



**WORKSHOP
PROCEEDINGS**

**KNOWLEDGE EXCHANGE
AND COLLABORATIVE
WORKSHOP**

July 25-26, 2024

**Environmental DNA
Applications in Alaskan
Coastal Communities:
Building Partnerships and
Collaboration Opportunities**

**PREPARED BY:
KACHEMAK BAY NATIONAL ESTUARINE
RESEARCH RESERVE**

**NERR SCIENCE
COLLABORATIVE**

Environmental DNA Applications in Alaskan Coastal Communities

Building Partnerships and Collaboration Opportunities

July 25-26, 2024

University of Alaska Anchorage, Kenai Peninsula College, Kachemak Bay Campus
Homer, Alaska

WORKSHOP BACKGROUND AND GOAL

Biological monitoring programs are vital for effectively managing estuaries and coasts, but they can be costly and harmful to the targeted species. However, recent advancements in DNA techniques enable us to identify organisms in an area by analyzing the DNA they leave behind. This type of DNA, known as environmental DNA (eDNA), originates from various sources like feces, gametes, scales, and shed cells of organisms. Fortunately, we can easily collect eDNA from samples of water and sediment. By studying eDNA from these samples, we can identify numerous species without the need to capture live animals or plants.

During this day-long introductory workshop, with optional second day field site visit, NERR staff and partners covered fundamental eDNA concepts and practices that can play a critical role in environmental monitoring. Local speakers shared expertise on eDNA projects on the ground at multiple scales, and how eDNA has been integrated into community driven research questions and conservation strategies. Through presentations and group discussion, participants learned about a range of opportunities and capacity in their local and regional geographies that can improve coastal community resilience. Most importantly, participants interacted with a diverse group of new and experienced eDNA practitioners making valuable connections for moving local and regional community driven eDNA projects forward.

The workshop was held as part of the Kachemak Bay National Estuarine Research Reserve (NERR) funded project, read more at the National Estuarine Research Reserve Science Collaborative project page “Explorations, Demonstrations and Novel Applications for Environmental DNA in Kachemak Bay” <https://nerrssciencecollaborative.org/project/Sutton23> and www.estuarydna.org

HOSTS

Kachemak Bay National Estuarine Research Reserve
University of Alaska Kenai Peninsula College Kachemak Bay Campus
With support from He'eia National Estuarine Research Reserve

ORGANIZATIONS IN ATTENDANCE

Alaska Conservation Foundation
Alaska Department of Fish and Game
Center for Alaskan Coastal Studies
Chickaloon Tribe
Chugach Regional Resources Commission
He'eia NERR
Kachemak Bay Birders
Kachemak Bay NERR Staff
Kachemak Bay NERR Student Interns
Kachemak Bay NERR Community Council
KBBI Radio Station
Kenai Peninsula Borough School District
National Park Service
NOAA Hollings Scholar Program
NOAA Kasitsna Bay Lab
NOAA Margaret A Davidson Fellow Program
UAA Biology Department
UAA Kenai Peninsula College Kachemak Bay
Campus
UAF College of Fisheries and Ocean Science

AGENDA

Time	Thursday July 25th - Full Day Kachemak Bay Campus 533 East Pioneer Ave Pioneer Hall 201
9:00 - 9:30	Pre-session Check In and Coffee, Welcome
9:30 – 10:00	Participant Interests and Community Questions Roundtable Facilitated discussion to share the wide variety of contexts and scales of approaches participants are interested in using eDNA for today led by Kachemak Bay NERR
15 min	Break
10:15 – 11:30	Concepts and Principles: What is eDNA? Hands on activity and small group discussion to explore questions around the concepts of eDNA led by Dr. Shimi Rii and Casey Ching He'eia NERR
30 min	Lunch Served Salads and Wraps from Latitude 59
12:00 – 1:00	Panel Lunch Discussion Scientists and stewards share about putting eDNA into practice
1:00 - 2:30	Methods and Capacity Demonstrations Demonstrations of eDNA sampling and processing techniques, discussion of regional capacity led by Dr. Debbie Tobin Kachemak Bay Campus Biology Faculty
2:30 - 3:30	Collaborative Applications in Kachemak Bay Co-develop research and monitoring strategies to address community questions led by Dr. Lauren Sutton Kachemak Bay NERR
15 min	Break
3:45 - 4:45	eDNA Research Ethics Facilitated Discussion Protocols for proposing research, planning for data management, sovereignty of information generated and collected in coastal communities
4:45 - 5:00	Wrap Up & Next Steps Ask remaining questions, identify opportunities and needs to move forward with partners and projects

