2024

Kodiak Area Marine Science Symposium

Program and Abstracts

April 23–25, 2024
Kodiak Marketplace

Sea Grant
ALASKA

Cama'i. As we gather together for the Kodiak Area Marine Science Symposium we acknowledge that we come together on the Alutiiq/Sugpiaq homeland. We thank and acknowledge the sustained efforts of the ten tribes of the Kodiak Alutiiq Region in maintaining sovereignty, culture and opportunity for their members. The heritage and culture of the Alutiiq people continue to enrich all of us. We find beauty, peace and livelihood from the Kodiak lands and waters, and give thanks for the stewardship of these resources.

Kodiak Area Marine Science Symposium

Hosted by the Alaska Sea Grant Marine Advisory Program with support from regional partners and contributors, KAMSS provides a forum for researchers to share findings within the research community and to the general public. The symposium offers the opportunity for stakeholders to engage and understand how Kodiak's marine environment and resources function, change, and affect our lives and livelihoods and provides a venue for researchers to plan for integrated, cooperative and community-inspired marine research.

Alaska Sea Grant is a partnership between NOAA and the University of Alaska Fairbanks. Sea Grant has been serving Alaska for over 50 years. Our work supports healthy coastal resources, strong economies, and vibrant communities. We do this through research, education, and outreach via Marine Advisory Program agents who live and work in eight coastal communities across Alaska. More information is available on our website or by contacting your local agent.

Steering Committee

Julie Matweyou (chair)
University of Alaska Fairbanks, Alaska Sea Grant Marine Advisory Program, Kodiak, AK

Alisa Abookire
Alaska Coastal Observations and Research, Kodiak, AK

Robin Corcoran
US Fish and Wildlife Service, Kodiak National Wildlife Refuge, Kodiak, AK

Ashley Dunker (event logistics)
University of Alaska Fairbanks, Alaska Sea Grant, Kodiak, AK

Tina Fairbanks
Kodiak Regional Aquaculture Association, Kodiak, AK

Brian Himelbloom
University of Alaska Fairbanks (retired), Kodiak, AK

Mike Litzow
NOAA Fisheries, Alaska Fisheries Science Center, Kodiak, AK

Molly Odell
Alutiiq Museum, Kodiak, AK

Theresa Peterson
Alaska Marine Conservation Council, Kodiak, AK

Cindy Trussell
University of Alaska Anchorage, Kodiak College, Kodiak, AK

Andy Wall
Kodiak Area Native Association, Kodiak, AK

AGENDA

Kodiak Marketplace | April 23–25, 2024

Tuesday, April 23, 2024

6:30–6:30 pm	Welcome and opening remarks	**Julie Matweyou**, UAF Alaska Sea Grant, Kodiak, AK
6:30–7:30 pm	Keynote Address: Kodiak's Changing Climate	**Rick Thoman**, UAF Alaska Center for Climate and Policy, Fairbanks, AK
7:40–8:00 pm	Film: Haulout	**Evgenia Arbugaeva**, Photographer and Producer

Wednesday, April 24, 2024

Session 1: Climate and Fisheries
Andie Wall, *session chair*

8:30 am	Registration Coffee and conversation	
9:00–9:05 am	Opening remarks	Julie Matweyou, UAF Alaska Sea Grant, Kodiak, AK
9:05–9:20 am	Kodiak Climate Recap	**Rick Thoman**, UAF Alaska for Climate and Policy, Fairbanks, AK
9:20–9:50 am	A forward-looking perspective on changing climate risk for Alaskan fisheries	**Mike Litzow**, Alaska Fisheries Science Center, Kodiak, AK
9:50–10:20	Gulf of Alaska 2023 ecosystem relative to the past 10 years	**Bridget Ferriss**, Alaska Fisheries Science Center, Seattle WA
10:20–10:30 am	10-Minute Break	
10:30–10:50 am	Climate Adaptation Planning for Fishing Communities	**Theresa Peterson**, Alaska Marine Conservation Council, Kodiak AK
10:50–11:10 am	Understanding Kodiak Area Marine Biodiversity through Trawl Survey Studies	**Joletta Silva**, Alaska Department of Fish and Game, Kodiak AK

11:10–11:30 am	Overview of the Kodiak District Tanner Crab Fishery	**Nat Nichols**, Alaska Department of Fish and Game, Kodiak AK
11:30–11:50 am	What beach seine catches tell us about Pacific cod recruitment	Alisa Abookire, Alaska Coastal Observations & Research, Kodiak, AK
11:50 am–1:30 pm	Lunch on your own and **Walking Tour: Alutiiq Ancestors' Memorial (~.3 mi)**	
Session 2: Environment and monitoring Tina Fairbanks, *session chair*		
1:30–1:50 pm	Gulf of Alaska phytoplankton: Endless spring on Albatross Bank	Suzanne Strom, Western Washington University, Anacortes, WA
1:50–2:10 pm	Progress toward understanding PSTs in the Kodiak region	Julie Matweyou, Alaska Sea Grant, Kodiak, AK
2:10–2:30 pm	KANA's Environmental Monitoring Program	Andie Wall and Kasey-Jo Wright, Kodiak Area Native Association, Kodiak, AK
2:30–2:50 pm	Kodiak Regional Aquaculture Association: Research and Monitoring	Kirstin Eaker, Kodiak Regional Aquaculture Association, Kodiak, AK
2:50–3:00 pm	10-Minute Break	
3:00–3:20 pm	The Kodiak Ocean Science Discovery Program-15 years of collaborative outreach	Switgard Duesterloh, Ocean Science Discovery Lab, Kodiak, AK
3:20–3:40 pm	Community monitoring for ocean acidification to inform local climate adaptation	Jake Cohen and Grace Ellwanger, Kodiak Area Native Association, Kodiak, AK
3:40–4:00 pm	Ocean Acidification and Alaska crabs: An update on red king and snow crabs	W. Christopher Long, Alaska Fisheries Science Center, Kodiak, AK
4:00–4:20 pm	Monitoring for invasive green crab on Kodiak Island	Noah Schrof, Prince William Sound Regional Citizens' Advisory Council, Kodiak, AK
4:30 pm	**Day 1 presentations end**	
5:30–7:30 pm	**Science for the whole family** Poster Session with Youth Science Activities Pizza and non-alcoholic refreshments	

5:30 - 6:00 pm 6:00 - 6:30 pm	Oscar Dyson Ship tours	Location: Pier II

Thursday April 25, 2024

Session 3: Living through change
Mike Litzow, *session chair*

8:30 am	Registration Coffee and conversation	
9:00–9:10 am	Welcome and announcements	Julie Matweyou, UAF Alaska Sea Grant, Kodiak, AK
9:10–9:40 am	Highly Pathogenic Avian Flu in Alaska	Andy Ramey, US Geological Survey, Anchorage, AK
9:40–10:00 am	Excavation of a 3,000-year-old house in interior Kodiak Island	Patrick Saltonstall, Alutiiq Museum, Kodiak, AK
10:00–10:20 am	Who We Are: What does it mean to be an Alutiiq/Sugpiaq person? Alutiiq video (10 min)	Dehrich Chya, Alutiiq Museum, Kodiak, AK
10:20–10:30 am	10-Minute Break	
10:30–10:50 am	Genetics through time; understanding Pacific cod population dynamics using ancient and modern DNA	Sara M. Schall, University of Oklahoma & NOAA Alaska Fisheries Science Center, Seattle, WA
10:50–11:10 am	Unraveling the genetic basis of rapid diversification in rockfish	Runyang Nicolas Lou, University of California Berkeley, Berkeley, CA
11:10–11:30 am	Introgression and subtle population structure in threatened Pacific rockfishes	Nathan Sykes, University of Victoria, Victoria, BC
11:30–11:50 am	Buskin River invasive crayfish (recorded)	Daniel Smith, The Sun'aq Tribe of Kodiak, Kodiak, AK
11:50 am–1:30 pm	Lunch on your own	

