Chugach Regional Ocean Monitoring Overview

Chugach Regional Resources Commission

Alutiiq Pride Marine Institute

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Seward, AK 99664

Project Name: Chugach Regional Ocean Monitoring Program

For questions regarding CROM sampling or data please contact the following:

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Chugach Regional Ocean Monitoring (CROM) Program

CRRC's CROM Program staff work with each of the Chugach communities to collect environmental samples and monitor ocean chemistry, phytoplankton presence, and toxins produced by harmful algal species. This monitoring helps us understand and document how changes in ocean chemistry and phytoplankton abundance affect subsistence resources in the Chugach region. Ocean acidification data helps reveal how shifts in pH and carbonate balance may influence shellfish and the plankton that make up a large portion of the base of marine food webs. By also tracking toxin-producing algae such as *Alexandrium* and *Pseudonitzschia*, we can identify when and where harmful algal blooms occur and how they relate to changing ocean conditions. Together, this information helps us detect signs of ecosystem change, monitor traditional foods for toxins, and build a long-term record of environmental trends in Alaska's coastal waters.

Data shared in this report may include gaps in sampling or analysis. It is common for community samplers to take short breaks in sample collection, and at times laboratory analysis may be delayed due to equipment troubleshooting or staffing changes. Consistent sampling can also be challenging in small or remote communities, where it may take time to identify and train new samplers or maintain regular participation over multiple seasons. Sampling kits are stocked with approximately eight weeks of supplies, and samplers typically collect until supplies run out. Because sampling and shipping are coordinated around weather, tides, and community schedules, there may be brief pauses between kit restocking and shipment. In general, long-term monitoring samples take about two months to collect and coordinate, plus an additional few weeks for laboratory processing and quality control.

Ocean acidification monitoring

Ocean acidification background: Ocean acidification occurs when carbon dioxide (CO_2) reacts with seawater, creating carbonic acid. Carbonic acid is very unstable, and splits into multiple different chemicals. One of these chemicals is carbonate. The mineral form of this chemical, called aragonite, is used by shellfish to create their shells. When carbon dioxide dissolves and reacts with water, it lowers the amount of aragonite in the water. This can cause seawater to become corrosive to shellfish and their larvae, which can cause major issues for subsistence species. This is of particular concern in Alaska because colder waters are more susceptible to absorbing CO_2.

General chemistry overview: The total carbon dioxide (TCO_2), total alkalinity (TA), partial pressure of carbon dioxide (pCO_2), pH, and aragonite saturation (Ω Aragonite) can be defined as described below.

- **TCO_2**: The total inorganic carbon in the water, in all its different forms.
- **TA**: The buffering capacity of the water, or how well it can withstand a change in CO_2 levels.
- **pCO_2**: The amount of dissolved carbon dioxide in the water.
- **pH**: How basic or acidic the water is.
- **Ω Aragonite:** A numerical representation of the availability of aragonite minerals to shell-building organisms. Different levels of saturation are more stressful to certain species, but a saturation state of 1 or lower is generally considered corrosive to shell-builders.

Each of the values described above are interlinked but uniquely informative. They also differ in their expected trends. Since gas more readily dissolves in colder waters, it is expected that pCO_2 will elevate in winter months. Following this, TCO_2 and TA are also elevated. However, this causes pH and ΩArag to

decrease in winter months. These are anticipated seasonal cycles, and most species are adapted to cope with such cycles; however, with increasing atmospheric CO_2 levels, these trends may or may not be exacerbated beyond their historical scope.

CROM chemistry methods: Samples are collected in brown glass bottles and fixed with supersaturated mercuric chloride to prevent interference via respiration. Seawater temperature and salinity were taken at the same time and location as water samples.

Upon return to the lab, samples were processed using a semi-automated gas-exchange sensor called a Burke-o-Lator. This equipment provides a measurement of TCO_2 and partial pCO_2. From these values and the temperature and salinity data provided by samplers, we calculate the total alkalinity (TA), pH, and aragonite saturation (ΩArag).

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Phytoplankton and HAB toxin monitoring

HABs and HAB toxins background: Phytoplankton are microscopic, plant-like organisms that form the base of marine food webs. At times, some species grow in very large numbers, creating what is called a "bloom." A few bloom-forming species, such as *Alexandrium* and *Pseudo-nitzschia*, can produce biotoxins. These toxins may accumulate in shellfish and other marine life, which is why the CROM program tracks their presence. The phytoplankton *Alexandrium* can produce saxitoxin, which causes paralytic shellfish poisoning; and *Pseudo-nitzschia* can produce domoic acid which causes amnesia shellfish poisoning. Chugach communities are underrepresented in the monitoring, research, and documentation of these species and there are few resources for testing subsistence harvest foods. Below is some basic information on the toxins we monitor:

Paralytic Shellfish Poisoning (PSP)

- **Cause:** Toxin called **saxitoxin**, often from the phytoplankton ***Alexandrium***.
- **How it gets to people:** Toxin can build up in shellfish (e.g., mussels, clams). The water may look normal.
- **Timing & symptoms:** Usually start within minutes to a few hours after eating. Tingling or numbness around lips and fingers, headache, dizziness, nausea/vomiting; severe cases can affect breathing.

Amnesic Shellfish Poisoning (ASP)

- **Cause:** Toxin called **domoic acid**, often from the phytoplankton ***Pseudo-nitzschia*.**
- **How it gets to people:** Builds up in shellfish and some other seafood.
- **Timing & symptoms:** Can start within hours or a day. Nausea, vomiting, diarrhea, headache; in some cases, confusion or short-term memory problems.

