Alutiiq Pride

CHUGACH
REGIONAL
RESOURCES
COMMISSION

Chugach Regional Ocean Monitoring (CROM) Program

Comprehensive biotoxin, harmful algae, and water chemistry monitoring

ALASKA

VALDEZ

TATITLEK
(TAATIILAAQ)

CORDOVA/EYAK
(IIYAAGDAAD)

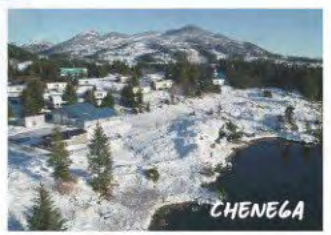
SEWARD
(QUTALLEQ)

CHENEGA
(CANIQAQ)

PORT GRAHAM
(PALUWIK)

NANWALEK

GULF OF ALASKA



ALUTIIQ
PRIDE
MARINE
INSTITUTE

MARICULTURE:

The focus is developing projects that enhance economic and subsistence opportunities for local communities, Tribal or otherwise, and diversifying mariculture development opportunities in the Chugach. The Alutiiq Pride Marine Institute is tasked with raising subsistence and commercial species while using the facility to expand research and development to several new species for potential mainstream mariculture applications.


BASKET COCKLE


BIDARKI


BLUE KING CRAB


BULL KELP


BUTTER CLAM


CALIFORNIA SEA CUCUMBER


GEODUCK CLAMS


HALIBUT


HERRING


LITTLENECK CLAM


PACIFIC OYSTER


PACIFIC RAZOR CLAM


PINK SALMON


PINTO ABALONE

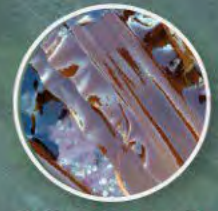

PURPLE HINGE ROCK SCALLOP

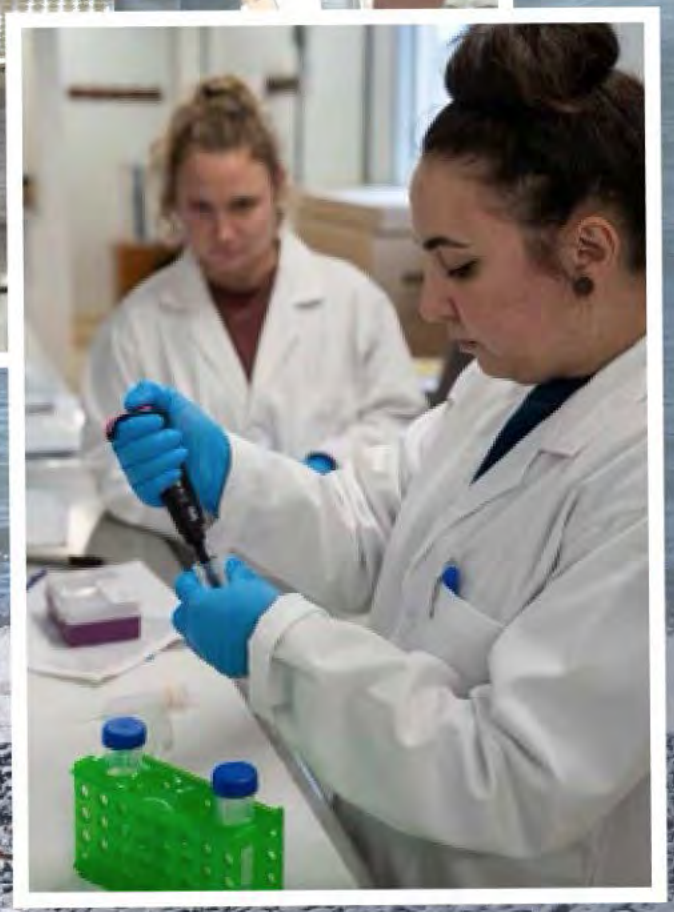

RED KING CRAB


RIBBON KELP


SOFT-SHELL CLAMS


SUGAR KELP


THREE-RIBBED KELP



CHUGACH REGIONAL OCEAN MONITORING PROGRAM

The focus is to fill in gaps in understanding of nearshore ocean health in Chugach communities through examining ocean chemistry, harmful algae, and shellfish biotoxin levels. The program relies on citizen science from our partners in Tribal communities throughout the region. With regional Tribal capacity, CRRC can further support safe and sustainable harvest opportunities for both local communities and the shellfish industry in Southcentral Alaska.

Alutiiq Pride MARINE INSTITUTE

CHUGACH REGIONAL OCEAN MONITORING
COMMUNITY SAMPLING

One Community Member at Each of the Seven Villages Works with APMI as a Field Sampler. Samples are Collected on a Weekly Basis.

CHENEGA • CORDOVA • NANWALEK • PORT GRAHAM • SEWARD • TATITLEK • VALDEZ

ANALYSES CONDUCTED BY APMI

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Chemistry Laboratory

ocean acidification and nutrient analysis

Receives water chemistry samples from Tribal communities

Performs continuous monitoring in Resurrection Bay

Monitors for aragonite and carbon dioxide in the water

$$H_2O + CO_2 \rightarrow H_2CO_3 \rightarrow HCO_3^- + H^+$$

Significance of ocean chemistry

Shellfish health ($CaCO_3$-)

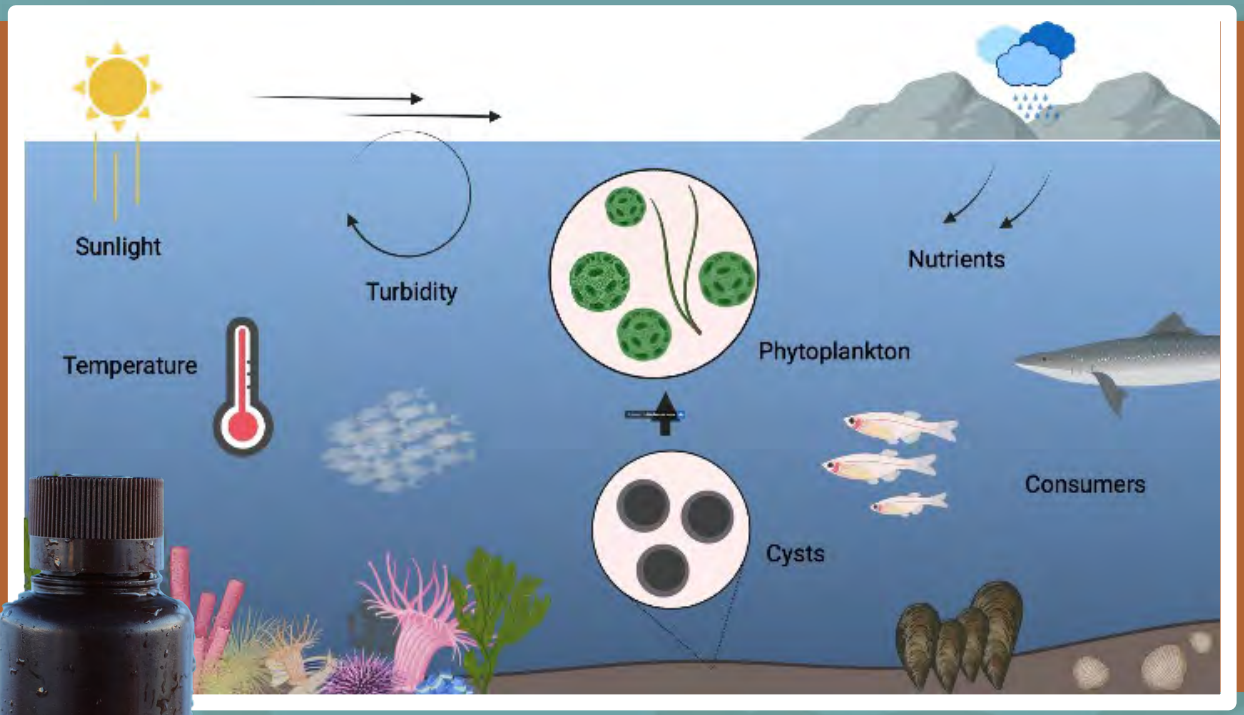
**Baseline monitoring

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Biology Laboratory

HABs and toxin detection



Monitor for Harmful Algal Blooms (HABs) - neurotoxins they can produce

Microscopes to look for HABs

Run tests on blue mussels for Toxins (can test subsistence species!)

Next Steps

Environmental DNA

- Small pieces of DNA found in the environment
- Allows us to accurately identify different animals and algae

CHUGACH REGIONAL RESOURCES COMMISSION

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Goals

The CROM program strives to…

1. Collect and share baseline monitoring data on water chemistry and harmful algae across the Chugach region of Alaska

2. Provide information for Tribes (and the public) to ***make choices*** about safe subsistence shellfish harvest.

CHUGACH REGIONAL RESOURCES COMMISSION

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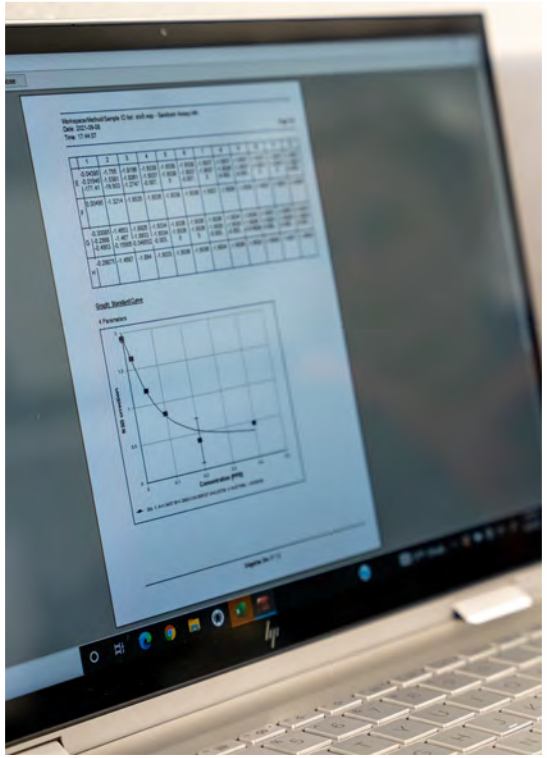
Outcomes

Long-term data, mitigate potential toxin exposure, listening and learning from Chugach community



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Federal Regulatory Limits

CRRC does not regulate shellfish harvest – We only inform of the limits and what we find

Saxitoxin

Algae: *Alexandrium* Species

Paralytic Shellfish Toxin/Poison (PST/PSP)

Federal limit: 80ug/100g

Domoic Acid

Algae: *Psuedo-nitzchia* species

Amnesic Shellfish Poison (ASP)

Federal Limit: 20 ppm

The allowable amount determined by the federal government

All commercial shellfish are required to be tested

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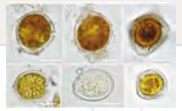
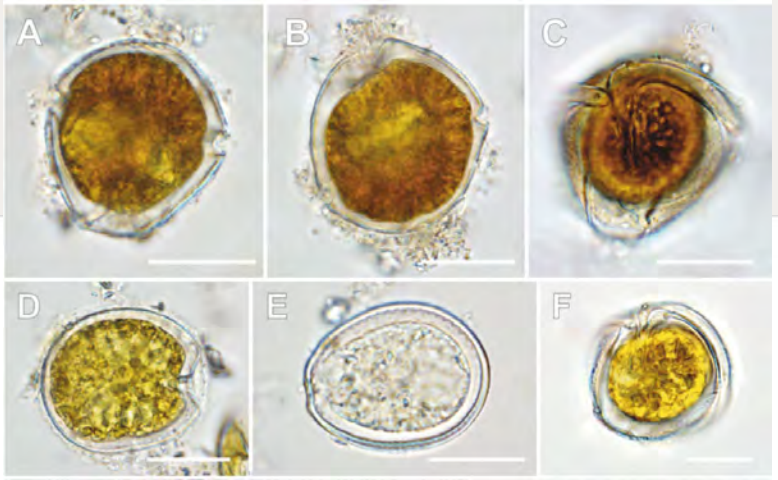
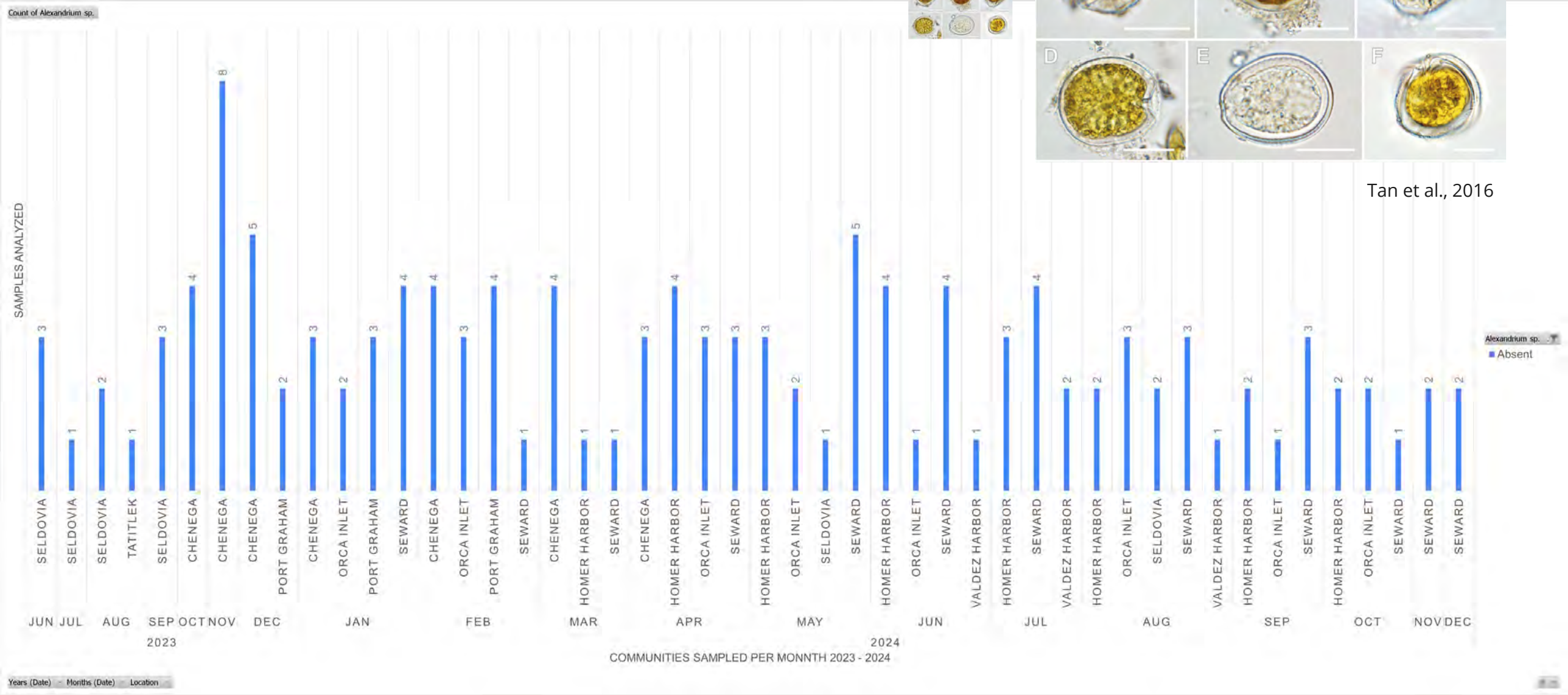
Alexandrium spp.





Tan et al., 2016



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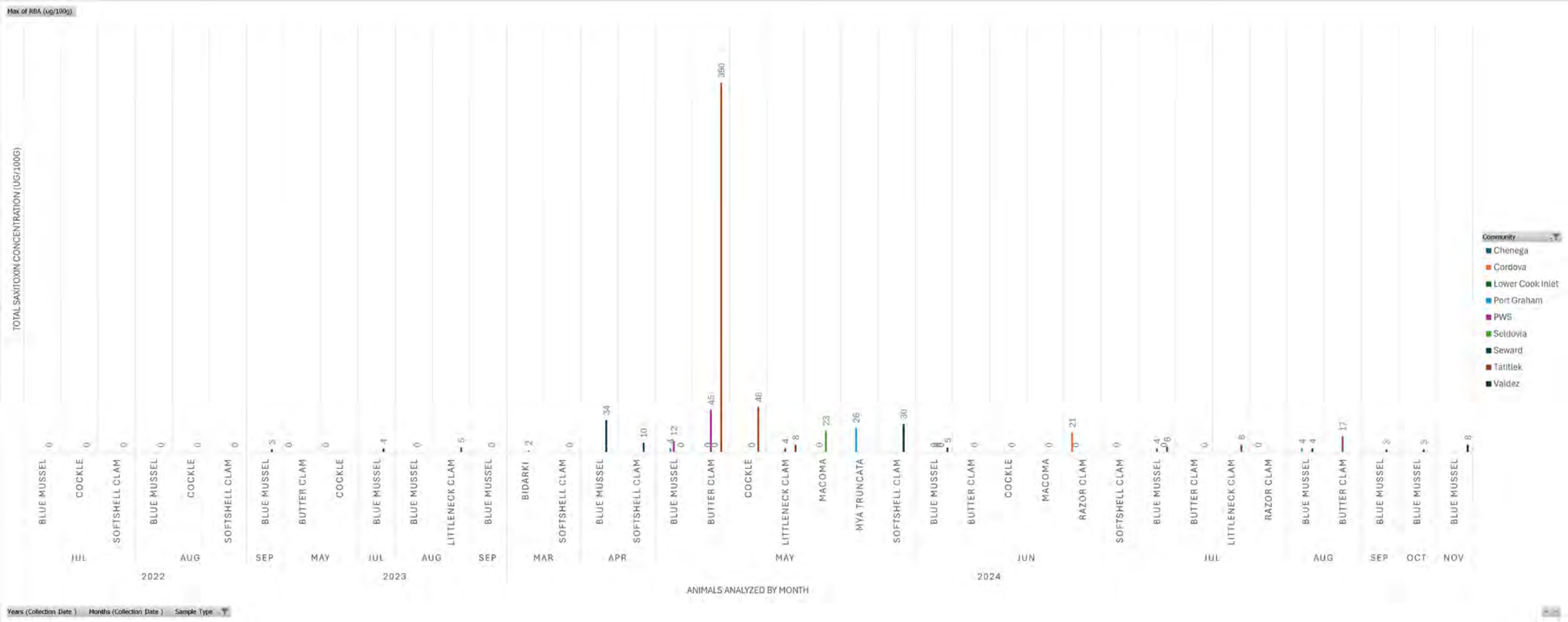
Saxitoxin Results



Public Service Announcement

Date

Paralytic Shellfish Toxin Advisory

The following advisories are for Chugach Regional Resources Commission (CRRC) sites with shellfish that have Paralytic Shellfish Toxins (PST) levels above the FDA regulatory limit of 80 µg/100 g. In high concentrations, 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.

Community	Beach	Species Affected	Date Collected
-	-	-	-

Recent PSPresults

Community	Location	Species	PST Results (µg/100g)	Date Collected
-	-	-	-	-

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.

<LOD = below limit of detection for the receptor binding assay. Red coloring indicates PST levels are above the FDA limit of 80 µg/100 g.

PSP Information

PSP is caused by an increase in concentration of a PST producing marine algae triggered by warm temperatures and currents. 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

CRRC is a Tribal organization within the meaning of the Indian Self Determination and Education Assistance Act of 1991, and an Alaska Native Organization (ANO) as defined in federal policies. We are authorized by our seven member Tribes in Alaska's Chugach region to provide essential governmental services to Tribal citizens. We provide support for natural resource management, subsistence activities, climate change adaptation and environmental concerns, food security, and access to healthy traditional foods and clean water.

How to Get Shellfish Tested

If you are interested in getting harvested shellfish tested or have any questions about paralytic shellfish poisoning, please contact Allison Carl at acarl@crrcalaska.org or Annette Jarosz at annette@alutiiqprideak.org.

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.

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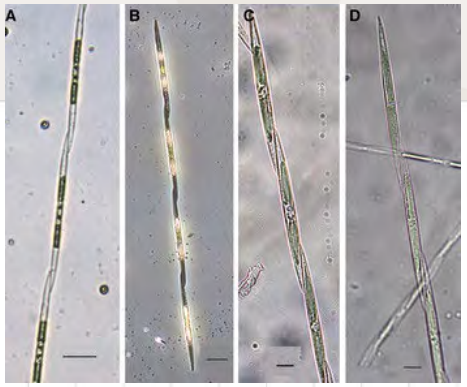
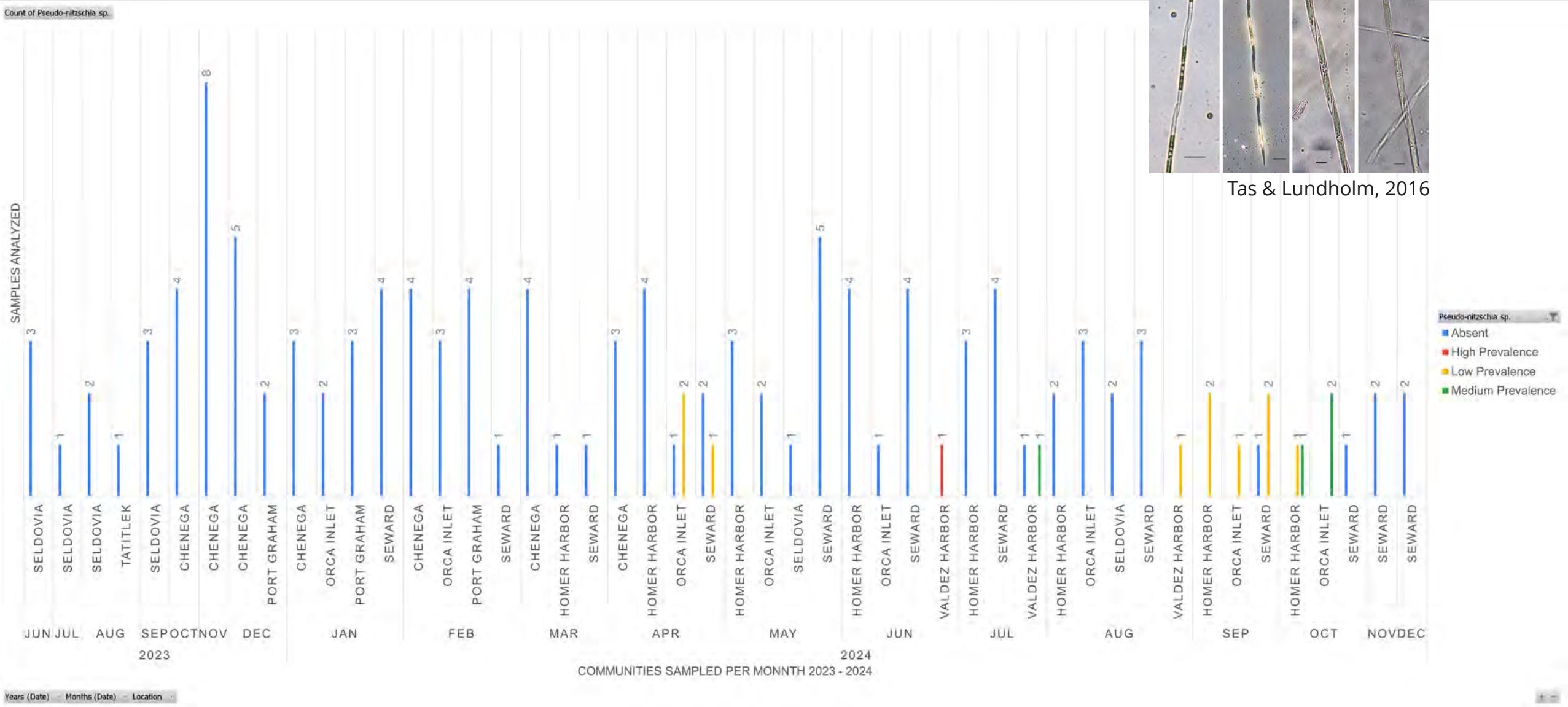
Pseudo-nitzscia spp.