Time	Friday July 26th - Half Day Meet at KBNERR Office 2181 Kachemak Drive
9:00 - 9:15	Van/Carpool to Field Sites Or meet at End of the Road Park, Homer Spit
9:30 – 10:30	Harbor Porpoise Studies Ferry Terminal, Homer Harbor
10:30 – 11:30	Nearshore Fish Studies Lands End Beach
12:00	Van/Carpool Travel to KBNERR

SUMMARY

During a day-long introductory workshop and second day discussion and field sampling demonstration in July, NERR staff and partners covered fundamental eDNA concepts and practices that can play a critical role in environmental monitoring. Local speakers shared expertise on eDNA projects on the ground at multiple scales, and how eDNA has been integrated into community driven research questions and conservation strategies. Through presentations and group discussion, participants learned about a range of opportunities and capacity in their local and regional geographies that can improve coastal community resilience. Most importantly, participants interacted with a diverse group of new and experienced eDNA practitioners making valuable connections for co-developing local and regional eDNA projects with coastal communities.

This community workshop in Kachemak Bay was an opportunity to share eDNA information and capacity, and take the first steps in co-developing research questions to pursue projects together. To achieve the objective, the workshop included:

- An activity to explore questions around the concepts of eDNA
- A panel of scientists and stewards putting eDNA into practice
- A demonstration of eDNA sample initial processing
- A facilitated discussion of research ethics related to eDNA community projects
- A brainstorming session on collaborative research applications
- A site visit to Homer Harbor for field sampling

Workshop Component Notes

First, the project team facilitated introductions using prompting questions about their organizational role, species of interest, local environmental changes or threats and context of their place. These prompts have been formalized in a project resource document: eDNA Project Start Up Worksheet. The target audience for this workshop was multi-sectoral with an emphasis in local community and indigenous knowledge representation. We were successful in recruiting a diverse group of engaged community leaders, tribal, agency, academic and government entities with 30 participants from 18 different organizations.

An activity to explore questions around the concepts of eDNA:

The morning progressed with a hands-on activity to build knowledge of what and where eDNA can be found, facilitated by Shimi Rii and Casey Ching from the He'eia NERR. They led an introductory discussion of eDNA applications pre and post activity.



Participants were asked to identify which species' DNA (via a form of eDNA from different sources) were on their card and then to place the card in the correct environment (e.g., marine, estuary, freshwater). This activity was based on He'eia NERR's 2022 "Applying eDNA in Fishpond Management" workshop but was altered to include Alaska-specific species, providing a resource for the project's Alaska partners. The What and Where is eDNA? Education and Engagement Activity description and Kachemak Bay GenBank Sequence Database educational product was refined after the workshop, with additional applications for use with different age groups and settings, and can be found on the project page and KBNERR website.

GENBANK SEQUENCE DATABASE		
sequences listed are educational examples		
Scientific Name	Origin	Environment
<i>Hippoglossus stenolepis</i>	Native	Marine
<i>Hexagrammos decagrammus</i>	Native	Marine
<i>Sebastes melanops</i>	Non-native	Marine
<i>Clupea pallasii</i>	Native	Marine
<i>Parachanna ocellatus</i>	Native	Marine
<i>Myoxocephalus polyacanthocephalus</i>	Native	Marine
<i>Patichthys stellatus</i>	Native	Marine
<i>Pholis laeta</i>	Native	Marine
<i>Gasterosteus aculeatus</i>	Native	Marine, Estuary
<i>Porhynchus shawwyttscha</i>	Non-Native	Marine

A panel of scientists and stewards putting eDNA into practice:

Coastal Alaskan researchers and resource managers are increasingly using eDNA in their work.

The panel of academic and agency members shared their projects and perspectives on the following questions:

- How did you scope your project to make it manageable? (sampling design, how you processed samples, etc.)
- Is there any creative problem solving you had to do for the project? (engineering new devices?)
- How are you engaging with community? (and who are the champions of this work?)