Cooking and/or freezing does NOT remove toxins. If you are experiencing any of the above symptoms after eating shellfish seek medical care immediately

Phytoplankton monitoring methods: samples are collected by performing a phytoplankton tow, where a net is connected to a plastic catch bottle and pulled through the water for three minutes. Tow samples are fixed with 1% Lugol's iodine to prevent decomposition until samples are ready to ship.

Toxin Monitoring methods: blue musses are hung in a holding net on the dock at the sampling site in April. Durin each weekly sample event, a handful of mussels are collected and stored in the freezer until samples are ready to ship. Shellfish samples are tested for saxitoxin using a receptor binding assay and for domoic acid using the enzyme-linked immunosorbent assay. Through CROM, blue mussel sampling for regular monitoring is performed from April to October; APMI can support year-round blue mussel monitoring and testing of subsistence harvested shellfish at the interest of each community.

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Paralytic Shellfish Toxin Advisory

The following advisories are for CRRC sites with shellfish that have Paralytic Shellfish Toxins (PST) levels above the FDA regulatory limit of 80 µg/100 g. PSTs cause Paralytic Shellfish Poisoning (PSP). Consuming wild shellfish from these sites may result in an increased risk of PSP.

New Advisories

CRRC sites with shellfish PST levels above the regulatory limit. CRRC is not a regulatory agency and the consumption of wild shellfish in Alaska is up to consumer discretion. Commercially harvested shellfish are considered safe for consumption. CRRC make no recommendations for harvest safety. If you believe you have consumed shellfish contaminated by harmful algal blooms reach out to your local health officals.

Community	Beach	Species Tested*	Date Collected
Test	Test	All*	Insert

**CRRC uses blue mussels for toxin testing. However, various shellfish species are known to hold onto toxins for different rates of time. If your community is interested in harvesting shellfish and would like to have them tested for PST's reach out to alutiiqpridemarineinstitute@gmail.com.*

Historic Annual Advisories

CRRC sites with shellfish PST levels above the regulatory limit as reported between July 7, 2022- August 7, 2022. Advisories will remain listed for one year days after issued. Toxins can depurvate differently in different species.

Community	Beach	Species affected	Date Collected
Test	Test	Test	Test

DISCLAIMER: There is always risk when consuming wild shellfish. Toxins cannot be cooked, cleaned, or frozen out of shellfish. Toxins can vary between regions, beaches, and shellfish species. Clean crab thoroughly and discard the gut contents since crab viscera and guts (butter) can contain high levels of toxins. Commercially available shellfish have been tested for PSTs and are considered safe for consumption. To have your subsistence shellfish tested reach out to alutiiqpridemarineinstitute@gmail.com

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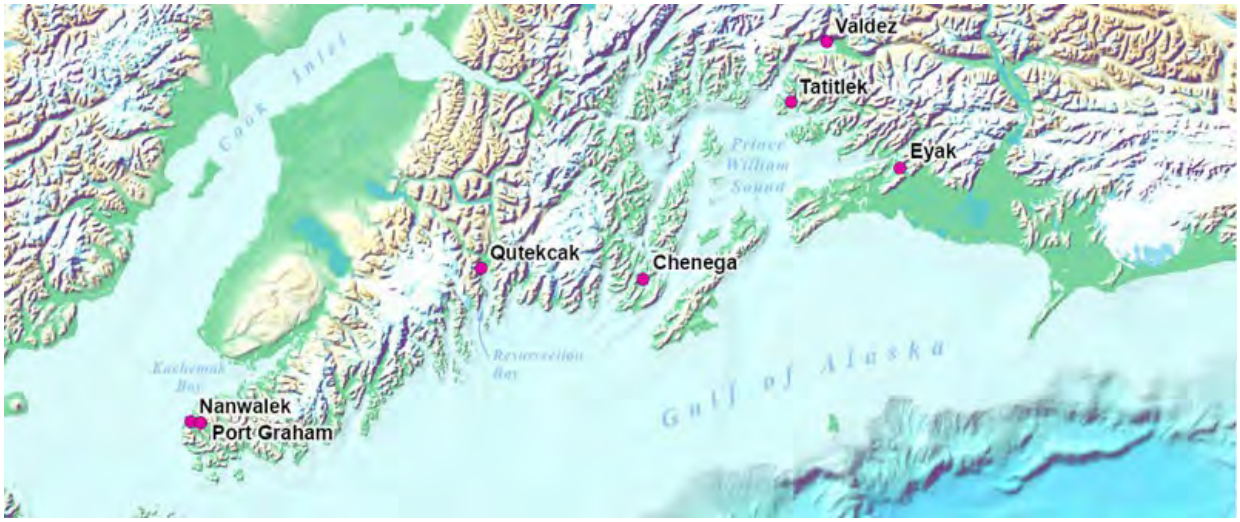
PSP Information

PSP symptoms include tingling in the lips and fingertips, numbing of the arms and legs, nausea, difficulty breathing, and even death. Anyone with these symptoms should seek immediate medical care or call **9-1-1**. To report PSP cases, contact the Alaska Department of Health and Social Services, Section of Epidemiology at (907) 269-8000, or (800) 478-0084 after hours.

CRRC Information

The Chugach Regional Resource Commission (CRRC) is comprised of seven tribes in the Chugach Region. CRRC partners collect phytoplankton and shellfish samples from local beaches to track harmful algal blooms and marine biotin risk in their communities. Phytoplankton and shellfish samples are analyzed by CRRC staff. These data are available on www.alutiiqprideak.org/hab-watch. Contact CRRC with additional questions at (907) 224-5181 or at alutiiqpridemarineinstitute@gmail.com.



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