Tas & Lundholm, 2016



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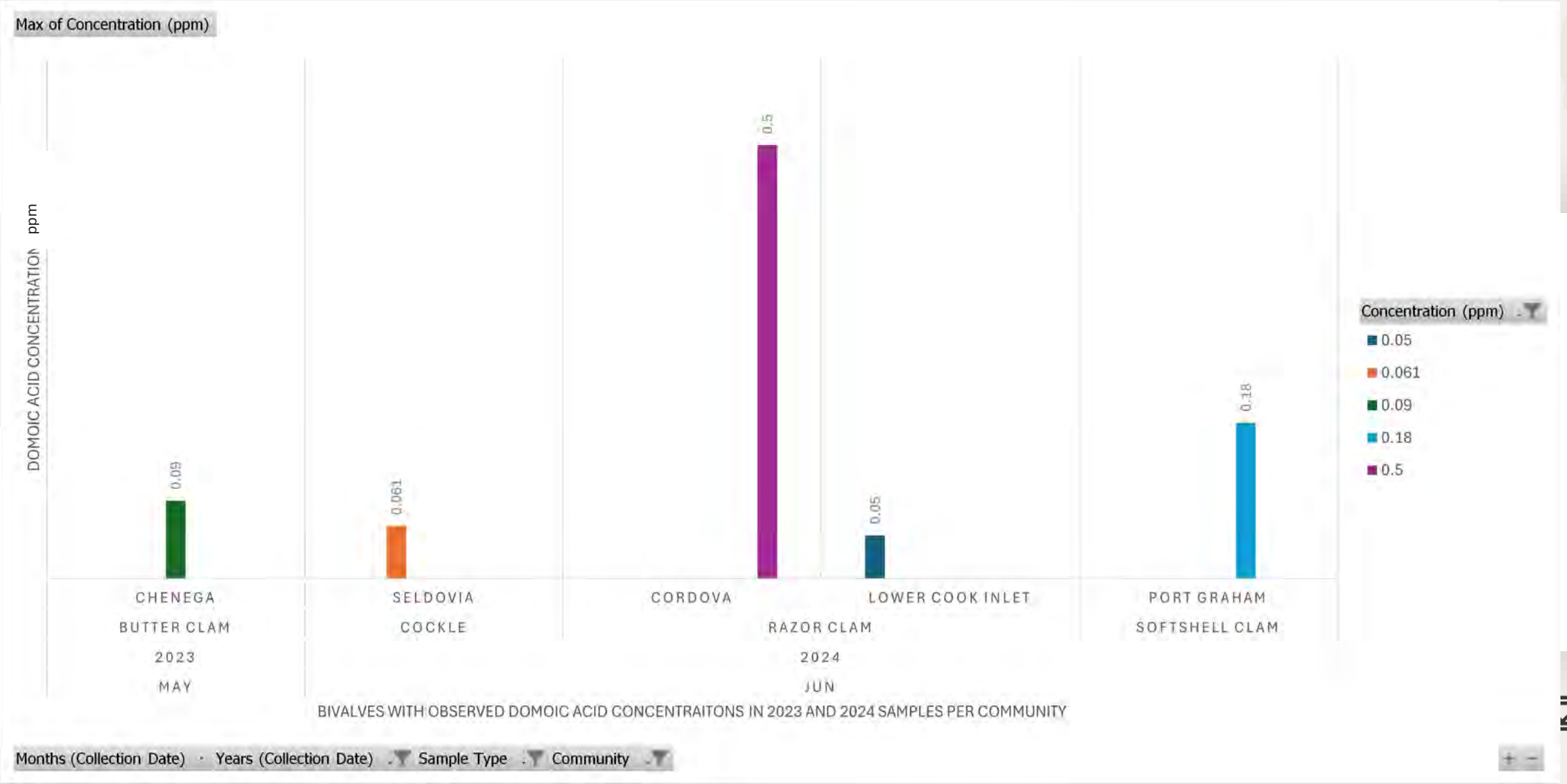
Domoic Acid Results



CHUGACH REGIONAL RESOURCES COMMISSION

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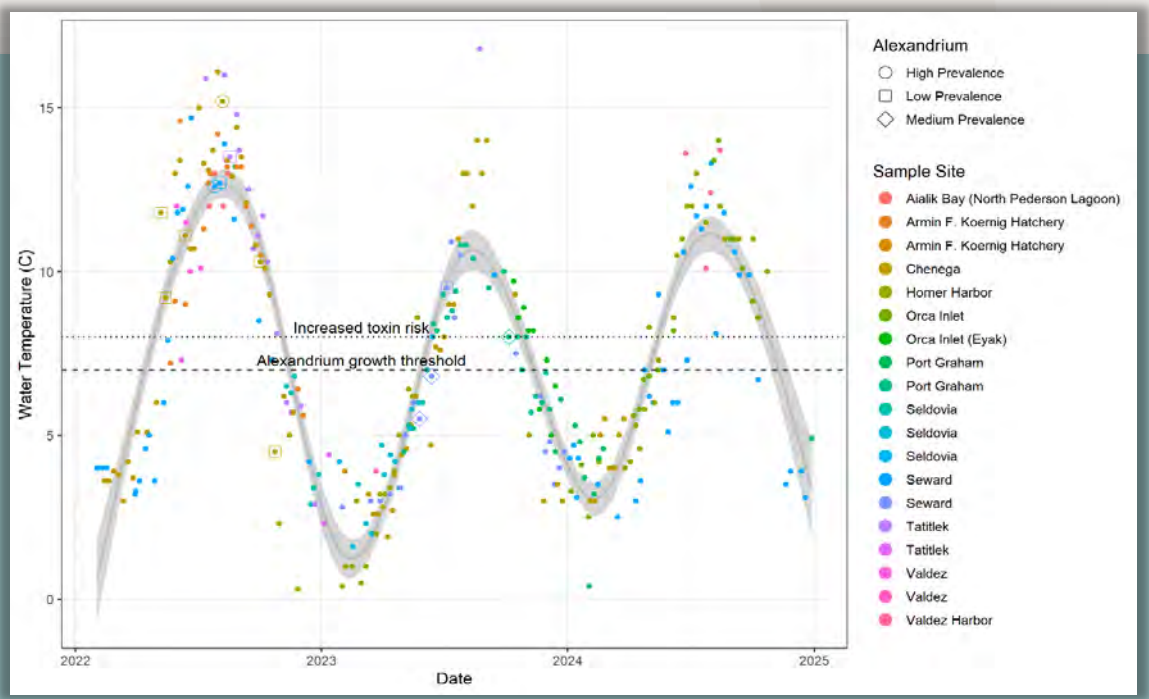
Next steps in data management and analysis

Preliminary data → Reports → Comprehensive analysis

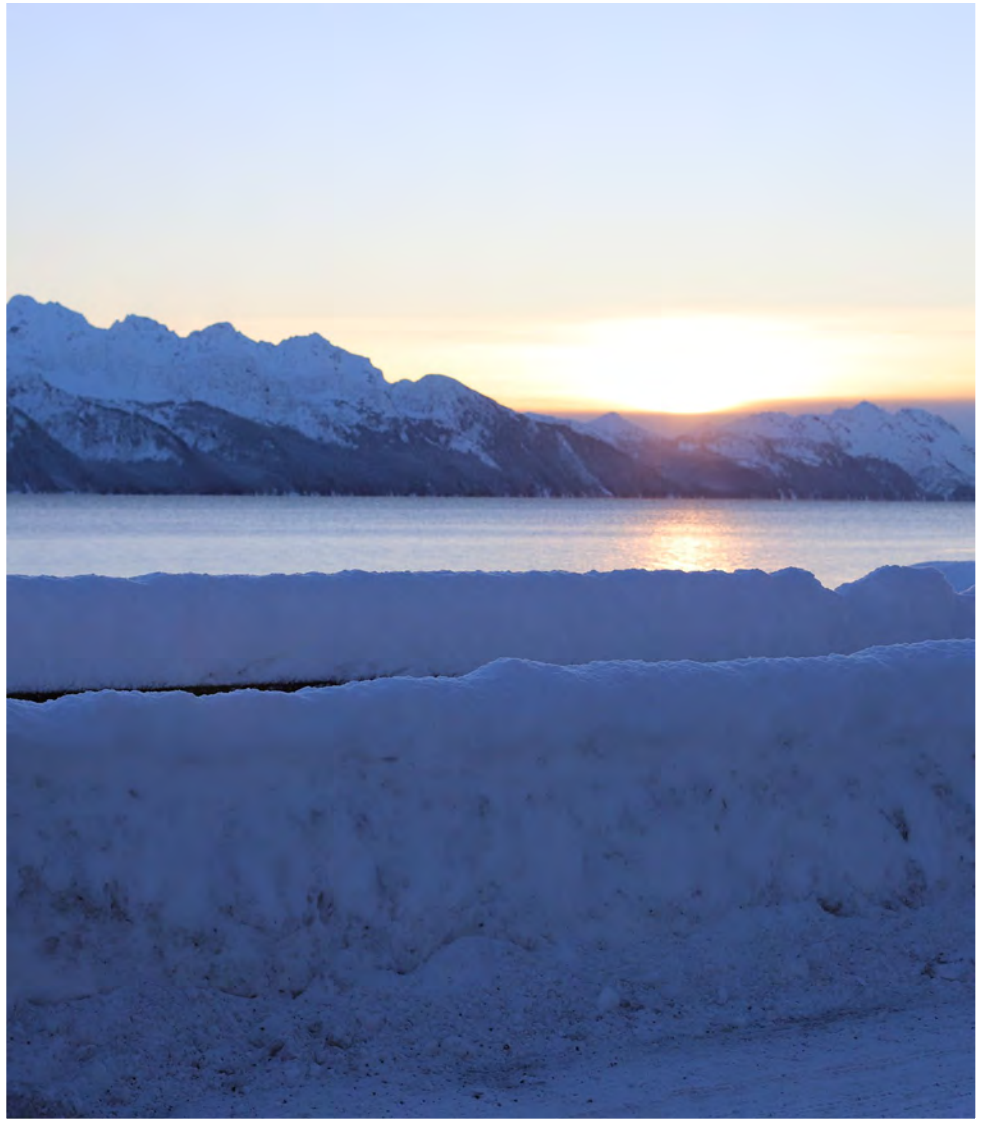
ID	Collection Date	Sample Type	Community	Sample Lo	Collector	RBA completed
27	7/3/2021	Blue mussel	PWS	Pigot Bay (	PWSSF	<LOD
28	7/18/2021	Blue mussel	PWS	Fox Farm E	PWSSF	12
29	7/27/2021	Blue mussel	PWS	Pigot Bay (	PWSSF	<LOD
30	8/5/2022	Blue mussel	PWS	Pigot Bay	PWSSF	<LOD
31	8/26/2022	Blue mussel	PWS	Derickson	PWSSF	<LOD
.19	9/30/2022	Blue mussel	Seward	4th of July	CRRC	3
1	4/11/2023	Blue mussel	PWS	Pigot Bay	PWSSF	4
2	4/23/2023	Blue mussel	Seward	4th of July	CRRC	6
3	4/26/2023	Blue mussel	Port Graham		CRRC	<LOD
4	5/3/2023	Blue mussel	Port Graham		CRRC	<LOD
5	5/5/2023	Blue mussel	Seward	4th of July	CRRC	<LOD
6	5/7/2023	Blue mussel	Chenega	Airport Be	CRRC	22
7	5/8/2023	Littleneck clam	Chenega	Airport Be	CRRC	<LOD
8	5/10/2023	Blue mussel	Port Graham		CRRC	<LOD
33	5/14/2023	Blue mussel	PWS	Pigot Bay	PWSSF	6
9	5/17/2023	Blue mussel	Port Graham		CRRC	4
10	5/24/2023	Blue mussel	Port Graham		CRRC	18
11	5/26/2023	Blue mussel	Seward	4th of July	CRRC	66
34	6/11/2023	Blue mussel	PWS	Derickson	PWSSF	25
11	6/16/2023	Blue mussel	Seward	4th of July	CRRC	22
12	6/21/2023	Blue mussel	Seward	4th of July	CRRC	54
35	6/27/2023	Blue mussel	PWS	Eleanor Isl	PWSSF	12
36	7/6/2023	Blue mussel	PWS	Derickson	PWSSF	<LOD
37	7/17/2023	Blue mussel	PWS	Fox Farm	PWSSF	4
13	7/17/2023	Blue mussel	Seward	4th of July	CRRC	5
14	7/20/2023	Blue mussel	Seward	4th of July	CRRC	4
15	7/22/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
38	7/25/2023	Blue mussel	PWS	60.932940	PWSSF	<LOD
16	7/26/2023	Blue mussel	Port Graham		CRRC	<LOD
17	7/26/2023	Blue mussel	Seward	4th of July	CRRC	5
20	7/26/2023	Blue mussel	Seward		CRRC	4
59	7/27/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
18	8/3/2023	Blue mussel	Seward	4th of July	CRRC	11
19	8/3/2023	Blue mussel	Port Graham		CRRC	<LOD
60	8/11/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
20	8/14/2023	Blue mussel	Port Graham		CRRC	<LOD
61	8/16/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
62	8/22/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
21	8/29/2023	Cockle	Tatitlek			15

Sample Type	Community	Sample Date	RBA completed (ug/100g)
Blue mussel	Seward	2022-07-18	<LOD
Softshell clam	Seward	2022-07-18	<LOD
Blue mussel	Seward	2022-07-27	<LOD
Cockle	Seward	2022-07-27	<LOD
Blue mussel	Seward	2022-08-09	<LOD
Blue mussel	Seward	2022-08-11	<LOD
Softshell clam	Seward	2022-08-11	<LOD
Cockle	Seward	2022-08-11	<LOD
Blue mussel	Seward	2022-08-24	<LOD
Blue mussel	Seward	2022-09-27	<LOD
Blue mussel	Seward	2022-09-30	3
Blue mussel	Seward	2023-07-26	4
Softshell clam	Seward	2024-03-06	<LOD
Softshell clam	Seward	2024-04-10	<LOD
Blue mussel	Seward	2024-04-30	34
Mya truncata	Port Graham	2024-05-06	26
Macoma	Port Graham	2024-05-06	<LOD
Butter clam	Port Graham	2024-05-06	<LOD
Blue mussel	Port Graham	2024-05-07	4
Macoma	Seldovia	2024-05-09	23
Cockle	Seldovia	2024-05-09	<LOD
Butter clam	Seldovia	2024-05-09	<LOD
Softshell clam	Seward	2024-05-09	30
Butter clam	Tatitlek	2024-05-13	390
Butter clam	Tatitlek	2024-05-13	298
Cockle	Tatitlek	2024-05-13	48
Littleneck clam	Tatitlek	2024-05-13	8
Littleneck clam	PWS	2024-05-14	4
Butter clam	PWS	2024-05-14	45



CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride



Questions?

Allison Carl

Ocean monitoring & shellfish testing

acarl@crrcalaska.org

Annette Jarosz

Mariculture Director

annette@alutiiqprideak.org


Stewards of the Bay
Community Connections Series
Join local Seward organizations and agencies for a monthly conversation on science, cultural knowledge, and community!
CHUGACH REGIONAL RESOURCES COMMISSION
NATIONAL PARK SERVICE
Alaska SeaLife Center
Seward, Alaska
UAF
UNIVERSITY OF ALASKA FAIRBANKS

We, the Chugach Regional Resources Commission, acknowledge Sugpiat and dAXunhyuu people's land and waters, the traditional homelands for over 10,000 years, what we call the Chugach Region. The Chugach Region includes over 5,000 miles of coastline, over 50 named islands, and over 20,000 square miles of mountains. Today we have over 1,500 Tribal Members living in Chenega, Eyak, Nanwalek, Port Graham, Seward, Tatitlek, and Valdez, including Whittier and our oldest traditional village, Nuchek. These communities are found within the lower Cook Inlet, Prince William Sound, and lower Copper River area. Ungualartukut imamek taumi qut'mek - We survived by the ocean and beach. We also acknowledge the space and land CRRC utilizes for our Marine Institute in Seward, the ancestral land of the Qutekcak Native Tribe. This land was and continues to be of great importance to the Alutiiq/Sugpiaq people.








CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

The CRRC is founded as a community-based, Alaska Native, natural resource management organization.

Community resiliency and self-determination are central threads interwoven throughout all our activities.

Executive Director
Willow Hetrick-Price

ALASKA

VALDEZ

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(TAATIILAAQ)

CORDOVA/EYAK
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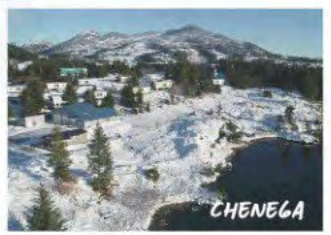


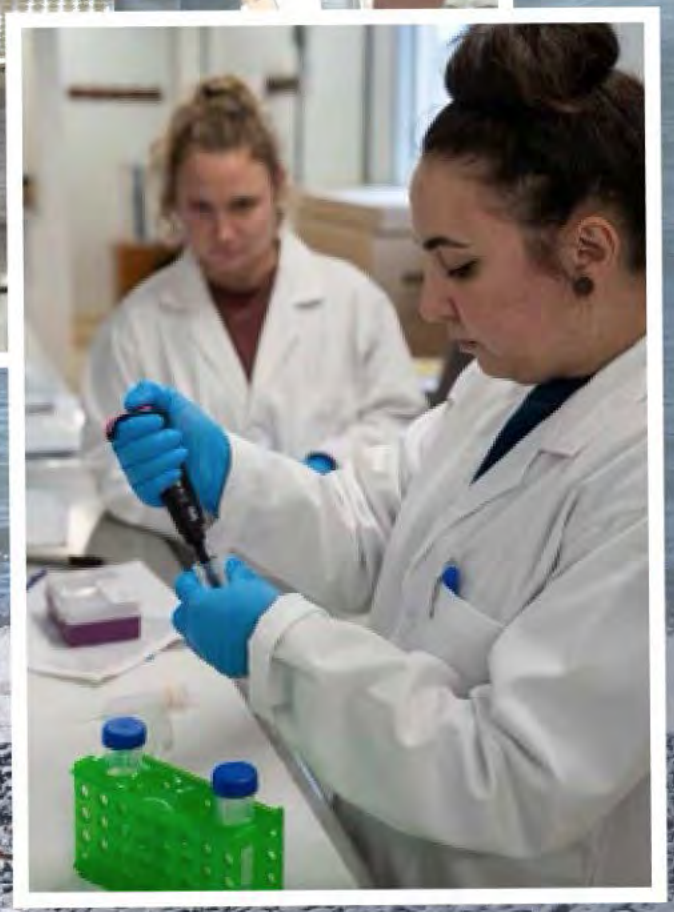
MISSION

To protect, rebuild, and conserve the Chugach environment and natural resources while promoting Tribal sovereignty and the protection of a subsistence lifestyle. We strive to assure bio-cultural restoration and conservation, sound economic development, and stewardship of the natural resources in the traditional use areas of the Chugach region while bringing Tribal voices to the forefront of natural resource management processes.

VISION

We envision a resilient future for the Sugpiaq (Alutiiq) and dAXunhyuu (Eyak) peoples, where the Chugach region leads in Tribal sovereignty, bio-cultural stewardship, and regenerative economic development. The future we envision is one in which:

- Chugach communities **THRIVE** through the integration of traditional ecological knowledge and contemporary science.
- Chugach communities **REACH** food security and sovereignty.
- Chugach communities **ADAPT** to impacts of climate change, build resiliency, and capitalize on opportunities.
- Chugach lands and waters remain **VIBRANT**, ensuring the survival and prosperity of the people for generations to come.



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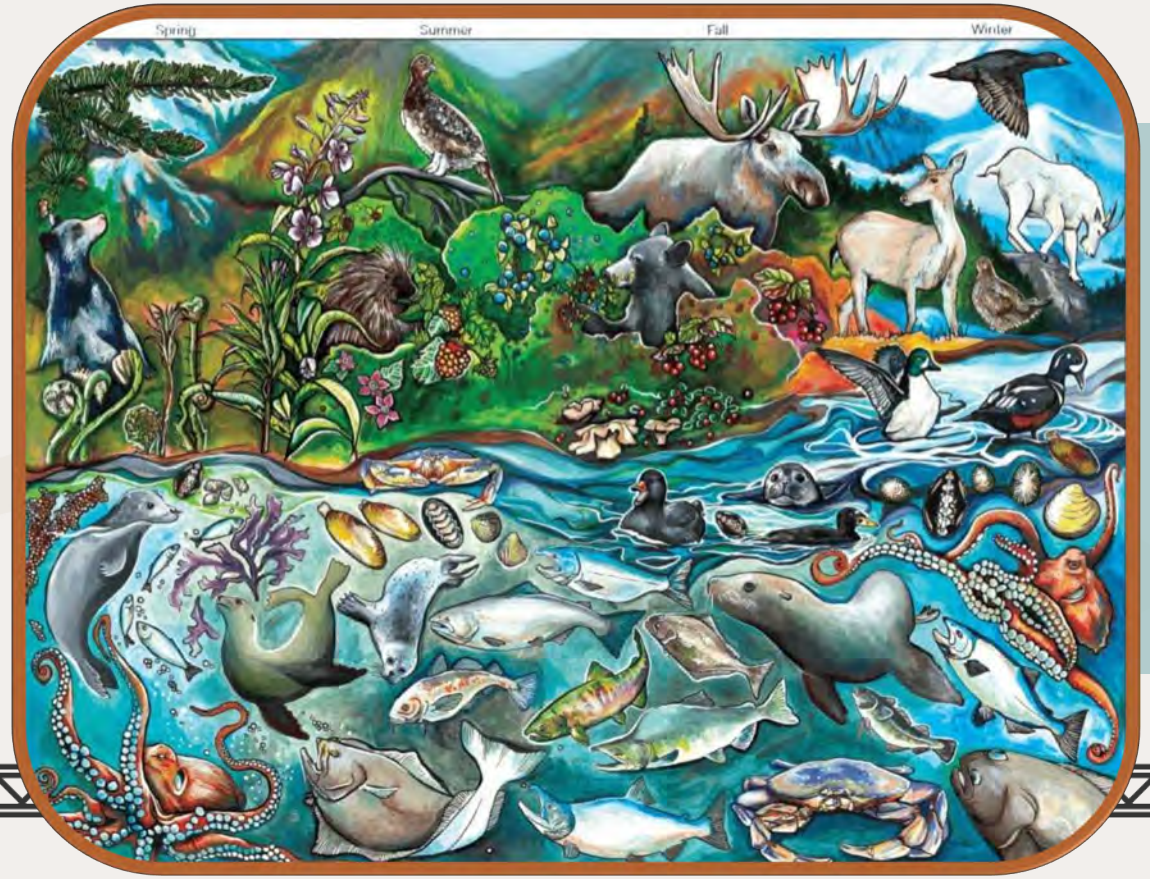
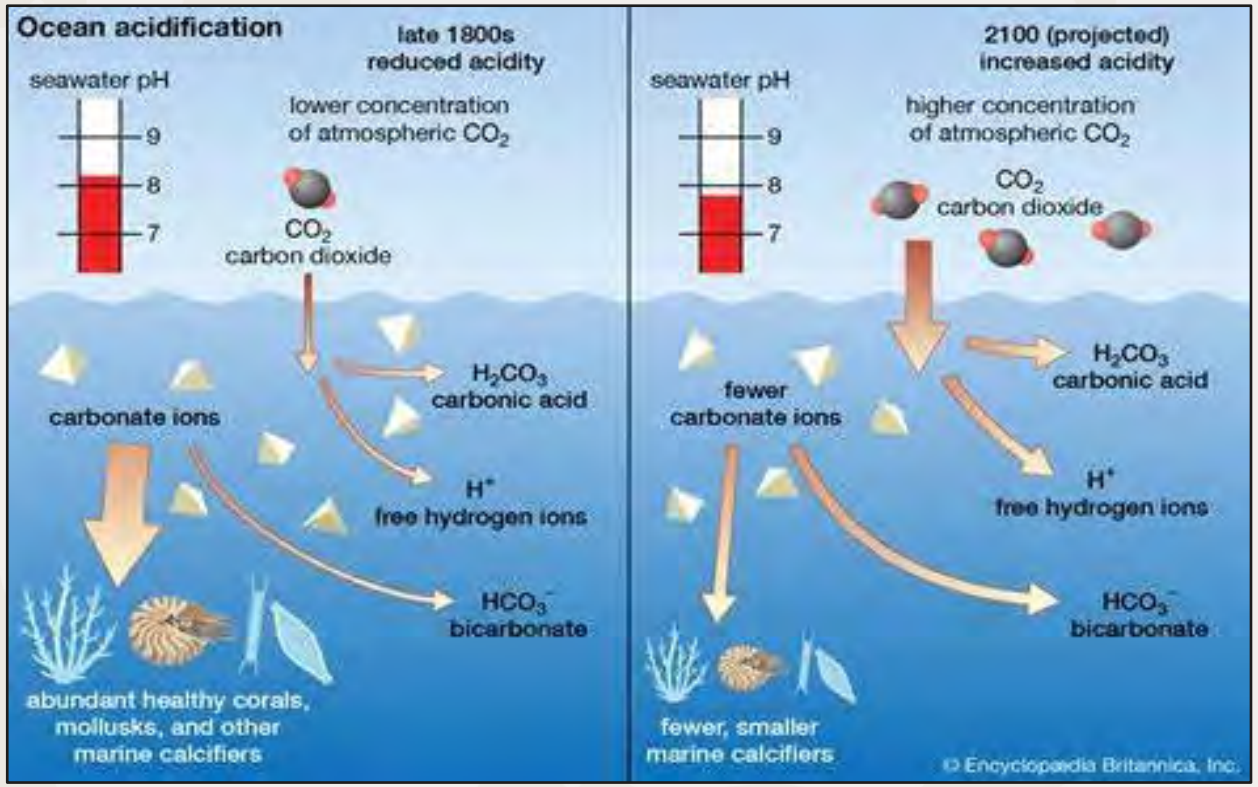
Traditional Foods

Ken’aq qaillun stuuluq caskiumaqaq kentaqan cumi

– When the tide is out, the table is set.



Ocean Acidification



$H_2O + CO_2 \Rightarrow H_2CO_3 \Rightarrow HCO_3^- + H^+$

What is OA?

- ❑ Change in ocean chemistry
- ❑ Many unknown and widespread effects
- ❑ Arctic waters are particularly vulnerably

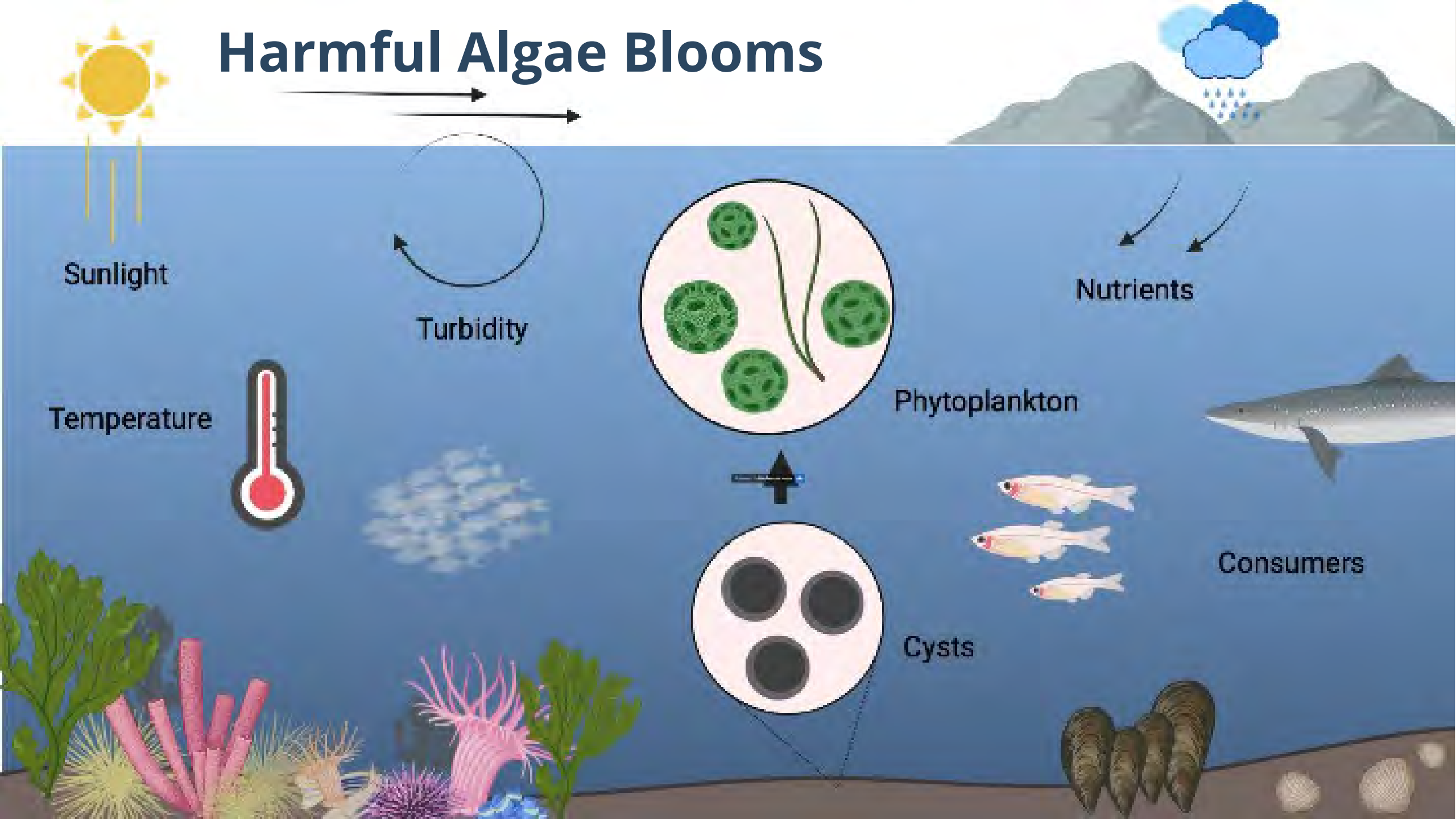
What we measure:

- ❑ Total dissolved carbon dioxide
- ❑ Aragonite saturation
- ❑ Temperature
- ❑ Salinity
- ❑ Alkalinity
- ❑ pH

Significance:

- ❑ Shellfish health ($CaCO_3$-)
- ❑ Baseline monitoring

Harmful Algae Blooms



Alutiiq Pride MARINE INSTITUTE

CHUGACH REGIONAL OCEAN MONITORING
COMMUNITY SAMPLING

One Community Member at Each of the Seven Villages Works with APMI as a Field Sampler. Samples are Collected on a Weekly Basis.

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2. Provide information for Tribes (and the public) to make choices about safe subsistence shellfish harvest

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REGIONAL
RESOURCES
COMMISSION

Next Steps:

Molecular Monitoring

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Environmental DNA

Next steps in monitoring..