Panel:

- Sonia Kumar, UAF College of Fisheries and Ocean Science, shared research in the Kenai and Kasilof rivers using eDNA and acoustics to identify potential prey for Cook Inlet beluga whales.
- Jess Stevens, UAA Biology Department, shared research on the utility of eRNA.
- Rachel Lekanoff, Alaska Conservation Foundation, UAF College of Fisheries and Ocean Science shared research on salmon returns and mariculture feasibility.
- Eric Wood, Alaska Department of Fish and Game, shared monitoring and management of invasive Northern Pike.
- Debbie Tobin, UAA Kenai Peninsula College Kachemak Bay Campus, shared behavioral ecology of beluga whales and harbor porpoises.

A demonstration of eDNA sample initial processing:

Dr. Debbie Tobin, UA Biology Faculty led the workshop demonstrations of eDNA sampling and initial processing techniques at the Classroom Laboratory at Kachemak Bay Campus. The group discussed regional capacity and connections to additional resources within the state, and when external partners would be needed for sampling processing. Participants also had the opportunity to practice hands-on sample processing techniques in the lab.



A facilitated discussion of research ethics related to eDNA community projects:

As identified in the prior January meeting of researchers at the Alaska Marine Science Symposium, there is a lot of interest in the eDNA community to understand research ethics and potential resources to guide practices working with coastal communities. He'eia NERR shared their research protocols where they work closely between the community members that own and manage land in their Research Reserve and scientists interested in doing research on those lands and waters. The general overview includes a workflow plan for how to engage with communities in Kachemak Bay, and template forms for gathering information about proposed research or engagement. The eDNA project has provided an excellent platform for this discussion. After the workshop, the Research and Engagement Protocol was refined for the NERR and Local Community Partners. Our most significant and meaningful discussion from the workshop was hearing about participant interests and concerns about respectful engagement in research and data sovereignty in response to historic extractive practices in Indigenous communities across Alaska.

A brainstorming session on collaborative research applications:

While the majority of participants attended day 1 of the workshop, the participants that remained for day 2 contributed to a discussion of considerations for co-developing research and monitoring initiatives with coastal communities, outlining needs for information, techniques and other considerations. Components addressed included field sampling equipment and a materials index, sample processing, data management and sharing, and future applications and questions.

A site visit to Homer Harbor for field sampling:

Finally, participants had an opportunity to discuss applications for eDNA water sampling at a phytoplankton monitoring location in Homer Harbor. Photo Credit Emilie Springer, Homer News.



CONCLUSIONS

This workshop was a first step to develop equitable partnerships with researchers and community leaders and resource managers, for the ultimate goal of co-developing strategies for effective research and monitoring in coastal Alaskan ecosystems. Evaluation from a participant feedback survey indicates that participants learned new information or skills and intend to apply them in their work. Of note, participants indicated they would be working towards integrating co-creation and reciprocal research models, increasing cultural and place-based relevance, and consider data stewardship and data sovereignty to benefit the human and natural systems.

Testimonials:

“The discussion on research ethics was really valuable, and I appreciated hearing about He’eia’s process for visiting researchers.”

“I liked hearing from people who are using eDNA currently about its potential and its limitations.”

Participants covered a wide range of possible research topics including using eRNA to investigate life stages of different species in addition to eDNA, using historical and ancient eDNA techniques to investigate subsistence species, using eDNA to study effects of disturbance on diversity, range expansions, and invasive species ecology. Additionally, rare species and community ecology were discussed as possible topics of interest in Kachemak Bay. The workshop reinforced the timeliness of the reserve engaging with the community of researchers and managers working with eDNA techniques. The ADFG panelist was actively responding to a report of invasive Pike in Homer’s Beluga Lake the day of the workshop and brought two additional field sampling devices and shared them with the 30 participants.

Data Sovereignty and Research Protocols for working in Communities continue to be a strong need from partners. While these outputs were not part of the original project, explorations in eDNA has sparked the creation of KBNERR best practices and research protocols modelled after He’eia’s research protocols. There is a lot of interest in the eDNA community to collaborate with the project team for these protocols. We believe these protocols will provide an example of how to do thoughtful research and the eDNA project has provided an excellent platform for this discussion.

The research and monitoring co-development session provided the reserve guidance in next steps for integrating eDNA in our programs with options to build capacity around community science sampling opportunities, workforce development in lab skills, and organizational collaboration to meet needs in Alaska. The Kachemak Bay NERR and partners built off of the workshop discussions and continue to identify resources and expertise to create opportunities for coastal practitioners to learn more about how eDNA can be used to address coastal stewardship and management needs.