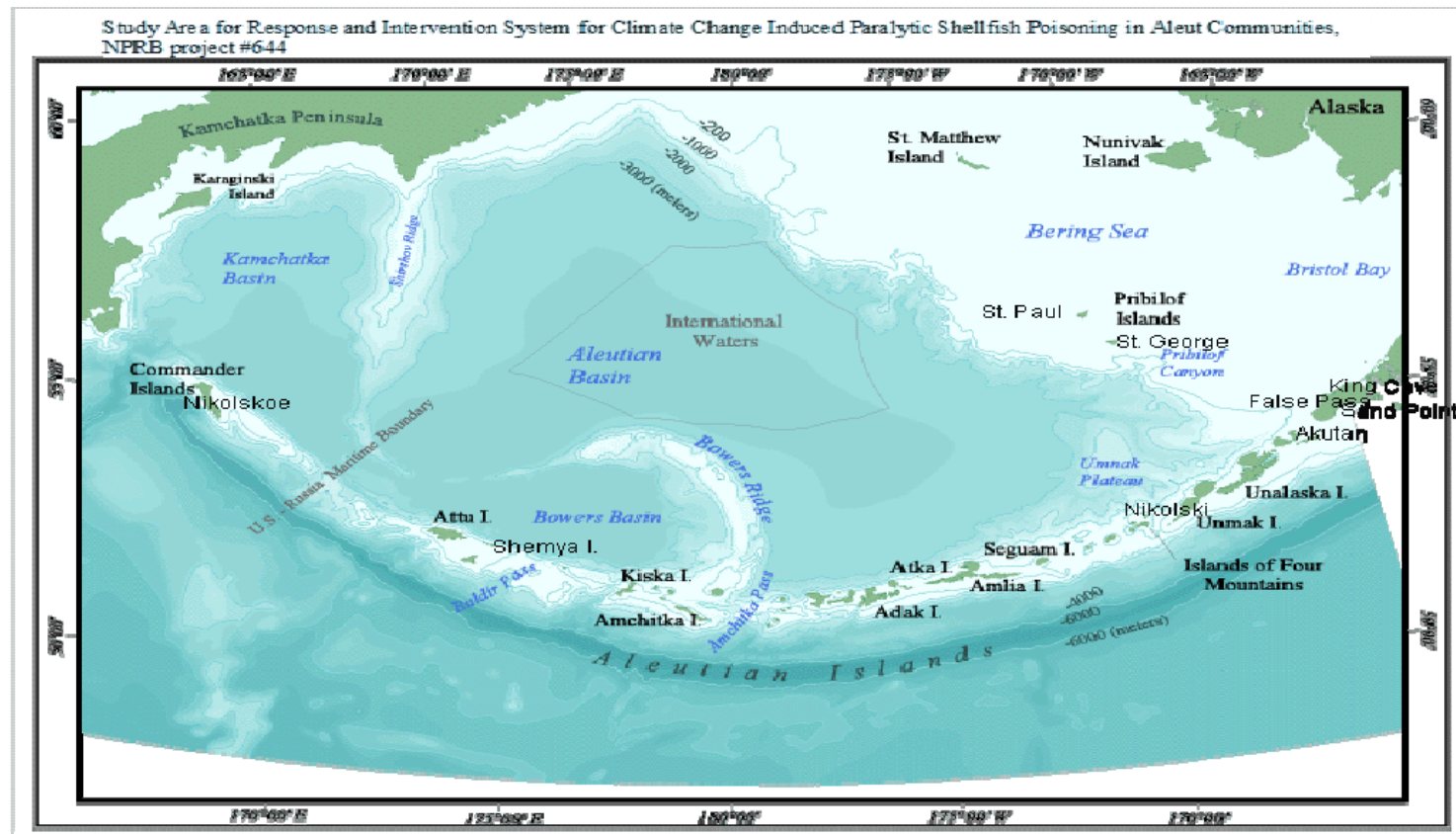
84															100.0			
	2.88	2.19	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
85															100.0			
	1.60	1.22	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
86	0.00	0.00																
87	0.00	0.00																
88	0.00	0.00																
89	0.00	0.00																
90	20.38	15.47	43.14	0.00	0.00	0.00	27.12	0.00	5.54	24.21	61.87	0.00	0.00	0.00	23.65	0.00	12.71	1.78
91	16.05	11.77	72.61	0.00	0.00	0.00	27.39	0.00	0.00	0.00	81.35	0.00	0.00	0.00	18.65	0.00	0.00	0.00
92	4.32	4.32	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
93	0.00	0.00																
94	0.00	0.00																
95	101.58	116.13	31.53	3.40	48.54	2.49	12.22	0.00	1.82	0.00	32.97	5.00	48.72	2.50	7.77	0.00	3.05	0.00
96	23.23	51.08	0.00	0.00	96.59	3.41	0.00	0.00	0.00	0.00	0.00	0.00	96.59	3.41	0.00	0.00	0.00	0.00
97	257.19	198.29	39.86	2.43	0.00	0.38	23.66	2.44	5.80	25.42	57.92	4.98	0.00	0.53	20.91	0.29	13.48	1.89
98	271.28	323.23	26.75	3.94	50.77	5.02	11.02	0.00	2.50	0.00	27.71	5.75	50.48	4.99	6.94	0.00	4.14	0.00
99	81.67	180.96	0.00	0.00	97.43	2.57	0.00	0.00	0.00	0.00	0.00	0.00	97.43	2.57	0.00	0.00	0.00	0.00
100	77.84	77.65	0.00	14.74	0.00	4.80	0.00	0.00	80.47	0.00	0.00	13.46	0.00	2.99	0.00	0.00	83.55	0.00
101	33.48	33.29	0.00	22.62	0.00	5.52	0.00	0.00	71.86	0.00	0.00	20.93	0.00	3.49	0.00	0.00	75.58	0.00
102	4.44	4.65	0.00	0.00	0.00	44.43	0.00	0.00	55.57	0.00	0.00	0.00	0.00	32.42	0.00	0.00	67.58	0.00
103	39.09	33.59	42.17	0.00	0.00	2.90	17.87	0.00	37.06	0.00	36.64	0.00	0.00	2.42	9.44	0.00	51.51	0.00
104	4.96	9.95	0.00	0.00	86.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	86.00	14.00	0.00	0.00	0.00	0.00
105	35.09	36.02	43.26	0.00	39.75	0.00	13.75	0.00	3.24	0.00	45.55	0.00	40.19	0.00	8.80	0.00	5.46	0.00
106	48.22	48.81	44.56	0.00	37.90	0.00	12.68	0.00	4.85	0.00	46.22	0.00	37.74	0.00	7.99	0.00	8.05	0.00

APPENDIX E: PSP DATA SUMMARY DOCUMENT

PSP Data Summary Document and Custody (updated 10-8-07)

Project Title: Response and Intervention System for Climate Change Induced Paralytic Shellfish Poisoning in Aleut Communities, NPRB project #644.

Project Summary: This project will educate local residents about paralytic shellfish poisoning (PSP) and train residents to sample bivalves and for the primary sites in Nikolskoye, Sand Point and Unalaska, use test kits to monitor for PSP toxin. The project activities will include workshops, development of a manual on how to set up a community-based surveillance system, and public outreach materials. The study communities extend the length of the Aleutian Islands where little baseline data is available on PSP toxin. The below image indicates the study region.



This is the updated paralytic shellfish poisoning (PSP) data report (updated 10-8-07). Mouse bioassay test results from the Alaska Department of Environmental Conservation (DEC) lab are included for many of the sites. Note that the Jellett tests in King Cove regularly had positives for PSP at 40 µg/100 grams (80 µg/100 grams is the FDA limit for human consumption) and the DEC mouse bioassay tests results were between 31 and 65µg/100 grams. Most of the samples tested were butter clams which maintain their toxicity for at least two years. But a new PSP event must have occurred in King Cove during the summer of 2007 based on the positive from mussels collected on 5/25/07.

We saw consistent positive results for PSP throughout the year in King Cove, Sand Point and Unalaska. Sand Point had the highest level of PSP toxin determined by the DEC lab with a surf clam sample collected on June 23, 2006 at 329 µg/100 grams followed by the second highest reading from a butter clam sample collect in Unalaska on July 20, 2006 with a reading of 218 µg/100 grams.

An additional 15 samples from Adak, Akutan, Atka, False Pass, Port Fidalgo, Port Lions and Valdez, are archived in the freezer until funding can be secured for analysis.

The NOAA Marine Biotoxins Program interfaces with this North Pacific Research Board (NPRB) PSP project, uses samples provided by the NPRB project and is leading the comparison study consisting of the following analyses. Dr. Kathi Lefebvre of the NOAA Marine Biotoxins Program said they will generate a comprehensive spread sheet that will have the results for each assay technique for each of the samples. It will show the toxin profile (quantify each type of toxin) as well as the STX equivalents (generated via HPLC analyses) and the quantifications from the receptor binding assay, presence/absence data from the Jellett strips and the mouse bioassay results. The North Pacific Research Board's PSP project has provided the NOAA Marine Biotoxins Program with 106 samples for the following tests:

- 1) HPLC (high pressure lipid chromatography) determination of the suite of toxins (toxin profile for the PSP toxins) and the associated STX equivalents in terms of toxicity. These analyses are led by a Post Doc Pedro Costa at NOAA.

2) Receptor binding assay quantification of PSP toxicity in terms of Saxitoxin equivalents (this is a receptor mediated assay that measures binding of STX to rat sodium channels by the displacement of radio labeled STX). These analyses are led by Keri Baugh at NOAA.

3) Jellett tests using both extraction methods performed by Stuart Hyde who is with NOAA.

4) If possible, the NOAA Marine Biotoxins Program lab will get some of the new ELISA based assays available commercially to quantify PSP toxins.

Stuart Hyde (Hollings Scholar intern) presented his portion of the study in Washington, D.C. to his advisors and fellow Hollings Scholars in July. He performed the Jellett tests with 15 mussel samples using both extraction techniques. He compared his results with the mouse bioassay results. His data will be added to the overall comparison.

The NOAA Marine Biotoxins Program will focus on the mussel samples first. They started running samples in July 2007 and have nearly completed analyzing the mussel samples via HPLC. They have analyzed standards, controls and perfected extraction techniques. The HPLC method is quite complex and toxin identification and quantification is time consuming. If all goes well, they should have a significant number of the mussel samples analyzed by November 2007. The NOAA lab has requested continuation of the DEC mouse bioassay test results. We have 15 samples in the queue now, and they will be analyzed if funding can be secured.

Several new sites were tested this month. I tested butter clams and mussels in Port Fidalgo, Prince William Sound (control site). Using the Jellett test kit, the results indicates PSP levels below 40 µg/100 grams. The control sites in Prince William Sound fill in an important geographical hole. Reid Brewer, Alaska Sea Grant, recently returned from a cruise in the Aleutian Islands; Mandy Lindeberg, NOAA's Auke Bay Lab, collected and tested mussel samples from three new sites; Rat Island (negative PSP), Amchitka (negative PSP) and Attu (positive PSP). I was surprised by the positive PSP test results from Attu. The PSP project hypothesis is that Bering Sea environmental conditions prevent or reduce PSP events. Another surprise was the positive PSP for Adak Harbor. All other Adak samples have been negative for PSP.

Remember, PSP is dangerous and butter clams can remain toxic for two years after infection with PSP, so this is a species to be avoided. Harvesters should remain cautious when consuming any bivalves in Alaska.

I will update and distribute this report on a regular basis, as we obtain more data. Let me know if you require additional information. You are welcome and encouraged to forward this report to others who may be interested in these results, or send me their e-mail address so I can forward the report. For more information about the PSP project please see up-to-date reports are available at the North Pacific Research Board web page (<http://project.nprb.org/view.jsp?id=c974307d-3e90-4f56-adb3-d6c370d38dd0>), Aleut International Association's PSP web page and newsletter (<http://www.aleut-international.org> and http://www.arcticpeoples.org/wp-content/uploads/2006/10/3rd_quarter_2006_aia_newsletter.pdf), Alaska Sea Grant's PSP page (<http://seagrant.uaf.edu/bookstore/pubs/M-02.html>) and Aleutian Pribilof Islands Association's PSP web page.

Bruce Wright, Senior Scientist
Aleutian Pribilof Islands Association
210 East 3rd Avenue
Anchorage, AK 99501-2503
phone: 907-222-4260
fax: 907-222-4273
e-mail: brucew@apiai.org
www.apiai.org

PSP DATA SUMMARY DOCUMENT DATA TABLES

Location: **Adak**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	7-15-07	blue mussel <i>Mytilus</i>	Connie Fredenberg	Clam Lagoon	Yes	7-17-07	negative		B. Wright	Frozen sample archived for DEC analysis.
2	7-9-07	blue mussel <i>Mytilus</i>	Reid Brewer and Many Lindeberg	Bay of Isles (west)	No	7-9-07	negative		Reid Brewer	
3	7-11-07	blue mussel <i>Mytilus</i>	Reid Brewer and Many Lindeberg	Harbor (central/north)	No	7-11-07	positive		Reid Brewer	
4	7-13-07	blue mussel <i>Mytilus</i>	Reid Brewer and Many Lindeberg	Chisak Bay (south)	No	7-13-07	negative		Reid Brewer	

Location: **Aiktak Island (near Ugamak Island and Unimak Pass)**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	9-2-06	blue mussel <i>Mytilus</i>	Joel Helm Tyra Zeman	Aiktak Island	Yes	10-11-06	negative		B. Wright	small mussels

Location: **Akutan**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	7-23-06	butter clam <i>Saxidomus</i>	Antone Shelikoff	1/4 mile west Trident	Yes	8/19/06	positive		B. Wright	2 clams, mixed with
2	7-23-06	littleneck clam <i>Protothaca</i>	Antone Shelikoff	1/4 mile west Trident	Yes	8/19/06	negative		B. Wright	3 clams, mixed with

3	7-24-06	blue mussel <i>Mytilus</i>	Antone Shelikoff	between Trident and church	Yes	8/19/06	positive		B. Wright	The DEC lab tests 33
4	7-23-06	soft-shell clam <i>Mya sp.</i>	Antone Shelikoff	1/4 mile west Trident	Yes	8/19/06	positive		B. Wright	The DEC lab tests ≤
5	7-23-06	blue mussel <i>Mytilus</i>	Antone Shelikoff	1/4 mile west Trident	Yes	8/19/06	positive		B. Wright	The DEC lab tests ≤
6	10-6-06	blue mussel <i>Mytilus</i>	Antone Shelikoff	Between Trident and church	Yes	11/5/06	positive		B. Wright	
7	10-6-06	blue mussel <i>Mytilus</i>	Antone Shelikoff	West of Trident	Yes	11/5/06	negative		B. Wright	The DEC lab tests ≤
8	2-7-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	West of Trident	Yes	2-16-07	negative		B. Wright	
9	2-7-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	between Trident and church	Yes	2-16-07	negative		B. Wright	The DEC lab tests ≤
10	3-12-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	between Trident and church	Yes	3-14-07	negative		B. Wright	The DEC lab tests ≤
11	3-12-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	West of Trident	Yes	3-14-07	negative		B. Wright	The DEC lab tests ≤
12	4-17-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	between Trident and church	Yes	6-13-07	Not enough		B. Wright	DEC tests indicate ≤
13	4-17-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	west of Trident	Yes	6-13-07	Not enough		B. Wright	DEC tests indicate ≤
14	5-18-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	west of Trident	Yes	6-13-07	Not enough		B. Wright	DEC tests indicate ≤

15	5-18-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	between Trident and church	Yes	6-13-07	Not enough		B. Wright	DEC tests indicate ≤
16	6-6-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	between Trident and church	Yes	9-7-07	negative		B. Wright	Frozen sample archived for DEC analysis.
17	6-6-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	West of Trident	Yes	9-7-07	negative		B. Wright	Frozen sample archived for DEC analysis.
18	8-2-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	between Trident and church	Yes	9-7-07	positive		B. Wright	Frozen sample archived for DEC analysis.
19	8-2-07	blue mussel <i>Mytilus</i>	Antone Shelikoff	West of Trident	Yes	9-7-07	Not enough		B. Wright	

Location: **Amchitka**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	7-2-07	blue mussel <i>Mytilus</i>	Reid Brewer and Many Lindeberg	Amchitka Island	No	7-2-07	negative		Reid Brewer	

Location: **Atka**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	2-8-07	blue mussel <i>Mytilus</i>	Andrew Zaochney	old village site	Yes	2-15-07	negative		B. Wright	
2	2-8-07	blue mussel <i>Mytilus</i>	Andrew Zaochney	new dock in Nazan Bay	Yes	2-15-07	negative		B. Wright	
3	2-8-07	blue mussel <i>Mytilus</i>	Andrew Zaochney	old side Village Creek	Yes	2-15-07	negative		B. Wright	7 large mussels

4	4-23-07	blue mussel <i>Mytilus</i>	Andrew Zaachney	Old village beach	Yes	4-30-07	negative		B. Wright	The DEC lab tests ≤
5	4-23-07	blue mussel <i>Mytilus</i>	Andrew Zaachney	Dump Beach by fish plant	Yes	4-30-07	negative		B. Wright	The DEC lab tests ≤
6	5-17-07	blue mussel <i>Mytilus</i>	Andrew Zaachney	Martin Bay Beach	Yes	5-21-07	negative		B. Wright	The DEC lab tests ≤
7	5-17-07	soft-shell clam <i>Mya sp.</i>	Andrew Zaachney	Martin Bay Beach	Yes	5-21-07	negative		B. Wright	The DEC lab tests ≤
8	6-14-07	blue mussel <i>Mytilus</i>	Andrew Zaachney	Korovin Bay Beach	Yes	?	negative		B. Wright	DEC lab tests ≤
9	7-16-07	blue mussel <i>Mytilus</i>	Reid Brewer and Many Lindeberg	Palisades Pt.	No	7-16-07	negative		Reid Brewer	
10	8-31-07	blue mussel <i>Mytilus</i>	Andrew Zaachney	Dump Beach	Yes	9-7-07	negative		B. Wright	Frozen sample archived for DEC analysis.
11	7-29-07	blue mussel <i>Mytilus</i>	Andrew Zaachney	Dump Beach	Yes	9-7-07	negative		B. Wright	Frozen sample archived for DEC analysis.