- Small pieces of DNA found in the environment
- Identify species of interest
- Effective monitoring method for species Identification
- Buildout of molecular lab

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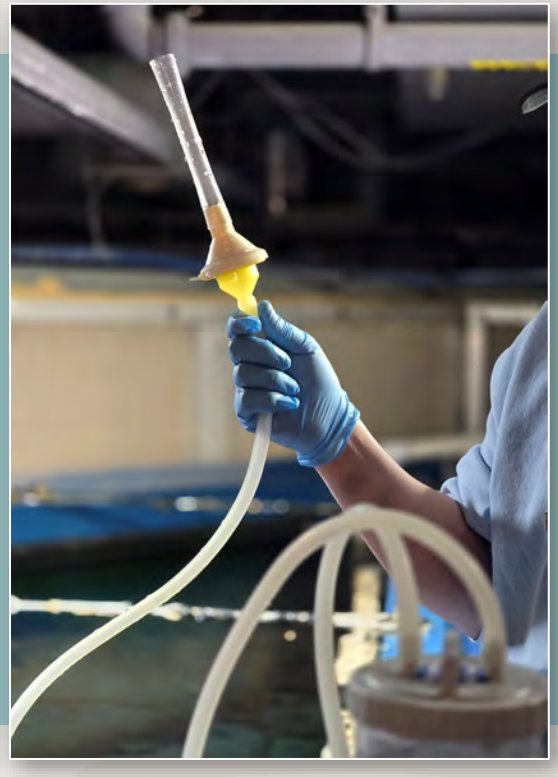
Environmental DNA

Procedure: Sample Collection



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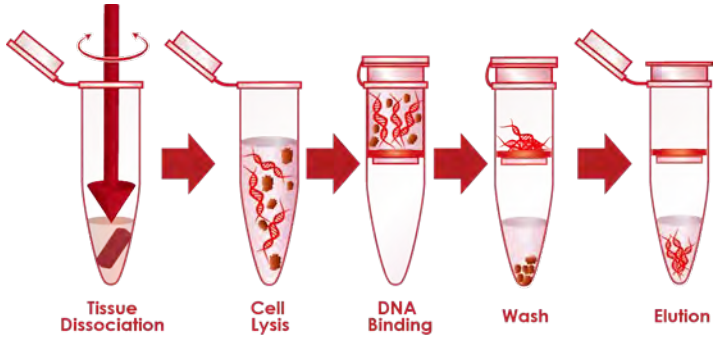
Environmental DNA

Protocol: Extraction



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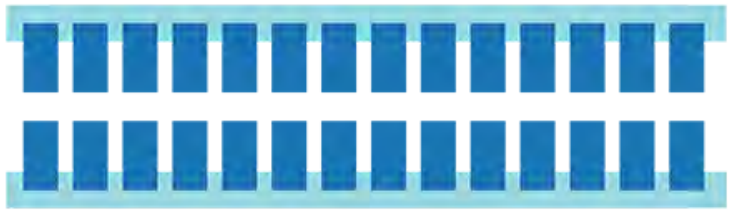
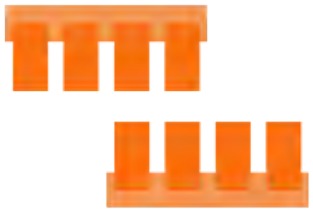
Environmental DNA

Protocol: Quantitative Polymerase Chain Reaction (qPCR)



DNA Template



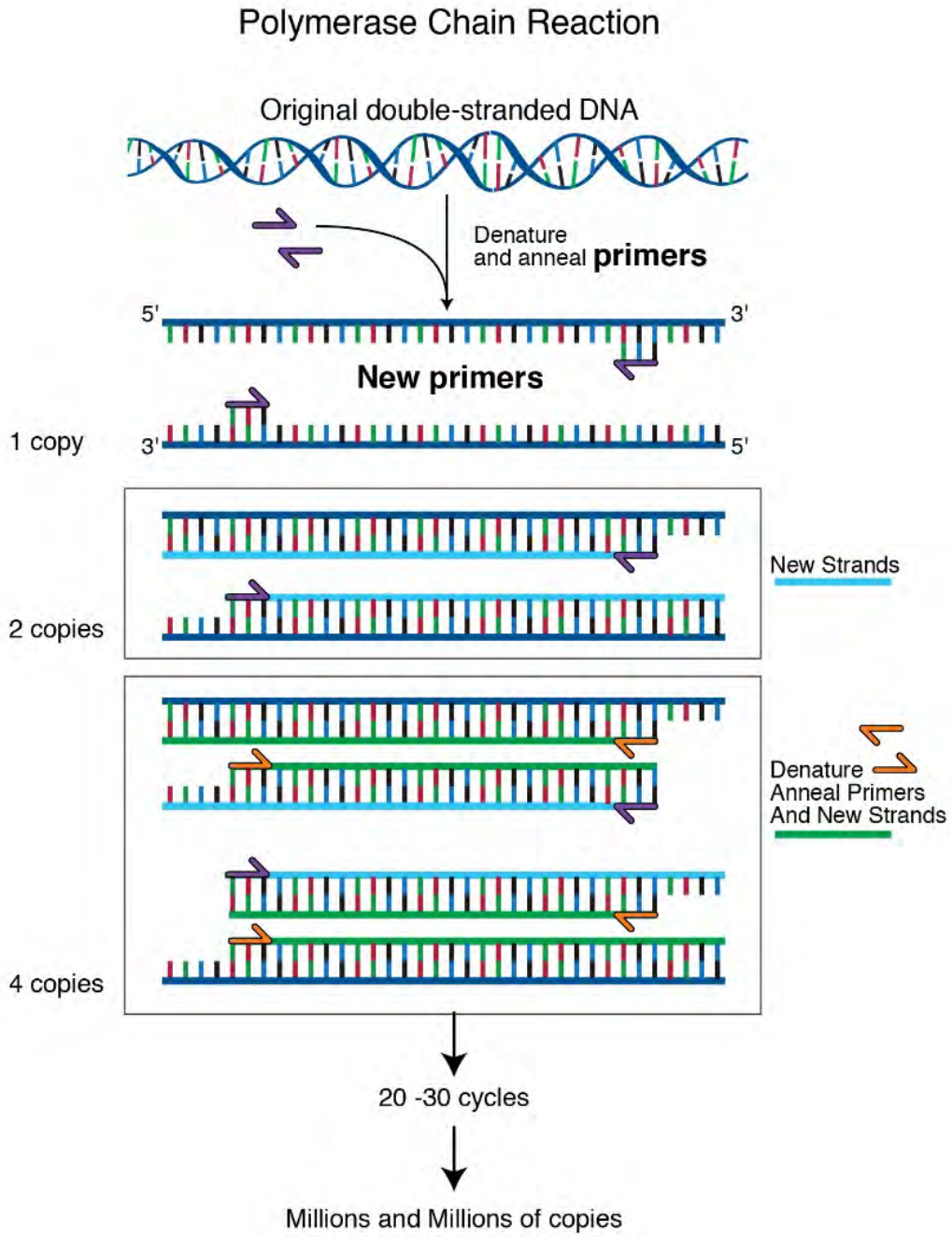
Primers

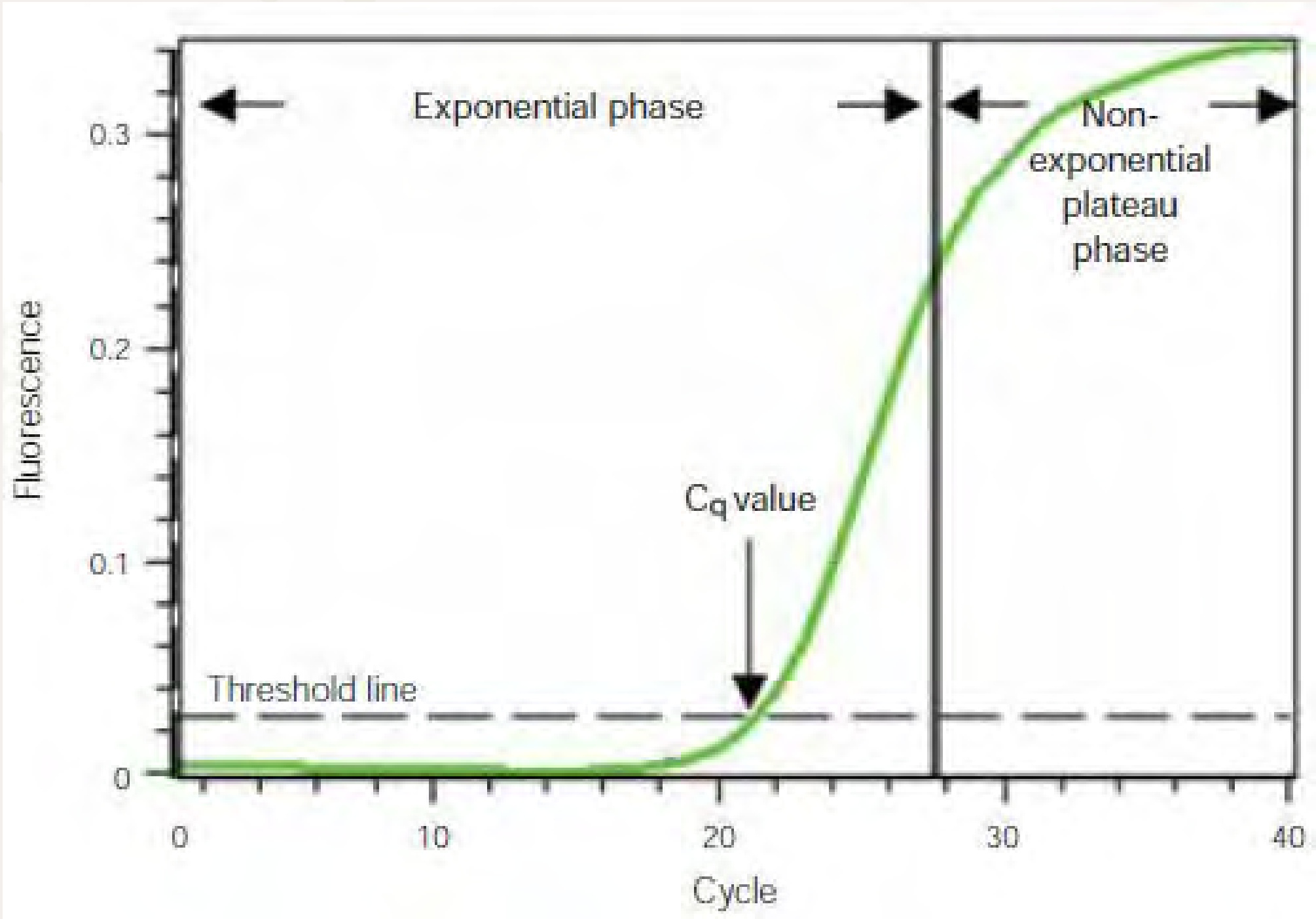
DNA Polymerase

dNDPs

Buffer/Cofactors


dNTPs
Primer
5'
3'
Template DNA
New DNA strand
DNA polymerase


Polymerase Chain Reaction
Original double-stranded DNA
Denature and anneal primers
5'
3'
New primers
1 copy
3'
5'
2 copies
New Strands
4 copies
Denature
Anneal Primers
And New Strands
20 -30 cycles
Millions and Millions of copies


Exponential phase
Non-exponential plateau phase
Fluorescence
0.3
0.2
0.1
0
C_q value
Threshold line
0
10
20
30
40
Cycle

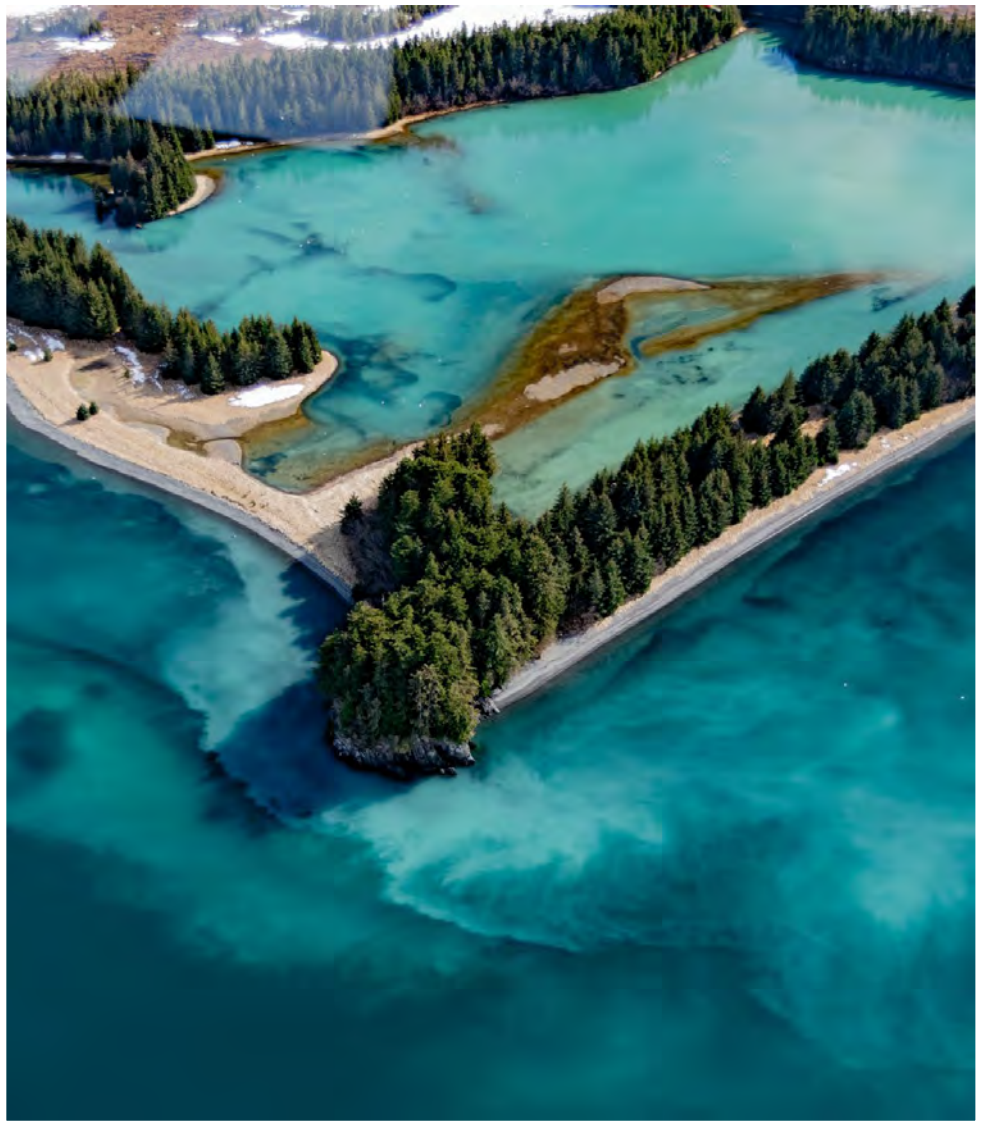
CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

eDNA Projects at APMI

CHUGACH REGIONAL RESOURCES COMMISSION

Aluutiiq Pride



Pacific Herring

The Prince William Sound

- Once a robust commercial and subsistence fishery
- Commercial Fishery closed in 1994
- Biomass decreased from 65,000 tons to 10,000 tons

HERRING SPAWN OBSERVED DURING ADF&G AERIAL SURVEY AT CEDAR BAY. PHOTO TAKEN BY BIOLOGIST SHANE SHEPHERD.

Prince William Sound Herring Watch

1.1K likes • 1.3K followers

Understanding herring health across environmental gradients

CHUGACH REGIONAL RESOURCES COMMISSION

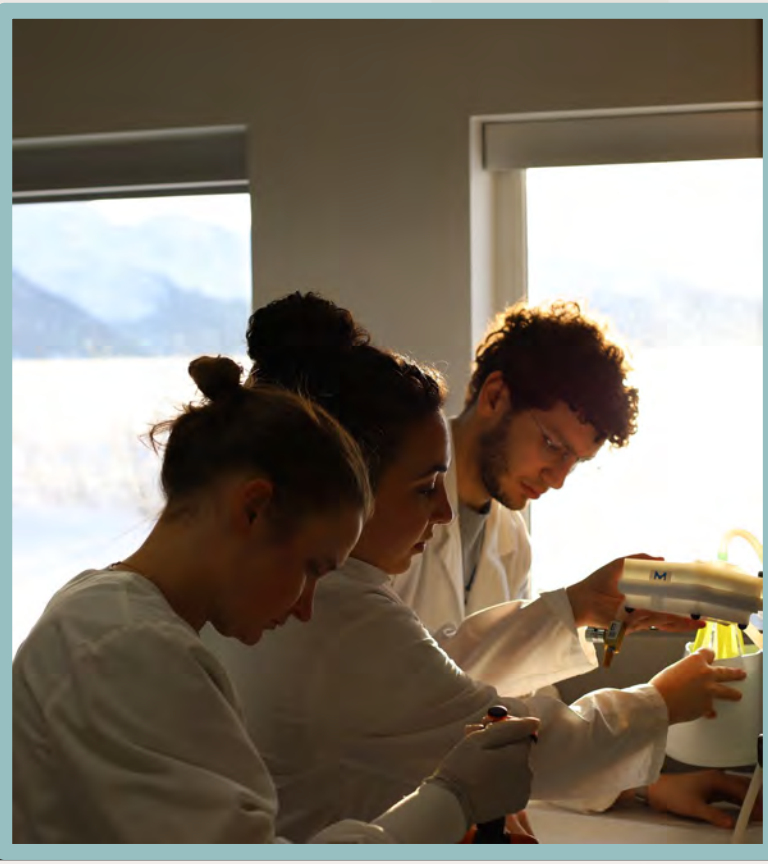
CRRC eDNA Project

Transferring Environmental DNA methods to the Alutiiq Pride Marine Institute (APMI) Laboratory to support the Chugach Regional Ocean Monitoring Program (CROM) with determining the spatial distribution of Pacific Herring (*Clupea pallasi*)

Funded by ANA

Process and analyze eDNA samples

Sample collection started in 2024

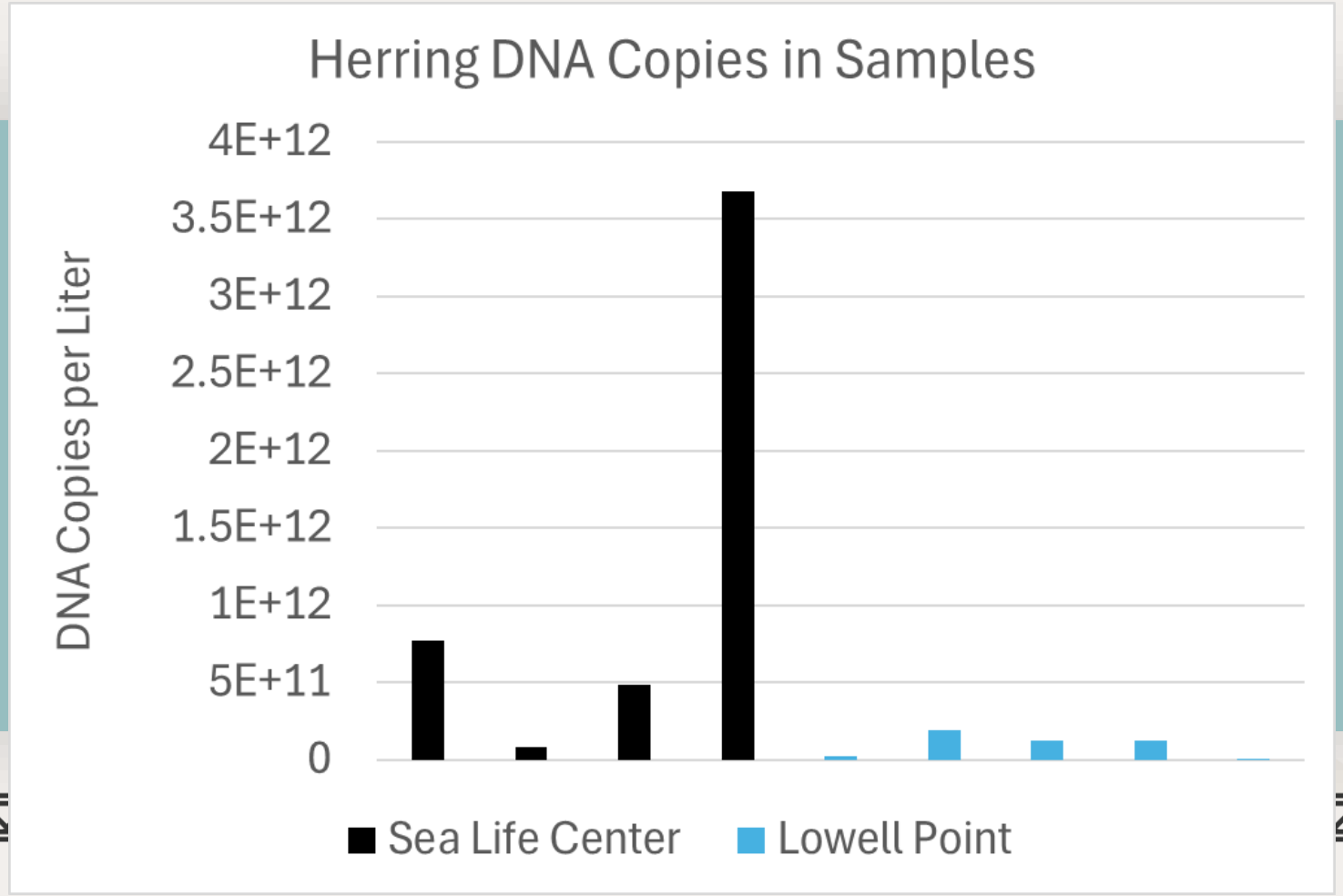


CHUGACH REGIONAL RESOURCES COMMISSION

Uniting Pride

Environmental DNA

Results



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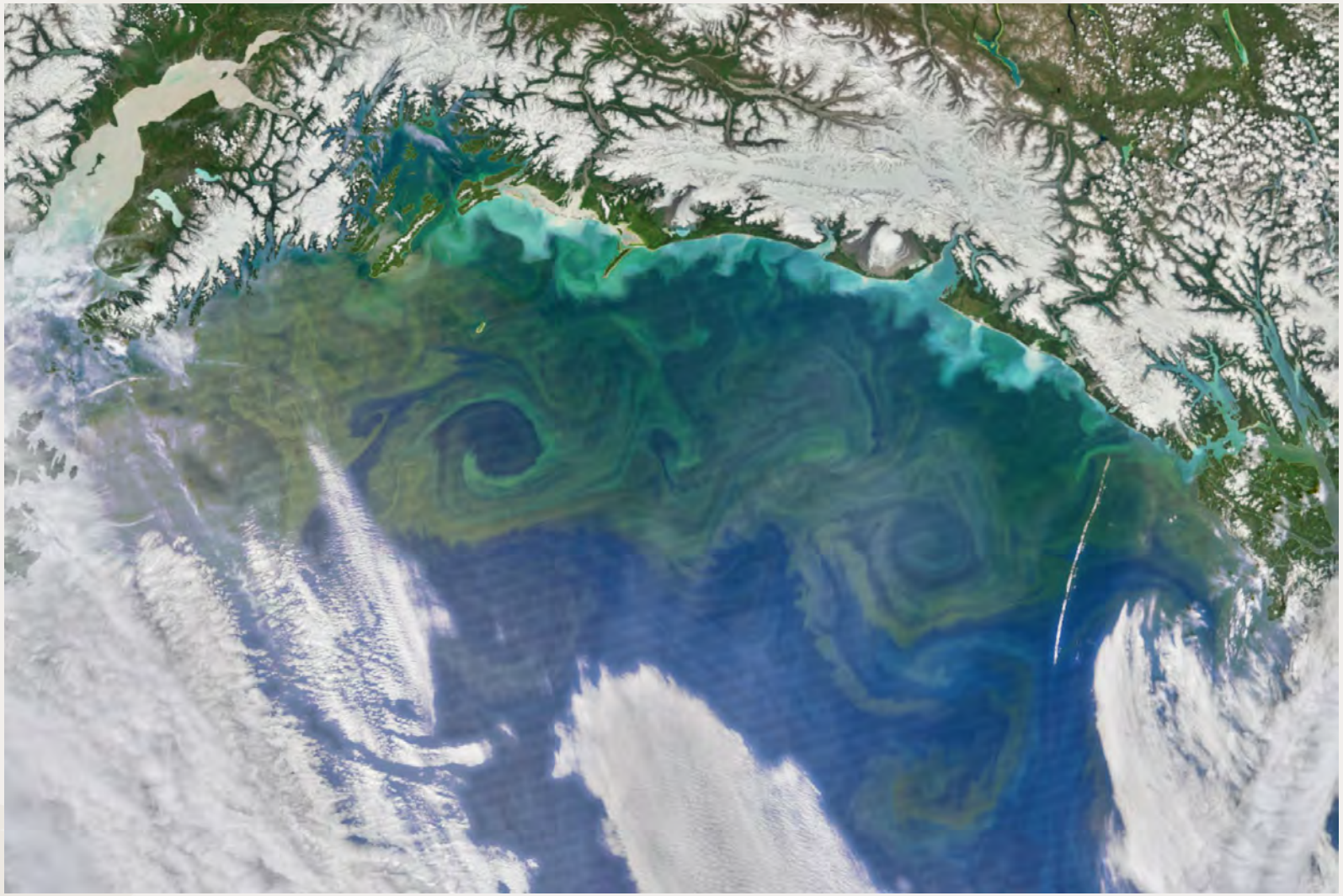
Aluutiiq Pride

Environmental DNA

Harmful Algal Blooms



CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Graduate Program

Investigating biodiversity using eDNA

Research Interest

- ❑Methods and applications of eDNA
- ❑Monitoring intertidal biodiversity

Goals:

1. Identify variation in community compositions and species richness at four distinct locations in Resurrection Bay.
2. Investigate spatial and temporal variation in biodiversity in Resurrection Bay.

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Methods

Collection, DNA extraction, target group

- ❑Four locations in Resurrection Bay
- ❑Monthly sampling over one year
- ❑DNA extraction
- ❑18S rRNA primers (eukaryotic, cells with nucleolus)
  - ➢ Animals, algae, plants
- ❑Inform monitoring and mariculture efforts

TRIBAL *AND* CULTURALLY *GROUNDED*

For more than 10,000 years, the Chugach people have lived in harmony with surrounding lands and waters that continue to hold profound cultural, spiritual, and economic significance. Guided by the wisdom of the Elders and the strength rooted in tradition, the Chugach Regional Resources Commission (CRRC) integrates traditional ecological knowledge with contemporary science to address the complex environmental challenges of today and tomorrow.

Through collaboration with Chugach Tribes, CRRC brings Tribal voices to the forefront of natural resource management, ensuring that cultural heritage and traditional practices are preserved and promoted. CRRC is committed to fostering community resilience, self-determination, and sustainable resource management. We strive to build a resilient future for the Chugach people by supporting food sovereignty, protecting lands and waters within traditional use areas, fostering sound economic opportunities within the communities, and ensuring the survival and prosperity of the Sugpiaq (Alutiiq) and dAXunhyuu (Eyak) cultures for generations to come.

Alutiiq Pride

CHUGACH
REGIONAL
RESOURCES
COMMISSION

Questions?

Alutiiq Pride

CHUGACH REGIONAL RESOURCES COMMISSION

Chugach Regional Ocean Monitoring (CROM) Program & Graduate Project

Allison Carl

Biology Laboratory Manager

Alutiiq Pride Marine Institute

Kurt Grinnell Scholarship Recipient

ALASKA

VALDEZ

TATITLEK
(TAATIILAAQ)

CORDOVA/EYAK
(IIYAAGDAAD)

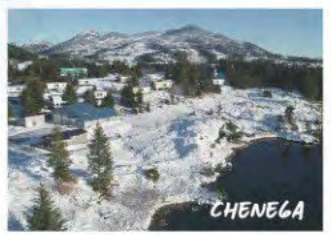
SEWARD
(QUTALLEQ)

CHENEGA
(CANIQAQ)

PORT GRAHAM
(PALUWIK)

NANWALEK

GULF OF ALASKA



Suumacirpet asirpiartuq Our way of living is the best

Funding provided by First Nations Institute in collaboration with Salix Group. Designed and illustrated by Sarah K. Glaser.