Session 4: Landscapes and seascapes Brian Himelbloom, *session chair*		
1:30–1:50 pm	Insonifying the Hidden Depths: An Exploration of Bathymetric Data Beyond Traditional Applications	Ryan Cross, Woolpert, Kodiak, AK
1:50–2:10 pm	Seascape Alaska: Working together to understand the Depths of Alaska's Vast Seascape	Christina Conrath, Alaska Fisheries Science Center, Kodiak, AK
2:10–2:30 pm	Non-breeding ecologies of Tufted and Horned Puffins (Fratercula cirrhata, F. corniculata) from the Kodiak Archipelago, Alaska	Robin Corcoran, U.S. Fish & Wildlife Service, Kodiak National Wildlife Refuge, Kodiak, AK
2:30–2:50 pm	Settlement history of a dynamic landscape: Archaeological survey of Tugidak Island	Molly Odell, Alutiiq Museum, Kodiak, AK
2:50–3:00 pm	10-Minute Break	
3:00–3:20 pm	Stepping up the scale of the marine debris issue	Andy Schroeder, Ocean Plastic Recovery, Kodiak, AK
3:20– 3:40 pm	Nearshore Marine Bird Surveys in the Kodiak Archipelago 2011-2022	Robin Corcoran, U.S. Fish & Wildlife Service, Kodiak, AK
3:40–4:00 pm	Ecosystem service evaluation of kelp farms versus natural kelp beds in Kodiak, Alaska	Alix Laferriere, Alaska Fisheries Science Center, Kodiak, AK
4:00–4:10 pm	Accounting for Well-Being in Fishery Science and Management	Rachel Donkersloot, Coastal Cultures Research, Aniak, AK
4:10–4:30 pm	NOAA Ship Oscar Dyson Update	Subject to ship schedule
4:30 pm	Day 2 Closing comments	Julie Matweyou, University of Alaska Fairbanks, Kodiak, AK
5:30 - 6:00 pm	Oscar Dyson Ship tour	Location: Pier II
6:00–8:00 pm	KAMSS Film Night 6:00 pm *Haulout* (25 min) 6:30 pm *Tongue Cutters* (1 hr 25 min)	Evgenia Arbugaeva, Producer Solveig Melkeraaen, Director

Local Partnered Activities

Alutiiq Ancestors' Memorial • April 24, 2024 • lunch break

Take a short walk with Alutiiq Museum staff to visit the Alutiiq Ancestors' Memorial in downtown Kodiak. Visitors learn about Alutiiq history and the repatriation of ancestral remains, and they are invited to remember their own ancestors. (~0.3 mi) Visit Alutiiq Ancestors' Memorial website

Shoreside tours of the NOAA ship Oscar Dyson • April 24 and 25, 2024

The NOAA ship Oscar Dyson is home ported in Kodiak and welcomes the community onboard for ship tours during the Kodiak Area Marine Science Symposium. Join Commanding Officer Emily Rose and Junior Officer Luca Grifo-Hahn for a 30 minute tour aboard the Dyson to explore the ship from bow to stern and learn about the science conducted on the vessel.

Tours will take place on April 24 at 5:30 pm and 6:00 pm and April 25 at 5:30 pm A sign up list is available through the KAMSS event page under partnered activities. . Priority will be given to people on the sign up list. All ages welcome.

Kodiak Audubon Whale Watching Hike • April 27, 2024 • 10:30 am

Whale Watching Hike (Narrow Cape). See gray whales. Bring lunch and water. Wear warm clothes and hiking boots. Meet at the Pasagshak State Recreational Area restroom for interpretive lecture and caravan to Fossil Beach. Contact: Stacy Studebaker 907-654-4881.
Contact: Julie Matweyou, KAMSS Chair, for carpool to Pasagshak if needed.

Salmon Shark Dissection • April 27, 2024 • 1:00 pm

All are welcome to join a salmon shark dissection led by Kodiak Island Borough School District teacher John Malloy. Mallow will lead a detailed dissection, exploring the anatomy and physiology of these amazing animals. Adults must accompany children under 10 years of age.
Location: Kodiak High School (outside).

Kodiak National Wildlife Refuge Visitor Center • April 21–27, 2024

The Kodiak Refuge Visitor Center is free to visit and will be open to the public the following hours during the week of KAMSS:

April 21: 9am-4pm (cruise ship day)
April 22: Closed
April 23: 12-4pm
April 24: 9am-4pm (cruise ship day)
April 25: 12-4pm
April 26: 12-4pm
April 27: 12-4pm

Visit the Kodiak National Wildlife Refuge Visitor Center website

Whale Fest Kodak • April 21–27, 2024

Whale Fest Kodiak has been a proud supporter of the Kodiak Area Marine Science Symposium since its inception in 2011. We are again happy to partner with Alaska Sea Grant to promote marine science literacy in our community. Visit the Whale Fest Kodiak Facebook page: ***facebook.com/groups/WhalefestKodiak***

Online Partnered Activities

Coastal Observation and Seabird Survey Team (COASST)

https://coasst.org/
https://coasst.org/join-our-team/coasstlite-virtual/

Date: April 21, 2024
Time: 8:30am - 11:30am AKDT

Link to webinar: https://coasst.org/join-our-team/trainings-events/

COASSTLite Level 1 offers introductory online training for beached bird surveying. Participants will engage in interactive Zoom workshops to learn standardized COASST survey techniques. This training equips individuals to monitor marine environments and promote local resource stewardship. Topics covered include beach zone measurement, data sheet completion, and how to take good pictures of dead birds. No prior scientific experience is necessary. Following the session, participants commit to surveying a designated beach monthly. Survey kits are provided following a refundable deposit. Subsequent Level 2 training focuses on bird identification and measurement techniques.

Reserve your training spot by emailing coasst@uw.edu or calling 206-221-6893. Please visit our website at coasst.org for more information.

Ocean Acidification

OA Storymap

A new storymap on ocean acidification in Alaska offers an engaging introduction to the topic, featuring visuals and resources to make it accessible to new audiences. It's one of six regional maps developed through a partnership between the International OA Alliance, the Aquarium Conservation Partnership and NOAA's Ocean Acidification Program in collaboration with the regional ocean acidification networks, including the Alaska Ocean Acidification Network. These maps aim to enhance communication about climate-ocean changes by highlighting localized impacts, responses, and calls to action across the U.S.Learn more about the collaborative project.

Visit the Alaska storymap

For questions, please email dugan@aoos.org

OA Online Course

The Alaska OA Network has launched a free online course offering an in-depth understanding of ocean acidification's impacts in Alaska. The course consists of 8 modules featuring short videos, colorful photos, and easy-to-follow language. Each module takes about 45-60 minutes to complete and is accessible from any device without the need for a login or homework assignments. Open to ages 14 and above, participants will explore topics including the basic principles of ocean acidification, effects of increasing atmospheric carbon dioxide on the ocean, regional OA conditions in Alaska, impacts on local species like crab, salmon and bivalves, and ways to support positive changes within communities.

Explore the course

For questions, please email dugan@aoos.org

Posters	
Aleutian Tern Breeding and Migration Season Movements 2019-2023	Robin Corcoran, U.S. Fish and Wildlife Service Kodiak, AK
Quantitative PCR for Alexandrium cysts in Kodiak, Puget Sound and the Gulf of Maine: Regional and seasonal variability	Tyler E. Harman, NOAA Affiliate, CSS.Inc Beaufort, NC
Mapping Alexandrium distribution in Kodiak to inform shellfish toxicity monitoring and bloom forecasting	Steve Kibler, NOAA Beaufort Laboratory Beaufort, NC
Seasonality of Bull Kelp Fertility in Kodiak and Juneau	Angela Korabik, NOAA Alaska Fisheries Science Center Kodiak, AK
Does the presence of a pop-up satellite archival tag affect movement of Tanner Crab (Chionoecetes bairdi) in an exposed Alaska Bay	Andrew Nault, Alaska Department of Fish and Game Kodiak, AK
Coloring iqalluut - fishing	Catherine West, Boston University Boston, MA
Putting the pieces together: red king crab movement and distribution in Bristol Bay	Leah Zacher, NOAA Alaska Fisheries Science Center Kodiak, AK

Abstracts are listed below in the order of presentation.