Location: **Attu Island**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	6-25-07	blue mussel <i>Mytilus</i>	Reid Brewer and Many Lindeberg	Attu Island	No	6-25-07	positive		Reid Brewer	

Location: **Chowiet Island, Semidi Islands**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	9-5-06	blue mussel <i>Mytilus</i>	Lucretia Fairchild	Landing Cove	Yes	10-11-06	positive		B. Wright	

Location: **False Pass**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	9-26-06	blue mussel <i>Mytilus</i>	Per Jonsson	False Pass Beach	Yes	10-3-06	positive		B. Wright	6 mussels
2	5-30-07	blue mussel <i>Mytilus</i>	Per Jonsson	False Pass, Peter Pan dock	Yes	6-1-07	positive		B. Wright	The DEC lab tests ≤
3	7-14-07	blue mussel <i>Mytilus</i>	Per Jonsson	False Pass, Peter Pan dock	Yes	7-16-07	positive		B. Wright	Frozen sample archived for DEC analysis.

Location: **King Cove**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	4-22-06	butter clam <i>Saxidomus</i>	?	King Cove Lagoon	Yes	6-23-06	positive		Dana Osterback	same as Sand Point
2	8-3-06	littleneck clam <i>Protothaca</i>	Delores Kochuten,	King Cove Lagoon	Yes	9-26-06	positive		Ray RaLonde	small sample
3	8-3-06	soft-shell clam <i>Mya sp.</i>	Delores Kochuten,	King Cove Lagoon	Yes	9-26-06	positive		Ray RaLonde	75% reduction
4	8-3-06	butter clam <i>Saxidomus</i>	Delores Kochuten,	King Cove Lagoon	Yes	9-26-06	positive		Ray RaLonde	The DEC lab tests 43
5	10-2-06	butter clam <i>Saxidomus</i>	Craig Bendixen	Harbor Bridge Lagoon	Yes	10-4-06	positive		B. Wright	The DEC lab tests 64
6	2-8-07	butter clam <i>Saxidomus</i>	Desirae Roehl	Lagoon	Yes	2-15-07	positive		B. Wright	The DEC lab tests 37
7	2-07	butter clam <i>Saxidomus</i>	Daniel Gould 6 clams provided	Lagoon	Yes	3-14-07	positive		B. Wright	The DEC lab tests 31
8	3-21-07	butter clam <i>Saxidomus giganteus</i>	Ray Kochuten	Lagoon	Yes	3-27-07	positive		B. Wright	The DEC lab tests 65 µg PSP.
9 (same sample as #8)	3-21-07	butter clam <i>Saxidomus giganteus</i>	Ray Kochuten	Lagoon	Yes	3-27-07		positive	B. Wright	The DEC lab tests 65 µg PSP.
10	3-29-07	blue mussel <i>Mytilus</i>	Charly Bendixen	Harbor Bridge	Yes	4-5-07	negative		Charly Bendixen	

11	5-25-07	blue mussel <i>Mytilus</i>	Charly Bendixen	Harbor Bridge	Yes	5-27-07	positive		Charly Bendixen	
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Location: **Nelson Lagoon**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	5-28-07	blue mussel <i>Mytilus</i>	Mike Nemeth	lagoon	Yes	6-12-07	Not enough		B. Wright	DEC tests indicate ≤

Location: **Nikolski**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	4-1-07	blue mussel <i>Mytilus</i>	Mike Brubaker	SW corner of Umnak Island	Yes	4-5-07	negative		B. Wright	The DEC lab tests ≤

Location: **Nikolskoye**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	8-10-06	blue mussel <i>Mytilus trossulus</i>	Natalia Tatarenkova	Eagle Rock Beach	Yes	8-10-06	negative		Ivan Vozhikov Natalia Tatarenkova	The DEC lab tests ≤ 33 µg
2	8-9-06	Alaska razor clam <i>Siliqua alta</i>	B. Wright	Sand Beach (near town)	No	8-10-06	negative		Ivan Vozhikov Natalia Tatarenkova	The DEC lab tests ≤ 33 µg

3	8-9-06	blue mussel <i>Mytilus trossulus</i>	Ivan Vozhikov Natalia Tatarenkova	Rocky Point	No	8-11-06	negative		Ivan Vozhikov Natalia Tatarenkova	The DEC lab tests ≤ 32 µg
4	8-9-06	blue mussel <i>Mytilus</i>	Ivan Vozhikov Natalia	Rocky Point	No	8-11-06		negative	Ivan Vozhikov Natalia	practice 80 µg test
5	8-9-06	Alaska razor clam <i>Siliqua alta</i>	B. Wright Natalia Tatarenkova	Sand Beach (near town)	Yes	8-11-06	negative		Ivan Vozhikov Natalia Tatarenkova	The DEC lab tests ≤ 33 µg
6	9-19-06	blue mussel <i>Mytilus trossulus</i>	Natalia Tatarenkova Ivan Vozhikov	Gaupt Cape	No	9-19-06	negative		Natalia Tatarenkova Ivan	
7	9-21-06	blue mussel <i>Mytilus</i>	Natalia Tatarenkova	Vhodnoy Ryf Cape	No	9-21-06	negative		Natalia Tatarenkova Ivan	
8	11-8-06	blue mussel <i>Mytilus</i>	Natalia Tatarenkova	Vhodnoy Ryf Cape	No	11-9-06	negative		Natalia Tatarenkova Ivan	
9	12-21-06	blue mussel <i>Mytilus</i>	Natalia Tatarenkova	Vhodnoy Ryf Cape	No	12-22-06	negative		Natalia Tatarenkova Ivan	
10	1-19-07	blue mussel <i>Mytilus</i>	Natalia Tatarenkova	Vhodnoy Ryf Cape	No	1-21-06	negative		Natalia Tatarenkova Ivan	
11	2/26/07	blue mussel <i>Mytilus</i>	Natalia	Mys Gupta Cape	No	2/26/07	negative		Natalia Tatarenkova Ivan	
12	3-18-07	blue mussel <i>Mytilus</i>	Natalia Tatarenkova	Vhodnoy Ryf Cape	No	3-19-07	negative		Natalia Tatarenkova Ivan	
13	4-7-07	blue mussel <i>Mytilus</i>	Natalia Tatarenkova	Vhodnoy Ryf Cape	Yes	4-23-07	negative		Natalia Tatarenkova Ivan	

14	5-6-07	blue mussel <i>Mytilus</i>	Natalia Tatarenkova	Mys Gupta Cape	no	5-6-07	negative		Natalia Tatarenkova Ivan	
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Location: **Rat Island**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	7-1-07	blue mussel <i>Mytilus</i>	Reid Brewer and Mandy	Rat Island	No	7-1-07	negative		Reid Brewer	

Location: **Sand Point**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1a	6-22-06	butter clam <i>Saxidomus giganteus</i>	Dana Osterback	Spit Beach	No	6-22-06	positive		Dana Osterback	1st test invalid but redo +. The DEC
1b	6-22-06	butter clam <i>Saxidomus giganteus</i>	Dana Osterback	Spit Beach	No	6-22-06	invalid		Dana Osterback	1st test (1b) invalid. The DEC
2	6-22-06	blue mussel <i>Mytilus</i>	Dana Osterback	Spit Beach	No	6-22-06	positive		Dana Osterback	The DEC lab tests ≤
3	6-22-06	cockle <i>Clinocardium</i>	Dana Osterback	Ivanoff Beach	Yes	6-22-06	positive		Dana Osterback	The DEC lab tests 57
4	4-22-06	butter clam <i>Saxidomus</i>	Dana Osterback	King Cove (Lagoon)	No	6-23-06	positive		Dana Osterback	same as King Cove

5	6-23-06	surf clam <i>Mactromeris</i>	Dana Osterback	Sand Dollar Beach	No	6-23-06	positive		Dana Osterback	The DEC lab tests ≤
6	6-23-06	surf clam <i>Mactromeris polynyma</i>	Dana Osterback	Sand Dollar Beach	No	6-23-06	positive		Dana Osterback	The DEC lab tests at 329 µg PSP. Meat
7	6-23-06	great tillin clam <i>Tellina lutea</i>	Dana Osterback	Sand Dollar Beach	No	6-23-06	positive		Dana Osterback	
8	6-23-06	Pacific razor clam	Dana Osterback	Sand Dollar Beach	No	6-23-06	positive		Dana Osterback	
9a	7-13-06	surf clam <i>Mactromeris</i>	Dana Osterback	Sand Dollar Beach	No	7-13-06	invalid		Dana Osterback	The DEC lab tests 55
9b	7-13-06	surf clam <i>Mactromeris</i>	Dana Osterback	Sand Dollar Beach	No	7-13-06	invalid		Dana Osterback	The DEC lab tests 55
10	7-25-06	blue mussel <i>Mytilus</i>	Dana Osterback	Spit Beach	No	7-25-06	positive		Dana Osterback	The DEC lab tests ≤
11	9-7-06	blue mussel <i>Mytilus</i>	Dana Osterback	Spit Beach	Yes	11-3-06	positive		JDK	
12	10-23-06	blue mussel <i>Mytilus</i>	Dana Osterback	Spit Beach	Yes	11-3-06	positive		JDK	The DEC lab tests ≤
13	11-6-06	Pacific razor clam	Dana Osterback	Sand Dollar Beach	Yes	12-6-06	positive		Dana Osterback	
14	12-4-06	littleneck clam <i>Protothaca</i>	B. Wright	Spit Beach	Yes	12-5-06	positive		Dana Osterback	
15	12-4-06	blue mussel <i>Mytilus</i>	B. Wright	Spit Beach	Yes	12-5-06	positive		Dana Osterback	The DEC lab tests ≤

16	12-4-06	butter clam <i>Saxidomus giganteus</i>	B. Wright	Spit Beach	Yes	12-5-06	negative		Dana Osterback	small clams, The DEC lab tests $\leq 33 \mu\text{g}$ per
17	1-19-06	littleneck clam <i>Protothaca</i>	Dana Osterback	Spit Beach	Yes	4-5-06	positive		B. Wright	
18	1-19-07	butter clam <i>Saxidomus</i>	Dana Osterback	Spit Beach	Yes	4-5-07	positive		B. Wright	
19	2-1-07	blue mussel <i>Mytilus</i>	Dana Osterback	Spit Beach	Yes	4-05-07	positive		B. Wright	The DEC lab tests \leq
20	3-1-07	blue mussel <i>Mytilus</i>	Dana Osterback	Spit Beach	Yes	4-05-07	positive		B. Wright	The DEC lab tests \leq
21	5-17-07	butter clam <i>Saxidomus</i>	Dana Osterback	Spit Beach	No	5-18-07	positive		Dana Osterback	DEC tests indicate
22	5-17-07	butter clam <i>Saxidomus</i>	Dana Osterback	Spit Beach	No	5-18-07	positive		Dana Osterback	DEC tests indicate \leq
23	5-18-07	blue mussel <i>Mytilus</i>	Dana Osterback	Spit Beach	Yes	5-18-07	positive		Dana Osterback	
24	5-23-07	cockle <i>Clinocardium</i>	Peter Devine	Ivanoff Bay	Yes	5-24-07	positive		JDK	DEC tests indicate \leq
25	5-24-07	cockle <i>Clinocardium</i>	Peter Devine	Ivanoff Bay	Yes	5-24-07	positive		JDK	DEC tests indicate
26	6-19-07	butter clam <i>Saxidomus</i>	Dana Osterback	Spit Beach	No	6-20-07	positive		Dana Osterback	
27	6-19-07	butter clam <i>Saxidomus</i>	Dana Osterback	Spit Beach	No	6-20-07	?		Dana Osterback	

28	6-19-07	blue mussel <i>Mytilus</i>	Dana Osterback	Spit Beach	No	6-20-07	?		Dana Osterback	
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Location: **Shemya Island (near Attu)**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	9-4-06	blue mussel <i>Mytilus</i>	Mike Schwitters	Shemya Island, south beach	Yes	9/28/06	negative		B. Wright	The DEC lab tests ≤
2	9-5-06	blue mussel <i>Mytilus</i>	Mike Schwitters	North Beach, Bering Sea	Yes	9/28/06	negative		B. Wright	

Location: **St. George**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	2-14-07	blue mussel <i>Mytilus trossulus</i>	Chris Mercurief	Staraya Artil	Yes	2-15-07	positive		B. Wright	Also positive using new buffer
2	4-1-07	blue mussel <i>Mytilus trossulus</i>	Chris Mercurief	Staraya Artil	Yes	4-6-07	positive		B. Wright	Also positive using new
3	1-8-07	blue mussel <i>Mytilus trossulus</i>	Karen Holser	Village by old landing	Yes	4-12-07	negative		B. Wright	Small sample, 4 mussels
4	3-13-07	blue mussel <i>Mytilus trossulus</i>	Karen Holser	Village by old landing	Yes	4-10-07	negative			DEC tests indicate ≤ 32ug PSP.

Location: **St. Paul**

Sample	Date	Species	Sampler	Sample	Frozen	Date	Results	Results	Tester	Notes
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Number	Collected			Location	Y or N	Tested	40 µg	80 µg	Name	
1	5-16-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	B. Wright et al.	Seal Point, St. Paul Island	Yes	5-19-07	positive		B. Wright	Strip test results are difficult to read. The DEC lab tests

Location: **Unalaska**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	7-18-06	blue mussel <i>Mytilus</i>	Anfesia Tutiakoff	Summer Bay	No	7-18-06	positive		Anfesia Tutiakoff	The DEC lab tests 55
2	7-19-06	littleneck clam <i>Protothaca</i>	Anfesia Tutiakoff	head of Captain's Bay	No	7-19-06	positive		Anfesia Tutiakoff	The DEC lab tests 69
3a	7-19-06	blue mussel <i>Mytilus</i>	Anfesia Tutiakoff	head of Captain's Bay	No	7-19-06	positive		Anfesia Tutiakoff	first reading
3b	7-19-06	blue mussel <i>Mytilus</i>	Anfesia Tutiakoff	head of Captain's Bay	No	7-19-06	positive		Anfesia Tutiakoff	redo of 3A
4	7-20-06	butter clam <i>Saxidomus</i>	Anfesia Tutiakoff	Priest Rock	No	7-20-06	positive		Anfesia Tutiakoff	The DEC lab tests 60
5	7-20-06	butter clam <i>Saxidomus</i>	Anfesia Tutiakoff	Little South America	No	7-20-06	positive		Anfesia Tutiakoff	The DEC lab tests
6	7-20-06	soft-shell clam <i>Mya sp.</i>	Anfesia Tutiakoff	Little South America	No	7-20-06	positive		Anfesia Tutiakoff	The DEC lab tests
7	3-6-07	blue mussel <i>Mytilus</i>	Bruce Wright	Small boat harbor float	No	3-8-07	negative		Reid Brewer	

8	4-17-07	butter clam <i>Saxidomus</i>	Reid Brewer	Little South America	No	4-17-07	positive		Reid Brewer	Slide UNAK#8
9	4-20-07	butter clam <i>Saxidomus</i>	Reid Brewer	Little South America	No	4-20-07	positive		Reid Brewer	Slide UNAK#9
10	4-20-07	blue mussel <i>Mytilus</i>	Reid Brewer	Little South America	No	4-20-07	negative		Reid Brewer	Slide UNAK#10
11	5-15-07	blue mussel <i>Mytilus</i>	Reid Brewer	Summer's Bay	No	5-15-07	positive		Reid Brewer	Slide UNAK#11
12	6-18-07	blue mussel <i>Mytilus</i>	Reid Brewer	Morris Cove	No	6-18-07	positive		Reid Brewer	Slide UNAK #12
13	7-22-07	blue mussel <i>Mytilus</i>	Reid Brewer and Many Lindeberg	Chernofski Bay	No	7-22-07	positive		Reid Brewer	

Location: **Unga**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	5-27-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	Mike Brubaker	Unga Beach	Yes	5-30-07	positive		Bruce Wright	The DEC lab tests indicate 38

Control Sites

Location: **Craig**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	9-4-06	soft-shell clam <i>Mya sp.</i>	Ray RaLonde	Baseball Field Beach	Yes	9-26-06	positive		Ray RaLonde	Very faint T line

Location: **Juneau**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	5-1-06	surf clam <i>Mactromeris</i> <i>polynyma</i>	Steve Gilbertson	Youngs Bay	Yes	9-15-06	negative		B. Wright	The DEC lab tests ≤ 33 µg PSP
2	4-29-06	surf clam <i>Mactromeris</i>	Chris Krenz	Eagle Beach	Yes	9-15-06	negative		B. Wright	The DEC lab tests ≤

Location: **Old Harbor**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	8-9-06	blue mussel <i>Mytilus</i>	Ray RaLonde	Boat pull beach across from Old	Yes	9-29-06	positive		Ray RaLonde	Very slight reduction
2	8-9-06	cockle <i>Clinocardium</i>	Ray RaLonde	Boat pull beach across from Old	Yes	9-29-06	positive		Ray RaLonde	Very slight reduction

Location: **Ouzinkie**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	3-13-07	blue mussel <i>Mytilus</i>	Ray RaLonde	Sourdough Beach	Yes	3-16-07	negative		Ray RaLonde	
2	3-13-07	littleneck clam <i>Protothaca</i>	Ray RaLonde	Sourdough Beach	Yes	3-16-07	negative		Ray RaLonde	
3	3-13-07	butter clam <i>Saxidomus</i>	Ray RaLonde	Sourdough Beach	Yes	3-16-07	positive		Ray RaLonde	The DEC lab tests 51

Location: **Port Lions**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	3-14-07	butter clam <i>Saxidomus</i>	Amanda Squartsoff	Airport Beach	No	3-16-07	positive		Amanda Squartsoff	Frozen sample archived for DEC analysis.
2	3-14-07	littleneck clam <i>Protothaca</i>	Yvonne Lukin	Airport Beach	No	3-16-07	negative		Yvonne Lukin	No HPLC sample
3	5-5-07	butter clam <i>Saxidomus</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	No	5-5-07	positive		Amanda Squartsoff, Yvonne	
4	5-5-07	cockle <i>Clinocardium</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	No	5-5-07	positive		Amanda Squartsoff, Yvonne	Frozen sample archived for DEC analysis.
5	5-5-07	littleneck clam <i>Protothaca</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	No	5-5-07	negative		Amanda Squartsoff, Yvonne	
6	6-18-07	butter clam <i>Saxidomus</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	6-24-07	positive		Amanda Squartsoff, Yvonne	Frozen sample archived for DEC analysis.