To the Alutiiq people, subsistence is life. There is no easy way to translate the word subsistence - suumacirpet - into the Alutiiq language. Westerners often think of subsistence as the process of obtaining and eating wild foods, an alternative to buying groceries. This definition, however, fails to capture the complexities of living off the land.

Collecting wild foods is not simply an economic act, but a central component of social and spiritual life. Through hunting, fishing, and gathering, Alutiiq people experience and express Native identity. They explore their deep and enduring connection to the land. They care for their families and communities. They celebrate and sustain life.

Subsistence is also a birthright, a way of living passed down from ancestors that has sustained generations. While not a literal translation of the word subsistence, suugucirpet asirpiartuq, "our way of living is best," expresses these many connections.

The Gulf of Alaska, including Prince William Sound and Lower Cook Inlet is one of the richest and biologically productive ecosystems on the planet. A local saying is: When the tide is out, the table is set.

ALL SEASONS

1. **Silver Salmon** *Silver Salmon*
2. **Red Salmon** *Red Salmon*
3. **King Salmon** *King Salmon*
4. **Pink Salmon** *Pink Salmon*
5. **Chum Salmon** *Chum Salmon*
6. **Dungeness** *Dungeness*
7. **Sea Lions** *Sea Lions*
8. **Bidarki** *Bidarki*

MULTIPLE SEASONS

9. **Octopus** (Spring, Winter) *Octopus*
10. **Bear** (Spring, Fall) *Bear*
11. **Blueberry** (Summer, Fall) *Blueberry*
12. **Seal** (Spring, Summer, Winter) *Seal*

SPRING

13. **Spruce Tips** *Spruce tips*
14. **Fiddleheads** *Fiddleheads*
15. **Fireweed Shoots** *Fireweed Shoots*
16. **Sitka Periwinkle** *Sitka Periwinkle*
17. **Herring** *Herring*
18. **Herring Eggs** *Herring Eggs*
19. **Seaweed** *Seaweed*

SUMMER

20. **Fireweed** *Fireweed*
21. **Porcupine** *Porcupine*
22. **Salmonberry** *Salmonberry*

SUMMER & WINTER

23. **Razor Clams** *Clams*
24. **Soft Shell Clams** *Clams*
25. **Cod** *Cod*
26. **Halibut** *Halibut*
27. **Grouse** *Grouse*

FALL

28. **Moose** *Moose*
29. **Lowbush Cranberry** *Lowbush Cranberry*
30. **Highbush Cranberry** *Highbush Cranberry*
31. **Mushrooms** *Mushrooms*

FALL & WINTER

34. **Deer** *Deer*
35. **Mountain Goat** *Mountain Goat*
36. **Black Scoter** *Black Scoter*
37. **Barrow's Goldeneye** *Barrow's Goldeneye*
38. **Surf Scoter** *Surf Scoter*

WINTER

32. **Harlequin Duck** *Harlequin*
33. **Limpits** *Limpits*

First Nations Development Institute

Chugach Regional Resources Commission

The Day the Water Died

CHUGACH REGIONAL OCEAN MONITORING PROGRAM

The focus is to fill in gaps in understanding of nearshore ocean health in Chugach communities through examining ocean chemistry, harmful algae, and shellfish biotoxin levels. The program relies on citizen science from our partners in Tribal communities throughout the region. With regional Tribal capacity, CRRC can further support safe and sustainable harvest opportunities for both local communities and the shellfish industry in Southcentral Alaska.

CHUGACH REGIONAL RESOURCES COMMISSION

Uniting Pride

CROM Program

What are we monitoring for?

- ❑ Coastal ocean chemistry and ocean acidification (OA) signatures
- ❑ Presence of algae with the potential to form harmful algal blooms (HABs)
- ❑ Presence of biotoxins associated with those HABs (e.g. paralytic shelf poison (PSP))
- ❑ General environmental conditions and how they related to HAB presence

Alutiiq Pride MARINE INSTITUTE

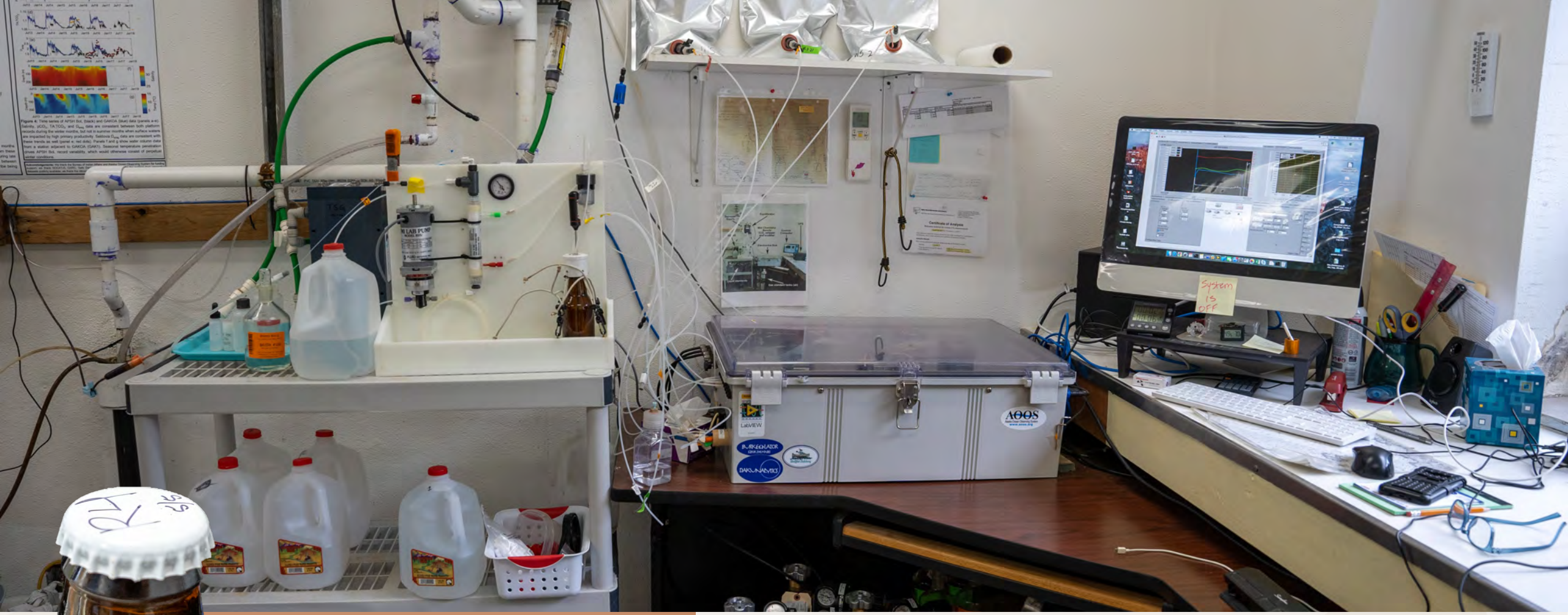
CHUGACH REGIONAL OCEAN MONITORING
COMMUNITY SAMPLING

One Community Member at Each of the Seven Villages Works with APMI as a Field Sampler. Samples are Collected on a Weekly Basis.

CHENEGA • CORDOVA • NANWALEK • PORT GRAHAM • SEWARD • TATITLEK • VALDEZ

ANALYSES CONDUCTED BY APMI

The focus is to fill in gaps in understanding of nearshore ocean health in Chugach communities through examining ocean chemistry, harmful algae, and shellfish biotoxin levels. The program relies on citizen science from our partners in Tribal communities throughout the region. With regional Tribal capacity, CRRC can further support safe and sustainable harvest opportunities for both local communities and the shellfish industry in Southcentral Alaska.



CROM Chemistry Lab

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

OA Monitoring Partnerships

Expansion to monitoring include Utqiagvik, Kotzebue, Nome, Unalaska, Kodiak, & some research cruises.

Longest running sampling program in Alaska!

CHUGACH REGIONAL RESOURCES COMMISSION

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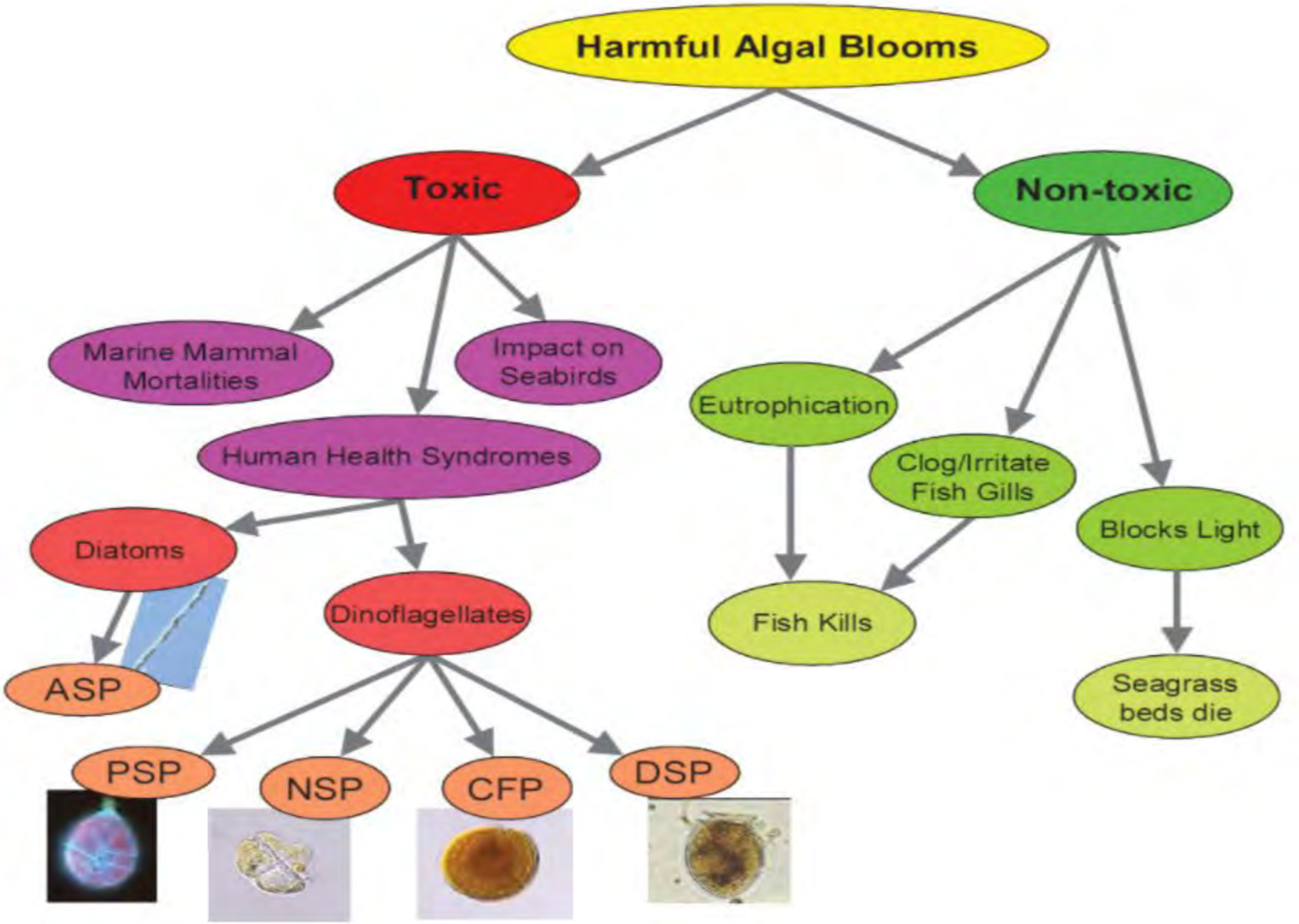
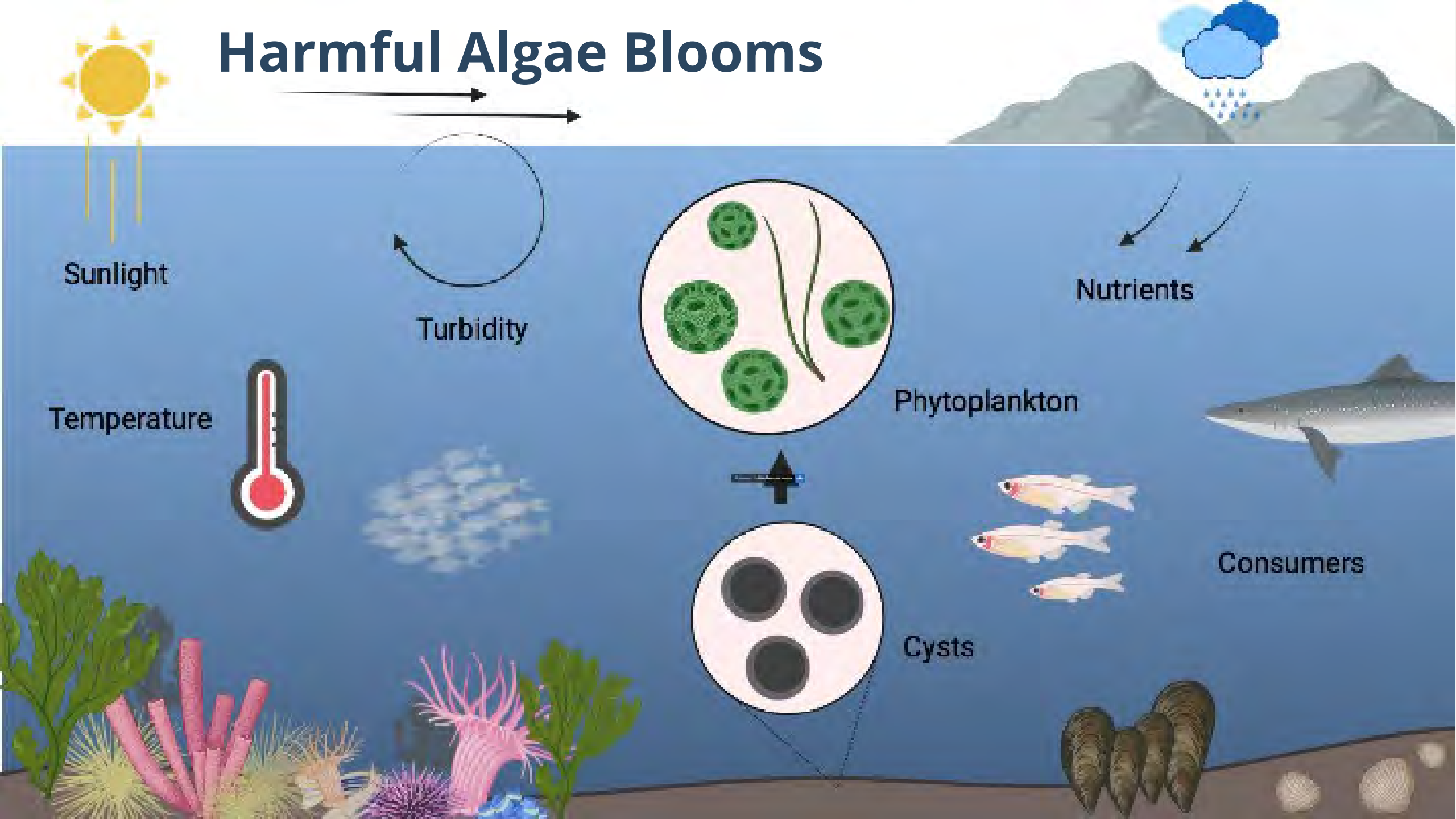
HABs Lab


Harmful Algal Blooms
Toxic
Non-toxic
Marine Mammal Mortalities
Impact on Seabirds
Human Health Syndromes
Diatoms
Dinoflagellates
ASP
PSP
NSP
CFP
DSP
Eutrophication
Clog/Irritate Fish Gills
Blocks Light
Fish Kills
Seagrass beds die

Harmful Algae Blooms




SALUTING PRIDE


New HAB Lab

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

New HAB Lab

CHUGACH REGIONAL RESOURCES COMMISSION

Uniting Pride

Federal Regulatory Limits

CRRC does not regulate shellfish harvest – We only inform of the limits and what we find

Saxitoxin

Algae: *Alexandrium* Species

Paralytic Shellfish Toxin/Poison (PST/PSP)

Federal limit: 80ug/100g

Domoic Acid

Algae: *Psuedo-nitzchia* species

Amnesic Shellfish Poison (ASP)

Federal Limit: 20 ppm

The allowable amount determined by the federal government

All commercial shellfish are required to be tested

CHUGACH REGIONAL RESOURCES COMMISSION

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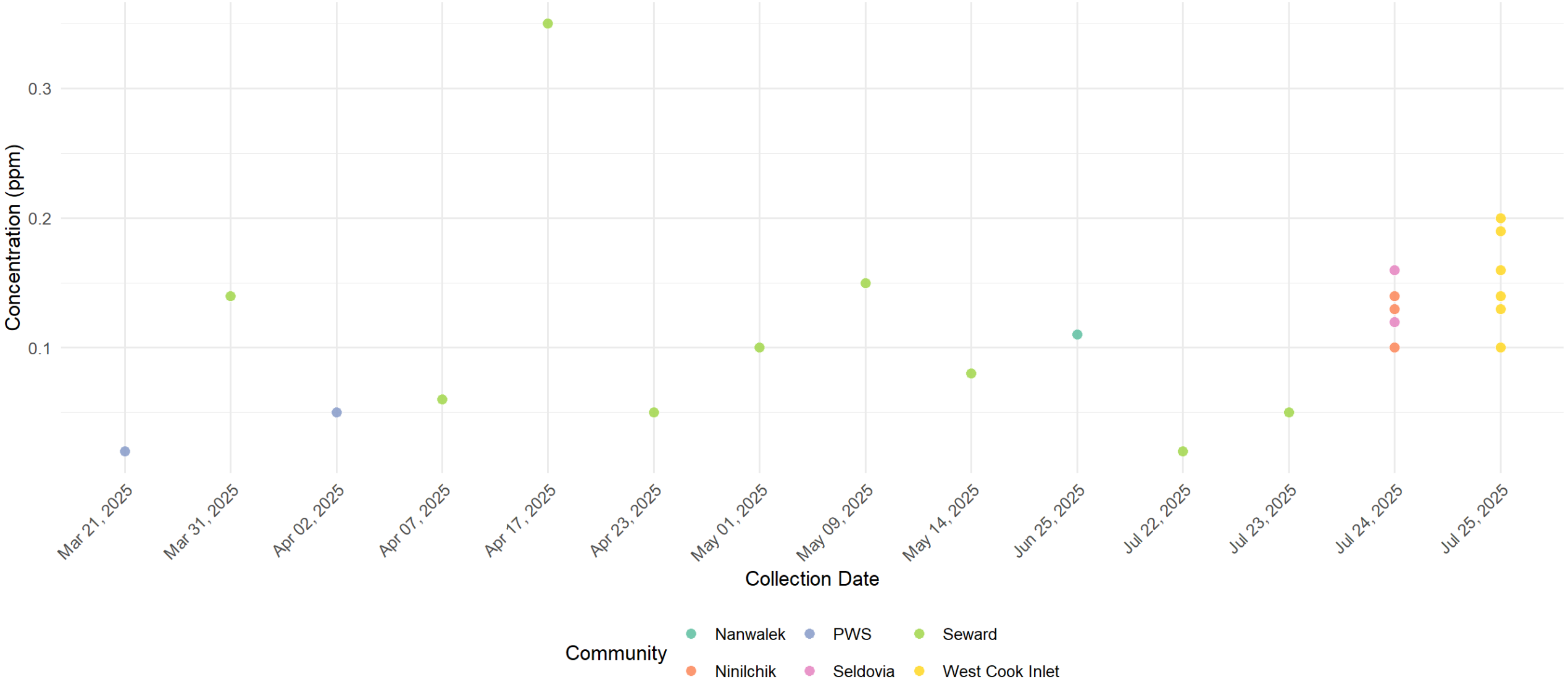
Domoic Acid (ASP)



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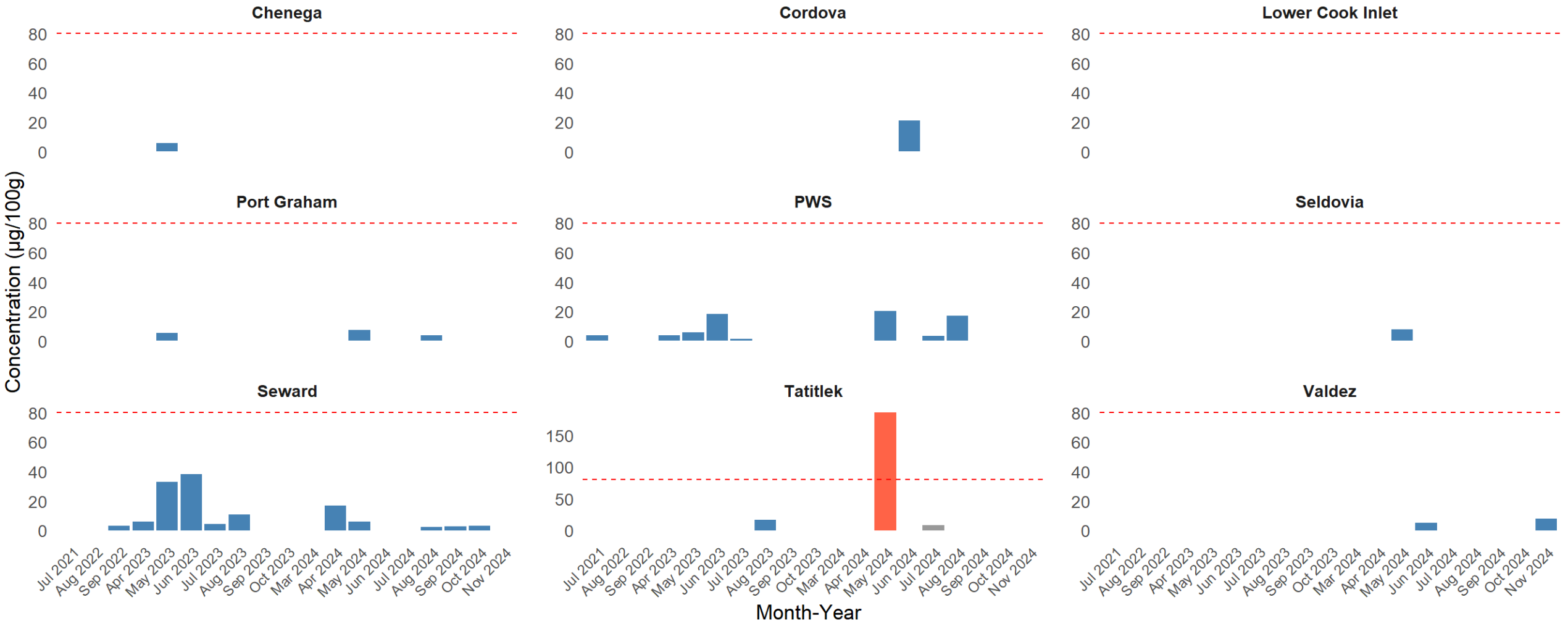
Saxitoxin (PSP)



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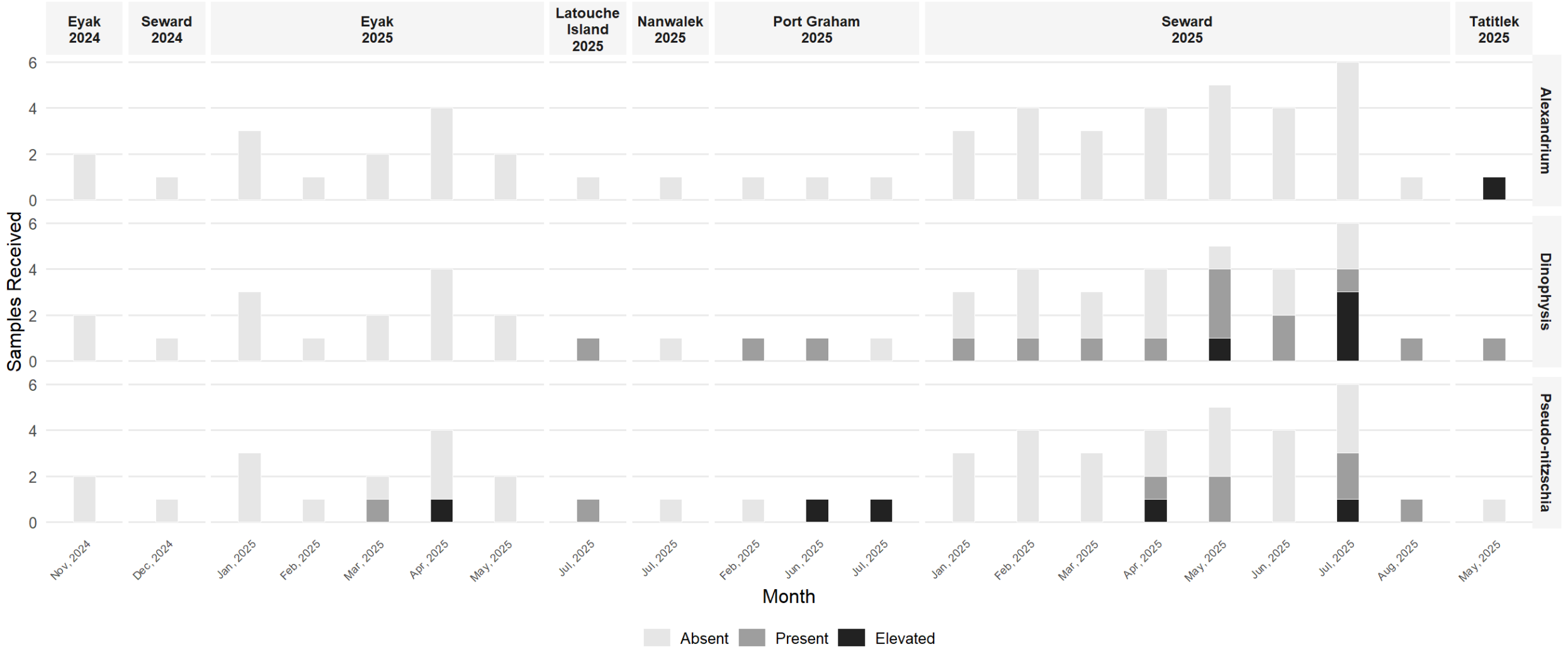
Alutiiq Pride

Microscopy



Public Service Announcement

Date

Paralytic Shellfish Toxin Advisory

The following advisories are for Chugach Regional Resources Commission (CRRC) sites with shellfish that have Paralytic Shellfish Toxins (PST) levels above the FDA regulatory limit of 80 µg/100 g. In high concentrations, 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.

Community	Beach	Species Affected	Date Collected
-	-	-	-

Recent PSPresults

Community	Location	Species	PST Results (µg/100g)	Date Collected
-	-	-	-	-

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.

<LOD = below limit of detection for the receptor binding assay. Red coloring indicates PST levels are above the FDA limit of 80 µg/100 g.

PSP Information

PSP is caused by an increase in concentration of a PST producing marine algae triggered by warm temperatures and currents. 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

CRRC is a Tribal organization within the meaning of the Indian Self Determination and Education Assistance Act of 1991, and an Alaska Native Organization (ANO) as defined in federal policies. We are authorized by our seven member Tribes in Alaska's Chugach region to provide essential governmental services to Tribal citizens. We provide support for natural resource management, subsistence activities, climate change adaptation and environmental concerns, food security, and access to healthy traditional foods and clean water.

How to Get Shellfish Tested

If you are interested in getting harvested shellfish tested or have any questions about paralytic shellfish poisoning, please contact Allison Carl at acarl@crrcalaska.org or Annette Jarosz at annette@alutiiqprideak.org.

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.