Abstracts - Keynote Speaker

Kodiak's Changing Climate

Rick Thoman, *University of Alaska Fairbanks, Alaska Center for Climate Adaptation, Fairbanks, AK rthoman@alaska.edu*

Kodiak's climate is changing in complex ways. This presentation will focus on observed changes in the climate over the past 50 to 100 years in Kodiak and the western Gulf of Alaska region. As is often the case with weather, climate changes in the Kodiak area show both similarities and important differences compared to other parts of Alaska and this highlights the importance of regionally specific information and projections as we adapt to a changing climate.

Rick Thoman is an Alaska and Arctic climate specialist with the Alaska Center for Climate Assessment and Policy at the International Arctic Research Center at the University of Alaska Fairbanks, where much of his work is focused on providing timely and relevant climate related information to the people, tribes and organizations of Alaska. He has also contributed to many Arctic-wide climate related activities, including NOAA's Arctic Report Card and the World Meteorological Organization's Polar Prediction Project Societal and Economic Research Application task team. He has more than 40 years experience as a weather and climate professional in the public, private and academic sectors, including 30 years with the National Weather Service Alaska Region.

Abstracts - Session 1: Climate and fisheries

A forward-looking perspective on changing climate risk for Alaskan fisheries

***Michael Litzow**, NOAA Fisheries Alaska Fisheries Science Center, Kodiak, AK, mike.litzow@noaa.gov*

Humans tend to evaluate the range of possible conditions in an ecosystem based on past experience. Traditionally, this "backward-looking" perspective has been optimal for estimating the risk of disruptive events like marine heatwaves. But in a situation where the system has a strong directional trend, the backward-looking perspective makes people more vulnerable to unpleasant surprises that are poorly predicted by past experience.

In this talk, I will present an approach for developing a forward-looking perspective for estimating the changing risk of extreme climate events, like marine heatwaves, in Alaskan marine ecosystems. Using historical ocean temperature data and an ensemble of 23 different climate models, I estimate how the risk of extreme temperature events has already changed, make projections of how we should expect that risk to continue to change during the 2020s and 2030s, and link these changes in climate risk to negative outcomes for cod, salmon, and crab fisheries. The results of this analysis illustrate the magnitude of the challenge we face: warm conditions in the Gulf of Alaska that used to be 1,000-year events are now expected to occur about every ten years. Fisheries that have shown negative impacts of marine heatwaves in the past are expected to show rapid increases in the incidence of similar negative outcomes during this decade and the next. Recognizing the range of possible outcomes is an important step towards planning to adapt to climate change, and the talk will finish with a brief discussion of some possible adaptation and mitigation measures.

Abstracts - Session 1: Climate and fisheries

Gulf of Alaska 2023 ecosystem relative to the past 10 years

Bridget Ferriss*, *NOAA Fisheries Alaska Fisheries Science Center, Seattle WA, bridget.ferriss@noaa.gov*
***Matt Callaha**n, Pacific States Marine Fisheries Commission, Juneau, AK, matt.callahan@noaa.gov*
***Sherri Dressel**, Alaska Department of Fish and Game, Juneau, AK, sherri.dressel@alaska.gov*
***Brie Drummond**, U.S. Fish and Wildlife Service, Homer, AK, Brie Drummond@fws.gov*
***Emily Fergusson**, Alaska Fisheries Science Center, Juneau, AK, emily.fergusson@noaa.gov*
***Christine Gabriele**, Glacier Bay National Park and Preserve, Gustavus, AK, chris gabriele@nps.gov*
***Kyle Hebert**, Alaska Department of Fish and Game, Juneau, AK, kyle.hebert@alaska.gov*
***Russell Hopcroft**, University of Alaska, Fairbanks, AK, rrhopcroft@alaska.edu*
***Timothy Jones**, University of Washington, Seattle, WA, timothy.t.jones@googlemail.com*
***Emily Lemagie**, NOAA's Pacific Marine Environmental Laboratory, Seattle, WA, emily.lemagie@noaa.gov*
***David McGowan**, Alaska Department of Fish and Game, Seattle, WA, david.mcgowan@noaa.gov*
***Cecilia O'Leary**, Alaska Department of Fish and Game, Seattle, WA , cecilia.oleary@noaa.gov*
***Rick Thoman**,, University of Alaska Fairbanks, AK, rthoman@alaska.edu*
***Shannon Whelan**, Institute for Seabird Research and Conservation, Anchorage, AK, swhelan.bio@gmail.com*

This presentation will summarize the findings of NOAA Fisheries' 2023 Gulf of Alaska Ecosystem Status Report, in the context of ecosystem conditions in the past 10 years. The warm period driven by 2014 2016 and 2019 marine heatwaves followed by multi-year cooling, during the 3 consecutive La Niña events (2020-2023), have jointly produced short-term and persistent changes in the marine ecosystem, including in populations of zooplankton, forage fish, groundfish, seabirds, and humpback whales. Highlights for 2023 include an increase in Pacific cod although still very low population levels) and capelin populations, and a transition from three consecutive years of La Niña to El Niño conditions. Given the current El Niño status and the associated warming surface waters in winter/spring of 2024, the reduction in zooplankton availability and quality may persist into the coming year. Vulnerable groundfish in 2024 (due to warm surface waters and reduced zooplankton quality) potentially include the larval and age-0 juveniles of Pacific cod, walleye pollock, and northern rock sole. Warm surface waters can be favorable for larval rockfish and sablefish. Adult zooplankton-eating groundfish may have reduced prey availability (walleye pollock, Pacific ocean perch, dusky and northern rockfish) but the deeper adult habitat is not predicted to warm unless El Niño-related warming persists long enough to be mixed to depth.

Abstracts - Session 1: Climate and fisheries

Climate Adaptation Planning for Fishing Communities

***Theresa Peterson**, Alaska Marine Conservation Council, Kodiak, AK theresa@akmarine.org*
***Marysia Szymkowiak** NOAA Fisheries Alaska Fisheries Science Center, Juneau AK marysia.szymkowiak@noaa.gov*
***Davin Holen,** Alaska Sea Grant, University of Alaska Fairbanks, Anchorage, AK dlholen@alaska.edu*

Climate change has taken hold in Gulf of Alaska fisheries, with numerous fisheries disasters over the last several years, and continuing ecosystem changes that are altering foundational relationships between the people in the region and the place. Across the many geographically isolated and fishing dependent communities within the Gulf of Alaska, fisheries losses may be devastating for local economies that lack economic diversity, maintain fishing-dependent food systems, and have cultural fishing practices that cannot be replaced. Despite the tremendous costs of declining fisheries in the region, there is a dearth of adaptation planning to ensure the resilience of fishing communities into the future. This project addresses the critical need for fishing communities in the Gulf of Alaska to formalize fisheries resilience strategies in adaptation plans, focusing on three of the most highly dependent and diverse fishing communities in the region - Cordova, Kodiak, and Sitka. The Alaska Marine Conservation Council (AMCC) is leading this effort in Kodiak, which kicked off in spring of 2024. Diverse community perspectives are being sought about climate vulnerabilities, resilience, and adaptation pathways.

Abstracts - Session 1: Climate and fisheries

Understanding Kodiak Area Marine Biodiversity through Trawl Survey Studies

Joletta Silva, *Alaska Department of Fish and Game, Kodiak, AK joletta.silva@alaska.gov*

The Kodiak area is renowned for its rich marine ecosystems, harboring ecologically and economically significant species. ADFG has conducted a standardized biological trawl survey since 1988 to study the intricate dynamics of this marine environment. This survey provides important information to fishery managers for multiple species including Tanner crab, Pacific cod, walleye pollock, and sablefish. It also provides a species composition and distribution time series for the Kodiak area that can inform us about the biodiversity in the region. Through systematic trawl sampling across various habitats and depths around the archipelago, 36 continuous years of data are available that can help us to understand the region's ecological makeup. Review of collected data shows a wide variety of species present, from commercially important fish species to lesser-known benthic organisms. These findings offer information that could potentially be useful for effective conservation and management strategies. Understanding the changing distributions of different species can help us make decisions that preserve the balance of these ecosystems in the face of environmental changes and anthropogenic pressures. This talk will provide an overview of the trawl survey history and methods, as well as touch upon trends and patterns observed in various species over time. Diverse data collected from the survey will be reviewed and presented to demonstrate the span and scope of the project. Specific examples of unique spatiotemporal data trends and patterns in various species groups will also be explored.