7	6-18-07	littleneck clam <i>Protothaca</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	6-24-07	positive		Amanda Squartsoff, Yvonne	Small sample for
8	6-18-07	cockle <i>Clinocardium</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	6-24-07	positive		Amanda Squartsoff, Yvonne	
9	7-2-07	butter clam <i>Saxidomus</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	7-12-07	positive		Amanda Squartsoff, Yvonne	Frozen sample archived for DEC analysis.
10	7-2-07	cockle <i>Clinocardium</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	7-12-07	positive		Amanda Squartsoff, Yvonne	
11	7-2-07	littleneck clam <i>Protothaca</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	7-12-07	positive		Amanda Squartsoff, Yvonne	
12	7-31-07	butter clam <i>Saxidomus</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	8-5-07	positive		Amanda Squartsoff, Yvonne	
13	7-31-07	cockle <i>Clinocardium</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	8-5-07	positive		Amanda Squartsoff, Yvonne	Frozen sample archived for DEC analysis.
14	7-31-07	littleneck clam <i>Protothaca</i>	Amanda Squartsoff, Yvonne Lukin	Airport Beach	Yes	8-5-07	positive		Amanda Squartsoff, Yvonne	

Location: **Prince William Sound**

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	7-31-07	butter clam <i>Saxidomus</i>	Bruce Wright	Port Fidalgo, East of Irish Cove	Yes	8-2-07	negative		B. Wright	Frozen sample archived for DEC analysis.
2	8-1-07	blue mussel <i>Mytilus</i>	D. Boone Hodgin	Port Fidalgo, Fish Bay	Yes	8-2-07	negative		B. Wright	Frozen sample archived for DEC analysis.
3	8-12-07	blue mussel <i>Mytilus</i>	B. Wright	Valdez	Yes	9-7-07	negative		B. Wright	Frozen sample archived for DEC analysis.

Location: Tenass Pass (N56 0.78,46' W133 18.963,29')

Sample Number	Date Collected	Species	Sampler	Sample Location	Frozen Y or N	Date Tested	Results 40 µg	Results 80 µg	Tester Name	Notes
1	7-29-06	cockle <i>Clinocardium</i>	Ray RaLonde	Tenass Pass Sea farm	Yes	12-2-06	negative	negative	Ray RaLonde	
2	8-15-06	cockle <i>Clinocardium</i>	Ray RaLonde	Tenass Pass Sea farm	Yes	12-2-06	positive	positive	Ray RaLonde	
3	9-25-06	cockle <i>Clinocardium</i>	Ray RaLonde	Tenass Pass Sea farm	Yes	12-2-06	positive	positive	Ray RaLonde	
4	9-19-06	cockle <i>Clinocardium</i>	Ray RaLonde	Tenass Pass Sea farm	Yes	12-2-06	positive	positive	Ray RaLonde	
5	10-22-06	cockle <i>Clinocardium</i>	Ray RaLonde	Tenass Pass Sea farm	Yes	12-2-06	positive	negative	Ray RaLonde	
6	10-2-06	cockle <i>Clinocardium</i>	Ray RaLonde	Tenass Pass Sea farm	Yes	12-2-06	positive	positive	Ray RaLonde	

APPENDIX F: PSP Test Data by Blind Test Sample Number

PSP test data by blind test sample number with locations, dates, species and tester's name and including results from mouse bioassay, Jellett Rapid Testing Kit, Receptor Binding Assay (RBA) and High Performance Liquid Chromatography with Fluorescence Detection (HPLC).

Blind Test No.	Sample Location and Number	Date Collected & tested	Species	Jellett Results 40 µg	Tester Name	Mouse bioassay µg STX	ELISA µg STX Abraxis	RBA µg STX NOAA	HPLC µg STX Qilliam	HPLC µg STX Oshima	HPLC % GTX1, 4	HPLC % NEO	HPLC % dcGTX 2,3	HPLC % dcSTX	HPLC % GTX2, 3	HPLC % B1	HPLC % STX	HPLC % C1,2
1	King Cove #4, Lagoon	8-3-06 9-26-06	butter clam <i>Saxidomus giganteus</i>	positive	Ray RaLonde	43		28.84	61.30	52.88	38.47	0.00	0.00	3.33	21.44	0.00	36.75	0.00
2	Craig #1, Baseball Field	9-4-06 9-26-06	soft-shell clam <i>Mya sp.</i>	positive	Ray RaLonde	none		31.66	28.95	29.10	0.00	0.00	0.00	5.56	0.00	0.00	94.44	0.00
3	King Cove #3, Lagoon	8-3-06 9-26-06	soft-shell clam <i>Mya sp.</i>	positive	Ray RaLonde	none		24.44	52.18	42.41	52.83	0.00	0.00	13.05	22.90	0.00	11.22	0.00
4	Old Harbor #1, Boat	8-9-06 9-26-06	blue mussel <i>Mytilus trossulus</i>	positive	Ray RaLonde	none		16.67	15.33	13.71	0.00	0.00	0.00	0.00	61.46	0.00	38.54	0.00
5	Old Harbor #2, Boat	8-9-06 9-26-06	cockle <i>Clinocardium sp.</i>	positive	Ray RaLonde	none	7.8	12.68	5.68	6.04	0.00	0.00	0.00	53.78	0.00	0.00	46.22	0.00
6	Sand Point, #1a & 1b	6-22-06 6-22-06	butter clam <i>Saxidomus giganteus</i>	Invalid then positive	Dana Osterback	34		17.69	32.66	27.48	0.00	0.00	0.00	0.00	22.91	29.71	9.00	38.38
7	Sand Point #2, Spit	6-22-06 6-22-06	blue mussel <i>Mytilus trossulus</i>	positive	Dana Osterback	≤ 33	35.8	52.25	42.36	42.12	0.00	0.00	0.00	2.98	6.65	0.00	90.37	0.00
8	Sand Point #3, Sand	6-22-06 6-22-06	cockle <i>Clinocardium sp.</i>	positive	Dana Osterback	57	23.6	19.57	50.06	40.19	44.89	0.00	0.00	10.07	35.99	0.00	9.05	0.00

9	Sand Point #5, Sand	6-23-06 6-23-06	surf clam <i>Mactromeris polynyma</i>	positive	Dana Osterback	≤ 33		7.23	3.91	3.91	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
10	Sand Point #6, Sand	6-23-06 6-23-06	surf clam <i>Mactromeris polynyma</i>	positive	Dana Osterback	329	55.2	139.90	202.59	188.08	15.91	0.00	0.00	1.35	15.41	6.20	55.97	5.16
11	King Cove #1, Lagoon	4-22-06 6-23-06	butter clam <i>Saxidomus giganteus</i>	positive	Dana Osterback	none		44.59	46.65	47.14	0.00	0.00	0.00	11.40	0.00	0.00	88.60	0.00
12	Shemya Is. #1 South	9-4-06 9-28-06	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 33		0.00	0.00	0.00								
13	Shemya Is. #2, North	9-5-06 9-28-06	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	none		0.00	0.00	0.00								
14	Sand Point #9, Sand	7-13-06 7-13-06	surf clam <i>Mactromeris polynyma</i>	invalid	Dana Osterback	55		45.51	41.99	41.39	0.00	0.00	0.00	6.00	15.14	0.00	78.86	0.00
15	Sand Point #10, Spit	7-25-06 7-25-06	blue mussel <i>Mytilus trossulus</i>	positive	Dana Osterback	≤ 32		30.66	92.81	71.21	43.89	0.00	0.00	0.00	30.06	0.00	7.51	18.55
16	Juneau #1, Youngs	5-06 9-15-06	surf clam <i>Mactromeris polynyma</i>	negative	B. Wright	≤ 33		3.03	0.00	0.00								
17	Juneau #2, Eagle Beach	4-29-06 9-15-06	surf clam <i>Mactromeris polynyma</i>	negative	B. Wright	≤ 33		0.00	0.00	0.00								
18	Chowiet Is. #1, Semidi	9-5-06 10-11-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	none		none	none	none								
19	False Pass #1	9-26-06 10-3-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	none		10.07	7.46	6.61	0.00	0.00	0.00	0.00	64.48	0.00	35.52	0.00
20	Akutan #1, 1-4 mile west	7-23-06 8-19-06	butter clam <i>Saxidomus giganteus</i>	positive	B. Wright	none		7.13	13.82	10.16	65.36	0.00	0.00	0.00	34.64	0.00	0.00	0.00

21	Akutan #2, 1-4 mile west	7-23-06 8-19-06	littleneck clam <i>Protothaca staminea</i>	negative	B. Wright	none		0.00	0.00	0.00								
22	Akutan #3, between	7-23-06 8-19-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	33		26.75	67.31	49.94	50.77	0.00	0.00	0.00	28.28	0.00	1.92	19.02
23	Akutan #4, 1-4 mile west	7-23-06 8-19-06	soft-shell clam <i>Mya sp.</i>	positive	B. Wright	≤ 33		4.78	8.81	6.40	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	Akutan #5, 1-4 mile west	7-23-06 8-19-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 32	9.8	18.45	47.83	34.96	58.32	0.00	0.00	0.00	21.45	0.00	0.00	20.23
25	Akutan, #6 between	10-6-06 11-5-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	none		3.84	3.25	2.47	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
26	Akutan #7, west of Trident	10-6-06 11-5-06	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
27	Nikolskoy e #1, Russia	8-10-06 8-10-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia	≤ 33		0.00	0.00	0.00								
28	Nikolskoy e #2, Russia	8-9-06 8-10-06	Alaska razor clam <i>Siliqua alta</i>	negative	Ivan Vozhikov Natalia	≤ 33		0.00	0.00	0.00								
29	Nikolskoy e #3, Russia	8-9-06 8-11-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia	≤ 32		3.54	0.00	0.00								
30	Nikolskoy e #5, Russia	8-9-06 8-11-06	Alaska razor clam <i>Siliqua alta</i>	negative	Ivan Vozhikov Natalia	≤ 33		0.00	0.00	0.00								
31	Aiktak Island #1	9-2-06 10-11-06	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	none		2.72	4.44	3.30	0.00	0.00	0.00	0.00	39.64	0.00	0.00	60.36
32	King Cove #5, Harbor	10-2-06 10-4-06	butter clam <i>Saxidomus giganteus</i>	positive	B. Wright	64		43.46	59.67	56.48	15.43	0.00	0.00	3.49	12.48	0.00	68.60	0.00

33	Unalaska #1, Summer	7-18-06 7-18-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Anfesia Tutiakoff	55		51.22	121.43	91.92	47.14	0.00	0.00	0.00	32.76	0.00	5.15	14.95
34	Unalaska #2, head of	7-19-06 7-19-06	littleneck clam <i>Protothaca</i> <i>staminea</i>	positive	Anfesia Tutiakoff	69		32.81	5.84	5.63	0.00	0.00	0.00	48.75	51.25	0.00	0.00	0.00
35	Unalaska #3, head of	7-19-06 7-19-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Anfesia Tutiakoff	none	134.4	301.70	832.66	628.67	35.65	2.96	0.00	0.00	27.36	1.35	1.79	30.90
36	Unalaska #4, Priest Rock	7-20-06 7-20-06	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Anfesia Tutiakoff	60		36.44	96.32	73.44	48.06	0.00	0.00	0.00	25.50	0.00	6.86	19.59
37	Unalaska #5, Little South	7-20-06 7-20-06	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Anfesia Tutiakoff	218	98	139.40	321.42	251.27	39.43	4.89	0.00	0.00	23.44	2.90	6.91	22.42
38	Unalaska #6, Little South	7-20-06 7-20-06	soft-shell clam <i>Mya sp.</i>	positive	Anfesia Tutiakoff	371		79.50	225.92	172.36	43.15	3.86	0.00	0.00	21.98	3.34	3.57	24.10
39	Sand Point #17, Spit	1-19-07 4-5-07	littleneck clam <i>Protothaca</i> <i>staminea</i>	positive	Dana Osterback	none		8.34	13.04	26.85	0.00	0.00	78.91	7.41	0.00	0.00	0.00	13.68
40	Sand Point #18, Spit	1-19-07 4-5-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Dana Osterback	none		27.32	61.74	53.06	22.15	0.00	0.00	2.56	30.48	0.00	27.11	17.70
41	Sand Point #19, Spit	2-1-07 4-5-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Dana Osterback	≤ 33		5.59	4.27	4.27	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
42	Sand Point #20, Spit	3-1-07 4-5-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Dana Osterback	≤ 32		11.78	11.31	10.40	0.00	0.00	0.00	0.00	50.74	0.00	49.26	0.00
43	Sand Point #11, Spit	9-7-06 11-3-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	JDK and Dana Osterback	none		8.30	8.64	7.94	0.00	0.00	0.00	0.00	50.98	0.00	49.02	0.00
44	Sand Point #12, Spit	10-23-06 11-3-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Dana Osterback	≤ 32		6.33	8.17	7.32	0.00	0.00	0.00	0.00	60.57	0.00	39.43	0.00

45	Sand Point #13, Spit	11-6-06 12-6-06	Alaska razor clam <i>Siliqua alta</i>	positive	Dana Osterback	none		220.12	332.05	322.27	12.27	4.71	5.63	8.87	16.50	0.00	52.02	0.00
46	Sand Point #14, Spit	12-4-06 12-5-06	littleneck clam <i>Protothaca staminea</i>	positive	Dana Osterback	none		16.58	3.48	4.07	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
47	Sand Point #15, Spit	12-4-06 12-5-06	blue mussel <i>Mytilus trossulus</i>	positive	Dana Osterback	≤ 31		23.54	16.47	15.77	0.00	0.00	0.00	0.00	30.45	0.00	69.55	0.00
48	Sand Point #16, Spit	12-4-06 12-5-06	butter clam <i>Saxidomus giganteus</i>	negative	Dana Osterback	≤ 33		13.30	5.69	5.69	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
49	Nikolski #1, SW Umnak	4-1-07 4-5-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								
50	Atka #1	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.00	0.00	0.00								
51	Atka #2	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.00	0.00	0.00								
52	Atka #3	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.70	0.00	0.00								
53	St. George #1,	2-14-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	positive	Bruce Wright	none		4.72	4.69	8.36								
54	St. George #2,	4-1-07 4-6-07	blue mussel <i>Mytilus trossulus</i>	positive	Bruce Wright	none		8.66	6.75	5.96	0.00	0.00	0.00	0.00	41.79	0.00	25.11	33.09
55	Ouzinkie #1, Sourdoug	3-14-07 3-16-07	blue mussel <i>Mytilus trossulus</i>	negative	Ray RaLonde	none		5.86	4.27	4.27	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
56	Ouzinkie #2, Sourdoug	3-13-07 3-16-07	littleneck clam <i>Protothaca staminea</i>	negative	Ray RaLonde	none		4.38	2.46	2.88	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00