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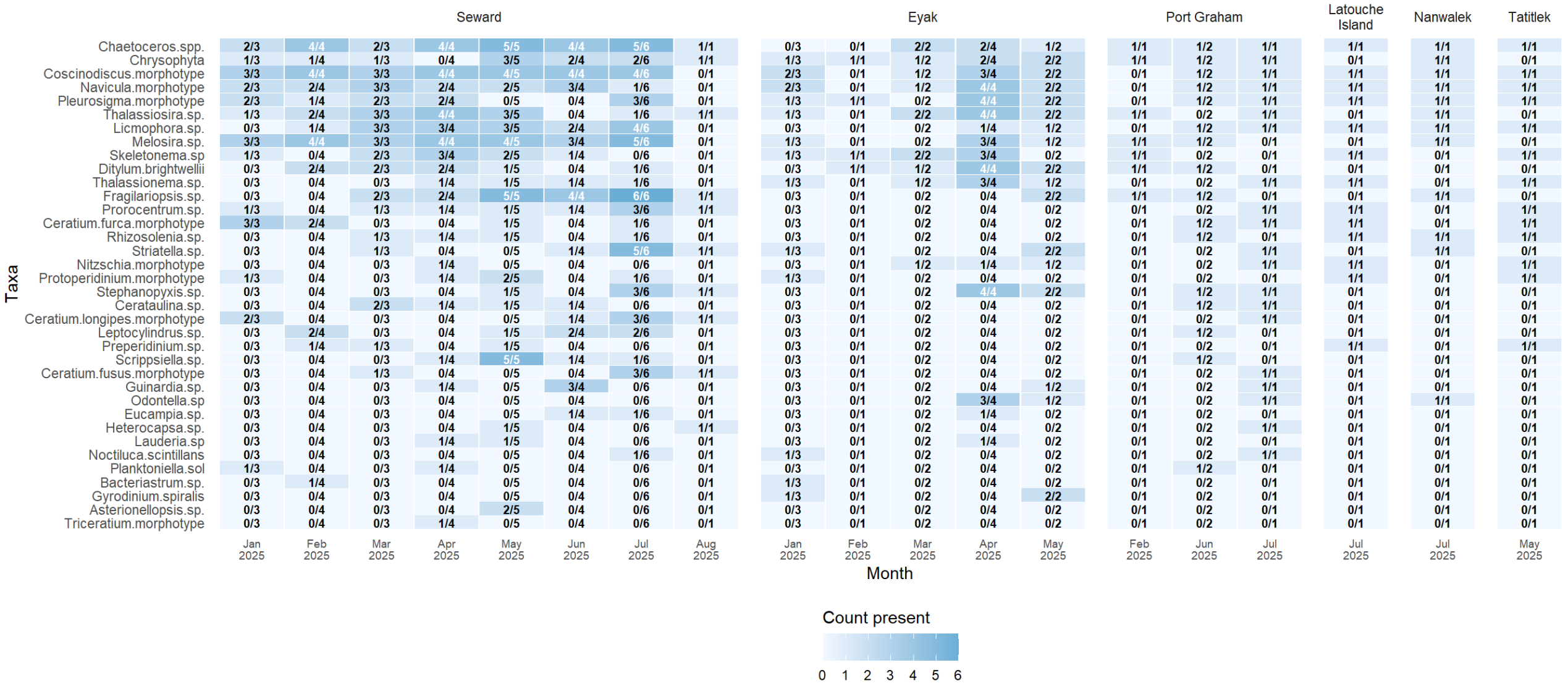
Algae presence absence



CHUGACH REGIONAL RESOURCES COMMISSION

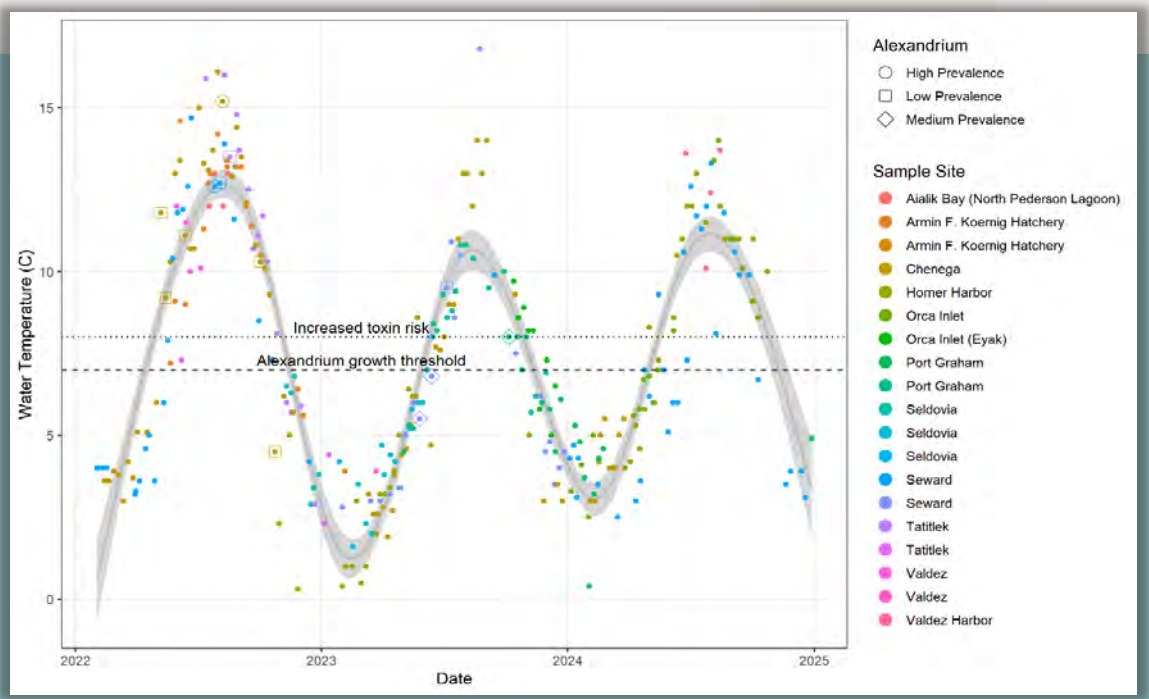
Uniting Pride

Next steps in data management and analysis

Preliminary data → Reports → Comprehensive analysis

ID	Collection Date	Sample Type	Community	Sample Lo	Collector	RBA completed
27	7/3/2021	Blue mussel	PWS	Pigot Bay (	PWSSF	<LOD
28	7/18/2021	Blue mussel	PWS	Fox Farm E	PWSSF	12
29	7/27/2021	Blue mussel	PWS	Pigot Bay (	PWSSF	<LOD
30	8/5/2022	Blue mussel	PWS	Pigot Bay	PWSSF	<LOD
31	8/26/2022	Blue mussel	PWS	Derickson	PWSSF	<LOD
.19	9/30/2022	Blue mussel	Seward	4th of July	CRRC	3
1	4/11/2023	Blue mussel	PWS	Pigot Bay	PWSSF	4
2	4/23/2023	Blue mussel	Seward	4th of July	CRRC	6
3	4/26/2023	Blue mussel	Port Graham		CRRC	<LOD
4	5/3/2023	Blue mussel	Port Graham		CRRC	<LOD
5	5/5/2023	Blue mussel	Seward	4th of July	CRRC	<LOD
6	5/7/2023	Blue mussel	Chenega	Airport Be	CRRC	22
7	5/8/2023	Littleneck clam	Chenega	Airport Be	CRRC	<LOD
8	5/10/2023	Blue mussel	Port Graham		CRRC	<LOD
33	5/14/2023	Blue mussel	PWS	Pigot Bay	PWSSF	6
9	5/17/2023	Blue mussel	Port Graham		CRRC	4
10	5/24/2023	Blue mussel	Port Graham		CRRC	18
11	5/26/2023	Blue mussel	Seward	4th of July	CRRC	66
34	6/11/2023	Blue mussel	PWS	Derickson	PWSSF	25
11	6/16/2023	Blue mussel	Seward	4th of July	CRRC	22
12	6/21/2023	Blue mussel	Seward	4th of July	CRRC	54
35	6/27/2023	Blue mussel	PWS	Eleanor Isl	PWSSF	12
36	7/6/2023	Blue mussel	PWS	Derickson	PWSSF	<LOD
37	7/17/2023	Blue mussel	PWS	Fox Farm	PWSSF	4
13	7/17/2023	Blue mussel	Seward	4th of July	CRRC	5
14	7/20/2023	Blue mussel	Seward	4th of July	CRRC	4
15	7/22/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
38	7/25/2023	Blue mussel	PWS	60.932940	PWSSF	<LOD
16	7/26/2023	Blue mussel	Port Graham		CRRC	<LOD
17	7/26/2023	Blue mussel	Seward	4th of July	CRRC	5
20	7/26/2023	Blue mussel	Seward		CRRC	4
59	7/27/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
18	8/3/2023	Blue mussel	Seward	4th of July	CRRC	11
19	8/3/2023	Blue mussel	Port Graham		CRRC	<LOD
60	8/11/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
20	8/14/2023	Blue mussel	Port Graham		CRRC	<LOD
61	8/16/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
62	8/22/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
21	8/29/2023	Cockle	Tatitlek			15

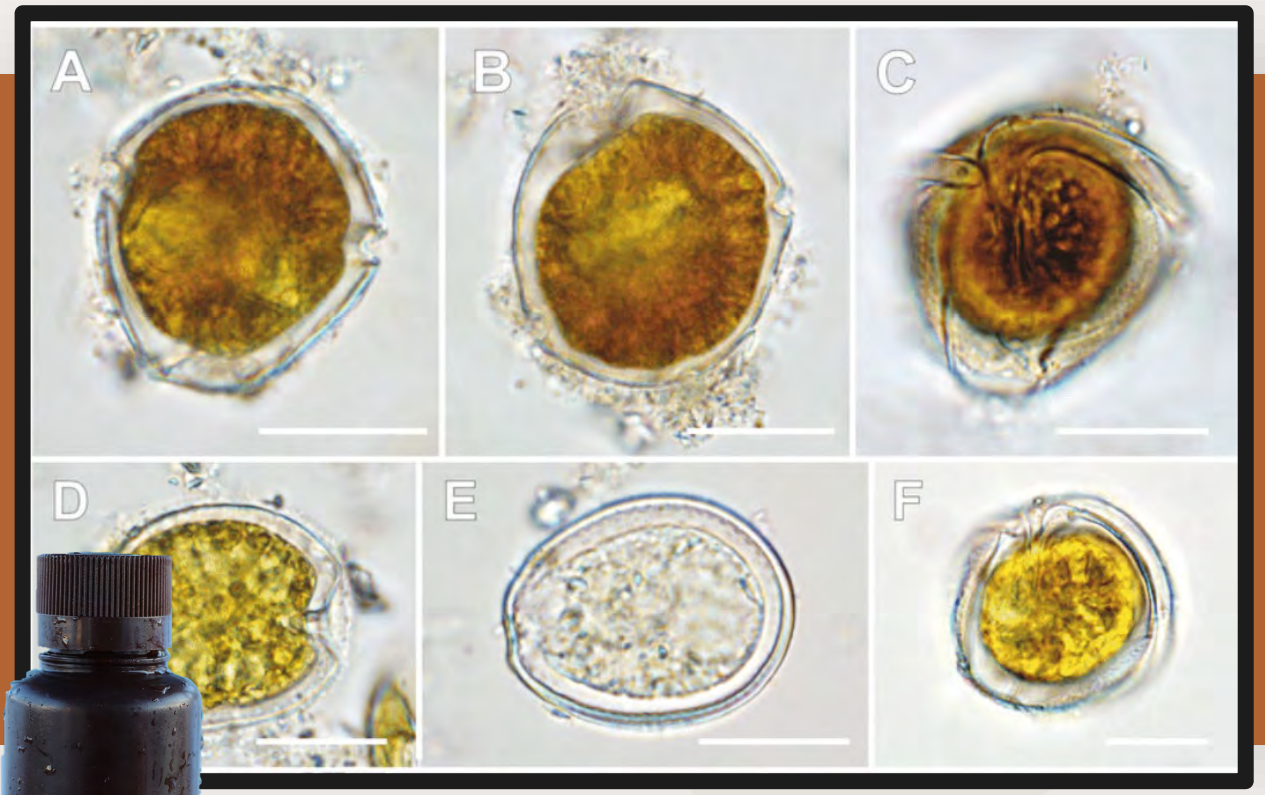
Sample Type	Community	Sample Date	RBA completed (ug/100g)
Blue mussel	Seward	2022-07-18	<LOD
Softshell clam	Seward	2022-07-18	<LOD
Blue mussel	Seward	2022-07-27	<LOD
Cockle	Seward	2022-07-27	<LOD
Blue mussel	Seward	2022-08-09	<LOD
Blue mussel	Seward	2022-08-11	<LOD
Softshell clam	Seward	2022-08-11	<LOD
Cockle	Seward	2022-08-11	<LOD
Blue mussel	Seward	2022-08-24	<LOD
Blue mussel	Seward	2022-09-27	<LOD
Blue mussel	Seward	2022-09-30	3
Blue mussel	Seward	2023-07-26	4
Softshell clam	Seward	2024-03-06	<LOD
Softshell clam	Seward	2024-04-10	<LOD
Blue mussel	Seward	2024-04-30	34
Mya truncata	Port Graham	2024-05-06	26
Macoma	Port Graham	2024-05-06	<LOD
Butter clam	Port Graham	2024-05-06	<LOD
Blue mussel	Port Graham	2024-05-07	4
Macoma	Seldovia	2024-05-09	23
Cockle	Seldovia	2024-05-09	<LOD
Butter clam	Seldovia	2024-05-09	<LOD
Softshell clam	Seward	2024-05-09	30
Butter clam	Tatitlek	2024-05-13	390
Butter clam	Tatitlek	2024-05-13	298
Cockle	Tatitlek	2024-05-13	48
Littleneck clam	Tatitlek	2024-05-13	8
Littleneck clam	PWS	2024-05-14	4
Butter clam	PWS	2024-05-14	45



CHUGACH REGIONAL RESOURCES COMMISSION

Biology Laboratory

eDNA



Monitor for Harmful Algal Blooms (HABs) - neurotoxins they can produce

Microscopes to look for HABs

Run tests on blue mussels for Toxins (can test subsistence species!)

Next Steps

Environmental DNA

- **Small pieces of DNA found in the environment**
- **Allows us to accurately identify different animals and algae**

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Environmental DNA

Next steps in monitoring..

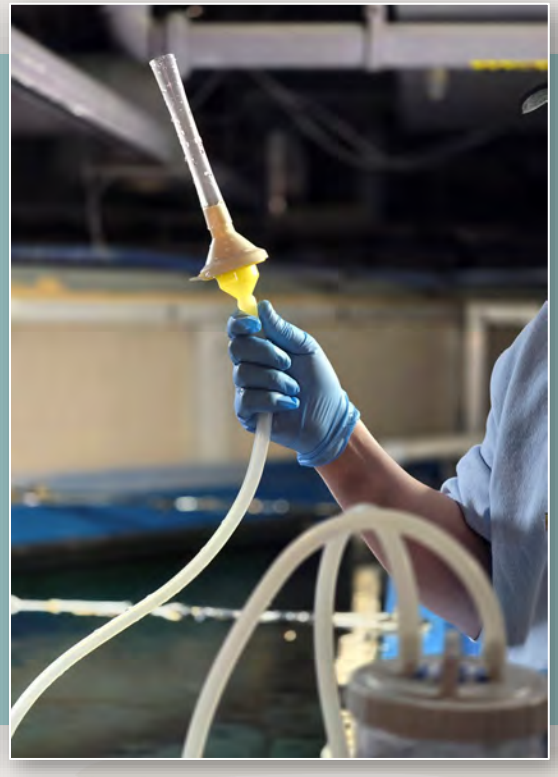
- ❑Small pieces of DNA found in the environment
- ❑Identify potentially harmful algae species
- ❑Effect monitoring methods for species Identification
- ❑Buildout of molecular lab

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Environmental DNA

Procedure: Sample Collection

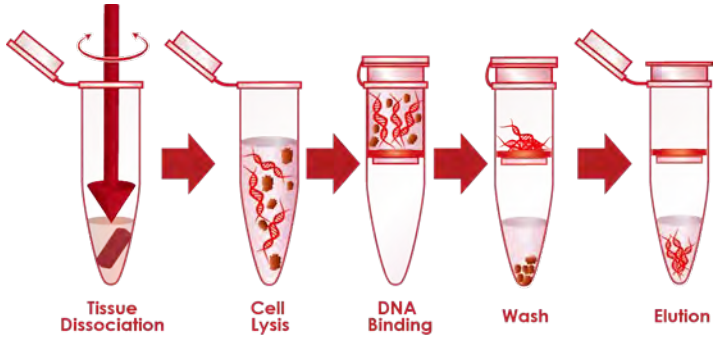


CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Environmental DNA

Protocol: Extraction



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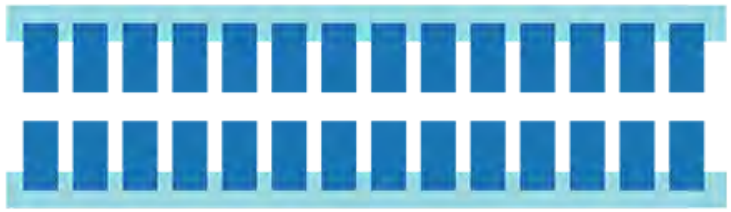
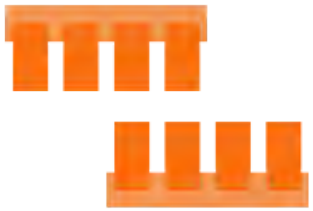
Alutiiq Pride

Environmental DNA

Protocol: Quantitative Polymerase Chain Reaction (qPCR)



DNA Template



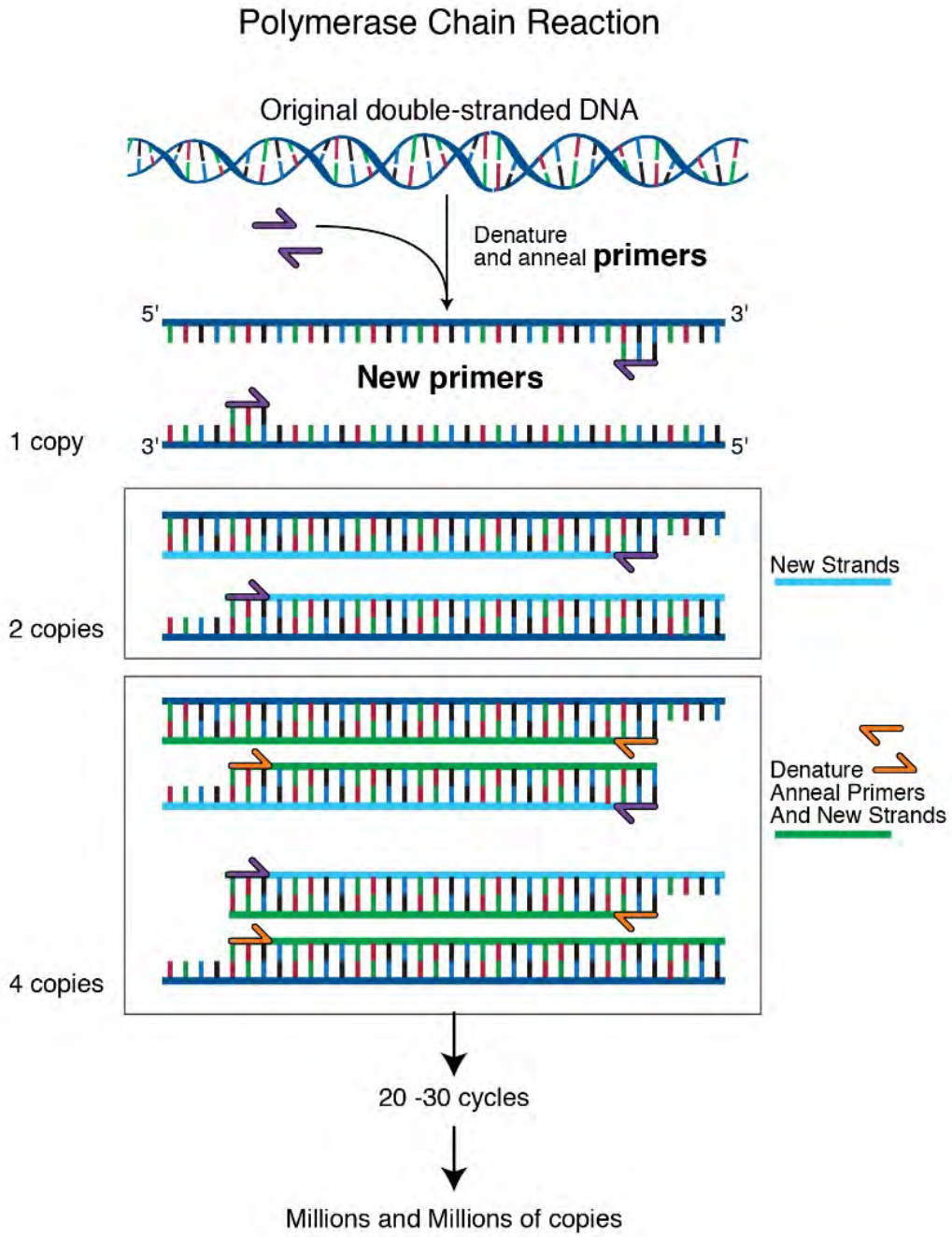
Primers

DNA Polymerase

dNDPs

Buffer/Cofactors


dNTPs
Primer
5'
3'
Template DNA
New DNA strand
DNA polymerase


Polymerase Chain Reaction
Original double-stranded DNA
Denature and anneal primers
5'
3'
New primers
1 copy
3'
5'
2 copies
New Strands
4 copies
Denature
Anneal Primers
And New Strands
20 -30 cycles
Millions and Millions of copies

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eDNA Projects at APMI

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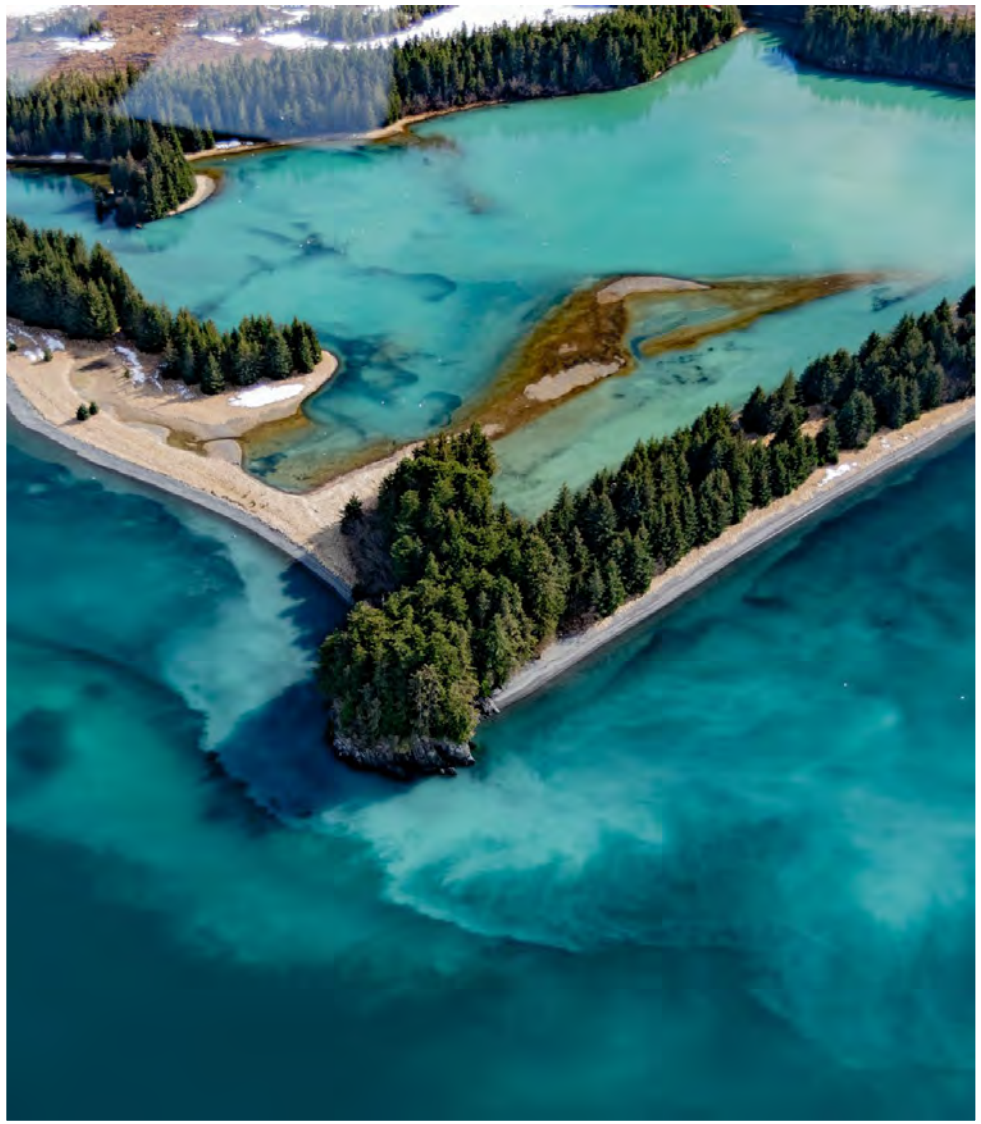


Pacific Herring

The Prince William Sound

- Once a robust commercial and subsistence fishery
- Commercial Fishery closed in 1994
- Biomass decreased from 65,000 tons to 10,000 tons

HERRING SPAWN OBSERVED DURING ADF&G AERIAL SURVEY AT CEDAR BAY. PHOTO TAKEN BY BIOLOGIST SHANE SHEPHERD.