Abstracts - Session 1: Climate and fisheries

Overview of the Kodiak District Tanner Crab Fishery

Nathaniel Nichols, *Alaska Department of Fish and Game, Kodiak, AK, nathaniel.nichols@alaska.gov*

This presentation provides an overview of Kodiak District Tanner crab trawl survey results, current population trends, regulatory harvest strategy, 2024 Tanner fishery summary, and future Tanner fishery outlook.

Abstracts - Session 1: Climate and fisheries

What beach seine catches tell us about Pacific cod recruitment

Alisa Abookire, *Alaska Coastal Observations and Research, Kodiak, AK alaskacor@gmail.com*
Mike Litzow*, Alaska Fisheries Science Center, Kodiak, AK, mike.litzow@noaa.gov*
Ben Laurel, *Alaska Fisheries Science Center, Newport, OR, ben.laurel@noaa.gov*
Louise Copeman, *Alaska Fisheries Science Center, Newport, OR, louise.copeman@noaa.gov*

Coastal areas can provide very productive nursery habitat for Pacific cod, making beach seine gear a good choice for sampling juveniles. In 2018 an extended beach seine survey between Kodiak and Sand Point was initiated to better understand the factors regulating condition and survival for age-0 Pacific cod (Gadus macrocephalus) across the western Gulf of Alaska. We sampled the eastern side of Kodiak Island, the Alaska Peninsula, and Shumagin Islands each summer from 2018 to 2023. We link the extended surveys with a local beach seine survey started in 2006 at Cook Bay and Anton Larsen Bay to create a timeseries of age-0 cod from 2006 – 2023. Fish samples were retained for investigations on condition, diet, age, and population genetics. Habitat, temperature, and salinity data were also collected. We investigate the effects of ocean temperature on juvenile cod abundance and condition. From 2006 to 2016 there was strong predictive skill from beach seine estimates of age-0 cod and the NOAA SAFE model assessment. But starting in 2017 we observe a new trend which suggests a new control on the population of Pacific cod. Currently, the number of adults recruiting to the fishery is lower than would have been predicted from age-0 cod pre-2016. To understand why, we are researching overwintering potential and measuring cod body condition in the fall at Cook Bay. Continued sampling of this joint research project in 2024 and 2025 will further our understanding of the processes regulating recruitment of Pacific cod in the Gulf of Alaska.

Abstracts - Session 2: Environment and monitoring

Gulf of Alaska phytoplankton: Endless spring on Albatross Bank

***Suzanne Strom**, Western Washington University, Anacortes, WA stroms@wwu.edu*
***Kerri Fredrickson**, Western Washington University, Anacortes, WA rederk@wwu.edu*

What makes some areas of the Gulf of Alaska (GOA) more productive than others? Differences in phytoplankton abundance and growth rates are two of the most important causes. Phytoplankton are the base of the food web in most of the ocean, including coastal areas. Oceanographic research in the northern GOA over several decades has shown that phytoplankton growth rates are typically regulated by light availability in the spring and by nutrient availability in the summer. Abundance is determined by growth minus losses, most importantly grazing by micro- and mesozooplankton and sinking to deep waters. Together these factors determine primary production, a fundamental ecosystem property.

During the most recent phase of our northern GOA research (2018-present), we have been able to occupy a line of stations extending 100 nautical miles seaward from Kodiak Island, crossing the relatively shallow Albatross Bank. The high-energy tidal currents of the northern GOA interact with the bank to generate vertical mixing of the water column. Relative to the surrounding shelf waters, this mixing reduces light availability in the spring, but increases nutrient availability in the summer and fall, leading to 'spring-like' conditions. Not only is the bank a hot spot of elevated primary production in summer, but larger phytoplankton cells (diatoms) make up much of the community. This can lead to more efficient food web transfers in the water column and more sinking to benthic communities. Phytoplankton responses to oceanographic conditions on Albatross Bank contribute to making this a favorable habitat for demersal fish, seabirds, and marine mammals.

Abstracts - Session 2: Environment and monitoring

Progress toward understanding PSTs in the Kodiak region

***Julie Matweyou**, Alaska Sea Grant, Kodiak, AK julie.matweyou@alaska.edu*
***Steven Kibler**, NOAA Beaufort Laboratory, Beaufort, NC, Steve.Kibler@noaa.gov*
***Jennifer McCall**, SeaTox Research Inc., Wilmington, NC, jmccall@seatoxresearch.com*
***Andie Wall**, Kodiak Area Native Association, Kodiak, Alaska, andie.wall@kodiakhealthcare.org*

Paralytic shellfish toxins (PSTs) are a long-standing problem in Alaska and have potential to affect human and ecosystem health, as well as negatively impact the economic viability of commercial shellfish operations. The toxic dinoflagellate *Alexandrium catenella* is responsible for producing PSTs in Alaska and persists year-round in our ecosystem. *A. catenella* cells proliferate in the water column in the spring and summer, and overwinter as benthic resting cysts in the sediment. Kodiak demonstrates some of the highest PST levels in Alaskan shellfish, with peak *Alexandrium* blooms occurring in late May to mid-June, and ranks among the highest in PSP incidents in the state due to the reliance of subsistence (untested) shellfish (AKDHSS 2022).

For decades, Alaska Sea Grant has worked with Alaska residents to address the multifaceted impacts of PSTs on human health, the economy and the environment. This presentation will provide an overview of the work done in the Kodiak region over the past 10 years to address PSTs, highlighting community partnerships, project data and achievements. Notably, these endeavors have catalyzed a 5-year, multi-agency initiative aimed at mitigating harmful algal bloom (HAB) toxin risks in Kodiak Archipelago communities and advancing NOAA HAB forecasting capabilities for the region. Efforts over the years to establish community-based monitoring, identify primary toxin congeners, explore shellfish cleaning practices, improve low-cost toxin testing, and understand and map *Alexandrium* cell and cyst abundance have demonstrated a multi-pronged, multi-partnered approach is necessary in addressing such a complex problem.

KANA Environmental Programs and Water Quality Monitoring

***Andie Wall**, Kodiak Area Native Association, Kodiak, Alaska, andie.wall@kodiakhealthcare.org*
***Kasey Jo Wright**, Kodiak Area Native Association, Kodiak, Alaska, kaseyjo.wrightl@kodiakhealthcare.org*

KANA believes that healthy people live in healthy communities. This session will dive into KANA's programs supporting the environmental health of Kodiak's diverse communities. Attendees will be able to learn about the progress of ongoing efforts and the guiding strategies for upcoming projects. The presentation will conclude with an overview of KANA's water quality programs and highlight the community-based monitoring efforts on Kodiak Island.

Kodiak Regional Aquaculture Association: Research & Monitoring

***Kirstin Eaker**, Kodiak Regional Aquaculture Association, Kodiak, Alaska, rm.limno@kraa.org*

Recognizing the importance of sustaining a healthy fishing industry (commercial, subsistence and sportfish) to Alaskans, regional aquaculture associations were created via legislation in 1976. It identified areas of need which included: rehabilitation of weak salmon stocks or supplemental salmon production, research, educational outreach, and habitat protection and improvement. In 1983, Kodiak Regional Aquaculture Association (KRAA) was established. Today KRAA now encompasses two hatcheries, Kitoi Bay Hatchery and Pillar Creek Hatchery, and a Research and Monitoring department (R&M). R&M has three primary areas of data collection: limnology, Spiridon Lake/Telrod Cove project, and Kodiak Pink Otolith Recovery project (KPOR). KRAA's limnology program gathers data used in evaluating juvenile salmon rearing conditions in over 20 lakes across the Kodiak Archipelago. This information is used in stocking recommendations, exploratory rehabilitation projects, and can aid in diagnosing run failures caused by unfavorable juvenile rearing conditions. At Spiridon Lake and Telrod Cove, KRAA and ADF&G biologists implement projects centered on monitoring and gauging juvenile salmon survival and adult salmon returns. The data collected includes enumerating smolt out migration, and sampling and enumerating adult returns at Telrod Cove leading to forecasting estimates, evaluating hatchery reared fish contributions, and assessing release strategies. KPOR collects otoliths from processors, streams, and terminal returns. The otolith marks are evaluated in the lab and aim to reflect hatchery contributions to surrounding ecosystems.