57	Unalaska #7, small boat	3-6-07 3-8-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Reid Brewer	none	56.4	603.09	47.69	47.94	0.00	0.00	0.00	5.74	0.00	0.00	94.26	0.00
58	King Cove #10, Harbor	3-29-07 4-5-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Charly Bendixen	none		10.77	43.04	32.23	51.78	0.00	0.00	0.00	35.37	0.00	3.27	9.58
59	King Cove #7, Lagoon	2-07 3-14-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Bruce Wright	31		41.58	48.06	47.40	0.00	0.00	0.00	5.59	14.42	0.00	79.99	0.00
60	King Cove #6, Lagoon	2-8-07 2-15-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Bruce Wright	37		27.84	32.68	32.01	0.00	0.00	0.00	7.43	20.30	0.00	72.27	0.00
61	Lagoon, King Cove #8, Lagoon	3-21-07 3-27-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Bruce Wright	65		49.60	52.98	53.12	0.00	0.00	0.00	4.75	0.00	14.14	81.10	0.00
62	Akutan #8, West of Trident	2-7-07 2-16-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Bruce Wright	none		0.00	0.00	0.00								
63	Akutan #10, between	3-12-07 3-14-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								
64	Akutan #9, between	2-7-07 2-16-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								
65	Akutan #11, West of Trident	3-12-07 3-14-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Bruce Wright	≤ 31		0.00	0.00	0.00								
66	Atka #4, Old Village	4-23-07 4-30-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Bruce Wright	≤ 33		0.00	0.00	0.00								
67	Atka #5, Dump Beach	4-23-07 4-30-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								
68	St. Paul #1, Seal Point, St.	5-16-07 5-19-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	≤ 32		4.01	6.45	5.68	0.00	0.00	0.00	0.00	67.04	0.00	32.96	0.00

69	Atka # 6, Martin Bay	5-17-07 5-21-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
70	Atka #7, Martin Bay	5-17-07 5-21-07	soft-shell clam <i>Mya sp.</i>	negative	B. Wright	≤ 33		0.00	0.00	0.00								
71	Unga #1, Unga Village	5-27-07 5-30-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	38		17.65	110.52	83.27	52.82	0.00	0.00	0.00	31.24	0.00	4.69	11.25
72	False Pass #2, Peter Pan dock	5-30-07 6-1-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	≤ 32		7.78	24.67	18.66	44.33	0.00	0.00	0.00	39.20	0.00	4.53	11.94
73	Sand Point #21, Spit	5-17-07 5-18-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Dana Osterback	33		21.98	48.20	40.38	40.80	0.00	0.00	0.00	28.50	0.00	30.71	0.00
74	Sand Point #22, Spit	5-18-07 5-18-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Dana Osterback	≤ 32		25.52	38.09	31.45	46.07	0.00	0.00	4.74	26.63	0.00	22.55	0.00
75	Sand Point #23, Spit	5-18-07 5-18-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Dana Osterback	none		25.30	48.40	37.62	59.03	0.00	0.00	0.00	28.44	0.00	12.53	0.00
76	Sand Point #24, Ivanoff	5-23-07 5-24-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Dana Osterback	≤ 31		34.11	36.23	30.66	42.71	0.00	0.00	13.81	23.45	0.00	20.03	0.00
77	Sand Point #25, Ivanoff	5-24-07 5-24-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Dana Osterback	35		23.34	42.15	35.99	41.22	0.00	0.00	18.55	22.79	0.00	17.43	0.00
78	Nelson Lagoon #1, lagoon	5-28-07 6-12-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	Not enough sample		≤ 32		13.81	17.95	13.18	68.06	0.00	0.00	0.00	31.94	0.00	0.00	0.00
79	Akutan #12, between	4-17-07 6-13-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	Not enough sample		≤ 31		0.00	0.00	0.00								
80	Akutan #13, west of Trident	4-17-07 6-13-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	Not enough sample		≤ 31		0.00	0.00	0.00								

81	Akutan #14, west of Trident	5-18-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 32		0.00	0.00	0.00								
82	Akutan #15, between Trident	5-18-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 31		0.00	0.00	0.00								
83	Atka #8, Korovin Bay	6-14-07 ?	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 31		0.00	0.00	0.00								
84	False Pass #3, Peter Pan	7-14-07 7-16-07	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 31		7.19	2.88	2.19	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
85	Adak #1, Clam Lagoon	7-15-07 7-17-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 33		3.82	1.60	1.22	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
86	Atka #10, Dump Bay	8-31-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
87	Atka #11, Dump Bay	7-29-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 31		0.00	0.00	0.00								
88	Akutan #16, between	6-6-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
89	Akutan #17, west of Trident	6-6-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 33		0.00	0.00	0.00								
90	Akutan #18, between	8-2-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 31		10.64	20.38	15.47	43.14	0.00	0.00	0.00	27.12	0.00	5.54	24.21
91	Akutan #19, west of Trident	8-2-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample	B. Wright	none		11.97	16.05	11.77	72.61	0.00	0.00	0.00	27.39	0.00	0.00	0.00
92	Prince William Sound #1,	7-31-07 8-2-07	butter clam <i>Saxidomus giganteus</i>	negative	B. Wright	≤ 32		8.39	4.32	4.32	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00

93	Prince William Sound #3	8-12-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	none		0.00	0.00	0.00									
94	Prince William Sound #2	8-1-07 8-2-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 31		0.00	0.00	0.00									
95	Port Lions #10, Airport	7-2-07 7-12-07	cockle <i>Clinocardium sp.</i>	positive	Amanda Squartsoff, Yvonne	none		40.70	101.58	116.13	31.53	3.40	48.54	2.49	12.22	0.00	1.82	0.00	
96	Port Lions #11, Airport	7-2-07 7-12-07	littleneck clam <i>Protothaca staminea</i>	positive	Amanda Squartsoff, Yvonne	none		17.49	23.23	51.08	0.00	0.00	96.59	3.41	0.00	0.00	0.00	0.00	0.00
97	Port Lions #12, Airport	7-31-07 8-5-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff, Yvonne	none	84.4	121.43	257.19	198.29	39.86	2.43	0.00	0.38	23.66	2.44	5.80	25.42	
98	Port Lions #13, Airport	7-31-07 8-5-07	cockle <i>Clinocardium sp.</i>	positive	Amanda Squartsoff, Yvonne	295	58	146.42	271.28	323.23	26.75	3.94	50.77	5.02	11.02	0.00	2.50	0.00	
99	Port Lions #14, Airport	7-31-07 8-5-07	littleneck clam <i>Protothaca staminea</i>	positive	Amanda Squartsoff, Yvonne	none		45.64	81.67	180.96	0.00	0.00	97.43	2.57	0.00	0.00	0.00	0.00	0.00
100	Port Lions #1, Airport	3-14-07 3-16-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff	68		60.86	77.84	77.65	0.00	14.74	0.00	4.80	0.00	0.00	80.47	0.00	
101	Port Lions #3, Airport	5-5-07 5-5-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff, Yvonne	none		21.58	33.48	33.29	0.00	22.62	0.00	5.52	0.00	0.00	71.86	0.00	
102	Port Lions #4, Airport	5-5-07 5-5-07	cockle <i>Clinocardium sp.</i>	positive	Amanda Squartsoff, Yvonne	<32		6.06	4.44	4.65	0.00	0.00	0.00	44.43	0.00	0.00	55.57	0.00	
103	Port Lions #6, Airport	6-18-07 6-24-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff, Yvonne	≤ 30		20.07	39.09	33.59	42.17	0.00	0.00	2.90	17.87	0.00	37.06	0.00	
104	Port Lions #7, Airport	6-18-07 6-24-07	littleneck clam <i>Protothaca staminea</i>	positive	Amanda Squartsoff, Yvonne	none		4.51	4.96	9.95	0.00	0.00	86.00	14.00	0.00	0.00	0.00	0.00	0.00

105	Port Lions #8, Airport	6-18-07 6-24-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Amanda Squartsoff , Yvonne	none		15.74	35.09	36.02	43.26	0.00	39.75	0.00	13.75	0.00	3.24	0.00
106	Port Lions #9, Airport	7-2-07 7-12-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Amanda Squartsoff , Yvonne	42		20.16	48.22	48.81	44.56	0.00	37.90	0.00	12.68	0.00	4.85	0.00

APPENDIX G: PSP Test Data by Location

PSP test data by location and including blind test sample number, dates, species and tester's name and including results from mouse bioassay, Jellett Rapid Testing Kit, Receptor Binding Assay (RBA) and High Performance Liquid Chromatography with Fluorescence Detection (HPLC).

Sample Location and Number	Blind Test No.	Date Collected & tested	Species	Jellett Results 40 µg	Tester Name	Mouse bioassa y µg STX	ELISA µg STX Abraxis	RBA µg STX NOAA	HPLC µg STX Qilliam	HPLC µg STX Oshima	HPLC % GTX1, 4	HPLC % NEO	HPLC % dcGTX 2,3	HPLC % GTX2, 3	HPLC % B1	HPLC % STX	HPLC % C1,2	
Adak #1, Clam Lagoon	85	7-15-07 7-17-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 33		3.82	1.60	1.22	0.00	0.00	0.00	0.00	100.00	0.00	0.00	
Adak #2, Bay of Isles		7-9-07 7-9-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer													
Adak #3, Harbor, central		7-11-07 7-11-07	blue mussel <i>Mytilus trossulus</i>	positive	Reid Brewer													
Adak #4, Chisak Bay		7-13-07 7-13-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer													
Aiktak Island #1	31	9-2-06 10-11-06	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	none		2.72	4.44	3.30	0.00	0.00	0.00	0.00	39.64	0.00	0.00	60.36
Akutan #1, 1/4 mile west	20	7-23-06 8-19-06	butter clam <i>Saxidomus giganteus</i>	positive	B. Wright	none		7.13	13.82	10.16	65.36	0.00	0.00	0.00	34.64	0.00	0.00	0.00
Akutan #2, 1/4 mile west	21	7-23-06 8-19-06	littleneck clam <i>Protothaca staminea</i>	negative	B. Wright	none		0.00	0.00	0.00								
Akutan #3, between	22	7-23-06 8-19-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	33		26.75	67.31	49.94	50.77	0.00	0.00	0.00	28.28	0.00	1.92	19.02

Akutan #4, 1/4 mile west	23	7-23-06 8-19-06	soft-shell clam <i>Mya sp.</i>	positive	B. Wright	≤ 33		4.78	8.81	6.40	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Akutan #5, 1/4 mile west	24	7-23-06 8-19-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 32	9.8	18.45	47.83	34.96	58.32	0.00	0.00	0.00	21.45	0.00	0.00	20.23
Akutan, #6 between	25	10-6-06 11-5-06	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	none		3.84	3.25	2.47	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Akutan #7, west of Trident	26	10-6-06 11-5-06	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
Akutan #8, West of Trident	62	2-7-07 2-16-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.00	0.00	0.00								
Akutan #9, between	64	2-7-07 2-16-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								
Akutan #10, between	63	3-12-07 3-14-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								
Akutan #11, West of Trident	65	3-12-07 3-14-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 31		0.00	0.00	0.00								
Akutan #12, between	79	4-17-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 31		0.00	0.00	0.00								
Akutan #13, west of Trident	80	4-17-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 31		0.00	0.00	0.00								
Akutan #14, west of Trident	81	5-18-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 32		0.00	0.00	0.00								
Akutan #15, between	82	5-18-07 6-13-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 31		0.00	0.00	0.00								

Akutan #16, between	88	6-6-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
Akutan #17, west of Trident	89	6-6-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 33		0.00	0.00	0.00								
Akutan #18, between	90	8-2-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 31		10.64	20.38	15.47	43.14	0.00	0.00	0.00	27.12	0.00	5.54	24.21
Akutan #19, west of Trident	91	8-2-07 9-7-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample	B. Wright	none		11.97	16.05	11.77	72.61	0.00	0.00	0.00	27.39	0.00	0.00	0.00
Amchitka #1		7-2-07 7-2-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer													
Atka #1	50	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.00	0.00	0.00								
Atka #2	51	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.00	0.00	0.00								
Atka #3	52	2-8-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	none		0.70	0.00	0.00								
Atka #4, Old Village	66	4-23-07 4-30-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 33		0.00	0.00	0.00								
Atka #5, Dump Beach	67	4-23-07 4-30-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								
Atka # 6, Martin Bay	69	5-17-07 5-21-07	blue mussel <i>Mytilus trossulus</i>	negative	B. Wright	≤ 32		0.00	0.00	0.00								
Atka #7, Martin Bay	70	5-17-07 5-21-07	soft-shell clam <i>Mya sp.</i>	negative	B. Wright	≤ 33		0.00	0.00	0.00								

Atka #8, Korovin Bay	83	6-14-07 ?	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	B. Wright	≤ 31			0.00	0.00	0.00								
Adka #9		7-16-07 7-16-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	Reid Brewer														
Atka #10, Dump Bay	86	8-31-07 9-7-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	B. Wright	≤ 32			0.00	0.00	0.00								
Atka #11, Dump Bay	87	7-29-07 9-7-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	B. Wright	≤ 31			0.00	0.00	0.00								
Attu #1, Attu Island		6-25-07 6-25-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Reid Brewer														
Chowiet Is. #1, Semidi	18	9-5-06 10-11-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	none													
Craig #1, Baseball Field		9-4-06 9-26-06	Soft-shell clam <i>Mya sp.</i>	positive	Ray RaLonde														
False Pass #1	19	9-26-06 10-3-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	none			10.07	7.46	6.61	0.00	0.00	0.00	0.00	64.48	0.00	35.52	0.00
False Pass #2, Peter Pan dock	72	5-30-07 6-1-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	≤ 32			7.78	24.67	18.66	44.33	0.00	0.00	0.00	39.20	0.00	4.53	11.94
False Pass #3, Peter Pan	84	7-14-07 7-16-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	≤ 31			7.19	2.88	2.19	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Juneau #1, Youngs	16	5-06 9-15-06	surf clam <i>Mactromeris</i> <i>polynyma</i>	negative	B. Wright	≤ 33			3.03	0.00	0.00								
Juneau #2, Eagle Beach	17	4-29-06 9-15-06	surf clam <i>Mactromeris</i> <i>polynyma</i>	negative	B. Wright	≤ 33			0.00	0.00	0.00								
King Cove #1, Lagoon	11	4-22-06 6-23-06	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Dana Osterback	none			44.59	46.65	47.14	0.00	0.00	0.00	11.40	0.00	0.00	88.60	0.00

King Cove #2, Lagoon		8-3-06 8-26-06	littleneck clam <i>Protothaca staminea</i>	positive	Ray RaLonde													
King Cove #3, Lagoon		8-3-06 8-26-06	Soft-shell clam <i>Mya sp.</i>	positive	Ray RaLonde													
King Cove #4, Lagoon		8-3-06 8-26-06	butter clam <i>Saxidomus giganteus</i>	positive	Ray RaLonde	43												
King Cove #5, Harbor	32	10-2-06 10-4-06	butter clam <i>Saxidomus giganteus</i>	positive	B. Wright	64		43.46	59.67	56.48	15.43	0.00	0.00	3.49	12.48	0.00	68.60	0.00
King Cove #6, Lagoon	60	2-8-07 2-15-07	butter clam <i>Saxidomus giganteus</i>	positive	Bruce Wright	37		27.84	32.68	32.01	0.00	0.00	0.00	7.43	20.30	0.00	72.27	0.00
King Cove #7, Lagoon	59	2-07 3-14-07	butter clam <i>Saxidomus giganteus</i>	positive	Bruce Wright	31		41.58	48.06	47.40	0.00	0.00	0.00	5.59	14.42	0.00	79.99	0.00
King Cove #8, Lagoon	61	3-21-07 3-27-07	butter clam <i>Saxidomus giganteus</i>	positive @ 40 µg	Bruce Wright	65		49.60	52.98	53.12	0.00	0.00	0.00	4.75	0.00	14.14	81.10	0.00
King Cove #9, Lagoon	61	3-21-07 3-27-07	butter clam <i>Saxidomus giganteus</i>	positive @ 80 µg	Bruce Wright	65		49.60	52.98	53.12	0.00	0.00	0.00	4.75	0.00	14.14	81.10	0.00
King Cove #10, Harbor	58	3-29-07 4-5-07	blue mussel <i>Mytilus trossulus</i>	negative	Charly Bendixen	none		10.77	43.04	32.23	51.78	0.00	0.00	0.00	35.37	0.00	3.27	9.58
King Cove #11, Harbor		5-25-07 5-27-07	blue mussel <i>Mytilus trossulus</i>	positive	Charly Bendixen													
King Cove #12, Harbor		12-17-07 12-17-07	butter clam <i>Saxidomus giganteus</i>	positive	Charly Bendixen	43												
Nelson Lagoon #1 lagoon	78	5-28-07 6-12-07	blue mussel <i>Mytilus trossulus</i>	Not enough sample		≤ 32		13.81	17.95	13.18	68.06	0.00	0.00	0.00	31.94	0.00	0.00	0.00
Nikolski #1, SW Umnak	49	4-1-07 4-5-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32		0.00	0.00	0.00								