CHUGACH REGIONAL RESOURCES COMMISSION

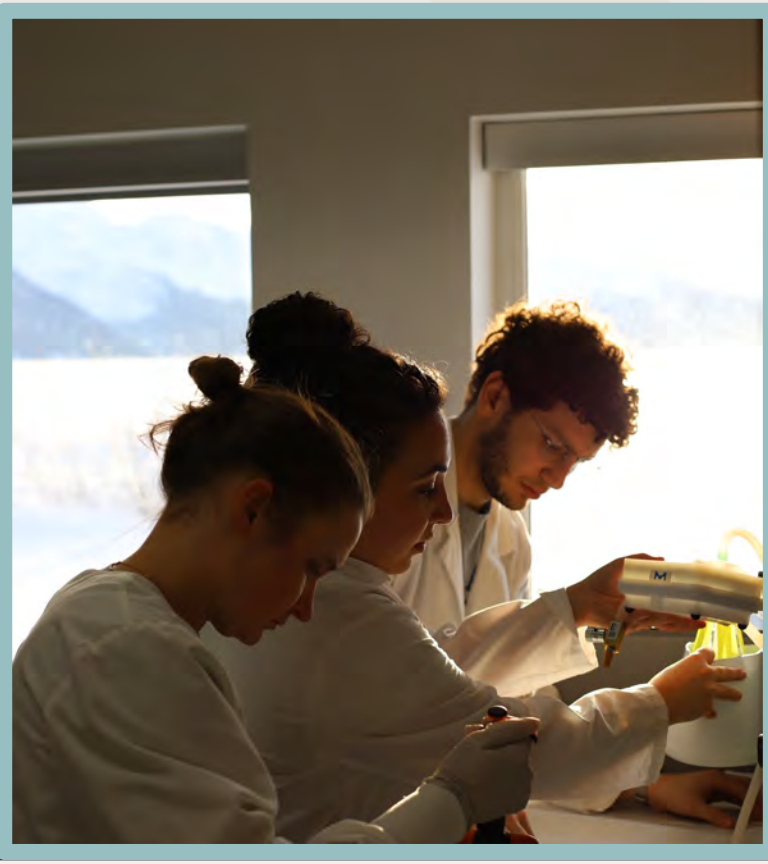
CRRC eDNA Project

Transferring Environmental DNA methods to the Alutiiq Pride Marine Institute (APMI) Laboratory to support the Chugach Regional Ocean Monitoring Program (CROM) with determining the spatial distribution of Pacific Herring (*Clupea pallasi*)

Funded by ANA

Process and analyze eDNA samples

Sample collection started in 2024



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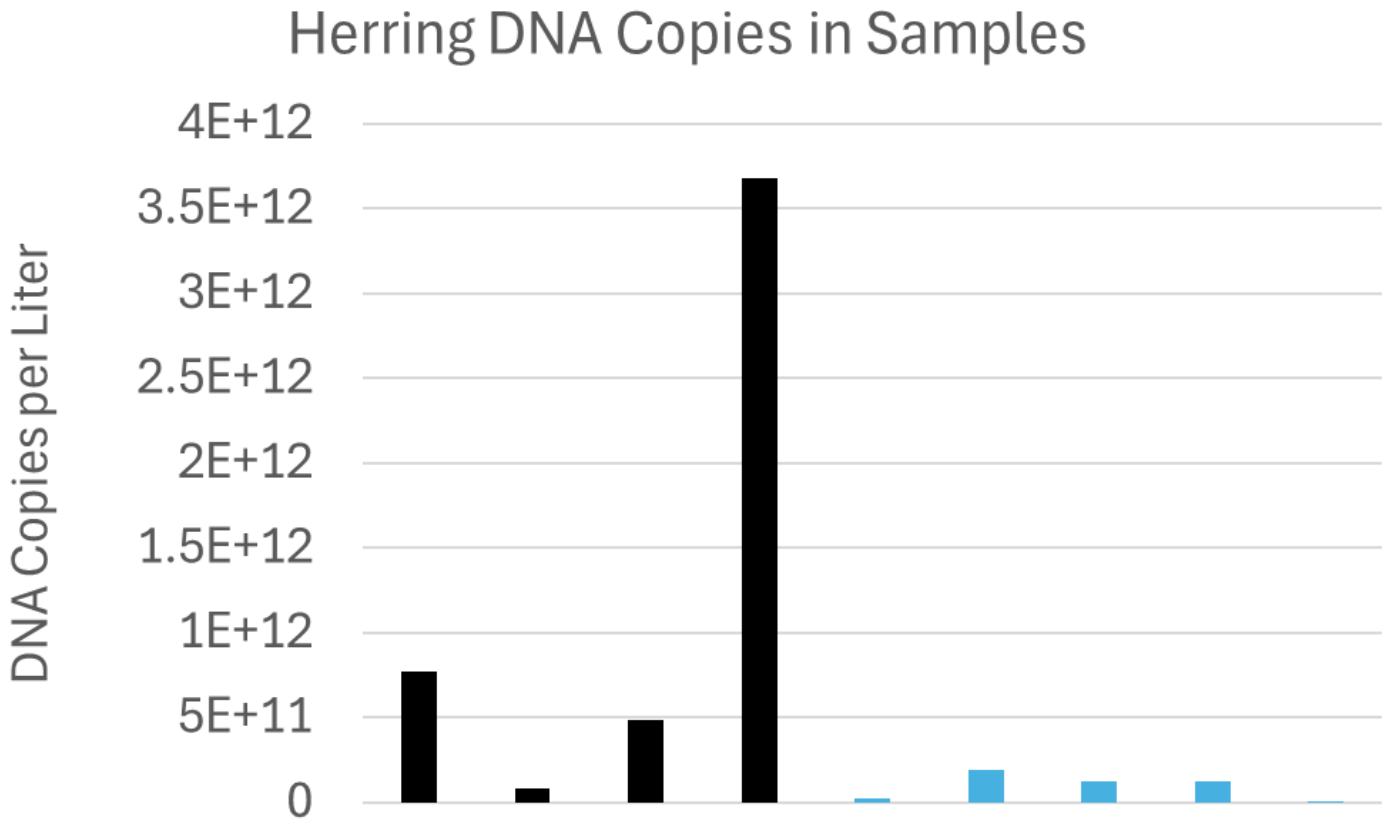
Alutiiq Pride

Environmental DNA

Results

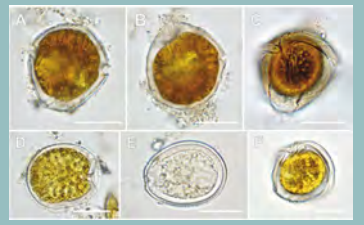


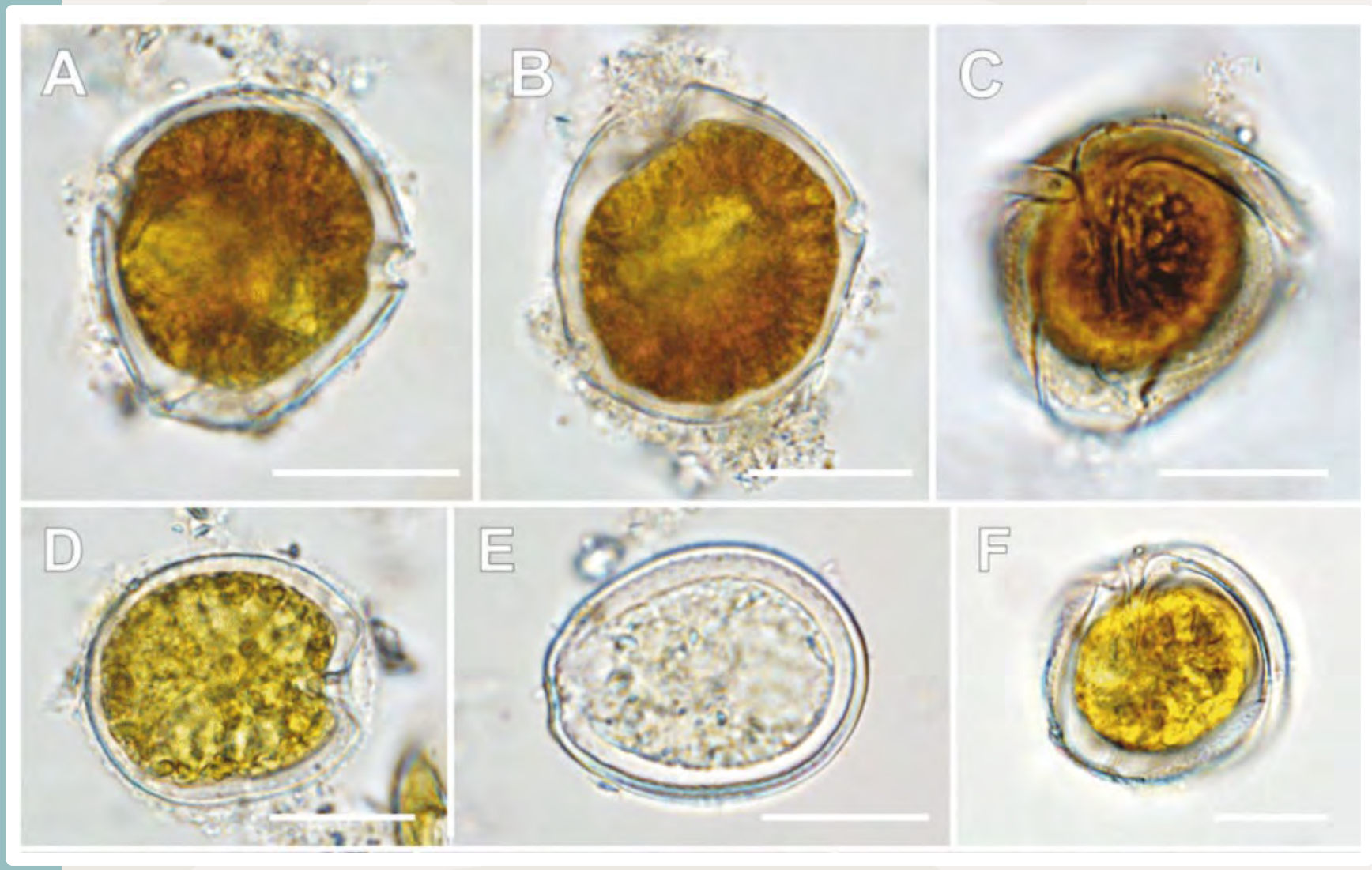
CHUGACH REGIONAL RESOURCES COMMISSION

Aluutiiq Pride

Environmental DNA

Harmful Algal Blooms





CHUGACH REGIONAL RESOURCES COMMISSION

Uniting Pride

Graduate Program

Investigating biodiversity using eDNA

Research Interest

- ❑Methods and applications of eDNA
- ❑Monitoring intertidal biodiversity

Goals:

1. Identify variation in community compositions and species richness at four distinct locations in Resurrection Bay.
2. Investigate spatial and temporal variation in biodiversity in Resurrection Bay.

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Methods

Collection, DNA extraction, target group

- ❑Four locations in Resurrection Bay
- ❑Total DNA extraction
- ❑Target 18S rRNA

Current and next steps

- ❑ samples complete
- ❑ Extractions completed
- ❑ Bioinformatic analysis and statistical workflow throughout the year

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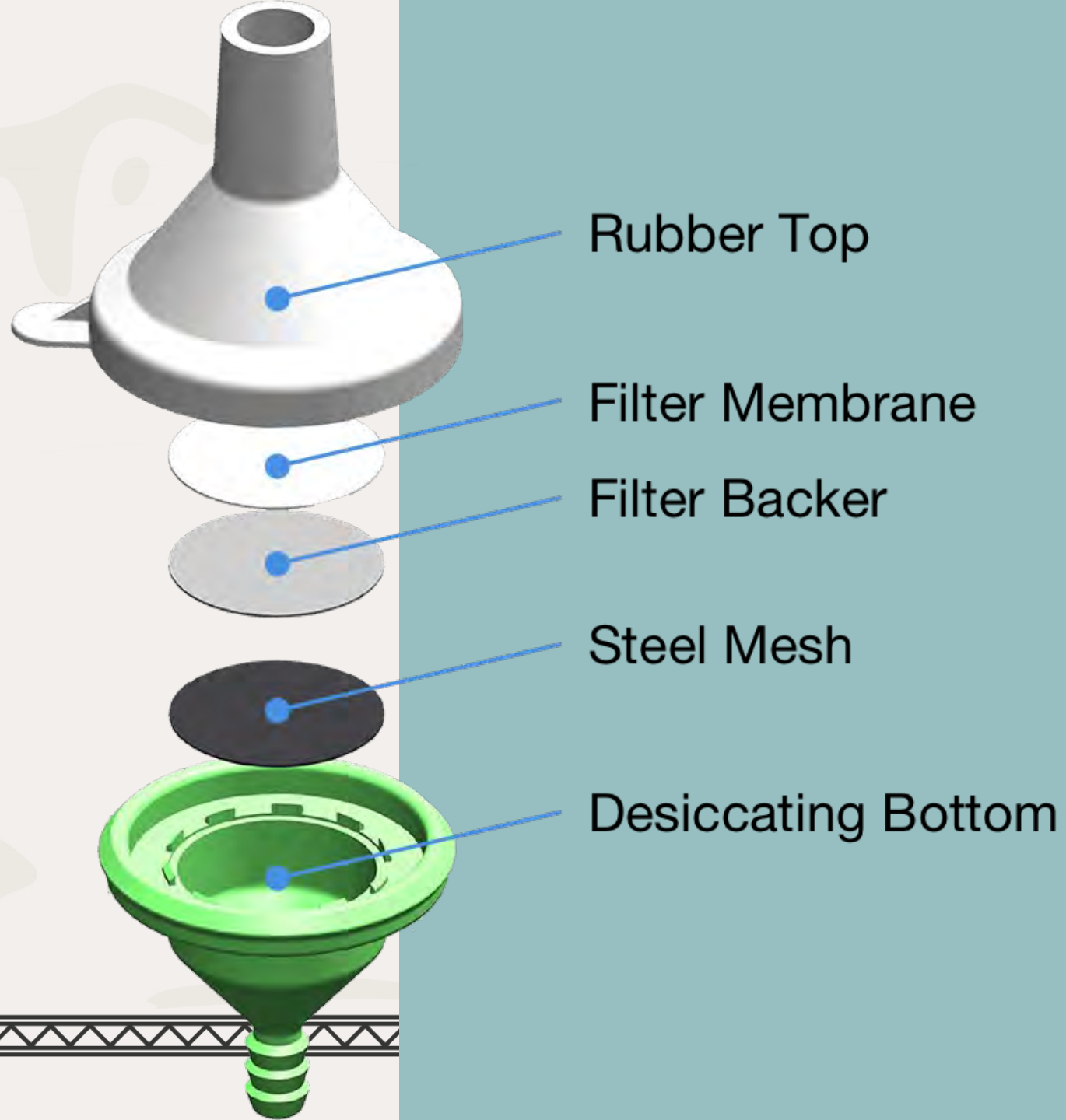
Side project

Validating self-preserving filters

- ❑Quadruplicate samples
- ❑2 stored at -80C
- ❑2 stored at room temp
- ❑Collected over 6 months
- ❑DNA extracted & quantification
- ❑18s amplification



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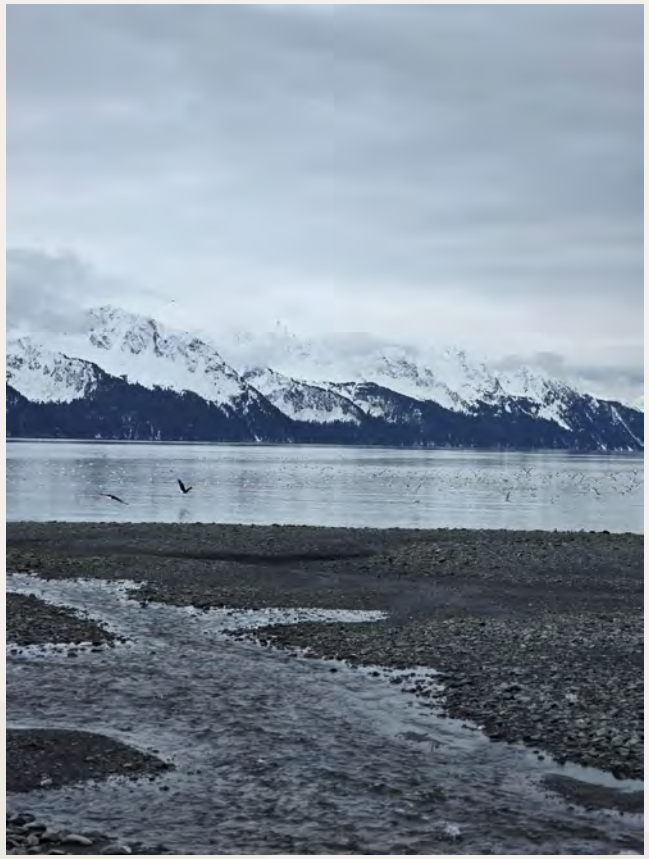
Expected Results



Quyana

Allison Carl
CRRC/APMI Biology Lab Manager
Seward, AK
907-884-7228
acarl@crrcalaska.org

General CRRC Info
admin@crrcalaska.org

Crrcalaska.org
www.alutiiqprideak.org

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Chugach Regional Ocean Monitoring (CROM) Program

Allison Carl
Biology Laboratory Manager
Chugach Regional Resources Commission
Alutiiq Pride Marine Institute

ALASKA

VALDEZ

TATITLEK
(TAATIILAAQ)

CORDOVA/EYAK
(IIYAAGDAAD)

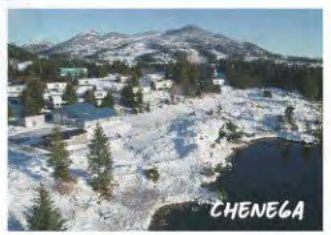
SEWARD
(QUTALLEQ)

CHENEGA
(CANIQAQ)

PORT GRAHAM
(PALUWIK)

NANWALEK

GULF OF ALASKA



Suumacirpet asirpiartuq Our way of living is the best

Funding provided by First Nations Institute in collaboration with Salix Group. Designed and illustrated by Sarah K. Glaser.

To the Alutiiq people, subsistence is life. There is no easy way to translate the word subsistence - suumacirpet - into the Alutiiq language. Westerners often think of subsistence as the process of obtaining and eating wild foods, an alternative to buying groceries. This definition, however, fails to capture the complexities of living off the land.

Collecting wild foods is not simply an economic act, but a central component of social and spiritual life. Through hunting, fishing, and gathering, Alutiiq people experience and express Native identity. They explore their deep and enduring connection to the land. They care for their families and communities. They celebrate and sustain life.

Subsistence is also a birthright, a way of living passed down from ancestors that has sustained generations. While not a literal translation of the word subsistence, suugucirpet asirpiartuq, "our way of living is best," expresses these many connections.

The Gulf of Alaska, including Prince William Sound and Lower Cook Inlet is one of the richest and biologically productive ecosystems on the planet. A local saying is: When the tide is out, the table is set.

ALL SEASONS

1. **Silver Salmon** *Silver Salmon*
2. **Red Salmon** *Red Salmon*
3. **King Salmon** *King Salmon*
4. **Pink Salmon** *Pink Salmon*
5. **Chum Salmon** *Chum Salmon*
6. **Dungeness** *Dungeness*
7. **Sea Lions** *Sea Lions*
8. **Bidarki** *Bidarki*

MULTIPLE SEASONS

9. **Octopus** (Spring, Winter) *Octopus*
10. **Bear** (Spring, Fall) *Bear*
11. **Blueberry** (Summer, Fall) *Blueberry*
12. **Seal** (Spring, Summer, Winter) *Seal*

SPRING

13. **Spruce Tips** *Spruce tips*
14. **Fiddleheads** *Fiddleheads*
15. **Fireweed Shoots** *Fireweed Shoots*
16. **Sitka Periwinkle** *Sitka Periwinkle*
17. **Herring** *Herring*
18. **Herring Eggs** *Herring Eggs*
19. **Seaweed** *Seaweed*

SUMMER

20. **Fireweed** *Fireweed*
21. **Porcupine** *Porcupine*
22. **Salmonberry** *Salmonberry*

SUMMER & WINTER

23. **Razor Clams** *Clams*
24. **Soft Shell Clams** *Clams*
25. **Cod** *Cod*
26. **Halibut** *Halibut*
27. **Grouse** *Grouse*

FALL

28. **Moose** *Moose*
29. **Lowbush Cranberry** *Lowbush Cranberry*
30. **Highbush Cranberry** *Highbush Cranberry*
31. **Mushrooms** *Mushrooms*

FALL & WINTER

34. **Deer** *Deer*
35. **Mountain Goat** *Mountain Goat*
36. **Black Scoter** *Black Scoter*
37. **Barrow's Goldeneye** *Barrow's Goldeneye*
38. **Surf Scoter** *Surf Scoter*

WINTER

32. **Harlequin Duck** *Harlequin*
33. **Limpits** *Limpits*

First Nations Development Institute

Chugach Regional Resources Commission

The Day the Water Died

CHUGACH REGIONAL OCEAN MONITORING PROGRAM

The focus is to fill in gaps in understanding of nearshore ocean health in Chugach communities through examining ocean chemistry, harmful algae, and shellfish biotoxin levels. The program relies on citizen science from our partners in Tribal communities throughout the region. With regional Tribal capacity, CRRC can further support safe and sustainable harvest opportunities for both local communities and the shellfish industry in Southcentral Alaska.

Alutiiq Pride MARINE INSTITUTE

CHUGACH REGIONAL OCEAN MONITORING
COMMUNITY SAMPLING

One Community Member at Each of the Seven Villages Works with APMI as a Field Sampler. Samples are Collected on a Weekly Basis.

CHENEGA • CORDOVA • NANWALEK • PORT GRAHAM • SEWARD • TATITLEK • VALDEZ

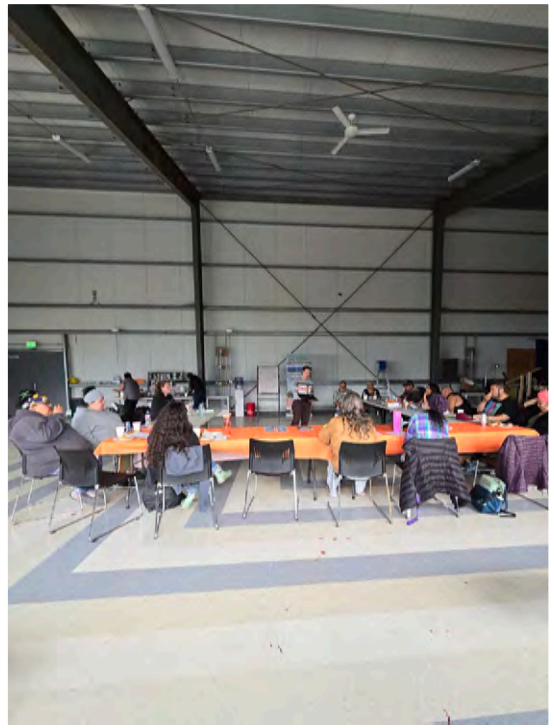
ANALYSES CONDUCTED BY APMI

The focus is to fill in gaps in understanding of nearshore ocean health in Chugach communities through examining ocean chemistry, harmful algae, and shellfish biotoxin levels. The program relies on citizen science from our partners in Tribal communities throughout the region. With regional Tribal capacity, CRRC can further support safe and sustainable harvest opportunities for both local communities and the shellfish industry in Southcentral Alaska.

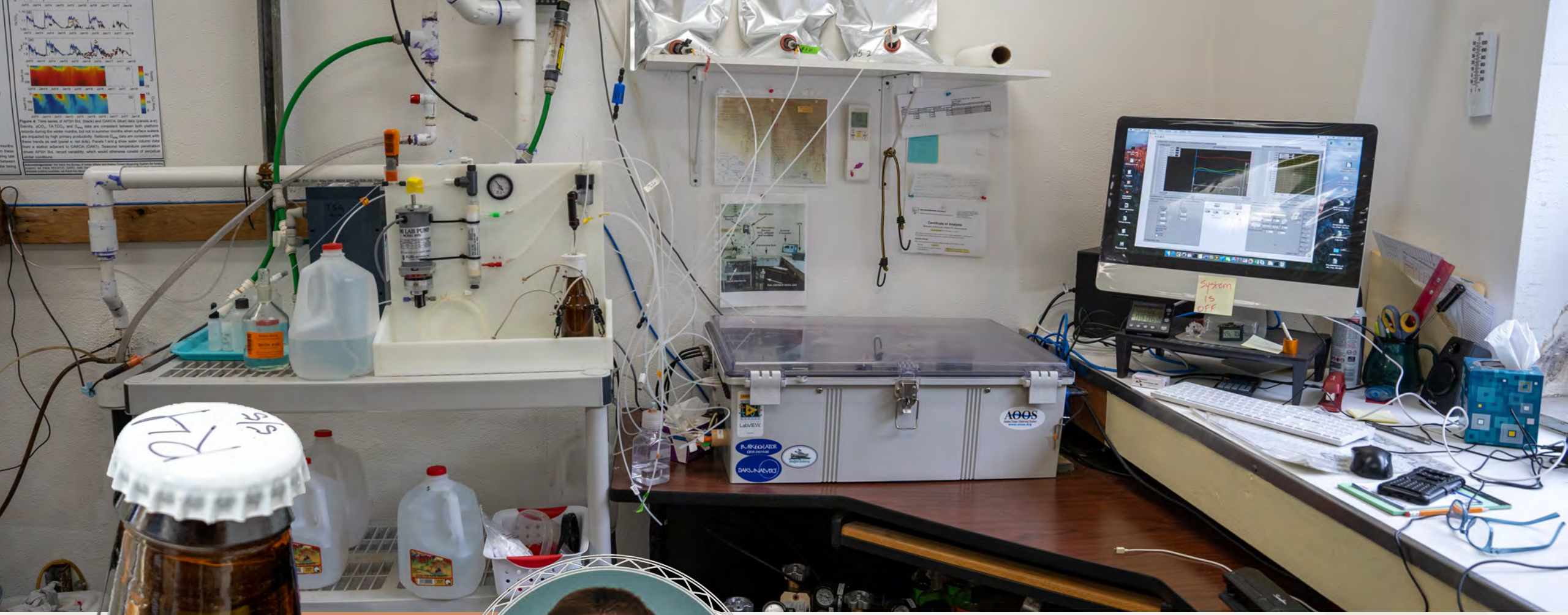
CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Strengthening capacity and collaborations