The Kodiak Ocean Science Discovery Program - 15 years of collaborative outreach

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The Ocean Science Discovery Program (OSDP) started in 2008 as an educational program to improve ocean literacy and stewardship in the Kodiak Island community by bridging the gap between scientists and classroom teachers. Marine science and environmental education are provided to support and assist the district-wide science curriculum.

All program components include a wide variety of sciences, engineering, technology, math and art through hands-on activities and experiments, student-scientist interactions, and field trips. The Kodiak Laboratory of the Alaska Fisheries Science Center (NMFS/NOAA) provides a laboratory classroom (OSDL) within a state-of-the-art research facility also featuring a touch tank and large aquarium with local species. In each grade level-specific unit, students handle live marine organisms and scientific tools, while also learning from local scientists. In addition to NOAA, scientists from the Alaska Department of Fish and Game, the Kodiak Regional Aquaculture Corporation, the University of Alaska Fairbanks and the Kodiak community volunteer their time and expertise in the OSDL. Students enjoy their annual class trip to the OSDL, which includes marine science content and scientific method, interdisciplinary and place-based learning, content-related games and sensory encounters with live animals.

Community monitoring for ocean acidification to inform local climate adaptation

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The culture, livelihoods, and community well-being of Alutiiq tribes on Kodiak Island are intricately linked to the health and stability of the marine environment. In recent years, changing ocean conditions have impacted Alaska's coastal ecosystems, threatening marine resources and the subsistence way of life. Since 2019, Kodiak Tribes and the Kodiak Area Native Association (KANA) have participated in a statewide community sampling program for ocean acidification (OA) to better understand shifts in local coastal waters. This collaborative effort has provided important data on regional carbonate chemistry. KANA is currently updating the sampling program and exploring avenues for better data communication and implementation. Currently, KANA is seeking to combine this work with its larger water quality program to inform adaptation to changing water conditions. The tribal ocean acidification monitoring program played a pivotal role in shaping the Kodiak Tribal Climate Adaptation Plan and the most recent version of the Comprehensive Economic Development Strategies (CEDS) for the region. This presentation will examine the integration of data collection with climate adaptation strategies that mitigate environmental risks and also foster cultural revitalization, bolster mental and spiritual health, invigorate local economies, and ensure overall resilience and prosperity of the region.

Ocean acidification and Alaskan crabs: An update on red king and snow crabs

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Ocean acidification, a decrease in oceanic pH from the uptake of anthropogenic CO2, can be a significant stressor for marine organisms. In two studies we looked at the effect of three pH treatments, current surface ambient, pH 7.8, and pH 7.5, on larval red king crab and juvenile snow crab. Larvae were monitored throughout development and the average length of each stage was determined, as well as survival, growth, size, and dry mass. Snow crab were reared for 296 days and growth and mortality were monitored. Red king crab larvae were highly resilient to ocean acidification. There were no differences among treatments in survival or in average stage length. Likewise, size and weight did not vary with pH treatment for the most part. Ambient larvae had a slightly higher mass than pH 7.8 larvae but not pH 7.5. For juvenile snow crab, reduced pH did not affect the intermolt duration, the carapace width after each molt, or wet mass of the crabs after each molt. There was thus no indication that growth rate was changed by reduced pH. However, the mortality rate of crabs held at pH 7.5 was 40% higher than those held at pH 7.8 or Ambient. Overall this study suggests that red king crab larvae are adapted to a wide range of pH conditions. Snow crab juveniles are less sensitive than other crab species, but still were negatively affected at the lowest pH.

Monitoring for invasive green crab on Kodiak Island

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Invasive green crab (*Carcinus maenas*) are notorious for negatively impacting ecosystems where they invade. Considered one of the worst global invaders, these small crabs can consume large amounts of prey, destroy eelgrass beds, and compete with native species, such as juvenile Dungeness crab, for food and space, posing a threat to fisheries and mariculture. A network of community and volunteer partners has been monitoring for green crab throughout coastal Alaska for decades following a standardized protocol. Unfortunately, in 2022, the first green crab were discovered in Alaska on Annette Island in southern southeast. In this presentation we will describe recent efforts to monitor for invasive green crab on Kodiak Island in 2022 and 2023. In 2022, monitoring occurred from July—September and in 2023, monitoring occurred from May—September. Six baited traps (five Fukui and one minnow) were deployed from shore at low tide once a month at Mission Beach and two sites on Near Island, for a total of 18 traps per month. The traps were allowed to soak for 24 hours then retrieved. No invasive green crab were detected during this study period. Common native species caught in traps were sculpin, kelp greenling, sea stars, shrimp, and helmet crab. All organisms caught in the traps were recorded and returned to the intertidal. This work and future monitoring is critical for the early detection of invasive green crab to inform sound management. Monitoring was supported through an internship program from the Prince William Sound Regional Citizens' Advisory Council.

Updates on highly pathogenic avian influenza in Alaska and beyond

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Highly pathogenic avian influenza (HPAI) is a viral disease that often results in serious illness or death among affected birds. HPAI was historically a poultry disease but has recently become an important wildlife disease, having affected primarily wild birds but also diverse terrestrial and marine mammals. In this presentation, background information will first be conveyed to provide an overview of the origins of HPAI, context as to how this disease has become more widespread through space and time, and updates on wildlife species and geographic areas recently affected. Next, information from two recent investigations of HPAI in Alaska will be presented that elucidates how this disease has spread across the state, through time, and among diverse species. Finally, information and ideas will be presented as to how everyone can be informed, be prepared, and take appropriate action should there be additional detections of HPAI in Alaska

Excavation of a 3,000-year-old House in Interior Kodiak Island

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How did Alutiiq ancestors use Kodiak Island's interior? Research beside Karluk Lake, one of Kodiak's largest salmon systems, is revealing settlement patterns and suggesting that people spent long periods away from the coast. In 2023, excavation uncovered a large, heavily built structure dating to about 3,000 B.P. A deep foundation, thick sod roof, and sod walls lined with planks reflect a substantial investment of labor and materials in construction, and perhaps use of the structure in the cold season. Household garbage, including the remains of woven grass mats, suggests the structure was a house and likely occupied in the fall.

Who Are We: What does it mean to be an Alutiiq/Sugpiaq person?

Introduced by:
***Dehrich Chya**, Alutiiq Museum, Kodiak, AK dehrich@alutiiqmuseum.org*

Who Are We is a film directed by Josh Branstetter, and produced by the Alutiiq Museum with support from the EVOS Trustee Council.

What does it mean to be an Alutiiq/Sugpiaq person? This short film by the Alutiiq Museum explores Alutiiq identity in the 21st century with interviews, historic photos, and songs in the Alutiiq language.

Genetics through time: understanding Pacific cod population dynamics using ancient and modern DNA

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Genomics tools provide key insights into many aspects of the ecology and evolution of a given species. These methods help researchers to facilitate a better understanding of both modern day population dynamics and the evolution of the species through the past.

We use modern day methods to first outline the population genetic structure of contemporary Pacific cod populations throughout the Gulf of Alaska and Bering Sea and second understand movement dynamics both seasonally and across ontogeny. We show that Pacific cod represent four distinct genetic groups that undergo variable movement patterns as adults and juveniles.