Nikolskoye #1, Russia	27	8-10-06 8-10-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia	≤ 33			0.00	0.00	0.00							
Nikolskoye #2, Russia	28	8-9-06 8-10-06	Alaska razor clam <i>Siliqua alta</i>	negative	Ivan Vozhikov Natalia	≤ 33			0.00	0.00	0.00							
Nikolskoye #3, Russia	29	8-9-06 8-11-06	blue mussel <i>Mytilus trossulus</i>	negative @ 40 µg	Ivan Vozhikov Natalia	≤ 32			3.54	0.00	0.00							
Nikolskoye #4, Russia	29 (same sample as Nikolskoye #3)	8-9-06 8-11-06	blue mussel <i>Mytilus trossulus</i>	negative @ 80 µg	Ivan Vozhikov Natalia	≤ 32			3.54	0.00	0.00							
Nikolskoye #5, Russia	30	8-9-06 8-11-06	Alaska razor clam <i>Siliqua alta</i>	negative	Ivan Vozhikov Natalia	≤ 33			0.00	0.00	0.00							
Nikolskoye #6, Gaunt		9-19-06 9-19-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #7, Ryf Cape		9-21-06 9-21-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #8, Ryf Cape		11-9-06 11-9-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #9, Ryf Cape		12-21-06 12-22-06	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #10, Ryf Cape		1-19-07 1-21-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #11, Gaunt		2-26-07 2-26-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #12, Ryf Cape		3-18-07 3-19-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Nikolskoye #13, Ryf Cape		4-7-07 4-23-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													

Nikolskoye #14, Gaup		5-6-07 5-6-07	blue mussel <i>Mytilus trossulus</i>	negative	Ivan Vozhikov Natalia													
Old Harbor #1, Boat	4	8-9-06 9-26-06	blue mussel <i>Mytilus trossulus</i>	positive	Ray RaLonde	none		16.67	15.33	13.71	0.00	0.00	0.00	0.00	61.46	0.00	38.54	0.00
Old Harbor #2, Boat	5	8-9-06 9-26-06	cockle <i>Clinocardium sp.</i>	positive	Ray RaLonde	none	7.8	12.68	5.68	6.04	0.00	0.00	0.00	53.78	0.00	0.00	46.22	0.00
Ouzinkie #1, Sourdoug	55	3-14-07 3-16-07	blue mussel <i>Mytilus trossulus</i>	negative	Ray RaLonde	none		5.86	4.27	4.27	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Ouzinkie #2, Sourdoug	56	3-13-07 3-16-07	littleneck clam <i>Protothaca staminea</i>	negative	Ray RaLonde	none		4.38	2.46	2.88	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Ouzinkie #3, Sourdoug		3-13-07 3-16-07	butter clam <i>Saxidomus giganteus</i>	positive	Ray RaLonde	51												
Port Lions #1, Airport	100	3-14-07 3-16-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff	68		60.86	77.84	77.65	0.00	14.74	0.00	4.80	0.00	0.00	80.47	0.00
Port Lions #2, Airport		3-14-07 3-16-07	littleneck clam <i>Protothaca staminea</i>	negative	Yvonne Lukin													
Port Lions #3, Airport	101	5-5-07 5-5-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff Yvonne	none		21.58	33.48	33.29	0.00	22.62	0.00	5.52	0.00	0.00	71.86	0.00
Port Lions #4, Airport	102	5-5-07 5-5-07	cockle <i>Clinocardium sp.</i>	positive	Amanda Squartsoff Yvonne	<32		6.06	4.44	4.65	0.00	0.00	0.00	44.43	0.00	0.00	55.57	0.00
Port Lions #5, Airport		5-5-07 5-5-07	littleneck clam <i>Protothaca staminea</i>	negative	Amanda Squartsoff Yvonne													
Port Lions #6, Airport	103	6-18-07 6-24-07	butter clam <i>Saxidomus giganteus</i>	positive	Amanda Squartsoff Yvonne	≤ 30		20.07	39.09	33.59	42.17	0.00	0.00	2.90	17.87	0.00	37.06	0.00
Port Lions #7, Airport	104	6-18-07 6-24-07	littleneck clam <i>Protothaca staminea</i>	positive	Amanda Squartsoff Yvonne	none		4.51	4.96	9.95	0.00	0.00	86.00	14.00	0.00	0.00	0.00	0.00

Port Lions #8, Airport	105	6-18-07 6-24-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Amanda Squartsoff Yvonne	none		15.74	35.09	36.02	43.26	0.00	39.75	0.00	13.75	0.00	3.24	0.00
Port Lions #9, Airport	106	7-2-07 7-12-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Amanda Squartsoff Yvonne	42		20.16	48.22	48.81	44.56	0.00	37.90	0.00	12.68	0.00	4.85	0.00
Port Lions #10, Airport	95	7-2-07 7-12-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Amanda Squartsoff Yvonne	none		40.70	101.58	116.13	31.53	3.40	48.54	2.49	12.22	0.00	1.82	0.00
Port Lions #11, Airport	96	7-2-07 7-12-07	littleneck clam <i>Protothaca</i> <i>staminea</i>	positive	Amanda Squartsoff Yvonne	none		17.49	23.23	51.08	0.00	0.00	96.59	3.41	0.00	0.00	0.00	0.00
Port Lions #12, Airport	97	7-31-07 8-5-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	positive	Amanda Squartsoff Yvonne	none	84.4	121.43	257.19	198.29	39.86	2.43	0.00	0.38	23.66	2.44	5.80	25.42
Port Lions #13, Airport	98	7-31-07 8-5-07	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Amanda Squartsoff Yvonne	295	58	146.42	271.28	323.23	26.75	3.94	50.77	5.02	11.02	0.00	2.50	0.00
Port Lions #14, Airport	99	7-31-07 8-5-07	littleneck clam <i>Protothaca</i> <i>staminea</i>	positive	Amanda Squartsoff Yvonne	none		45.64	81.67	180.96	0.00	0.00	97.43	2.57	0.00	0.00	0.00	0.00
Prince William Sound #1	92	7-31-07 8-2-07	butter clam <i>Saxidomus</i> <i>giganteus</i>	negative	B. Wright	≤ 32		8.39	4.32	4.32	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Prince William Sound #2	94	8-1-07 8-2-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	B. Wright	≤ 31		0.00	0.00	0.00								
Prince William Sound #3	93	8-12-07 9-7-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	negative	B. Wright	none		0.00	0.00	0.00								
Sand Point, #1a & 1b	6	6-22-06 6-22-06	butter clam <i>Saxidomus</i> <i>giganteus</i>	Invalid then positive	Dana Osterback	34		17.69	32.66	27.48	0.00	0.00	0.00	0.00	22.91	29.71	9.00	38.38
Sand Point #2, Spit	7	6-22-06 6-22-06	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	Dana Osterback	≤ 33	35.8	52.25	42.36	42.12	0.00	0.00	0.00	2.98	6.65	0.00	90.37	0.00
Sand Point #3, Sand	8	6-22-06 6-22-06	cockle <i>Clinocardium</i> <i>sp.</i>	positive	Dana Osterback	57	23.6	19.57	50.06	40.19	44.89	0.00	0.00	10.07	35.99	0.00	9.05	0.00

Sand Point, #4, same as		4-22-06 4-23-06	butter clam <i>Saxidomus giganteus</i>	Positive (King Cove #1)	Dana Osterback													
Sand Point #5, Sand	9	6-23-06 6-23-06	surf clam <i>Mactromeris polynyma</i>	positive	Dana Osterback	≤ 33		7.23	3.91	3.91	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Sand Point #6, Sand	10	6-23-06 6-23-06	surf clam <i>Mactromeris polynyma</i>	positive	Dana Osterback	329	55.2	139.90	202.59	188.08	15.91	0.00	0.00	1.35	15.41	6.20	55.97	5.16
Sand Point #7, Sand		6-23-06 6-23-06	Great tillin clam <i>Tellina lutea</i>	positive	Dana Osterback													
Sand Point #8, Sand		6-23-06 6-23-06	Alaska razor clam <i>Siliqua alta</i>	positive	Dana Osterback													
Sand Point #9, Sand	14	7-13-06 7-13-06	surf clam <i>Mactromeris polynyma</i>	invalid	Dana Osterback	55		45.51	41.99	41.39	0.00	0.00	0.00	6.00	15.14	0.00	78.86	0.00
Sand Point #10, Spit	15	7-25-06 7-25-06	blue mussel <i>Mytilus trossulus</i>	positive	Dana Osterback	≤ 32		30.66	92.81	71.21	43.89	0.00	0.00	0.00	30.06	0.00	7.51	18.55
Sand Point #11, Spit	43	9-7-06 11-3-06	blue mussel <i>Mytilus trossulus</i>	positive	JDK and Dana Osterback	none		8.30	8.64	7.94	0.00	0.00	0.00	0.00	50.98	0.00	49.02	0.00
Sand Point #12, Spit	44	10-23-06 11-3-06	blue mussel <i>Mytilus trossulus</i>	positive	Dana Osterback	≤ 32		6.33	8.17	7.32	0.00	0.00	0.00	0.00	60.57	0.00	39.43	0.00
Sand Point #13, Spit	45	11-6-06 12-6-06	Alaska razor clam <i>Siliqua alta</i>	positive	Dana Osterback	none		220.12	332.05	322.27	12.27	4.71	5.63	8.87	16.50	0.00	52.02	0.00
Sand Point #14, Spit	46	12-4-06 12-5-06	littleneck clam <i>Protothaca staminea</i>	positive	Dana Osterback	none		16.58	3.48	4.07	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Sand Point #15, Spit	47	12-4-06 12-5-06	blue mussel <i>Mytilus trossulus</i>	positive	Dana Osterback	≤ 31		23.54	16.47	15.77	0.00	0.00	0.00	0.00	30.45	0.00	69.55	0.00

St. George #1,	53	2-14-07 2-15-07	blue mussel <i>Mytilus trossulus</i>	positive	Bruce Wright	none		4.72	4.69	8.36								
St. George #2,	54	4-1-07 4-6-07	blue mussel <i>Mytilus trossulus</i>	positive	Bruce Wright	none		8.66	6.75	5.96	0.00	0.00	0.00	0.00	41.79	0.00	25.11	33.09
St. George #3,		1-8-07 4-12-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright													
St. George #4,		3-13-07 4-10-07	blue mussel <i>Mytilus trossulus</i>	negative	Bruce Wright	≤ 32												
St. Paul #1, Seal Point, St.	68	5-16-07 5-19-07	blue mussel <i>Mytilus trossulus</i>	positive	B. Wright	≤ 32		4.01	6.45	5.68	0.00	0.00	0.00	0.00	67.04	0.00	32.96	0.00
Tenass Pass #1, sea farm		7-29-06 12-2-06	cockle <i>Clinocardium sp.</i>	negative @ 40 µg negative	Ray RaLonde													
Tenass Pass #2, sea farm		8-15-06 12-2-06	cockle <i>Clinocardium sp.</i>	positive @ 40 µg positive	Ray RaLonde													
Tenass Pass #3, sea farm		9-25-06 12-2-06	cockle <i>Clinocardium sp.</i>	positive @ 40 µg positive	Ray RaLonde													
Tenass Pass #4, sea farm		9-19-06 12-2-06	cockle <i>Clinocardium sp.</i>	positive @ 40 µg positive	Ray RaLonde													
Tenass Pass #5, sea farm		10-22-06 12-2-06	cockle <i>Clinocardium sp.</i>	positive @ 40 µg negative	Ray RaLonde													
Tenass Pass #6, sea farm		10-2-06 12-2-06	cockle <i>Clinocardium sp.</i>	positive @ 40 µg positive	Ray RaLonde													
Unalaska #1, Summer	33	7-18-06 7-18-06	blue mussel <i>Mytilus trossulus</i>	positive	Anfesia Tutiakoff	55		51.22	121.43	91.92	47.14	0.00	0.00	0.00	32.76	0.00	5.15	14.95

Unalaska #2, head of	34	7-19-06 7-19-06	littleneck clam <i>Protothaca staminea</i>	positive	Anfesia Tutiakoff	69		32.81	5.84	5.63	0.00	0.00	0.00	48.75	51.25	0.00	0.00	0.00
Unalaska #3, head of	35	7-19-06 7-19-06	blue mussel <i>Mytilus trossulus</i>	positive	Anfesia Tutiakoff	none	134.4	301.70	832.66	628.67	35.65	2.96	0.00	0.00	27.36	1.35	1.79	30.90
Unalaska #4, Priest Rock	36	7-20-06 7-20-06	butter clam <i>Saxidomus giganteus</i>	positive	Anfesia Tutiakoff	60		36.44	96.32	73.44	48.06	0.00	0.00	0.00	25.50	0.00	6.86	19.59
Unalaska #5, Little South	37	7-20-06 7-20-06	butter clam <i>Saxidomus giganteus</i>	positive	Anfesia Tutiakoff	218	98	139.40	321.42	251.27	39.43	4.89	0.00	0.00	23.44	2.90	6.91	22.42
Unalaska #6, Little South	38	7-20-06 7-20-06	soft-shell clam <i>Mya sp.</i>	positive	Anfesia Tutiakoff	371		79.50	225.92	172.36	43.15	3.86	0.00	0.00	21.98	3.34	3.57	24.10
Unalaska #7, small boat	57	3-6-07 3-8-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer	none	56.4	603.09	47.69	47.94	0.00	0.00	0.00	5.74	0.00	0.00	94.26	0.00
Unalaska #8, Little South		4-17-07 4-17-07	butter clam <i>Saxidomus giganteus</i>	positive	Reid Brewer													
Unalaska #9, Little South		4-20-07 4-20-07	butter clam <i>Saxidomus giganteus</i>	positive	Reid Brewer													
Unalaska #10, Little South		4-20-07 4-20-07	blue mussel <i>Mytilus trossulus</i>	negative	Reid Brewer													
Unalaska #11, Summer's		5-15-07 5-15-07	blue mussel <i>Mytilus trossulus</i>	positive	Reid Brewer													
Unalaska #12, Morris		6-18-07 6-18-07	blue mussel <i>Mytilus trossulus</i>	positive	Reid Brewer													
Unalaska #13, Chernofsk		7-22-07 7-22-07	blue mussel <i>Mytilus trossulus</i>	positive	Reid Brewer													

Unga #1, Unga Village	71	5-27-07 5-30-07	blue mussel <i>Mytilus</i> <i>trossulus</i>	positive	B. Wright	38			17.65	110.52	83.27	52.82	0.00	0.00	0.00	31.24	0.00	4.69	11.25
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APPENDIX H: Comparative determination of paralytic shellfish toxins (PSTs) in Alaska shellfish using four distinct analytical methodologies

Pedro Costa, Keri Baugh, Shelly Nance and Kathi Lefebvre

Marine Biotoxins Program, Northwest Fisheries Science Center, NOAA Fisheries, Seattle, WA

1. Brief overview

Shellfish collection for human consumption is an ancient cultural custom in Alaska. High levels of paralytic shellfish toxins (PSTs) and human poisoning and fatalities associated with PSTs have been reported in this region (Gessner and Middaugh 1995). Consequently, there is a critical need for effective monitoring programs. Currently, the mouse bioassay (MBA) is the official method for PST monitoring purposes, however alternative chemical or biochemical methods have been developed for the quantification of PSTs. Recently, a liquid chromatography (HPLC) method was validated by the AOAC for PST determination in shellfish (Lawrence *et al* 2005).

The objective of this study was to compare four analytical methods for PST detection.

The four methods used are listed below:

- 1) **MBA:** Mouse bioassay (AOAC 1999).
- 2) **JRT:** Jellett Rapid Testing Kit, a commercial antibody-based qualitative test developed and manufactured by Jellett Rapid Testing Ltd, Canada (Jellett *et al* 2002).
- 3) **RBA:** Receptor Binding Assay, which measures binding of STX to rat sodium channels by the displacement of radio labeled STX (Trainer and Poli 2000).
- 4) **HPLC:** High Performance Liquid Chromatography with Fluorescence Detection (HPLC), PSP toxins are detected and quantified using liquid chromatography after prechromatographic oxidation with hydrogen peroxide and periodate (Lawrence *et al* 2005).

2. Results

One hundred and four samples of 7 different shellfish species collected in Alaska were analyzed using both RBA and HPLC. In addition, 98 samples were analyzed by JRT and 53 were analyzed by mouse bioassay (Table 1).

2.1 The Jellett Rapid Test (JRT)

This test gives a rapid and qualitative (yes/no) indication of the presence of PSTs. According

to the manufacturer, this method has an average detection limit of 40 µg STX equiv./100 g shellfish (Jellett *et al* 2002). In this comparison, every sample that tested positive for PSTs by MBA (n=21) also gave a positive result using the JRT. However, 10 samples that tested negative by MBA, tested positive by JRT. Eight of those samples were *Mytilus trossulus* and two were *Saxidomus giganteus*. In nine of these cases, GTX1,4 and/or GTX2,3 made up all or a major portion of the toxin profile. In one case, STX made up the entire profile, however the overall level (4 µg STX equiv./100 g shellfish) was far below the regulatory limit. This suggests that the toxin profile may contribute to “false positives” by JRT when compared to MBA. It is known that the gonyautoxins are less potent than STX in biological systems.

A total of 61 samples tested positive with JRT analysis. However, PST concentrations below the JRT detection limit were detected in 45 of these samples when quantified by RBA and 32 when quantified by HPLC (Figure 1). Furthermore only 6 and 13 samples were considered higher than the regulatory limit after analysis by RBA and HPLC respectively (Figure 1). These data further suggest that there is a high percentage of “false positives” in terms of the “advertised” JRT detection limit of 40 µg STXequiv./100 g shellfish. In general the data suggest that “false negatives” are rare. However, one sample reached a concentration of 43 µgSTXequiv./100 g using the HPLC method and tested negative by JRT (Figure 1). PSTs consist of a “suite” of toxins not just saxitoxin. By using the HPLC method in the present study, we observed that GTX1,4 as well as GTX2,3 and C toxins were present in the PST profile of this sample. These compounds do not bind efficiently to the antibody on the JRT strip. The JRT has been shown to give best results when STX is the major component.