Riley Thomas
IGAP Environmental Coordinator



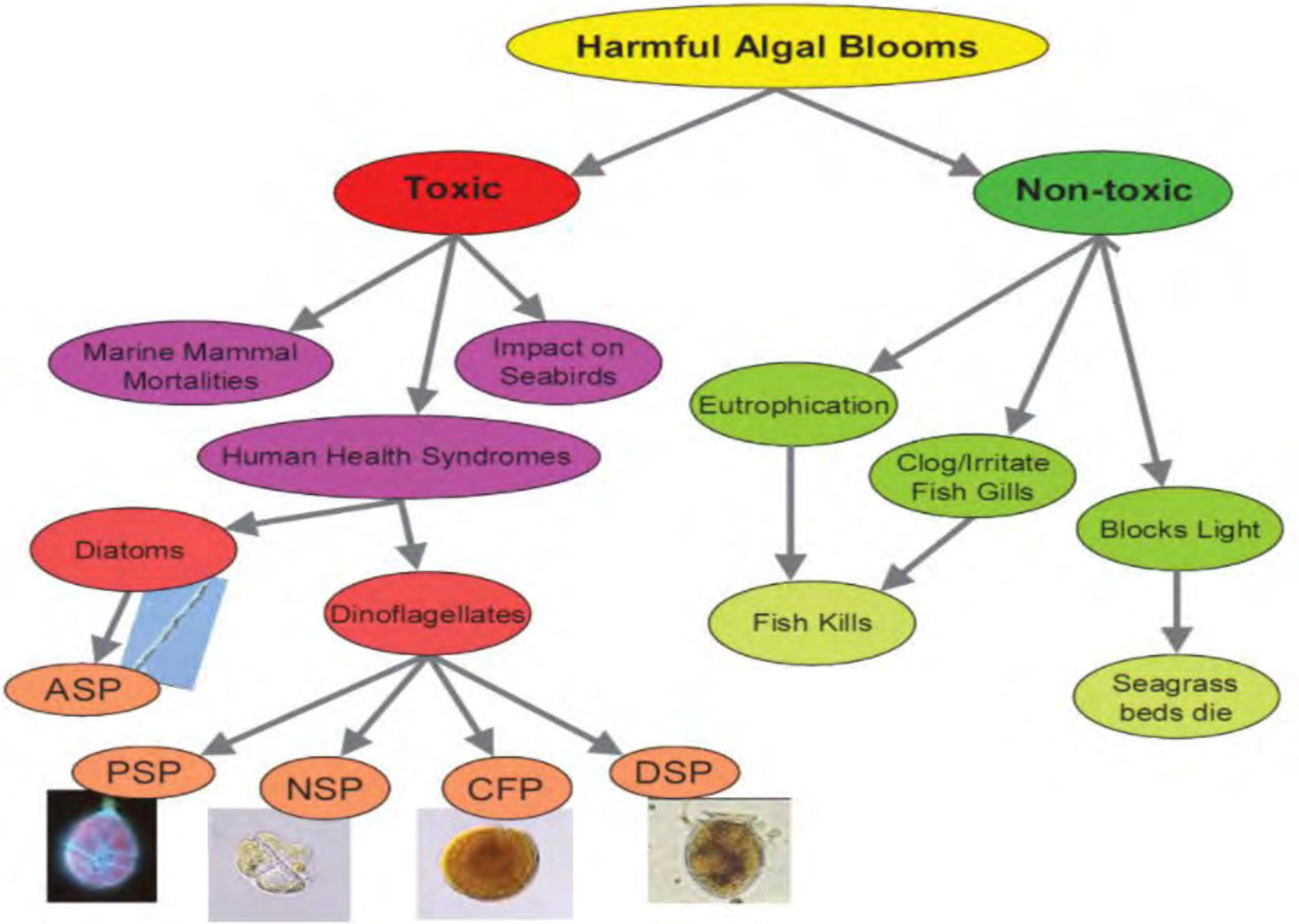
CROM Chemistry Lab

Sierra Lloyd – Chemistry Lab Manager

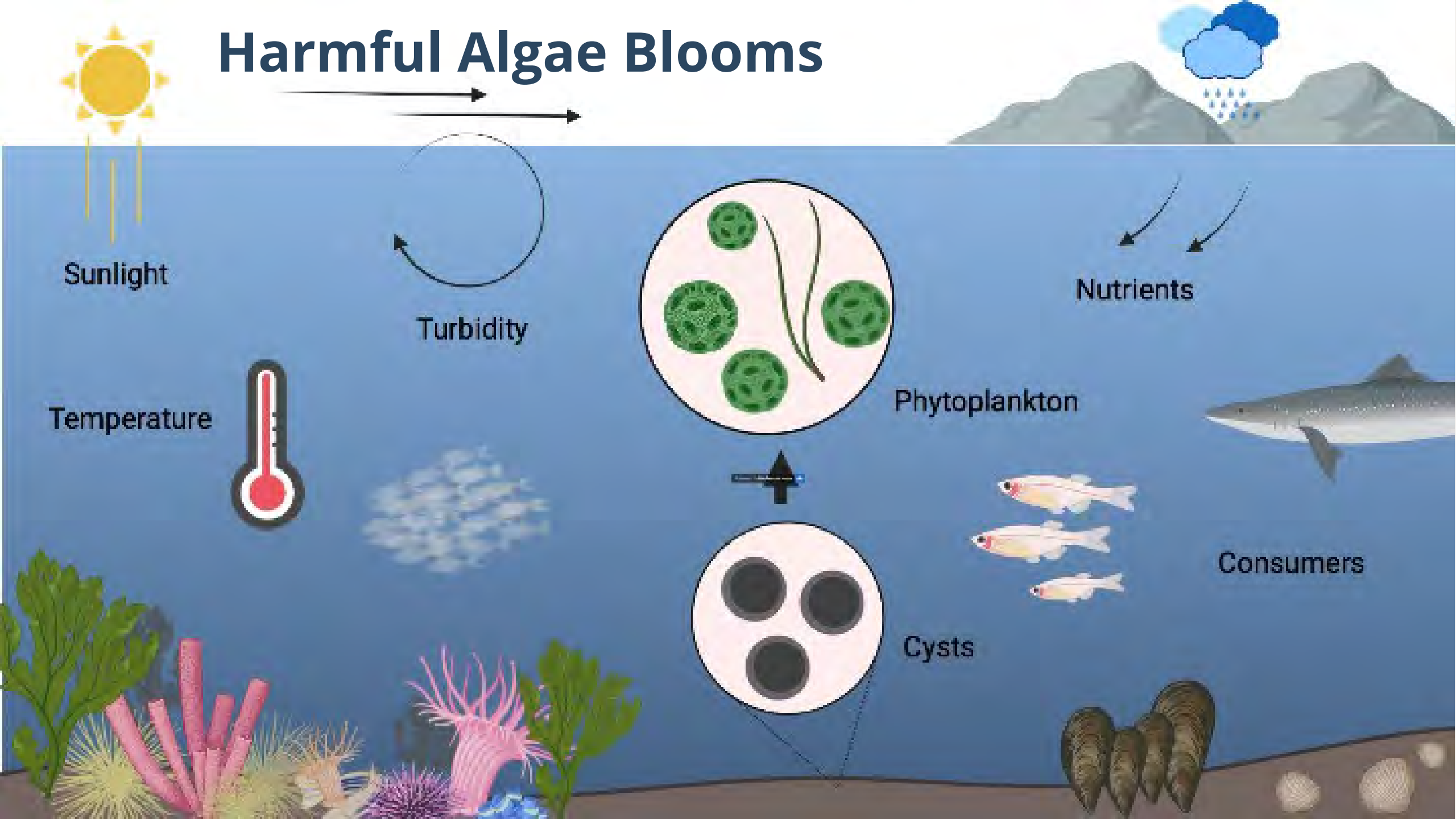
Alutiiq Pride

CHUGACH REGIONAL RESOURCES COMMISSION

HABs Monitoring:
phytoplankton identification, toxin analysis and eDNA


Harmful Algal Blooms
Toxic
Non-toxic
Marine Mammal Mortalities
Impact on Seabirds
Human Health Syndromes
Diatoms
Dinoflagellates
ASP
PSP
NSP
CFP
DSP
Eutrophication
Clog/Irritate Fish Gills
Blocks Light
Fish Kills
Seagrass beds die

Harmful Algae Blooms



CHUGACH REGIONAL RESOURCES COMMISSION

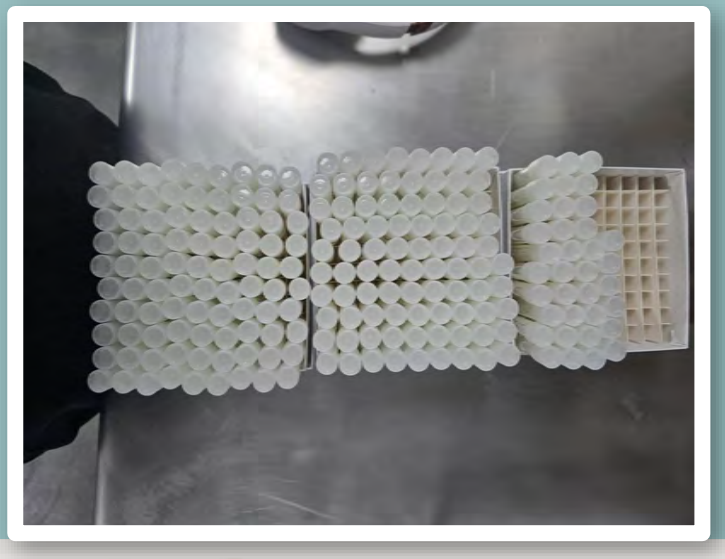
Allison Carl
Biology Lab Manager

Jana Wheat
Biology Lab Technician

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Bio lab update: ELISA & RBA



CHUGACH REGIONAL RESOURCES COMMISSION

Uniting Pride

Federal Regulatory Limits

CRRC does not regulate shellfish harvest – We only inform of the limits and what we find

Saxitoxin

Algae: *Alexandrium* Species

Paralytic Shellfish Toxin/Poison (PST/PSP)

Federal limit: 80ug/100g

Domoic Acid

Algae: *Psuedo-nitzchia* species

Amnesic Shellfish Poison (ASP)

Federal Limit: 20 ppm

The allowable amount determined by the federal government

All commercial shellfish are required to be tested

Public Service Announcement

Date

Paralytic Shellfish Toxin Advisory

The following advisories are for Chugach Regional Resources Commission (CRRC) sites with shellfish that have Paralytic Shellfish Toxins (PST) levels above the FDA regulatory limit of 80 µg/100 g. In high concentrations, 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.

Community	Beach	Species Affected	Date Collected
-	-	-	-

Recent PSPresults

Community	Location	Species	PST Results (µg/100g)	Date Collected
-	-	-	-	-

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.

<LOD = below limit of detection for the receptor binding assay. Red coloring indicates PST levels are above the FDA limit of 80 µg/100 g.

PSP Information

PSP is caused by an increase in concentration of a PST producing marine algae triggered by warm temperatures and currents. 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

CRRC is a Tribal organization within the meaning of the Indian Self Determination and Education Assistance Act of 1991, and an Alaska Native Organization (ANO) as defined in federal policies. We are authorized by our seven member Tribes in Alaska's Chugach region to provide essential governmental services to Tribal citizens. We provide support for natural resource management, subsistence activities, climate change adaptation and environmental concerns, food security, and access to healthy traditional foods and clean water.

How to Get Shellfish Tested

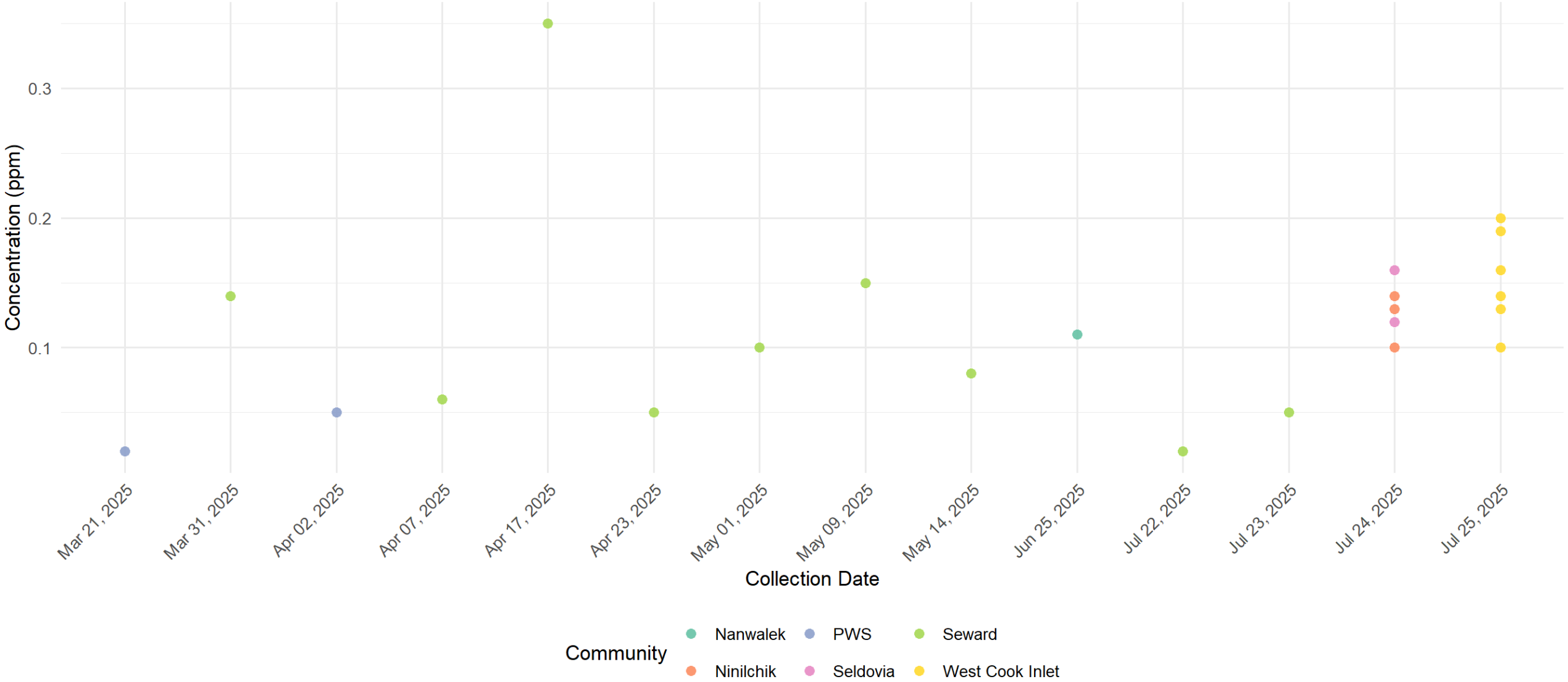
If you are interested in getting harvested shellfish tested or have any questions about paralytic shellfish poisoning, please contact Allison Carl at acarl@crrcalaska.org or Annette Jarosz at annette@alutiiqprideak.org.

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.

CHUGACH REGIONAL RESOURCES COMMISSION

Uniting Pride

Domoic Acid (ASP)



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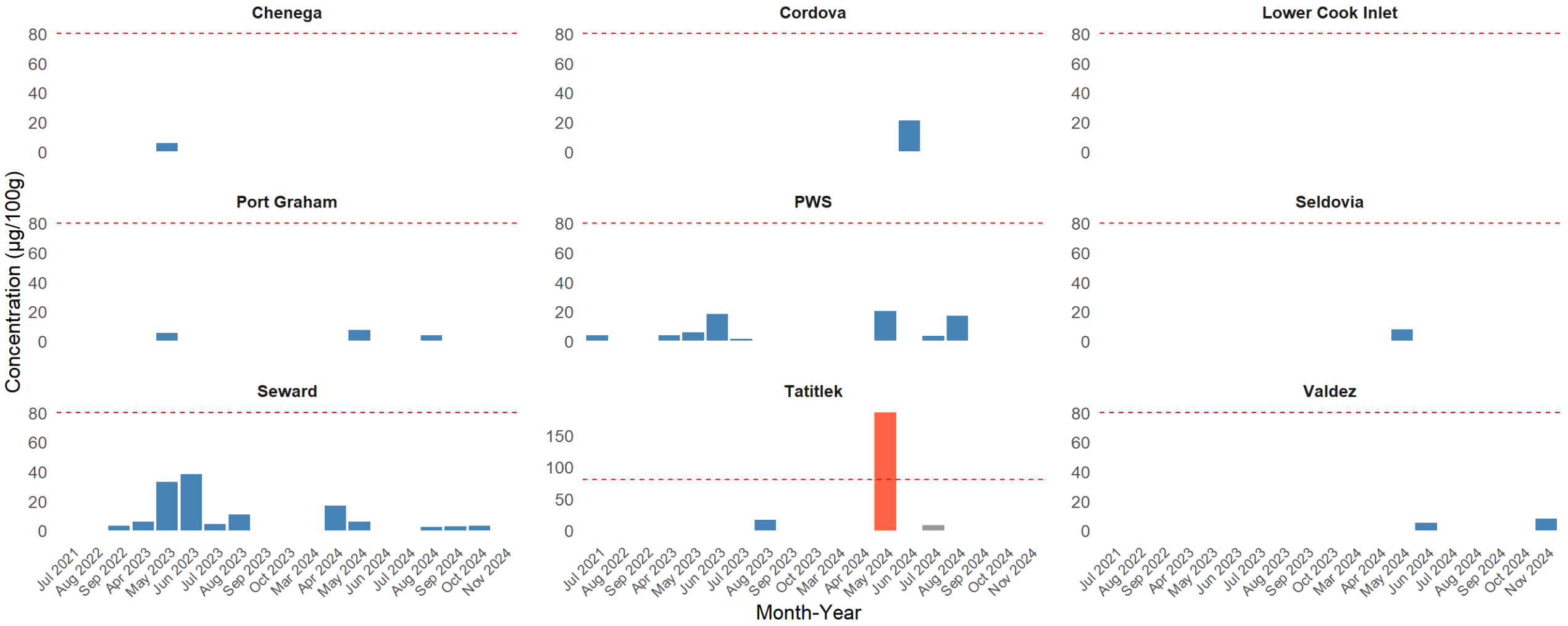
Saxitoxin (PSP)



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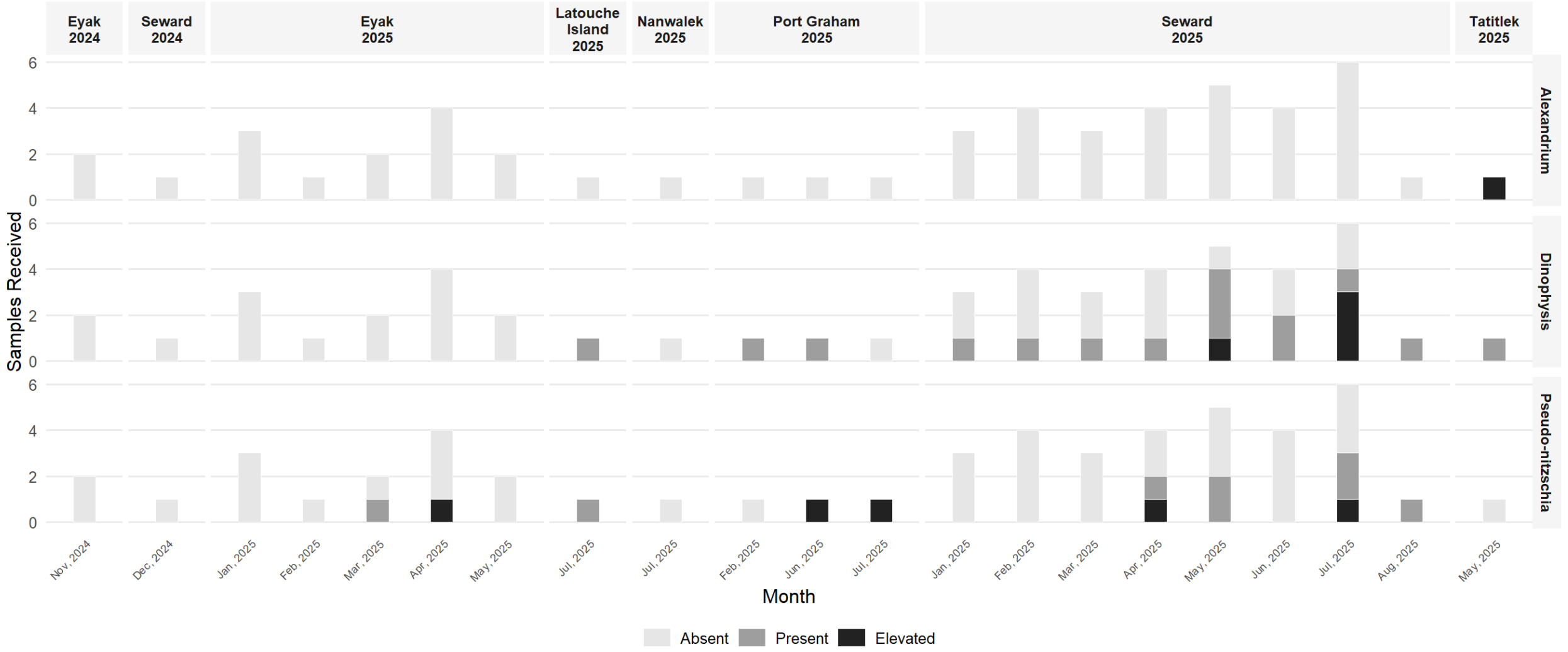
Alutiiq Pride

Microscopy



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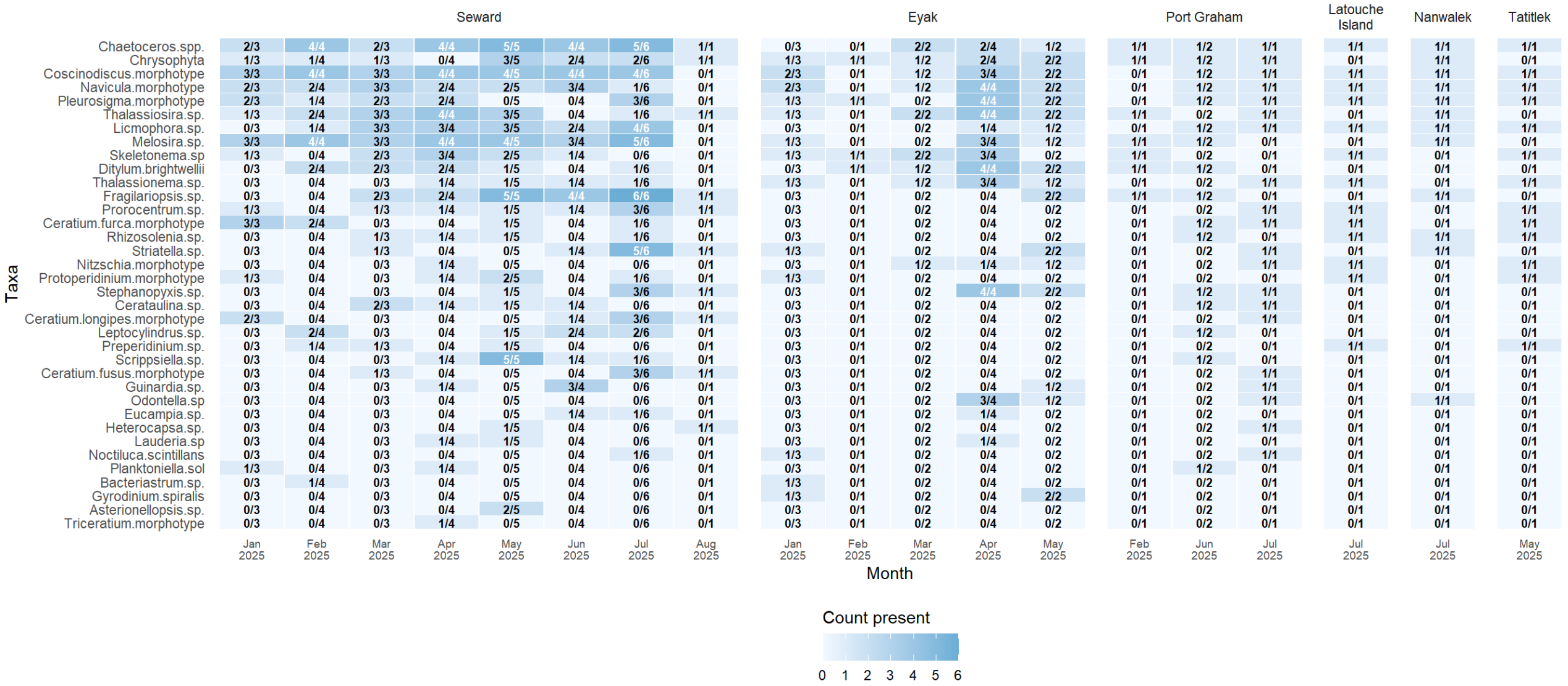
Uniting Pride

Algae presence absence



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Alutiiq Pride

Bio Lab update: eDNA

Dustin Carl

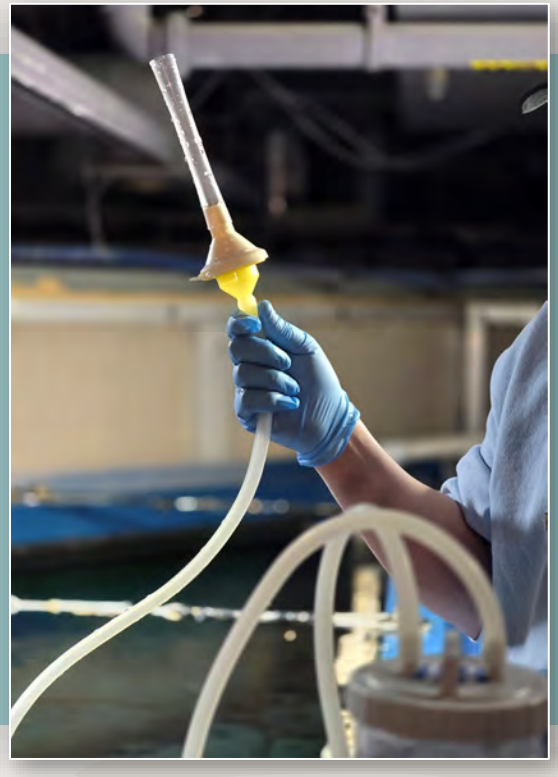
Tribal Fish & Wildlife Director

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Environmental DNA

Next steps in HABs monitoring



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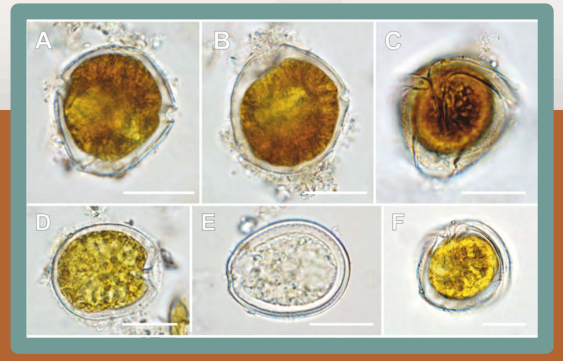
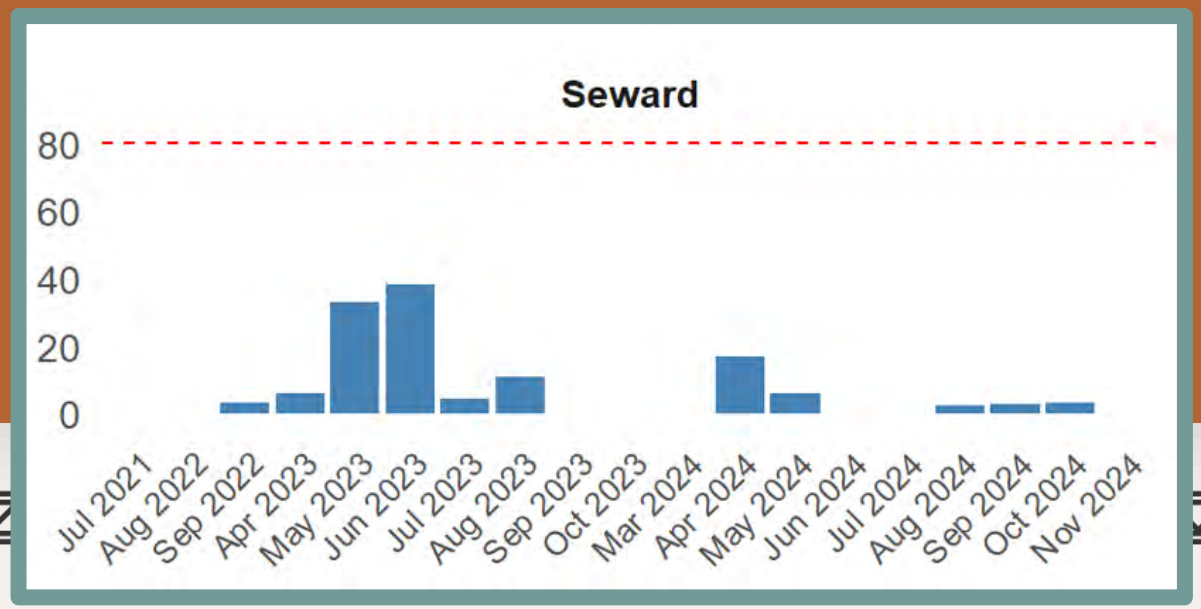
Next steps for CROM Biology Laboratory

eDNA





Monitor for Harmful Algal Blooms (HABs) - neurotoxins they can produce

Microscopes to look for HABs

Run tests on blue mussels for Toxins (can test subsistence species!)