Finally, we are then using ancient bones of Pacific cod found in three locations around the Gulf of Alaska to evaluate the evolution of three of the four genetic groups of Pacific cod through the last two major climatic events: the Medieval Warming Periods and the Little Ice Age. These data are ongoing and we will show the methods we are employing to evaluate this research objective.

Unraveling the genetic basis of rapid diversification in rockfish

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Rockfish (genus Sebastes) is one of the most speciose group of vertebrates, with more than 100 species described worldwide. Most of this diversity is distributed in the northeast Pacific Ocean, where rapid speciation occurred repeatedly in separate lineages, often along a depth gradient. These speciation events are also accompanied by extreme life history changes, resulting in highly variable lifespan across rockfish species ranging from 11 years to over 200 years. In this project, we selected 17 rockfish species from 7 species pairs/trios and broadly sampled across their geographic distribution. Using whole genome sequencing of 947 individuals, we show different pairs and trios of species are in different stages of speciation with varying degrees of reproductive isolation. Within each species, there is a diversity of population structures, from range-wide panmixia to strong signatures of isolation-by-distance. Strikingly, we uncover several cases of cryptic diversity within species, where distinct populations exist in sympatry or parapatry and are potentially in the process of ongoing speciation. By implementing various population genetic analyses under a comparative genomics framework, we investigate the shared and unique genetic basis of rapid diversification in different groups of rockfish. We further construct a rockfish pangenome reference by assembling chromosome-level genomes for all species included in this study, which allows us to examine the roles of structural variation in speciation with an unprecedented resolution. Together, we demonstrate that rockfish harbor snapshots of speciation at its different stages, thus enabling us to study speciation in real time. Our findings lend unique insight into the mechanisms of ecological speciation and have important implications in lifespan evolution as well as in fisheries management.

Introgression and subtle population structure in threatened Pacific rockfishes

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Quillback and copper rockfishes are sibling species that range from Alaska to Baja California. The former are considered 'threatened' in B. C. and 'overfished' in the Southern U.S. due to continuing population declines. We leverage whole genome sequencing of individuals throughout their range to characterize genetic diversity and population structure within and between these species. Consistent with most marine fishes, we find very little population structure in both species, but significantly more geographic divergence in copper than in quillback. Further, we find distinct haplotypes that, in some cases, are shared between species, suggesting either introgression or segregation of ancient standing genetic variation. We also looked for shared adaptive variation associated with latitude in both species. While we found no overlap at the gene level, there was significant overlap at the gene function level, suggesting parallel adaption can take place at functionally related genes at different places in the genome.

Abstracts - Session 3: Living through change

Buskin River invasive crayfish

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Over the last twenty years, an invasive signal crayfish (*Pacifastacus leniusculus*) population has become established in the Buskin River Watershed, a local drainage on the Kodiak Road System in Kodiak Island, Alaska. The Buskin historically supported strong runs of sockeye salmon, an important cultural, subsistence resource for tribal members of the Sun'aq Tribe of Kodiak and Kodiak's residents. Over the same time span that crayfish have been within the Buskin, there has been an obvious decline in sockeye returning to the drainage to spawn. Signal crayfish are known to predate on fish eggs and over consume macroinvertebrates in the water bodies they invade, and the Sun'aq Tribe has been working to protect this subsistence resource by removing signal crayfish from the Buskin through direct means (snorkeling/diving, hand capture, electrofishing, and trapping). To pair with the ongoing control effort, current research performed by the Tribe is trying to understand the role signal crayfish play in the Buskin relating to their foraging habits and trophic level they fall under using 13C and 15N stable isotope analysis, movement and dispersal ability using acoustic telemetry monitoring, and their population abundance over time using multiple census mark-recapture. Preliminary data has shown that crayfish are predominately detritivores but largely consume macroinvertebrates within the Buskin during the spring-summer months. Crayfish movement on average was low but spiked due to seasonal behavior during the breeding season. Dispersal among monitored sites in Buskin Lake was detected indicating a higher chance for population expansion to areas of lower density.

Abstracts - Session 4: Landscapes and seascapes

Insonifying the Hidden Depths: An Exploration of Bathymetric Data Beyond Traditional Applications

***Ryan Cross**, Woolpert, Kodiak, Alaska, ryan.cross@woolpert.com*

Bathymetric survey, known primarily as a tool for ocean depth measurement, has evolved into a versatile tool with broad applications in marine research. This presentation dives into the many uses of bathymetric data, extending its scope beyond depth measurement. Advanced mapping techniques and high-resolution multibeam echosounders facilitate detailed seafloor analysis. These instruments enable the generation of precise elevation models and facilitate the analysis of seafloor sediment types based on acoustic reflectivity. Furthermore, high resolution bathymetric data allows for the identification and examination of various seafloor features, including bedrock outcrops, geomorphological structures, seafloor infrastructure, cultural resources, and debris. By offering insights into both natural and anthropogenic seafloor features, high-quality bathymetric data supports informed decision-making, exceeding its original purpose in maritime navigation safety. A significant portion of the Kodiak Archipelago has been mapped with modern bathymetric survey equipment and methods by the NOAA Office of Coast Survey within the last decade and is publicly available.

Abstracts - Session 4:
Landscapes and seascapes

Settlement history of a dynamic landscape: Archaeological survey of Tugidak Island

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Tuiy'uq—Tugidak Island lies at the far southern end of the Kodiak Archipelago and the Alutiiq/Sugpiaq world. Until recently, this remote part of the Alutiiq homeland had been little studied. In 2023, Alutiiq Museum archaeologists surveyed Tuiy'uq to expand understanding of its human history. Some parts of the island are experiencing severe erosion, while others have prograding beach ridges, lagoons, and dune complexes. This project highlights the need to understand coastal geomorphology to locate archaeological sites, and to interpret what the distribution of sites, including their absence, can reveal about Alutiiq history.

Abstracts - Session 4:
Landscapes and seascapes

Seascape Alaska: Working Together to Understand the Depths of Alaska's Vast Seascape

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Seascape Alaska is a regional campaign composed of federal, tribal, state, and non-governmental partners working across coastal and ocean waters throughout Alaska. The broad objectives of this campaign are to support the objectives of the National Ocean Mapping, Exploration, and Characterization (NOMEC) Council within Alaska waters. While Seascape partners share a common interest in the complete mapping of Alaska waters, this effort also supports a wide range of activities that fall under the exploration and characterization goals of this national effort. These activities include marine hazards and navigation, identifying and characterizing benthic marine habitats, identification of marine cultural heritage sites, exploring renewable marine energy sources and critical marine minerals and supporting fisheries management and subsistence activities. This group meets regularly to share plans and progress, to ensure data sources are widely known and available, and to maximize opportunities for collaboration. The Alaska Coral and Sponge Initiative at the Alaska Fisheries Science Center is focused on and contributes to objectives related to benthic habitat characterization and the exploration of parameters that influence the ecosystems and fishery resources of Alaska. A better understanding of the underlying oceanography and habitats of Alaska waters is a necessary step in supporting ecosystem-based fisheries management. We will present information on the progress of this campaign, its various subgroups, and discuss opportunities to get involved with this effort.

Abstracts - Session 4:
Landscapes and seascapes

Non-Breeding Ecologies of Tufted and Horned Puffins (*Fratercula cirrhata, F. corniculata*) from the Kodiak Archipelago, Alaska

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Tufted and Horned Puffins (*Fratercula cirrhata, F. corniculata*) are of conservation concern due to declining populations within their breeding range. However, uncertainty remains regarding the scale of and mechanisms for these declines. Conservation and management efforts are currently limited by lack of data for puffin complete annual cycles. To better understand puffin movements and habitat use during the non-breeding season, we deployed archival geolocation light-sensing (gls) tracking devices on both species in the Kodiak Archipelago, Alaska during the 2022 breeding season. During summer 2023, we retrieved 15 from Tufted and 3 from Horned Puffins. We present preliminary results from tracking data collected during the non-breeding season that represent year-one of a three-year study. Next steps include pairing ecological data on non-breeding distributions with isotopic diets and measurements of corticosterone deposition in winter-grown feathers. Results will allow us to assess non-breeding conditions experienced by individuals from known breeding and wintering locations. Species-specific information on *Fratercula* puffin non-breeding resource use and response to environmental variability is crucial for identifying and targeting management decisions and actions.

