Exxon Valdez Oil Spill Trustee Council
Long-Term Research and Monitoring, Mariculture, Education and Outreach
Annual Project Reporting Form

For Instructions for each section below, see Reporting Policy, II (B); the Reporting Policy can be found on the website, https://evostc.state.ak.us/policies-procedures/reporting-procedures/

Project Number: 24220302

Project Title: Sustainable mariculture development for restoration and economic benefit in the EVOS spill area

Principal Investigator(s): Ginny Eckert (University of Alaska Fairbanks), Katrina Hoffman (Prince William Sound Science Center), Caitlin McKinstry (Native Village of Eyak), Alex Huller (Alaska Fisheries Development Foundation)

Reporting Period: February 1, 2024 – January 31, 2025

Submission Date (Due March 1 immediately following the reporting period): March 1, 2025

Project Website: www.pwssc.org/mar-recon

Please check all the boxes that apply to the current reporting period.

☒ **Project progress is on schedule.**

Most components within the project are on schedule and proceeding as planned. See Project Timeline, Milestones, and Tasks tables and the Summary of Work Performed sections below.

☒ **Project progress is delayed.**

Project initiation was delayed due to the delay in release of funds from EVOSTC in the first year. As such, the timing of many activities shifted forward a year. With that shift in mind, the overall project is on track and making excellent progress.

Project Timeline, Milestones, and Tasks for FY22-FY26 from the final proposal are described within each of the tables below. "C" indicates completed, "D" indicates delayed, "X" scheduled as planned.

Table 1. These timelines, milestones, and tasks will be accomplished by PIs **Umanzor, Hollarsmith, Kelley, Pinchuk, Eckert, and Campbell**. Objectives addressed by these activities include Component 1: Mariculture and the physical environment, objectives 1.1, 1.2, and 1.4; Component 2: Mariculture interactions with biological communities, objectives 2A.1 and 2A.2, and Component 3, Enhancing farm production, objective 3A - Regional Variation.

	FY22				FY23				FY24				FY25				FY26			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone Objective 1																				
Equipment purchase/calibration			C	C																
Carbonate system deployment					C				C											
Sensor data/bottle sampling							C		C		C									
Carbonate chemistry data analysis								C		C		C								
Carbonate chemistry model prep										C		C								
Milestone Objective 1b																				
Purchasing/testing equipment			C	C																
Zooplankton and eDNA sampling			C	C	C	C	C	C	C	C	C	C								
Sample processing			C	C	C	C	C	C	C	C	C	C								
Data analysis and synthesis			C	C	C	C	C	C	C	C	C	C								
Milestone Objective 3A																				
Coordination/training with farmers						C	C		C	C	C	C								
Kelp and oyster sampling						C	C	C	C	C	C	C	X	X	X					
Sample processing							C	C			C	C			X	X				
Data analysis																X	X	X	X	X
Fatty acid analyses									D	D	D	D	X	X	X	X				
Isotope analyses									D	D	D	D	X	X	X	X				
Polyculture kelp/oyster sampling																				
Reporting																				
*Annual reports					C				C				X				X			
Final report																		X	X	X
Deliverables																				
Peer reviewed papers																	X	X	X	C
Data posted online												D				X				X

Table 2. These timelines, milestones, and tasks will be accomplished by PIs **Konar** and **Long** from the University of Alaska and NOAA. Objectives addressed by these activities include Component 2B, Benthic Communities, objectives 2B.1-2B.6.

	FY22				FY23				FY24				FY25				FY26			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone: Monitoring																				
Site Selection (evaluated annually)	C				C				C				X							
Recruit Graduate Student (changed to 2 masters students)											C									C
Supplies Purchasing	D	D			C	C														
Sampling – Field Work			D	D		C	C			C	C			X	X					
Sample Processing			D	D			C	C			C	C			X	X	X			
Analyses				D				C				C				X	X	X		
Reporting																				
Annual reports					C				C				X				X			
Final report																				
Deliverables																				
Manuscript publications								C											X	X
Contribute to data synthesis									C								X			
Present at conferences					C				C				X				X			
Website updates					D				C				X				X			
Data Upload					D				C				X				X			

Table 3. PWS-Specific Ecosystem Surveys. These timelines, milestones, and tasks will be accomplished by PIs **Cypher**, **Campbell**, and **Schaefer** from the PWSSC. Objectives addressed by these activities include 1.3, 2A.3, 2C, 2D, and 2E.1

	FY22				FY23				FY24				FY25				FY26			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Expand GWA LTRM to MAR (Objs. 1.3, 2A.3, 2C.1, 2D, 2E.1)																				
Equipment purchasing		C																		
Sampling cruises		D		C	C	C		C	C	C		C	X	X		X	X	X		X
Sample processing/data analysis				D		C		C		C		C		X		X				X
Fish imaging sonar (2C.2, 2C.3)																				
Equipment purchasing																				
Imaging sonar cruise (2C.2)					D			C	C			C	X			X	X			X
Data analysis					D			C	C			C	X			X	X			X
Compare sonar data to eDNA (2C.3)									D				X				X			
EcoPath modeling (2C.4)																				
Hiring of postdoctoral researcher				D	D									X						

Data compilation							D	D	D				X				X			
Data processing and model prep										D	D	D		X	X	X				
EcoPath modeling																X	X	X	X	X
Model adaptation to other regions																				
Reporting																				
Annual reports					C				C				X				X			
Final Report																				
Deliverables																				
Manuscript publication																	X			
Contribute to Data synthesis									D							X	X	X	X	X
Present at conferences									C								X			
Delta Sound Connections		X				X			C				X				X			
Website updates					D				C				X				X			
Data Upload					C				C				X				X			

Table 4. These timelines, milestones, and tasks will be accomplished by PI **Umanzor** from the University of Alaska Fairbanks. Objectives addressed by these activities include Component 3: Enhancing farm production, objectives 3C1, 3C2, and 3C3.