Collectively, these data suggest that the JRT is an efficient method for rapid screening in order to eliminate shellfish containing low levels of PSTs. However, there is a relatively high potential for “false positives”. However, we found that negatives from this test were also negatives using other testing methods, so negatives are negatives!

2.2 The receptor binding assay (RBA)

The RBA values obtained for 104 samples showed a strong positive correlation with the values obtained via HPLC. A Pearson correlation coefficient (r) was determined as 0.950 (Figure 2). There were some differences that could be explained by the suite of toxins present in the samples. The RBA has been developed and optimized for detection of the most potent PSP toxin, saxitoxin (STX). Other toxins, such as GTX1,4, GTX 2,3, GTX 5 (B1) and the C toxins do not have the same cross-reactivities in RBA as STX. Consequently, samples with a PST profile containing mostly these compounds might be underestimated by RBA (as well as in antibody-based assays like ELISA and JRT). A comparison of HPLC and RBA values revealed that a majority (68%) of the samples

analyzed had higher PST values when quantified by HPLC than when quantified by RBA. For these samples, GTX1,4, GTX2,3 and C1,2 levels were positively correlated with the difference between HPLC and RBA total PST values (Figure 3). For the 32% of samples that showed a higher PST value by RBA than HPLC, none presented GTX1,4.

2.3 The HPLC method

A liquid chromatographic method with fluorescent detection after a precolumn oxidation was developed by Lawrence et al (2005) and was validated by the AOAC for PST determination in shellfish. The suite of PSTs in six shellfish species was determined using HPLC and is illustrated in Figure 4. The six species tested in this study had different PST profiles as determined by HPLC (Figure 4). However, the littleneck clam *Protothaca staminea* revealed a distinct profile from the other species in that it contained a distinctly high proportion of dcGTX2,3 with relatively low standard deviation (Figure 4). Further analyses are needed to confirm this result. GTX1,4, GTX2,3 and STX were the major toxins present in the other five species (Figure 4).

3. Conclusions

- The Jellett Rapid Test (JRT) is a valuable screening tool that gives a fast and qualitative result. This method can be used to eliminate samples containing PST levels below the regulatory limit and reduce the amount of analyses in a monitoring program (i.e. the number of animals sacrificed in the mouse bioassay). However, in terms of the stated detection limit of 40 µg STX equiv./100 g shellfish for the JRT, the test results in a high percentage of false positives.
- The receptor-binding assay (RBA) is useful for monitoring purposes. This method gives a measurement of the biological activity of the toxins present in a sample, but does not discriminate the suite of toxins. Although not as rapid as the JRT, the RBA is faster than the HPLC method and can be used for efficient screening. RBA PST values diverge from HPLC PST values when toxins other than STX are present (i.e. GTX1,4 and GTX2,3 and C1,2).
- It appears that PST profiles differed between species in the present comparison, however, more research in this area is required before generalities can be made. There was a high level of variation within species as well.

- The HPLC method developed by Lawrence et al (2005) was validated by the AOAC for PST determination in shellfish. This method is now included in European Directives to act as a legal alternative to MBA. The down side to this method is that it is technical and time-consuming. The HPLC method has the advantage of determining the suite of toxins present in a sample, which can be used to more accurately estimate the potential toxicity of the sample than other biochemical methods. It is also very useful for research purposes.

References:

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Gressner, B. D., J. P. Middaugh 1995. Paralytic shellfish poisoning in Alaska: a 20-year retrospective analysis. *Am J Epidemiol* 141:766-760.

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Lawrence, J. F., B. Niedzwiadek, C. Menard. 2005. Quantitative determination of paralytic shellfish poisoning toxins in shellfish using prechromatographic oxidation and liquid chromatography with fluorescence detection: collaborative study. *J AOAC Int* 88:1714-1732.

Trainer, V., M. Poli. 2000. Assays for Dinoflagellate Toxins, Specifically Brevetoxin, Ciguatoxin, and Saxitoxin, Birkhauser, Berlin.

Table 7: Number of samples analyzed by each method (>LOD= total number of samples above the limit of detection for each assay).

	MBA	JRT	RBA	HPLC
Samples analyzed	53	97	104	104
> LOD	21	61	75	72

Figure 13: Concentration of paralytic shellfish toxins (PSTs) determined by a) RBA (green bars) and b) HPLC (blue bars) in shellfish samples that tested negative (n=37) or positive (n=61) by the Jellett Rapid Test (JRT). The regulatory and JRT detection limits are indicated by the red and yellow horizontal lines, respectively. Total PST levels are listed in terms of saxitoxin equivalents per 100 grams shellfish ($\mu\text{g STX eq./100 g}$).

a)

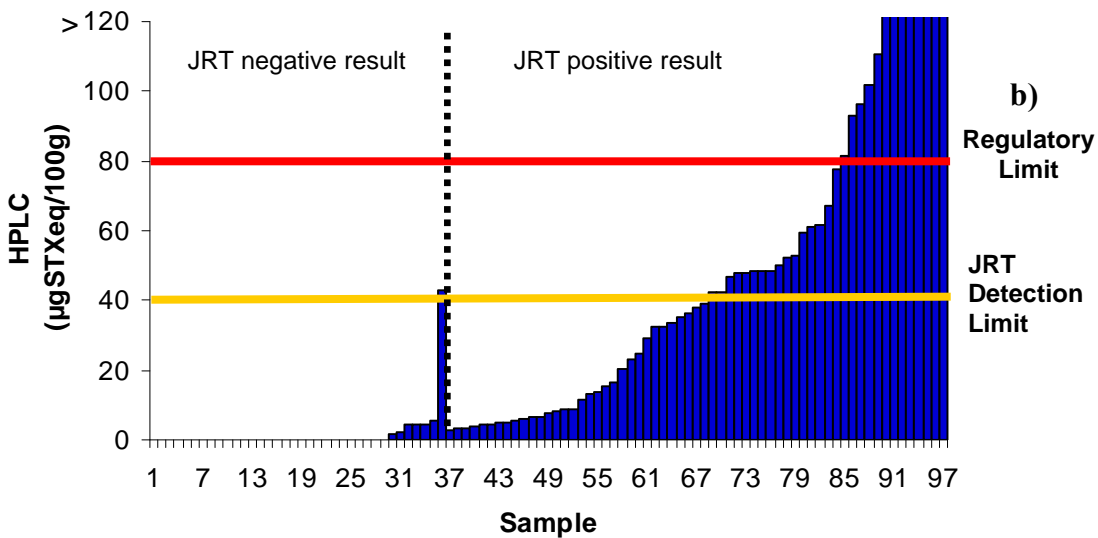
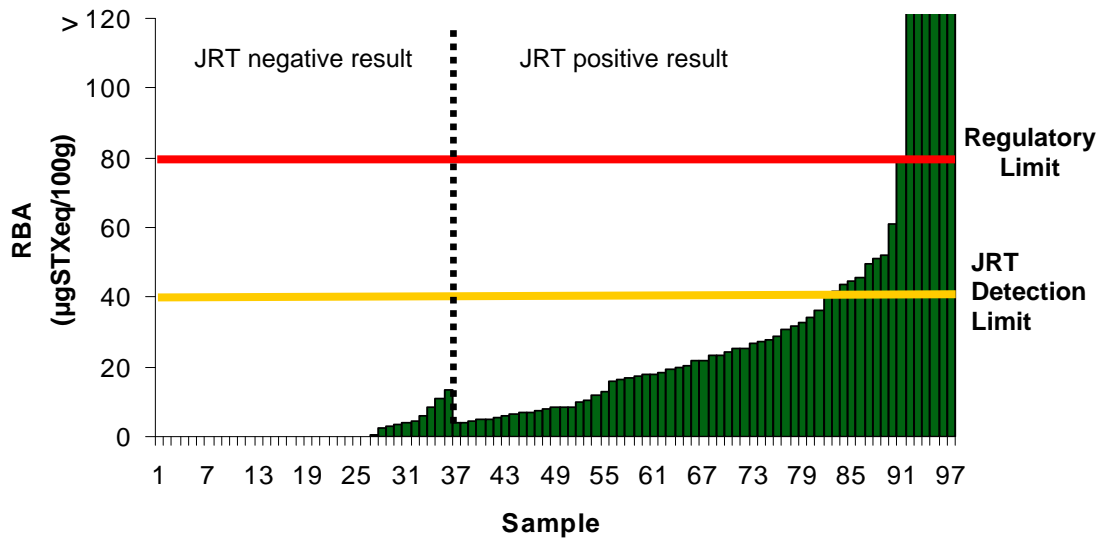


Figure 14: Correlation between PSP toxin concentration ($\mu\text{g STX equiv. /100 g}$) determined with receptor binding assay (RBA) and liquid chromatography (HPLC) analysis ($y=0.4147 + 5.5949x$, $r=0.950$, $n=104$)

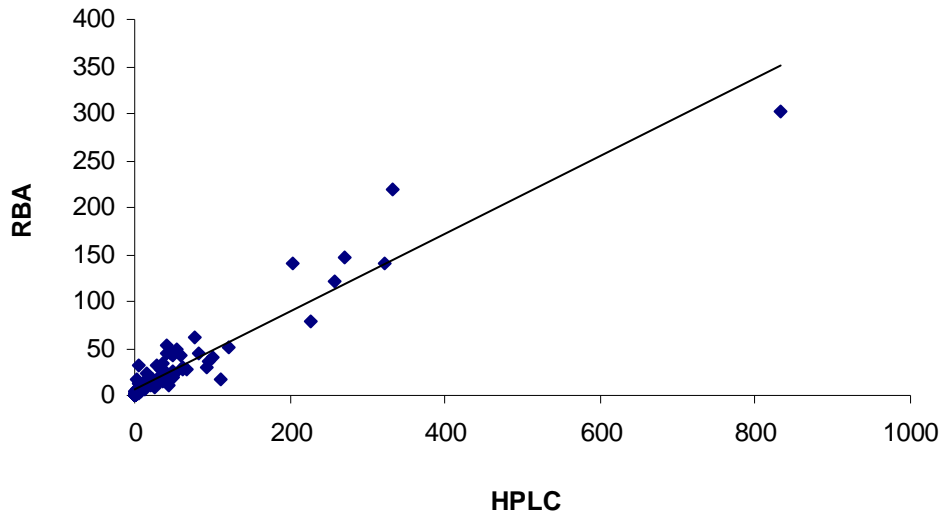
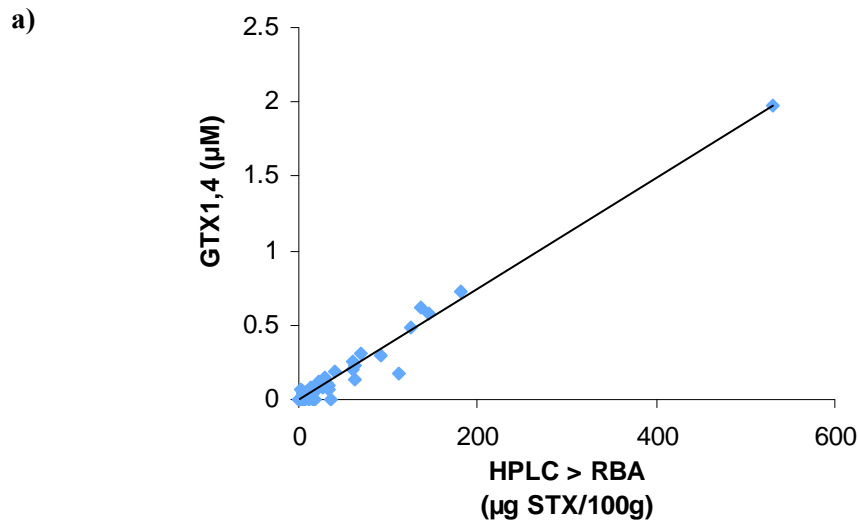
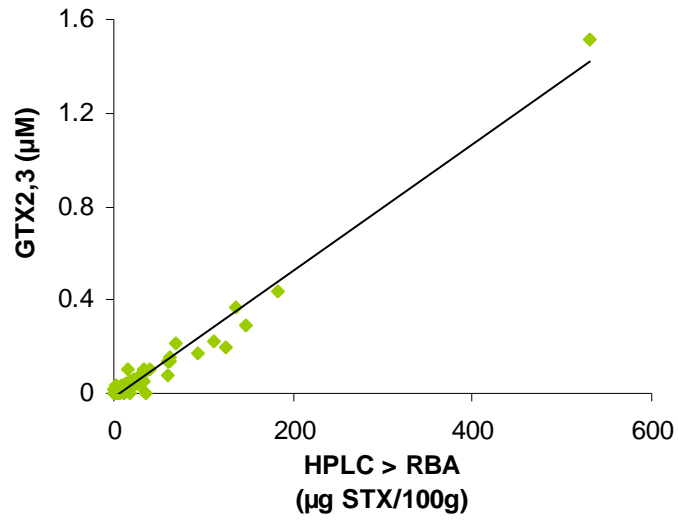


Figure 15: Regression plot of a) GTX1,4 b) GTX2,3 and c) C1,2 amount (μM) vs toxin concentration difference between HPLC and RBA ($n=49$). Correlation coefficient (r) was 0.985, 0.984 and 0.940 for GTX1,4; GTX2,3 and C1,2 respectively.



b)



c)

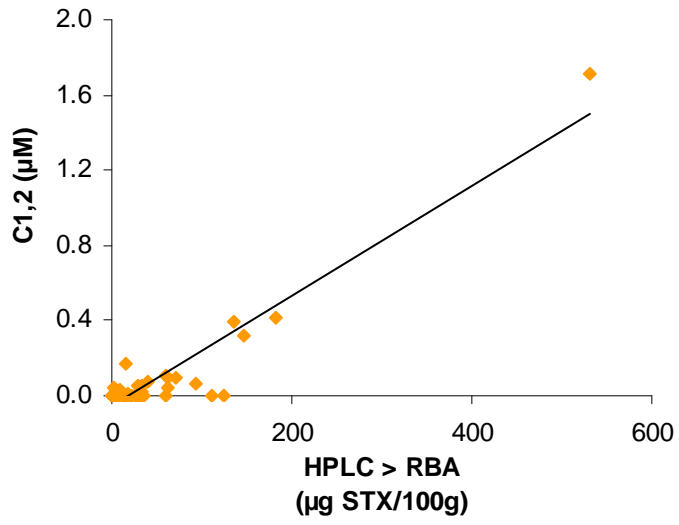
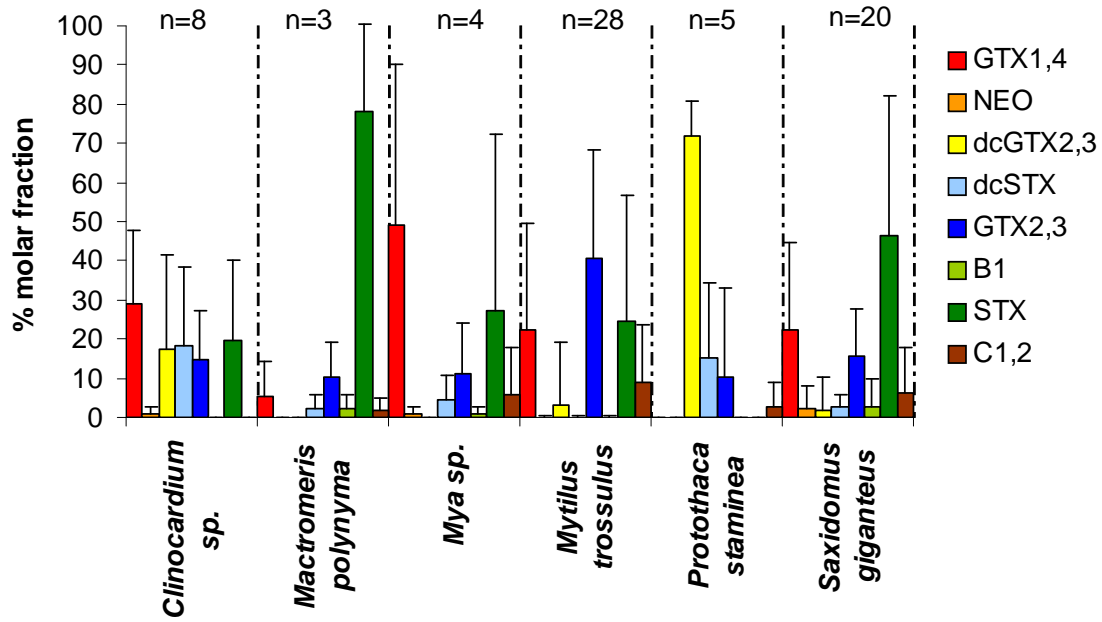


Figure 16: Paralytic shellfish toxins (PSTs) profile in six shellfish species collected in Alaska
(mean \pm SD)



Monthly Update

From: Bruce Wright
Date: June 19, 2007
Project: Paralytic Shellfish Poisoning Project

PURPOSE: This project is designed to determine distribution of PSP toxin in the Aleut Region. This project is designed to educate local residents about paralytic shellfish poisoning (PSP) and train technicians in Nikolskoye, Sand Point and Unalaska to use test kits to monitor for PSP toxin. Additional study sites will be secured as funding allows.