Abstracts - Session 4:
Landscapes and seascapes

Stepping up to the scale of the marine debris issue

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The Ocean Plastic Recovery Project seeks to harness the power of science, education, and storytelling to reverse the flow of plastics into the marine environment, restore critical habitat so that nature can thrive, and return ocean-recovered plastics to the circular economy. Initially formed in Oregon as a benefits corporation in 2018, OPR was reincorporated in Alaska in 2023. Funded primarily by a grant from NOAA\ through the Bipartisan Infrastructure Law, OPR is now building the first marine debris processing facility in the U.S., with plans to begin processing operations this summer. The facility is intended to address the issue of what to do with ocean plastics after they are collected--a problem which has stymied numerous marine debris removal programs in the region. As OPR builds out its capacity for recycling ocean plastics, we also hope to boost collection efforts. OPR has partnered with Alaska Sea Grant and the Aleut Community of St. Paul Island to form the Alaska Center for Marine Debris, which will advise Sea Grant on the distribution of $2M in marine debris removal grants across Alaska and provide technical assistance to applicants and grantees. Looking beyond grants, OPR has begun an effort to aggregate best available scientific and economic data in an attempt to quantify in dollars the environmental service value of ocean plastics removal and recycling. Our hope is to help launch a new sector of the blue economy focused on the restoration of impaired marine ecosystems.

Abstracts - Session 4:
Landscapes and seascapes

Nearshore Marine Bird Surveys in the Kodiak Archipelago 2011-2022

***Robin Corcoran**, U.S. Fish & Wildlife Service, Kodiak, AK, robin_corcoran@fws.gov*

The goals of the Kodiak National Wildlife Refuge nearshore marine bird survey were to determine archipelago–wide population estimates, long–term trends, and an index to annual productivity for key marine bird species relevant to management objectives, and to contribute data to a regional monitoring program for birds throughout the Gulf of Alaska (GOA). The survey included systematic sampling from a random start point and transects surveyed represented 19 21% of the nearshore survey zone and 4–5% of the offshore survey zone. Black–legged Kittiwake, Glaucous–winged Gull, Tufted Puffin, Common Murre, Harlequin Duck, Pigeon Guillemot, and Marbled Murrelet were the most frequently encountered species and accounted for approximately 85% of nearshore marine birds observed across all years. We present the first archipelago-wide population estimates and trends for a suite of marine bird species of conservation concern. Marine bird productivity as measured by the ratio of hatch–year to adult birds was generally consistent with broader patterns seen in the GOA. The 2015–2016 surveys coincided with the most extreme marine heat wave on record in the North Pacific in which maximum sea surface temperatures anomalies at times exceeded 3–6°C. During 2015 surveys, Common Murre density increased significantly, and correspondingly fewer Pigeon Guillemot and Marbled Murrelet were observed. These declines may have resulted from increased competition in the nearshore for forage fish due to increases in the number of Common Murres.

Abstracts - Session 4: Landscapes and seascapes

Ecosystem service evaluation of kelp farms versus natural kelp beds in Kodiak, Alaska

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Seaweed farming is a rapidly growing industry in Alaska. In 2022, Alaska produced 536,000 pounds of kelp which was nearly double the production of kelp in 2021. An important question for both scientists and industry is to better understand the ecosystem interaction of kelp farms in the nearshore environment. Discussions with industry and collaborators have identified that there is a need to quantify the ecosystem services, specifically habitat provisioning of kelp aquaculture for commercial or ecologically-important species. In fall of 2022, the Alaska Fisheries Science Center initiated a small scale study in Kodiak, Alaska to assess juvenile and adult fish habitat use of kelp farms. We asked a cascading set of basic questions 1) What is the species composition within a kelp farm versus a natural kelp bed, 2) How does the population change over the course of the grow-out season and, 3) What happens to the population post-harvest? We are using a three pronged approach to assess the habitat provisioning of local kelp farms and natural kelp beds through: visual surveys via gopro cameras; e-DNA collection and analysis; and juvenile fish collection via Standard Monitoring Units for Recruitment of Fishes (SMURFs). We present here our methods and preliminary results of our study.

Abstracts - Session 4:
Landscapes and seascapes

Accounting for Indigenous Well-Being in Fishery Science and Policy

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This research project was carried out in partnership with Igiugig Village Council. Igyaraq (Igiugig in Yup'ik) carries the meaning of like a throat that swallows water, a reference to its geographic location on the western shore of Lake Iliamna where the Lake feeds into Kuicaaq (Kvichak River). In this project, we examine Indigenous conceptions of equity, well-being, and sustainability. We pay particular attention to how sovereignty underpins and informs these interrelated terms and how they are co-articulated and achieved in Indigenous communities. As part of this project we created a three-part series on Science, Sovereignty, and Well-Being intended to serve as learning and outreach tools and resonate with the many audiences that we sought to reach through this project.

The first video in the series lays a foundation for understanding Indigenous hunting and fishing rights in Alaska. The second video focuses on equity and well-being in fisheries. The final video discusses the importance of social science research and data in fishery policy and decision-making.

This series was created in partnership with the Indigenizing Salmon Management research team. We thank our many advisors on this project including Janessa Esquible, Brooke Woods, Jonathan Samuelson, Carrie Stevens, Apay'uq Moore, Kevin Illingworth, and Igiugig Village Council.

Abstracts - Session 4:
Landscapes and seascapes

NOAA Ship Oscar Dyson

TBD Subject to ship schedule

The NOAA Ship Oscar Dyson, commissioned in 2005, is homeported in Kodiak and operates primarily in the Bering Sea and Gulf of Alaska. It is the first in a class of ultra-quiet fisheries survey vessels built to collect data on fish populations, conduct marine mammal and seabird surveys, and study marine ecosystems. The 208-ft. ship is a stern trawler capable of conducting trawling operations to depths of nearly 6,000 feet, and is equipped with sound-dampening technology to minimize altering fish behavior.

Crew with the Oscar Dyson will highlight the research conducted by the ship, share a day in the life aboard the vessel, and talk about opportunities on the vessel.

Shoreside ship tours are also scheduled (see program agenda).

Poster Abstracts

Aleutian Tern Breeding and Migration Season Movements 2019-2023

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Aleutian Tern (*Onychoprion aleuticus*) counts at known breeding colonies in Alaska have declined dramatically over the last several decades. Unfortunately, conservation planning is limited by the lack of information on breeding season site fidelity, formation of new colonies, and with-in season dispersal after colony failure and abandonment. We studied breeding season and migratory movements by fitting Aleutian Terns (n = 20) with 2g satellite telemetry tags at nesting colonies in the Kodiak Archipelago and Nome, AK from 2019-2023. Most tagged terns displayed extended fidelity to their capture location, with the maximum distance from their respective capture sites ranging from 60 to 190 km until the onset of migration from late July to mid-August. Several terns also spent time onshore near previously documented colonies and visited sites that potentially represent previously undocumented colonies. Onshore movements to active or previously documented colonies suggests these individuals may have attempted renesting after nest failure at their tagging site. All individuals with working tags at the time of migratory departure displayed steady long-distance migrations to Southeast Asia. Our initial results demonstrate that satellite telemetry tags are useful tools to study movements of Aleutian Terns and can help assess within season colony attendance patterns and identify previously unknown colony sites.