Next Steps

Environmental DNA

- **Small pieces of DNA found in the environment**
- **Allows us to accurately identify different animals and algae**

CHUGACH REGIONAL RESOURCES COMMISSION

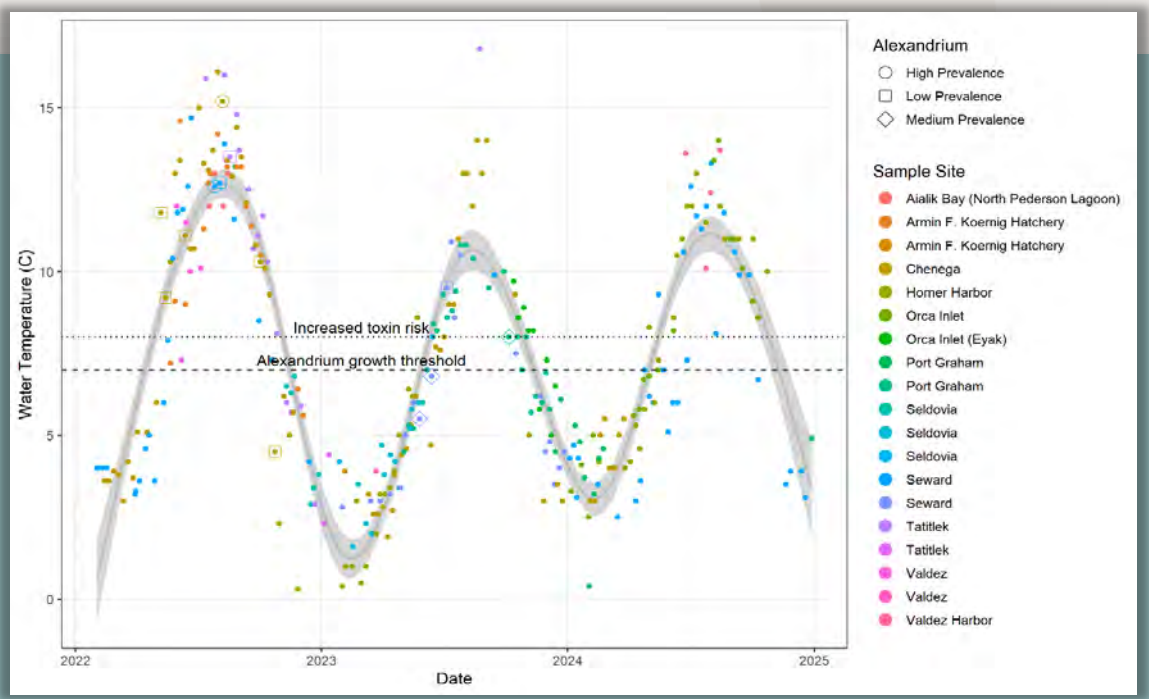
Uniting Pride

Next steps in data management and analysis

Preliminary data → Reports → Comprehensive analysis

ID	Collection Date	Sample Type	Community	Sample Lo	Collector	RBA completed
27	7/3/2021	Blue mussel	PWS	Pigot Bay (	PWSSF	<LOD
28	7/18/2021	Blue mussel	PWS	Fox Farm E	PWSSF	12
29	7/27/2021	Blue mussel	PWS	Pigot Bay (	PWSSF	<LOD
30	8/5/2022	Blue mussel	PWS	Pigot Bay	PWSSF	<LOD
31	8/26/2022	Blue mussel	PWS	Derickson	PWSSF	<LOD
.19	9/30/2022	Blue mussel	Seward	4th of July	CRRC	3
1	4/11/2023	Blue mussel	PWS	Pigot Bay	PWSSF	4
2	4/23/2023	Blue mussel	Seward	4th of July	CRRC	6
3	4/26/2023	Blue mussel	Port Graham		CRRC	<LOD
4	5/3/2023	Blue mussel	Port Graham		CRRC	<LOD
5	5/5/2023	Blue mussel	Seward	4th of July	CRRC	<LOD
6	5/7/2023	Blue mussel	Chenega	Airport Be	CRRC	22
7	5/8/2023	Littleneck clam	Chenega	Airport Be	CRRC	<LOD
8	5/10/2023	Blue mussel	Port Graham		CRRC	<LOD
33	5/14/2023	Blue mussel	PWS	Pigot Bay	PWSSF	6
9	5/17/2023	Blue mussel	Port Graham		CRRC	4
10	5/24/2023	Blue mussel	Port Graham		CRRC	18
11	5/26/2023	Blue mussel	Seward	4th of July	CRRC	66
34	6/11/2023	Blue mussel	PWS	Derickson	PWSSF	25
11	6/16/2023	Blue mussel	Seward	4th of July	CRRC	22
12	6/21/2023	Blue mussel	Seward	4th of July	CRRC	54
35	6/27/2023	Blue mussel	PWS	Eleanor Isl	PWSSF	12
36	7/6/2023	Blue mussel	PWS	Derickson	PWSSF	<LOD
37	7/17/2023	Blue mussel	PWS	Fox Farm	PWSSF	4
13	7/17/2023	Blue mussel	Seward	4th of July	CRRC	5
14	7/20/2023	Blue mussel	Seward	4th of July	CRRC	4
15	7/22/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
38	7/25/2023	Blue mussel	PWS	60.932940	PWSSF	<LOD
16	7/26/2023	Blue mussel	Port Graham		CRRC	<LOD
17	7/26/2023	Blue mussel	Seward	4th of July	CRRC	5
20	7/26/2023	Blue mussel	Seward		CRRC	4
59	7/27/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
18	8/3/2023	Blue mussel	Seward	4th of July	CRRC	11
19	8/3/2023	Blue mussel	Port Graham		CRRC	<LOD
60	8/11/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
20	8/14/2023	Blue mussel	Port Graham		CRRC	<LOD
61	8/16/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
62	8/22/2023	Blue mussel	Seldovia	Seldovia H	SVT	<LOD
21	8/29/2023	Cockle	Tatitlek			15

Sample Type	Community	Sample Date	RBA completed (ug/100g)
Blue mussel	Seward	2022-07-18	<LOD
Softshell clam	Seward	2022-07-18	<LOD
Blue mussel	Seward	2022-07-27	<LOD
Cockle	Seward	2022-07-27	<LOD
Blue mussel	Seward	2022-08-09	<LOD
Blue mussel	Seward	2022-08-11	<LOD
Softshell clam	Seward	2022-08-11	<LOD
Cockle	Seward	2022-08-11	<LOD
Blue mussel	Seward	2022-08-24	<LOD
Blue mussel	Seward	2022-09-27	<LOD
Blue mussel	Seward	2022-09-30	3
Blue mussel	Seward	2023-07-26	4
Softshell clam	Seward	2024-03-06	<LOD
Softshell clam	Seward	2024-04-10	<LOD
Blue mussel	Seward	2024-04-30	34
Mya truncata	Port Graham	2024-05-06	26
Macoma	Port Graham	2024-05-06	<LOD
Butter clam	Port Graham	2024-05-06	<LOD
Blue mussel	Port Graham	2024-05-07	4
Macoma	Seldovia	2024-05-09	23
Cockle	Seldovia	2024-05-09	<LOD
Butter clam	Seldovia	2024-05-09	<LOD
Softshell clam	Seward	2024-05-09	30
Butter clam	Tatitlek	2024-05-13	390
Butter clam	Tatitlek	2024-05-13	298
Cockle	Tatitlek	2024-05-13	48
Littleneck clam	Tatitlek	2024-05-13	8
Littleneck clam	PWS	2024-05-14	4
Butter clam	PWS	2024-05-14	45



Alutiiq Pride

CHUGACH REGIONAL RESOURCES COMMISSION

Baseline data and regular monitoring to inform food safety and security in the Chugach region

Quyana

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CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Community-Based Ocean Chemistry Monitoring in the Chugach Region

Sierra Lloyd[1], Allison Carl[1], Jana Wheat[1], Riley Thomas[1], Burke Hales[2], Dale Hubbard[2], Willow Hetrick-Price[1], Jeff Hetrick[1]

[1]Chugach Regional Resources Commission, [2]Oregon State University

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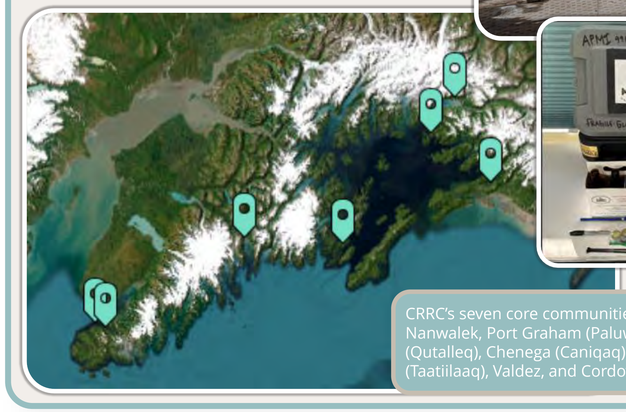
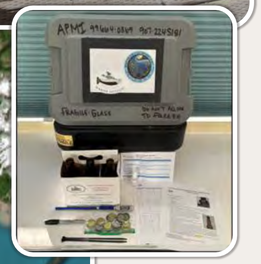
Community Sampling

- Sampling is completed by community members who are trained by CRRC staff and compensated for their time and effort.
- Samples, along with environmental data, are taken approximately weekly, with monthly triplicates.
- Today, the Chemistry Laboratory serves 21 sampling communities statewide.





CRRC's seven core communities (west to east): Nanwalek, Port Graham (Paluwik), Seward (Qutalleq), Chenega (Caniqaq), Tatitlek (Taatiilaaq), Valdez, and Cordova (IiyaaGdaad)

Next Steps

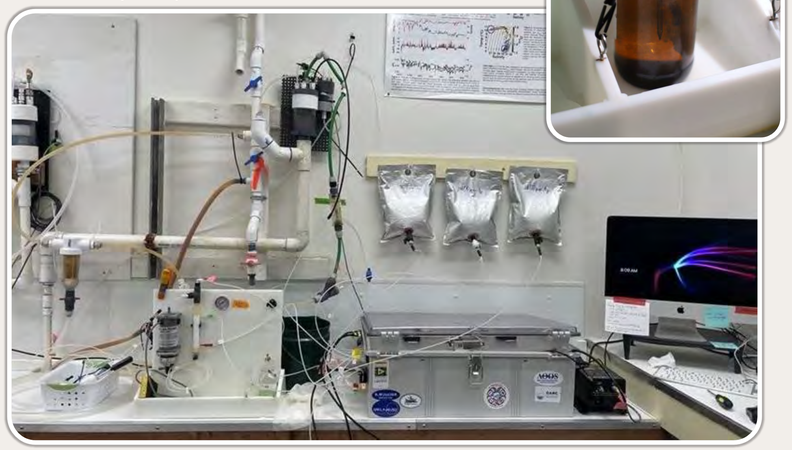
- Growing our sampling program
- Partnerships for developing climate models and resources
- Nutrients analysis (SEAL Autoanalyzer)
- Species response studies

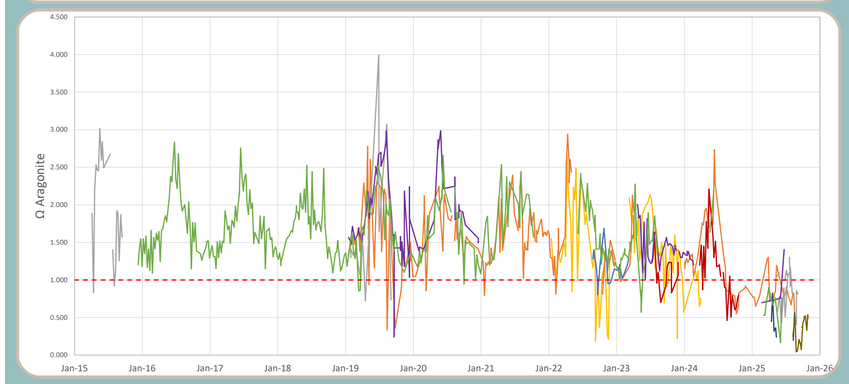
Ocean Acidification Trends in the Chugach Region

- Expected seasonal variation is apparent in longer-running datasets.
- Data from the past year shows that CO_2 is elevated from historical data. The chemistry lab is looking into these readings to ensure accuracy and determine potential causes.
- There are many knowledge gaps regarding subsistence species responses to ocean acidification. Filling those gaps is essential to ensuring that those reliant on those resources have the information they need to move forward in a changing world.

The Burke-O-Lator

The Burke-O-Lator was developed by the Hales Laboratory at Oregon State University. The chemistry laboratory hosts two of these machines; one used for continuous, 24/7 monitoring of Resurrection Bay, and one used to process discrete community samples.





The Chemistry Laboratory gratefully acknowledges all of the community samplers who have given their time and energy to the program.
We also would like to acknowledge Dr. Natalie Monacci at the Ocean Acidification Research Center for her assistance with data dissemination.

Effective Early Detection Monitoring of Harmful Algae Blooms and Ocean Acidification with Community Monitoring

Riley Thomas, Jana Wheat, Sierra Lloyd, Willow Hetrick-Price, Allison Carl

1. Chugach Regional Resources Commission

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What is Ocean Acidification (OA)?

- CO_2 dissolves in seawater and forms carbonic acid.
- Reduces the availability of carbonate ions – essential building blocks for marine organisms.

What are Harmful Algae Blooms (HABs)?

- HABs occur when algae grows out of control and produces toxins.
- These toxins can cause Amnesic Shellfish Poisoning (ASP) and Paralytic Shellfish Poisoning (PSP) to humans and animals.

Outcomes

- Community Reports
- Solicit communication feedback and traditional knowledge feedback
- Building baseline data

Data Collection & Analyzation

OA Sampling

Water is collected into a glass bottle, capped, and sent to the APMI Chemistry Lab.

HABs Sampling

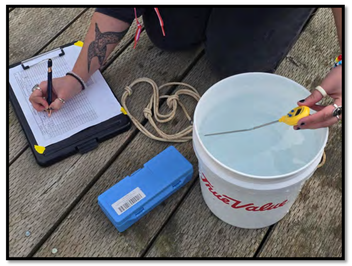
Water is collected via plankton tow and sent to the APMI Biology Lab.

Mussel Sampling

Mussels are collected from a mussel net and sent to the APMI Biology Lab.

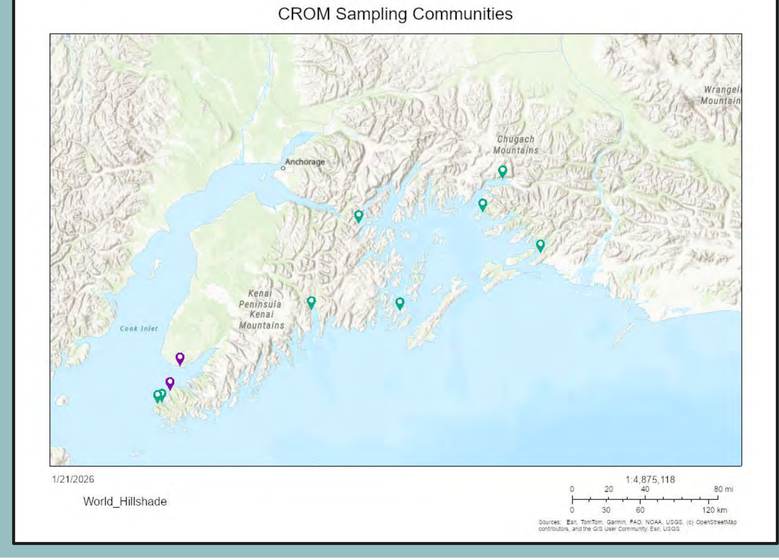
Environmental data is also taken such as salinity and temperature.

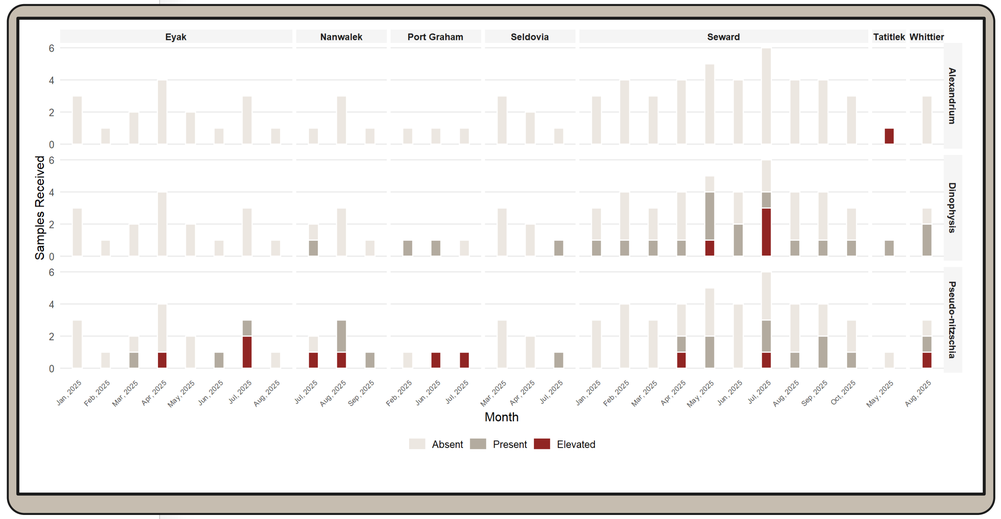
Community Trips and Workshops occur yearly to conduct sampling refreshers and training



Why Do We Monitor?

- Monitoring acts as an early detection system for communities.
- HABs are expected to increase in frequency and intensity with warming ocean temperatures.
- OA is expected to increase due to increasing temperatures and CO_2 emissions.
- HABs and OA both negatively impact the life cycles of important subsistence species for Chugach Region Tribes.
    - Making it harder to harvest subsistence species compared to years past.





Graph depicts the absence/presence of different harmful algae bloom species in community samples received throughout the year. Elevated levels are highlighted in red.

Acknowledgments: this program has been made possible from funding by the Exxon-Valdez Oil Spill Trustee Council, the Environmental Protection Agency along with support from University of Alaska Fairbanks, Ocean & Earth Environmental, and NOAA. Thank you to our community samplers and participating Tribes for collecting vital monitoring data

Harmful Algal Monitoring in the Chugach Region to Support Safe Subsistence Harvesting

Jana Wheat[1], Annette Jarosz[1], Riley Thomas[1], Willow Hetrick-Price[1], Allison Carl[1]

1. Chugach Regional Resources Commission, Alutiiq Pride Marine Institute

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Who are we?

Alutiiq Pride Marine Institute (APMI) is a marine research facility that established and operates the Chugach Regional Ocean Monitoring (CROM) program, which supports monitoring efforts for harmful algal blooms and biotoxins in the Chugach Region.

Chugach Regional Resources Commission Villages

Why is harmful algal monitoring important?

Harmful algal blooms (HABs) occur when conditions are favorable for algal growth. The CROM programs monitors for two species of harmful algae, *Alexandrium* spp. and *Pseudo-nitzschia* spp.

Phytoplankton Species	Toxin Produced	Poisoning Caused	Symptoms in Humans
Alexandrium spp. 	Saxitoxin	Paralytic Shellfish Poisoning, PSP	**Mild**: Tingling sensation in lips and tongue **Severe**: Paralysis in chest and abdominal muscles, can lead to suffocation
Pseudo-nitzschia spp. 	Domoic Acid	Amnesic Shellfish Poisoning, ASP	**Mild**: nausea, vomiting, diarrhea **Severe**: headache, dizziness, short-term memory loss, seizures, coma

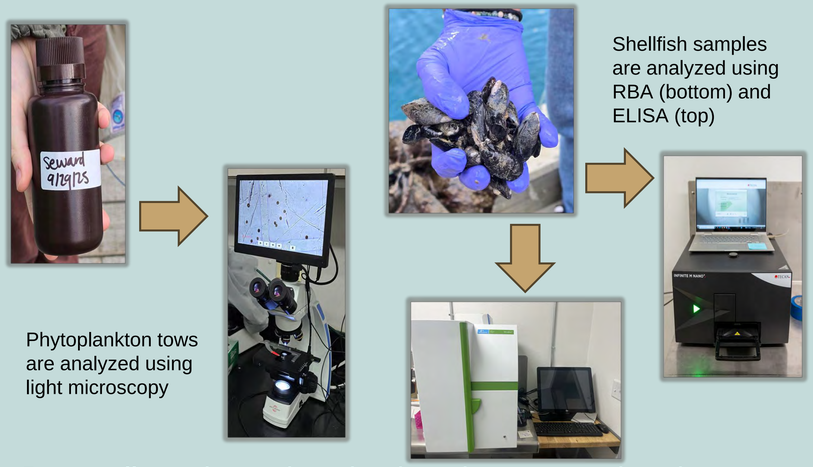
What samples are used for monitoring?

The CROM program employs community samplers to collect weekly phytoplankton tow, blue mussel sample, and environmental data.

Components of sampling kit. Including phytoplankton tow, ziploc bag of blue mussel

How are these samples analyzed?

Samples are analyzed at APMI, using light microscopy, ELISA, and RBA. APMI is also validating qPCR methods for HABs identification.

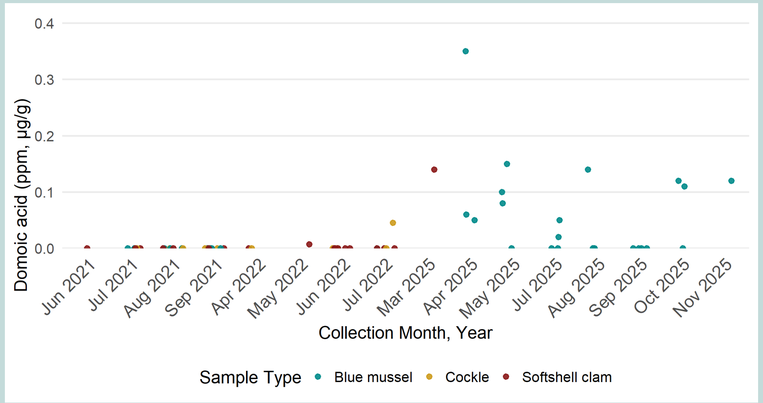


Shellfish samples are analyzed using RBA (bottom) and ELISA (top)

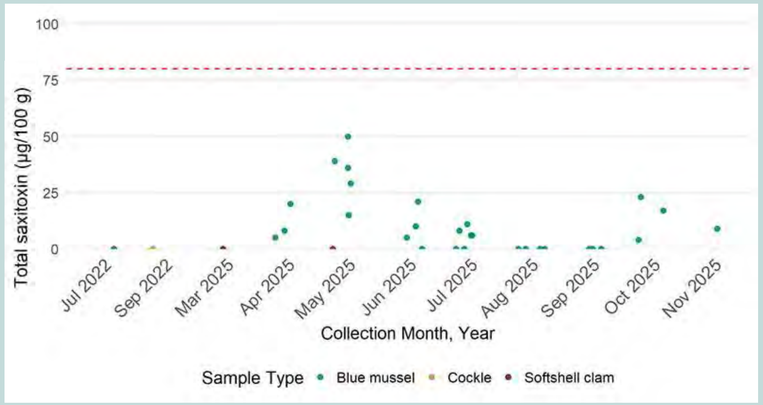
Phytoplankton tows are analyzed using light microscopy

Data collected are given back to the community where the samples were collected, so members can make informed shellfish harvesting decisions. Data is also used to build baseline marine heath data in the region.

Toxin levels in Seward shellfish samples



Graph showing domoic acid concentrations in shellfish collected from July 2021 to November 2025. The FDA regulatory limit is 20 (ug/g).



Graph showing saxitoxin concentrations in shellfish collected from July 2022 to November 2025. The FDA regulatory limit of 80 (ug/100g), depicted with the red dashed line.

Funders: These efforts are funded through the Exxon Valdez Oil Spill Trustee Council and the Environmental Protection Agency

Partnerships: These projects have been made possible through partnerships with NOAA's Nation Centers for Coastal Ocean Sciences

Using Environmental DNA to investigate intertidal biodiversity in the Chugach region of Alaska

Allison Carl[1,2], Maile Branson[2], Douglas Causey[2], Brandon Briggs[2]

1. Chugach Regional Resources Commission

2. University of Alaska Anchorage

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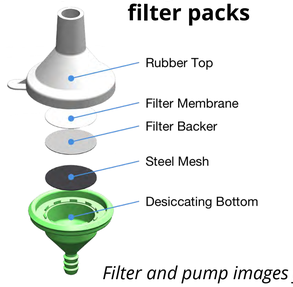
Significance & Background

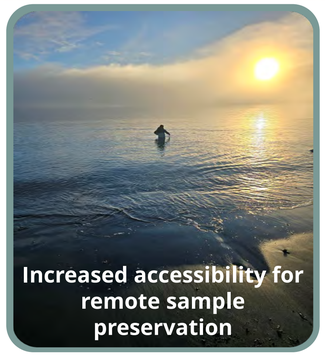
Intertidal ecosystems provide abundant resources for both terrestrial and marine habitats, as well as support local and global subsistence and commercial economies. Although coastal ecosystems can serve as indicators of broader environmental health, logistical constraints can make them particularly challenging to monitor, especially in remote areas. As part of a larger intertidal eukaryotic diversity study in Resurrection Bay, this project investigated efficacy of the Smith-Root self-preserving filters.

Smith-Root self-preserving (desiccating) filter packs



Battery-powered filter pump

Filter and pump images from Smith-Root, Inc.



Objective

Identify variation in DNA yield and community retention between Smith-Root self-preserving filters and freezer controls over a six-month collection period.

Paired Time Series Design: Field & Storage Methods

Each month, samples were filtered on site at Lowell Point in Resurrection Bay. Samples were collected in quadruplicates plus a field blank using the Smith-Root pump and self-preserving filters.

Duplicate preservation treatments

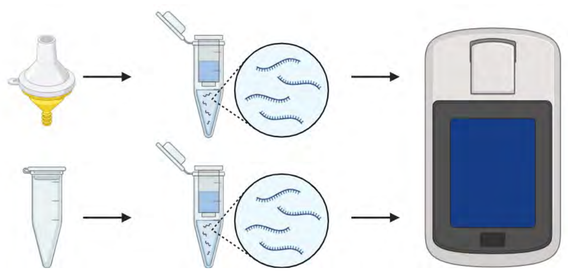
6-month sample collection and storage period

Ambient
filters were stored in the lab to self-preserve for up to 6-months in their original bags.

Freezer
filters were transferred to -80°C freezer on collection day

Laboratory Methods & Analysis

DNA was extracted using the Qiagen DNeasy Blood and Tissue Kit



DNA concentrations were measured and compared between treatments

Wilcoxon Sign-Ranked Test (α=0.05)

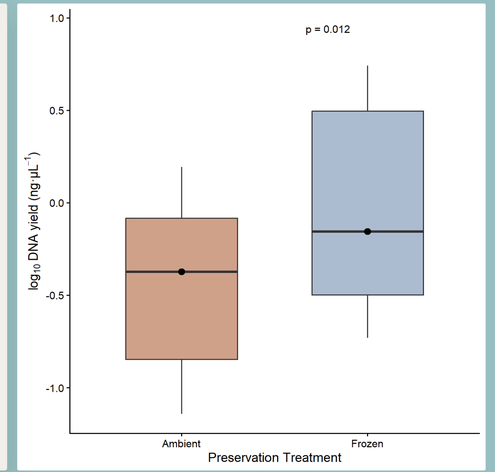
Simple linear regression (ΔDNA Yield = Ambient-Freezer)

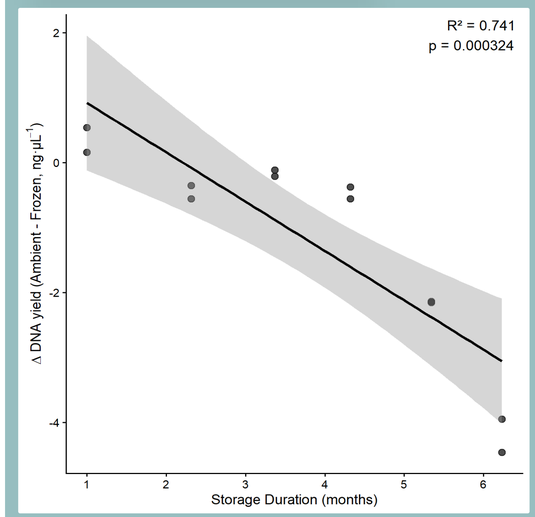
All extracts were sent to the AIMS Lab at UAA for 18S rRNA sequencing on the Illumina MiSeq platform

Results

Ambient vs Frozen Preservation

Significant variation was found between treatment and control groups (p = 0.012). Median DNA yields and majority of paired samples had lower yields in treatment groups.





DNA yield over storage time

Significant variation in DNA yield over time was observed between treatments. Points represent differences in DNA yield between paired samples collected monthly.

Next Steps: 18S rRNA sequencing and community retention analysis between treatment groups

Alpha Diversity

- ❑ Shannon index
- ❑ Wilcoxon Sign-Ranked Test

Beta Diversity

- ❑ Bray-Curtis dissimilarity matrix & PERMANOVA
- ❑ NMDS

Acknowledgments: These efforts are funded through the Exxon Valdez Oil Spill Trustee Counsil, the Kurt Grinnell Aquaculture Scholarship Foundation and the Chugach Heritage Foundation.