ACCOMPLISHMENTS:

Mouse bioassay test results indicate no PSP in St. George and St. Paul mussels. Jellett test results indicate Atka and Nikolskoye (Russia) mussels and clams remain below 40 micrograms (80 micrograms is the FDA limit for consumption). King Cove, Sand Point, and Unalaska PSP levels are increasing based on Jellett test kit results of mussels. Spring and summer are traditionally the seasons when PSP levels increase. Last month butter clams in King Cove were measured (using mouse bioassay methods) to be at 65 micrograms, but I suspect the levels in butter clams have increased based on the higher PSP levels we are seeing in King Cove mussels. Remember, butter clams can remain toxic for two years, so this is a species to be avoided and harvesters should remain cautious when consuming any bivalves in Alaska. Samples have been collected during April and May from Akutan, King Cove, and Sand Point and are awaiting transport to Anchorage for testing. Samples collected from throughout the Aleut region were sent to a NOAA lab in Seattle for testing using high-tech (high performance liquid chromatography). They have agreed to accept and analyze all the samples we provide. So far 77 samples were prepared using procedures for a blind test which should dramatically increase the scientific understanding of PSP in the region.

PLANS:

Continue monthly testing in Sand Point, Unalaska and Nikolsakoye. Continue periodic sampling in Akutan, Atka, False Pass, King Cove, Nelson Lagoon, Nikolski, St. George and St. Paul.

CHALLENGES:

A primary challenge is to find funding sources to continue the PSP monitoring project and to set up PSP food safety monitoring using FDA approved techniques for King Cove.

APPENDIX J: COMMUNITY NOTICE

When? 1:00 PM, June 22, 2006

What? PSP (paralytic shellfish poisoning) community meeting

Where? Sand Point City Chambers

Why? Learn about and get involved with the Sand Point PSP project.

APIA, in cooperation with Aleut International Association and Alaska Sea Grant, is running a public meeting and training about PSP in Sand Point. Everyone is welcome to attend the public workshop where you will learn what scientists know about PSP, and what we don't know. The project title is:

Testing and monitoring for Paralytic Shellfish Poisoning in Bering Sea and Aleutian Island Communities.

Objectives

1. Educate the citizens of selected communities in the Aleutian and the Commander Islands on the oceanography processes that produce PSP plankton blooms, associated toxicity and their relation to climate change.
2. Educate bivalve harvesters about the relative risk of encountering PSP from their harvest and the difference in species of bivalves and harvesting and processing methods to reduce their risk of illness.
3. Train tribal/village environmental coordinators in use of the Jellett PSP test kit.
4. Develop a community-based monitoring program at selected locations in the Aleutian and Commander Islands to determine occurrence and potential range expansion as a result of climate change.
5. Confirm field test results with the Jellett Biotech laboratory.
6. Provide Alaska Department of Environmental Conservation and Health Department of the Kamchatka Regional Administration with collected PSP monitoring data that may encourage these government agencies to develop additional surveillance programs and advisories to consumer of traditional foods.
7. Develop informational materials for community outreach that will provide practical recommendations for protection against PSP.

If you eat any of the following, you should attend this meeting: blue mussel (*Mytilus trossulus*),

butter clam (*Saxidomus giganteus*), cockle (*Clinocardium nuttalli*), geoduck (*Panope abrupta*), horse clam, gapper clam (*Tresus capax*), littleneck clam (*Protothaca staminea*), razor clam (*Siliqua patula* and *Siliqua alta*), soft-shell clam (*Mya arenaria*), surf clam (*Mactromeris polynyma*), bay, pink or reddish scallop (*Chlamys rubida*), giant Pacific weathervane scallop (*Patinopecten caurinus*), rock scallop (*Crassedoma giganteum*) and Dungeness crab (*Cancer magister*).

For more information please contact:

Bruce Wright	Dana Osterback	Anne Morris	Amy Foster
APIA	QTT	Pauloff Harbor Tribe	Unga Tribe
907-222-4260	383-6968	383-2487	383-5215
brucew@apiai.org	qttadmin@arctic.net	phttec@arctic.net	ungatribe@arctic.net



Community workshop in Unalaska

APPENDIX K: APIA PSP Front Page



Paralytic Shellfish Poisoning (PSP)

Monitoring Paralytic Shellfish Poisoning in the Aleutian, Commander and Pribilof Islands

Project title: Response and Intervention System for Climate Change Induced Paralytic Shellfish Poisoning in Aleut Communities



The North Pacific Research Board (NPRB) funded the paralytic shellfish poisoning (PSP) project in May 2006. The PSP project objectives include developing methods for communities to monitor the occurrence and distribution of PSP toxins that occur in connection with climate change observations. The project goals are: 1) devise a mechanism to better respond to the threat and minimize the risks of poisoning, 2) develop a process of interlinking modern technology and traditional knowledge, 3) educate local residents about PSP and 4) train local technicians to use test kits to monitor for PSP toxin. Project activities include workshops, development of a manual on how to set up a community-based surveillance system, and public outreach materials. Up-to-date reports are available at <http://project.nprb.org/view.jsp?id=c974307d-3e90-4f56-adb3-d6c370d38dd0>.

Study Sites: The PSP project is designed to determine distribution of PSP toxin in the Aleut Region. We also organize community meetings to educate local residents about paralytic shellfish poisoning and we trained technicians in King Cove, Nikolskoye, Sand Point and Unalaska to use test kits to monitor for PSP toxin. Additional study sites have been added including Aiktak Island, Akutan, Atka, Chowiet Island, Semidi Islands, False Pass, Nelson Lagoon, Nikolski, Shemya Island (near Attu), St. George, St. Paul and

Unga.

For more information about the PSP project please see up-to-date reports are available at the North Pacific Research Board web page (<http://project.nprb.org/view.jsp?id=c974307d-3e90-4f56-adb3-d6c370d38dd0>), Aleut International Association's PSP web page and newsletter (<http://www.aleut-international.org> and http://www.arcticpeoples.org/wp-content/uploads/2006/10/3rd_quarter_2006_aia_newsletter.pdf), Alaska Sea Grant's PSP page (<http://seagrant.uaf.edu/bookstore/pubs/M-02.html>).

Samples collected from throughout the Aleut region were sent to a NOAA lab in Seattle for testing using high-tech (high performance liquid chromatography*). So far 77 samples were prepared using procedures for a blind test. The results from these tests should dramatically increase the scientific understanding of PSP in the region.

Periodic reports of the data collected are available in the [PSP Data Summary Document and Custody](#) Report.

* *High performance liquid chromatography* (HPLC) is the chromatographic technique for separating and analyzing mixtures of substances used frequently in biochemistry and analytical chemistry. It is also sometimes referred to as *high-pressure liquid chromatography*. HPLC is used to separate compounds of a mixture by using a variety of chemical interactions between the substance being analyzed and the chromatography column.

Updated November 20, 2007

APPENDIX L: APIA Board Report

The Community Services Department - Safe, Healthy and Sustainable Communities
Bruce Wright, Senior Scientist 907-222-4260 brucew@apiai.org

APIA Board Report

PARALYTIC SHELLFISH POISONING (PSP) PROJECT

PURPOSE: This project is designed to determine distribution of PSP toxin in the Aleut Region. This project will educate local residents about paralytic shellfish poisoning (PSP) and train technicians in Nikolskoye, Sand Point and Unalaska to use test kits to monitor for PSP toxin.

OBJECTIVES: We will develop methods for communities to monitor occurrence and distribution of toxins in connection with climate change observations that will increase communities' capacities in devising a mechanism to better respond to the threat and minimize the risks of poisoning. We will provide this information in the context of local and traditional knowledge.

FOCUS COMMUNITIES: Sand Point and Unalaska in Alaska and Nikolsakoye, Bering Island, Russia are the primary study sites and the satellite communities are Akutan, Atka, King Cove, Nelson Lagoon, Nikolski, St. George and St. Paul which will send samples to Anchorage for testing. Additional location in the Aleut Region will be tested from samples collected opportunistically.

ACCOMPLISHMENTS: The field manual was written and presentation materials and PowerPoint presentation completed and used for field training sessions. Another PowerPoint presentation with preliminary results has been prepared for presentation at the PICES conference in Japan and the Forum for the Environment conference in Anchorage.

HOBO temperature data loggers were calibrated and programmed to sample water temperatures every hour. The data loggers were deployed in Sand Point, Unalaska and Nikolsakoye. Data was downloaded from the Sand Point data logger showing the predicted seasonal changes.

We tested shellfish samples from Akutan, Atka, False Pass, King Cove, Sand Point, St. George, Unalaska and Nikolsakoye. The Jellett test results were positive for PSP in Akutan, False Pass, King Cove, Sand Point, St. George and Unalaska and negative for PSP in Atka and Nikolsakoye.

PLANS: Continue monthly testing in Sand Point, Unalaska and Nikolsakoye. Continue periodic sampling in Akutan, Atka, False Pass, King Cove, Nelson Lagoon, Nikolski, St. George and St Paul. Arrange for

U.S. Fish and Wildlife Service to collect samples from their remote Aleutian Islands field stations.

CHALLENGES: A primary challenge is to find funding sources to continue the PSP monitoring project and to set up PSP food safety monitoring using FDA approved techniques for King Cove. Two proposals have been submitted, including a four-year proposal to EPA.

APPENDIX M: Panel Presentation at the Alaska Public Health Summit

Climate Change and Shellfish Diseases

PART III: Bruce Wright, Senior Scientist, Aleutian Pribilof Islands Association

Alaska has a well documented and pervasive problem with harmful algal blooms (HAB) and safe consumption of personally harvested bivalve shellfish is a major concern for coastal residents. The most dangerous documented HAB is *Alexandrium* dinoflagellate blooms that cause paralytic shellfish poisoning (PSP). A persistent Alaskan problem, PSP fatalities date back to 1799 when the crew of Alexander Baranof of the Russian American Trading Company ate contaminated blue mussels in southeast Alaska. Since 1973 over 150 outbreaks have been reported. Although the large number of outbreaks shows evidence of a significant problem, the Alaska Division of Epidemiology estimates actual outbreaks are likely seven times more frequent than reported. The continuing threat has resulted in three additional fatalities since 1994. The State of Alaska's official policy is that no recreationally harvested shellfish are safe to eat except those certified by the State. Despite the threat of encounters with toxic shellfish, recreational and subsistence fisheries for bivalves are active throughout Alaska.

Although most PSP illnesses happen during the summer months, the season for toxin conditions appears to be expanding. In the spring of 1999, another death occurred on Kodiak Island, and an illness requiring emergency attention was reported in February 2000. The alarming aspect of reported PSP illness is that the state Department of Epidemiology estimates that the actual number of illnesses may exceed reported incidences by 10 to 30-fold. Past efforts to address the PSP problem have focused reducing risk through a public education program sponsored by the Alaska Sea Grant Marine Advisory Program. Alaska supported the initial efforts to develop the Jellett Rapid Test Kit, and genetic studies to determine molecular mechanisms within the toxic algae responsible for toxin production. Currently, a PSP monitoring program is underway, funded through the North Pacific Research Board (<http://project.nprb.org/view.jsp?id=c974307d-3e90-4f56-adb3-d6c370d38dd0>).

Participants in the session will be able to:

- List some of the most common PSP symptoms.
- Describe how to treat a person suspected of PSP poisoning.
- Describe some of the myths about PSP.

APPENDIX N: PSP Survey Questionnaire

PSP survey questionnaire Date _____ Respondent _____ AIA 2007

INTERVIEW # _____

1. What is your favorite dish that you prepare from seafood?

2. Do your kids enjoy clam digging?

Yes No

3. Last time you were out digging clams, how many buckets did you get?

4. How do you prepare your clams?

5. Do you know of anyone who still eats mussels?

Yes No

6. Who taught you about shellfish?

- How were you taught?

- Where did you first learn about this?

7. Do you have kids?

Yes No

If your answer is “Yes”:

8. Have you taught kids about shellfish?

Yes No

If your answer is “Yes”:

- How do you teach kids about shellfish?

- What do you teach kids about shellfish?

- At what age do you think it would be good to begin teaching about shellfish?

9. What information do you think would be important to share with kids learning about shellfish?

10. Have you heard any traditional stories/tales about shellfish?

Yes No

If your answer is “Yes”:

- Who did you hear it from?

- What is it called?

- Could you please tell me the story?

11. Do you think Aleut people have always eaten shellfish?

Yes No Don't know/Not sure

- What makes you think so?

12. Would today be a good day to dig clams/collect shellfish?

Yes No Don't know/Not sure

- Why is that?

13. Complete the sentence:

The best season to collect shellfish is

.....

- When does this season begin and end?

14. When the tide is low, is it the only condition important for collection of shellfish?

Yes No Don't know/Not sure

15. Is water temperature important to you when you decide to gather shellfish?

Yes No Don't know/Not sure

If your answer is “Yes”:

- What should the water temperature be?

- What water temperature range do you consider to be a “cool” temperature?

- What water temperature range do you consider to be “warm”?

16. Is air temperature important to you when you decide to gather shellfish?

Yes No Don't know

If your answer is “Yes”:

- What should the air temperature be?

- What air temperature range do you consider to be a “cool” temperature?

- What air temperature range is “warm”?

17. What should the weather be like when you gather clams, mussels?

Clear and calm

Clear with wind

Cloudy and calm

Cloudy with wind

Raining

Snowing

Other

18. Do you think that many people are gathering shellfish today?

Yes No Don't know/Not sure

- Why do you think so?

19. Fill the blanks:

I don't think that kids should be gathering shellfish when

the weather is.....

because they can.....

20. Circle your answer:

In a month like this I would ask /would **not** ask kids to collect shellfish.

21. What are the months that you collect shellfish? (Name months.)

- Do you notice anything different in the environment in the months when you gather shellfish than in the months that you do not?

Yes No Don't know/Not sure

If "Yes"

- What is different?

- Do you notice anything different in the quality/condition of the shellfish in the months when you gather shellfish than in the months that you do not?

Yes No Don't know/Not sure

If "Yes"

- What is different?

22. Finish the sentence:

My favorite shellfish are

.....

.....

23. Fill the blanks:

I would always let my family eat (name species)

.....

because

.....

24. Fill the blanks:

I would not let my family eat (name species)

.....

because

.....

25. Finish the sentence:

When shellfish are

I would not eat them because.....

.....

26. Are shellfish different today than 20 years ago?

Yes No Don't know/Not sure

- If yes, how is it different?

27. Fill the blanks:

Nowadays, the clams are

.....

than they were when I was a child.

28. The three most important things to remember when deciding if a clam is **not** good are:

1.).....

2.)

3.)

29. What are the three main qualities that would tell you that the clam **is** good to eat?

1.
2.
3.

30. Complete the sentence:

When I eat our traditional food it makes me feel

.....

31. Complete the sentence:

People say that a person who eats a lot of shellfish will or is.....

.....

32. What is the best traditional food that comes to mind first?

--

- And what is the next best traditional food?

33. Do you have shellfish in your freezer?

Yes No Don't know/Not sure

34. Do you use only fresh shellfish?

Yes No Don't know/Not sure

35. How often do you prepare shellfish for your family?

Yearly Monthly Weekly Daily Not at all

36. When did you serve shellfish to your family last time?

- And prior to that?

37. Do you get shellfish from other communities/areas?

Yes No Don't know/Not sure

If your answer is “Yes”:

- Which communities/areas?

38. Do you send shellfish from here to other places?

Yes No Don't know/Not sure

If your answer is “Yes”:

- Where?

39. Do you eat more store bought food or more traditional food?

More traditional food *More store food*

- Why?

40. Compared to other food that you eat, how much shellfish do you eat?

A lot Quite a bit Some Not much None

41. If your community were not able to gather shellfish any more for some reason, how big an impact do you think that would have on the community?

Very big Pretty big Somewhat big Not much None

42. How important is water temperature to your decision to gather shellfish?

Very Important Somewhat important Not very important Not at all important

43. How important is water clarity to your decision to gather shellfish?

Very Important Somewhat important Not very important Not at all important

44. How important are ocean currents and upwellings to your decision to gather shellfish?

Very Important Somewhat important Not very important Not at all important

45. Are there some kinds of shellfish that you would not eat?

Yes No Don't know/Not sure

- Why would you avoid these shellfish?

46. How important is the amount of natural light to your decision to gather shellfish?

Very Important Important Somewhat important Not very important Not at all important

Please answer the questions bellow using these pictures of shellfish.

47. Which of these do you usually eat?

48. For each shellfish that you showed me, when are conditions right for collecting it?

49. What beach do you go to collect it?

50. Do you know any names either in Native language or any other well-known names in the community of these shellfish?

Yes No Don't know/Not sure

- What are these names? (Please coordinate with number on photographs.)

51. If you were to go out today which shellfish do you think you could find and where would you look for them?

Would you like to be acknowledged by name in the final project reports for your contribution to this survey?

Would you please tell me about yourself?