Quantitative PCR for Alexandrium cysts in Kodiak, Puget Sound and the Gulf of Maine: Regional and seasonal variability

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Alexandrium catenella is a paralytic shellfish poisoning-causing dinoflagellate that overwinters as a resting cyst, and then germinates into the water column in the spring. Winter cyst distributions have been used to develop seasonal and weekly *A. catenella* bloom forecasts for the Gulf of Maine, and an early warning system for blooms in Puget Sound, WA to mitigate human health risks and economic effects of shellfish closures. The forecast tools depend on estimating *A. catenella* cyst abundance in sediment samples using manual counting, but a quantitative PCR (qPCR) assay was developed here to provide a rapid, cost-effective alternative. The assay targets a region of the LSU rDNA gene and uses standard curves made from dilution series of *A. catenella* cysts. qPCR cyst abundance estimates are based on the quantity of rDNA copy numbers/cyst. One objective of this study is to use the PCR assay to map cyst distribution in the Gulf of Maine, Puget Sound and Alaska. Here, we evaluate Alexandrium cysts from the three regions to determine if differences in the number of target gene copies per cyst affect qPCR abundance estimates. We also examine the effect of seasonal variation in copies using cysts from a single site in Puget Sound. Regional variation was assessed using cysts from surface sediments in the central Gulf of Maine, Quartermaster Harbor in Puget Sound, and Chiniak Bay in Kodiak, AK. qPCR standard curves were constructed for each location using cysts concentrated from sediment samples. Comparison of regional curves showed significant differences in gene copy number among the three areas, supporting the need for a separate standard curve for each region. Seasonal variation in copy number was assessed using cyst samples collected every two months at Quartermaster Harbor during June 2022 – March 2023. Standard curve comparison will be used to test if one curve is sufficient for a whole year, or if there is a change in copy number over the study period. The results will be discussed with ramifications for the application for future management in the Southwest Alaska region.

Poster Abstracts

Mapping Alexandrium distribution in Kodiak to inform shellfish toxicity monitoring and bloom forecasting

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Alexandrium catenella, a dinoflagellate that produces toxins causing paralytic shellfish poisoning (PSP), blooms annually during the spring/summer in Kodiak. Shellfish in the Kodiak Archipelago show variability in toxin levels but generally exhibit some of the highest levels in AK, with the highest PSP incidence over the last decades. Years when *Alexandrium* blooms are intense are particularly dangerous, as the increase in shellfish toxicity renders health organizations and subsistence harvesters unprepared before toxicity monitoring data are available. Advanced warning of intense bloom years would therefore be instrumental for health surveillance organizations to increase shellfish monitoring and risk messaging before an intense bloom. *Alexandrium* HAB forecasting efforts in Kodiak have been initiated to provide advanced warning of the most dangerous bloom years. A first step in forecast development was a bloom survey in July 2023 to characterize *A. catenella* distribution in relation to hydrographic parameters and shellfish toxicity. Despite low shellfish toxicity levels at beach monitoring sites during the same period (< 80 µg/100g tissue), the bloom survey showed *A. catenella* cells reached bloom levels in Chiniak Bay, with cell concentrations reaching >3,000 cells/L. The highest *A. catenella* abundances were in high temperature surface water in the mainstem of Chiniak Bay. Further investigation, including into winter resting cyst distribution, will be used to compare spring cell distribution (May, 2024) with cyst abundance patterns to identify cyst seed beds contributing to blooms. These distribution data will be used to develop an *Alexandrium* bloom forecast model based on NOAA's Gulf of Maine HAB forecast.

Poster Abstracts

Seasonality of Bull Kelp Fertility in Kodiak and Juneau

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Bull kelp (*Nereocystis luetkeana*) is a foundation species that supports a diverse marine ecosystem and commercially valuable fisheries, and culturally, bull kelp is also important for subsistence and traditional practices. Additionally, bull kelp is also economically desirable as a food source and there is a growing effort to establish bull kelp farms along the southern Alaskan coast. Currently, the farming calendars being used for bull kelp cultivation are based on what has traditionally worked for other kelp species such as sugar kelp (*Saccharina latissima*) (Steckoll et al. 2021) and ribbon kelp (*Alaria marginata*). However, no studies so far have sought to understand the seasonal dynamics of bull kelp reproduction and how that might affect the kelp farming cycle in different locations within Alaska. In this study, we are aiming to answer the following questions about spore dynamics and seasonality: 1) how does the seasonality of bull kelp sori production and spore release vary between Juneau and Kodiak, two of the largest areas in Alaska for kelp mariculture, and 2) how does the amount of time since sori begin spore release affect the number/density of spores released and the ratio of motile to non-motile spores? In order to understand how timing since spore release impacts bull kelp spore motility, settlement and germination success, and gametophyte development, we are running monthly laboratory experiments culturing the microscopic stages of bull kelp in Kodiak and Juneau for the duration of 2024. Results so far indicate that spore dynamics can vary between neighboring patches within the same region, but ultimately, fertile sori can be available even in the early months of the year. Providing a better understanding of spatial-temporal variations in the bull kelp life cycle in Alaska can be beneficial for kelp forest conservation and how bull kelp dynamics vary between Juneau and Kodiak, two areas looking to cultivate bull kelp commercially.

Poster Abstracts

Does the presence of a pop-up satellite archival tag affect movement of Tanner crab (*Chionoecetes bairdi*) in an exposed Alaskan bay

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Fluctuating environmental conditions and crab population declines in the Bering Sea have elevated interest in pop-up satellite archival tags (PSATs) as a tool for investigating changes in crab spatial dynamics. However, PSATs are large relative to crab body size and may have some impact on behavior which could limit their utility in ecological studies needed for management and conservation efforts. Investigating such potential pitfalls is a critical step to ensure sound results are available for fishery managers. Accordingly, we tagged Tanner crab (*Chionoecetes bairdi*) with a small acoustic tag (n = 20) or with both an acoustic tag and PSAT (n = 20) and monitored their movements within an array of acoustic receivers in an exposed bay near Kodiak, Alaska. Using a suite of metrics (residence time, movement rate, mean position, terminal position, depth, speed, path straightness, and directional change) we did not detect any differences in movement or habitat use between tag groups over the 78-day study. The lack of differences could be due to the relatively small hydrodynamic forces acting on the tag compared to the crab. We encourage expanded use of PSATs in future crab research, but efforts should explore species-specific tag effects to further inform minimum crab size thresholds and ensure accurate movement and distribution information is available for fishery management decisions.

Poster Abstracts

Coloring iqalluut – fishing

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Alutiiq ancestors left behind the remnants of past meals in archaeological middens (trash dumps) across the Kodiak archipelago for generations. As part of a larger North Pacific Research Board research project (Genomic Resources for Alaska Rockfish Sustainability and Management), we have collaborated with the Alutiiq Museum and Archaeological Repository and Alutiiq artist Hanna Sholl to create "Coloring Iqalluut - Fishing", an innovative coloring book that illustrates the cultural, linguistic, and ecological importance of fish to the Alutiiq people of the Kodiak archipelago. This coloring book draws on biological, linguistic, ethnographic, and archaeological data to inspire illustrations of individual fish, underwater landscapes, and Alutiiq fishing gear. The coloring book, written in English and translated into the Alutiiq language, has reached a wide public across coastal Alaska and beyond, and serves as a unique resource for both biological and cultural information that now resides with the local community in Kodiak.

Poster Abstracts

Putting the Pieces Together: Red King Crab Movement and Distribution in Bristol Bay

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After 90 years of almost continuous commercial fishing on the Bristol Bay red king crab stock, this iconic crab stock has been declining steadily for the past decade, leading to fishery closures in 2021 and 2022. The North Pacific Fishery Management Council has been reevaluating protective measures for Bristol Bay red king crab. However, since red king crab distributions are only well documented in summer, it has been challenging for the Council to determine whether current and/or additional closure areas are likely to help red king crab by reducing bycatch in other seasons. For this reason, an October 2022 Council Motion stated that "the Council encourages continued research and testing on methods to gather data on interannual and seasonal distribution of crab, such as additional surveys and tagging studies". In response to this need for seasonal distribution data, we are using a multipronged approach including additional surveys, tagging, analyses of fishery data, and modeling. To date we have deployed 685 pop-up satellite archival tags and 503 acoustic tags on Bristol Bay red king crab throughout all seasons. In addition, a new survey was launched in 2023, with a focus of obtaining distributions during the late winter / early spring when crabs are molting and mating. Throughout these studies our goal has been to better understand the biology and life history of this stock, while providing the Council with pertinent data for evaluating the effectiveness of current or newly proposed protective measures for Bristol Bay red king crab.


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