What year were you born? _____

How long have you lived here? _____

How long have you lived in western Alaska? _____

How many years have you been gathering shellfish? _____

APPENDIX O: News Release in Russia

NEWS RELEASE
2006

August 4,

Стартует международная программа мониторинга опасных для здоровья токсинов в Алеутском регионе в США и России.

В августе в селе Никольском Алеутского района Камчатской области (Командорские острова) начинает работу проект «Мониторинг паралитического токсина в двустворчатых моллюсках в Алеутском регионе». Проект реализуется Алеутской Международной Ассоциацией на территории Аляски (Алеутские острова) и Камчатки (о-в Беринга) и финансируется грантовой программой Совета по исследованию севера Тихого океана (США). Основная цель программы – повысить безопасность употребления моллюсков местным населением через проведение научных исследований, сопоставления их с традиционными знаниями и через просвещение населения о возможных рисках и методах защиты. Проект рассчитан на один год.

Проблема отравлений паралитическим токсином моллюсков (ПТМ) становится все более актуальной, в связи с изменением климата в Арктике. С климатом меняется и разнообразие биологических видов, и ареал их распространения. Так, потепление океанических вод привело к тому, что представители южных видов переместились ближе к северу, в том числе и вредные морские водоросли. На Аляске наиболее опасными являются водоросли, которые становятся причиной ПТМ. Изменилось не только место, но и время появления наибольшей концентрации токсина, поэтому традиционные сезоны сбора моллюсков становятся небезопасными. Так, начиная с 1973 года на Алеутских островах было зарегистрировано свыше 150 вспышек отравлений, 3 смертельных случая произошло в 1994, последний - в 2002 на острове Кодьяк. Эпидемиологическая обстановка в связи с ПТМ ухудшилась в семь раз. Кроме того, коренное население в 11,6 раз больше подвержено риску отравления, т.к. их рацион традиционно больше зависит от морепродуктов. Проверка на содержание токсина в моллюсках проводилась в основном в районах коммерческого сбора на южном и южно-центральной побережье Аляски. Учитывая все эти факторы, возникла крайняя необходимость в принятии срочных мер по выработке научно обоснованных рекомендаций по безопасному употреблению двустворчатых моллюсков. На решение этих вопросов и

направлена программа мониторинга ПТМ в Алеутском регионе.

Основными целями проекта в Никольском являются информирование населения об угрозе, которую представляет собой ПТМ, рекомендации сборщикам моллюсков по безопасности, подготовка и обучение координаторов из числа местных жителей работе с оборудованием для проведения тестов на содержание токсина, а также обработке первичных данных. Далее предполагается передавать полученную информацию в научную лабораторию Jellet Biotech. В конечном итоге жители Командор должны получить научно подтвержденные рекомендации по безопасному употреблению моллюсков, которые являются одним из составных компонентов традиционной кухни, это также даст возможность для коммерческой добычи и обработки моллюсков местными жителями. Безусловно, этот проект предусматривает не только научно-исследовательскую деятельность, но и дальнейшее сотрудничество между жителями Командорских островов на Камчатке и Прибыловских и Алеутских островов на Аляске на всех уровнях: национальном, культурном, административном.

Одним из первых шагов в реализации данного проекта станет проведение 8-12 августа обучающего семинара по работе с оборудованием Jellet для проведения тестов на содержание паралитического токсина в двустворчатых моллюсках. Проведет занятия научный консультант проекта, ученый-биолог из Анкориджа (Аляска, США) Брюс Райт.

APPENDIX P: Traditional Knowledge Survey Workshop Agenda

Traditional Knowledge Survey Workshop Agenda Anchorage April 3-5, 2007

Day 1

1. Welcome and project progress overview
2. Survey structure(presentation)
 - a. Who should be interviewed (selected group or random)
 - b. How often/schedule
 - c. Interview process components
 - i. contacting a prospect and introducing the project
 1. explaining responsibilities and rights
 2. getting commitment to follow the schedule and procedures
 3. signing consent and other forms
 - ii. scheduling interviews
 - iii. preparing interview document packages and testing audio recording equipment
 - iv. conducting interviews
 - v. reviewing paperwork and audio file for quality of record
3. Questionnaire testing
 - a. [Participants will be asked to respond to questions and will be probed on question comprehension]
 - b. [Participants will be presented with a problem and asked to formulate questions to solve the problem]
4. Researches will summarize the results and produce a semi-final version

Day 2

1. Audio recording device use training
2. Participants form two groups and interview each other
3. Researchers' feed back on the exercise
4. Participants interview Lorraine

Day 3

1. Finish any business from day 2
2. Discussion on the expected project results and they should be communicated to the villages
3. Development of recommendation to project researches

APPENDIX R: PSP IN MOTION

By Charly Wilson

Last week I had the opportunity to meet several great people working toward healthier eating among subsistence foods. People whom you may know, as either family or friends, within your own communities; Anton Shellikoff from Akutan, Naomi Kashevarof from St. George, Dana Osterback from Sand Point and myself, Charly Wilson from King Cove. Last year Aleutian Pribilof Islands Association (APIA), Aleut International Association (AIA) and the University of Alaska saw a need for some sort of system that would test shellfish among the Aleutians and Russian areas for high levels of toxins. Many people, me included, have our own opinions on when shellfish are safe or not to eat. We all came together with a purpose, to begin putting together scientific and traditional knowledge to help prevent our families and friends from shellfish poisoning.



We began by brainstorming and building a simple yet very informative survey, which we will be bringing into our corresponding communities. We will be asking many people for their help in conducting this survey while we are collecting samples that will be sent out for laboratory tests. Testing and collecting is already in progress and we have that information available for anyone interested, by contacting your tribes, APIA or AIA.



We will have more information as it develops, yet feel free to contact any of the participants with your questions or concerns.

APPENDIX S: PSP COORDINATORS TELECONFERENCE – MAY 23, 2007

In attendance were:

Dana Osterback	Via Telephone
Charly Bendixen	Via Telephone
Antone Shelikoff	Via Telephone
Naomi Kashevarof	Via Telephone
Victoria Gofman	Present in Anchorage Office
Jim Gamble	Present in Anchorage Office

Meeting commenced at 3:00 PM

Victoria Gofman introduced Jim Gamble, the new Assistant Director of AIA

Victoria asked for an update from all coordinators on the progress of the PSP Project Traditional Knowledge Surveys:

Dana Osterback from Sand Point indicated that she has received all updated materials and has been able to print them out. She has completed one interview, but has none scheduled at this time. She says that she's having trouble finding participants for the survey, that people say they are too busy preparing for fishing. She thinks that part of the problem is that the questionnaire is too long

Antone Shelikoff from Akutan says he hasn't completed any interviews yet. He also thinks that the questionnaire is too long that that people might need to be given incentives to participate.

Charly Bendixen from King Cove has all of the updated documents, but had printed a large quantity of the old questionnaires and wants to alter them and continue to use them so they don't go to waste. Victoria said that she does need to print out the new ones and use them as they provide consistency with the Russian survey. She has completed one interview but has no more scheduled at this time. She has contacted person who are willing to participate, but they say they don't eat shellfish this time of year and they are busy.

Naomi Kashevarof from St. George hasn't completed any interviews and so far has none scheduled. She says that people on St. George don't eat shellfish and so are not interested. She also thinks the questionnaire is too long.

Due to technical difficulties the connection was lost for about 10 minutes, the meeting was then resumed.

Victoria says that it appears that there are three areas of difficulty that have been identified:

1. The questionnaire is too long
2. The survey is being conducted at the wrong time of year. People are too busy preparing for fishing and are not eating shellfish at this time.
3. There is a general lack of interest, especially in areas where shellfish are not eaten

Regarding the survey being conducted at the wrong time of year, Victoria states that the project has been extended which gives us more time into the fall to complete the surveys. However, the coordinators need to keep trying to do the surveys now. Antone suggests again the some incentives would encourage people to want to complete the surveys. Victoria asks what type of incentives might work in Akutan? Antone says offering fuel might work. Victoria asks if incentives might help in other villages as well. Naomi says she doesn't think incentives would help in St. George, the issue there is that no one eats shellfish, so there is a lack of interest. Dana thinks a food incentive, such as a roast or turkey could help in Sand Point, however the lack of time at this time of year is the primary issue. Charly says she has found people interested in completing the survey, they just don't have time right now.

Victoria says the time of year can't be helped at this point; we'll just have to keep trying to find people to complete the surveys. Victoria and Jim will look into the idea of offering some incentive for survey completion. The lack in interest, particularly in St. George where shellfish aren't consumed might be helped by presenting this project in broader terms, not just as a survey related to shellfish gathering, but as a project about traditional knowledge. Victoria says we haven't tried to do any informational campaigns in any of the communities, what if we made announcements on the radio about the project? Charly says that radio probably won't work in King Cove as reception is spotty. Victoria asks her what she'd recommend. Charly things posting flyers could help generate interest. Naomi also thinks flyers would be the best way in St. George. Antone agrees that flyers are the best option for Akutan, especially if they're used with incentives. Dana thinks that flyers should be used in Sand Point as well, and that radio announcements could be made from the flyer.

Regarding the length of the survey, Victoria asks if going back to the original graphics with a smaller font and less room to write answers would help. This would make the survey far fewer pages. It's pointed out that even with those changes; the survey will still be 51 questions. Victoria asks Charly and Dana how long the surveys they completed took. Charly says hers took about nine minutes. Dana says she convinced a council member to take the survey, but he wanted to fill out the questionnaire himself. Completing it that way took him 45 minutes. The question is raised as to whether the questionnaires can be given out for people to complete on their own. Victoria says that they can, but it's preferable that the coordinators interview the participants. One reason is that the survey takes less time if the coordinator asks the questions. Jim says that when asking people to participate, the survey should be described as a 10 minute interview. Victoria says that people should also be told that there are no right or wrong answers and that the questions are easy to answer.

Action items for this week:

1. Develop a flyer – Coordinators should think about what they want in the flyer. What would make it catchy and relevant in their community? Send in one or two ideas by next Wednesday (May 30) so that a specific flyer can be developed for each community.
2. No one should make any more copies of the questionnaire. The office will send out a new and shorter version. Make one copy and try it out to see how it works, and then let the office know.
3. Keep trying to schedule interviews; everyone should just do the best they can.

Victoria asks if anyone has been doing any collecting and testing for Bruce. Charly and Dana both say they have.

Victoria asks if teleconferences like this should be done on a monthly basis, so everyone can hear what is happening in the other communities. It's agreed that this is a good idea. End of the meeting

APPENDIX T: TRADITIONAL KNOWLEDGE SURVEY MANUAL



**MANUAL FOR TRADITIONAL KNOWLEDGE
SURVEY**

**Response and Intervention System for Climate Change Induced
Paralytic Shellfish Poisoning in Aleut Communities**



PREVENTING POISONING FROM SHELLFISH TOXINS

(A project to monitor shellfish toxins in the Aleut region from May 2006 to August 2007)

Developed and implemented by:

- Aleut International Association (AIA, a non-profit formed by APIA and the Russian Aleuts to work on international projects)
- Aleutian Pribilof Island Association
- University of Alaska, Anchorage and Fairbanks

Funded by:

- The North Pacific Research Board (NPRB)

Participating communities:

- In Alaska: Sand Point, Unalaska, King Cove, St. George, Akutan
- In Russia: Nikolskoye

Other sampling areas:

- Adak, Atka, Attu, Belkofski, Nelson Lagoon, Nikolski, St. Paul

Lead Researchers:

- Victoria Gofman, AIA
- Bruce Wright, APIA

Main Activities:

- Wright trained technicians to collect and test samples for the project in summer of 2006. For almost a year samples has been collected and analyzed for levels of toxins.
- Quarterly reports are sent to Tribal environmental offices
- In 2007, traditional knowledge surveys will be conducted in Sand Point. This information on local and traditional knowledge will be compared with scientific findings. Reports will be available to the communities.

With this project we want to:

- Find ways to lower the risk of poisoning
- Link modern technology and traditional knowledge
- Educate local residents about paralytic shellfish poisoning
- Train local technicians to use test kits to monitor for PSP toxin.

Through our study results, we hope to give communities tools to convince the government to take steps in preventing health risks from eating shellfish. These steps may include financing testing of species and educating residents.

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How to Plan and Conduct the Survey

PREPARATION & SCHEDULING

Task	Check When Completed
1. Make a list of _____ people who were not participants of PSP workshops in your village and who have a reputation of being knowledgeable about shellfish. They should be from different families.	
2. Contact each of these people on your list and explain the purpose of the project and ask for their participation. If fewer than _____ people from the list agree to participate, think about more people to contact.	
3. Mark the days scheduled for shellfish collections on the calendars provided.	
4. When you have _____ people who have agreed to participate, schedule individual meetings with each of them within 24 hours before/after scheduled shellfish collections. The time should coincide with tides and actual specimen collection days or periods.	
5. Mark the days scheduled for your meetings on the calendars provided.	
6. Send a copy of the schedule of interviews (your calendars) to the AIA office (fax 907-338-5380 or email aia@alaska.net).	
7. Confirm the scheduled meeting date and time with the person to be interviewed two to four days before the meeting.	
8. At the first meeting:	
a) Bring project description sheet, the consent form and calendars.	
b) Talk briefly how much we would appreciate it if that person could share their knowledge on shellfish.	
c) Explain the purpose of the project.	
d) Explain how often and how much time interviews will take.	
e) Explain why you need to audio record them.	
f) Have them sign the consent form	
g) Ask if the person prefers to be anonymous or recognized in project reports as a contributor.	

INSTRUCTIONS FOR INTERVIEWING

1. Do not make any substantial changes to the wording of the interview questions
2. Do not give any part of the answer to a question to the person being interviewed. Allow them to provide the answer in their own words.
3. If there is a problem with a question, skip it and move on to the next question. Provide a description of the problem you encountered with that question to AIA.
4. Provide a report to AIA on whether the interviews are going as planned or whether there are unforeseen difficulties that require correction.

AT THE INTERVIEW

Task	Check When Completed
1. Have two copies of the interview form. Give one to the respondent to review. Use the other to write the respondent's answers on.	
2. Begin the interview with a five minute general conversation.	
3. Remind the respondent about the reasons for recording the conversation.	
4. Turn on the recording device.	
5. Ask a few warm questions ... <ol style="list-style-type: none"> a) What is your favorite dish that you prepare from seafood? b) Do your kids enjoy digging for shellfish? c) What do you think is the best condiment for shellfish? 	
6. At the end of the interview thank the respondent for their time and information.	

AFTER THE INTERVIEW

Task	Check When Completed
1. Download your digital audio file to your computer.	
2. Name the computer file like this: PSP_Osterback_12_04.20.07 Osterback = the coordinator's name 12 = the number assigned to the person interviewed 04.20.07 = the date of the interview	
3. Verify the written version of the interview matches the audio version of the interview	
4. Copy the audio version of the interview from the computer on to a CD	
5. Mail copies of the CD's to the AIA office each month	

Participant List

	Name & Contact Info	PSP Project Involvement	Qualification	Date of Contact	Results
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

13					
14					
15					
16					
17					
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Consent Form
Study of Paralytic Shellfish Poisoning for Alaska Natives on the Aleutian Islands

Researchers:	Principal Investigator	Co-Principal Investigators	Local PSP Technician
Lilian Alessa, UAA	Victoria Gofman	Bruce Wright, APIA	
Anchorage, AK	AIA Executive Director	201 E. 3 rd Avenue	
(907) 786-1507	333 W. 4 th Avenue, Suite 301	Anchorage, AK 99501	
	Anchorage, AK 99501	(907) 222-4260	
	(907) 332-5388		
Paula Williams, UAA		Ray RaLonde, UAA	
Anchorage, AK		1007 W. 3 rd Avenue, #100	
(907) 786-7749		Anchorage, AK 99508	
		(907) 274-9697	

Description:

You are being asked to participate in a survey regarding your knowledge about and experiences with paralytic shellfish poisoning (PSP). If you agree to participate, the survey will take approximately 20 minutes to complete. It can be taken in any location convenient to you.

Voluntary Nature of Participation:

Your participation in this study is voluntary. You may stop at any time and you do not have to answer any questions you don't want to. Nothing will happen to you if you choose not to answer any questions or if you decide not to participate.

Confidentiality:

Your responses will be confidential. We would like to record the interview on a digital recorder to ensure that the interviewers' notes are accurate. The person interviewing you will also take notes of the interview. However, only the researchers will have access to the completed interview notes and records. These will be kept in a secure file cabinet in the office of the Aleut International Association (AIA) to which only they have access. Data will be compiled in such a way that you cannot be identified. We will not attach your name, address, or any other identifiable information about you to any of your responses, or to any reports or publications describing the results of this study.

Potential Benefits and Risks:

Your participation in this study requires a commitment of time on your part. However, if you decide to participate, your willingness to share your experiences and knowledge may provide valuable insights for improving the testing of shellfish in the Aleutians. There are no foreseeable risks or benefits to you personally with respect to your personal or professional status from participation in this study.

Contact People

If you have any questions about this study, please contact Victoria Gofman at AIA (907-332-5388) or Bruce Wright at APIA (907-276-2700)

Signature

Your signature below means that you have read the information above and agree to participate in this study. If you have any questions, please feel free to ask them now or at any time during the study.

Signature _____ Date _____

Print Name _____

A copy of this consent form is attached for you to keep.