	FY22				**FY23**				**FY24**				**FY25**				**FY26**			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Objective 3C.1											C									
Measure photosynthetic activity and morphometrics					C	C														
Data processing and analysis						C	C	C												
Objective 3C.2 - ribbon kelp																				C
Measure the effect of trimming on kelp performance									C	C							X	X		
Sample processing											C	C								
Data processing and analysis													X	X						
Objective 3C.3 – sugar kelp																				C
Salinity and temp effect on juvenile sporophytes														X	X	X	X	X		
Data processing and analysis																	X	X	X	
Reporting																				
*Annual reports									C				X				X			
Final report																				
Deliverables																				
Peer-reviewed paper																				X
Data posted online									D				X				X			

Table 5. These timelines, milestones, and tasks will be accomplished by PI **Rehberg** from ADF&G. Objectives 2E.2, 2E.3, and 2E.4 are addressed in the Marine Mammal sub-component. Activity 2E.1 is on Table 3.

	FY22				FY23				FY24				FY25				FY26			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Objective 2E.2																				
Cooperatively designed farmer surveys	D	D	D							C	C	C								
Obtain farmer survey data				D				D				D				X				X
Summarize survey data					D	D			D	D			X	X			X	X		
Objective 2E.3																				
Install time-lapse cameras		D	D																	
Service cameras and retrieve data						D				D				X				X		
Analyze camera data							D	D			D	D			X	X			X	X
Objective 2E.4																				
Focused mitigation discussion and planning																X	X	X	X	X
Reporting																				
Annual reports					C				C				X				X			
Final Report																				
Deliverables																				
Interim results to study participants					D				D				X				X			
Marine mammal interaction workshop																X				X
Present at conferences									D							X				
Lay audience article or presentation												D	X							

Table 6. These timelines, milestones, and tasks will be accomplished by PIs **Eckert**, **Huller**, **Good**, **McKinstry**, and **Hollarsmith**. They address objectives 3A.3, 3B.1, 3B.2, and 3B.3 from Component 3: Enhancing farm production.

	FY22				FY23				FY24				FY25				FY26			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone: breeding program																				
Set up wet lab space	D	D	D	D											X					
Obtain broodstock					C	C														
Spawn and rear larvae					C	C		C	C			C	X			X	X			
Milestone: Grow-out on farms																				
Grow juvenile oysters in FLUPSY									C				X				X			
Grow-out on farms							C			C	C	C	X	X	X	X	X	X	X	X
Milestone: Physiology																				
Growth model												D				X				X
Reporting																				
Annual reports					C				C				X				X			
Final report																				
Deliverables																				
Peer reviewed paper																	X	X	X	C
Data posted online													X				X			

Table 7. These timelines, milestones, and tasks will be accomplished by PIs **Fong** and **Good**. They address objectives 4.1-4.4 from Component 4: Economic feasibility.

	FY22				FY23				FY24				FY25				FY26			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone																				
Literature Review				D	D	D	D	D	D	D	C	C								
Expert Opinion Solicitation							D	D	D	D	C	C	X	X	X	X	X	X	X	X
Seed Market Research							D	D	D	D	D	D	X	X	X	X				
Conceptual Hatchery Development								D	D	D	D	D		X	X	X				
Data Gatherings														X	X	X				
Baseline Bioeconomic Model Established															X	X	X			
Economic Model Simulation																X	X	X		
Final Report and Recommendations Preparations																		X	X	X
Reporting																				
*Annual reports				C				C				C		X						
Final report																				

Table 8. These timelines, milestones, and tasks will be accomplished by PIs **Fong, Sannito,** and **Good**. They address objective 5.1 from Component 5: Product Development. This component has experienced significant delays because of the difficulties in recruiting a post-doc for product development. The university conducted three searches for a seafood safety position to support mariculture product development and all were unsuccessful. The pool of candidates with this kind of expertise is small. We will submit a budget revision, change in scope, and new Deliverables Table to reflect that this position has not been and is not anticipated to be filled.

Milestone/Task	**FY22**				**FY23**				**FY24**				**FY25**				**FY26**			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone: Product Development Cycle 1																				
Phase 1: Engagement, Secondary Information Sources and Advisory Committee	D	D																		
Phase 2. Conduct Focus Groups and/or Expert to Define Product Attributes and Survey Design		D	D	D																
Phase 3. Consumer taste Panels and/or Value Chain Intermediary Product Evaluation				D	D	D	D													
Phase 4. Dissemination of Results and Outreach Activities							D	D												
Reporting																				
*Annual reports				C				C												
Final report								C												
Deliverables																				
Peer reviewed paper									D	D	D	D					X	X	X	X
Data posted online									D	D	D	D				X	X	X	X	
Outreach Activities and Extension Publication								C				D							X	X
Milestone: Product Development Cycle 2																				
Phase 1: Engagement, Secondary Information Sources and Advisory Committee									D	D	D	D		X	X	X				
Phase 2. Conduct Focus Groups and/or Expert to Define Product Attributes and Survey Design										D	D	D			X	X	X	X		

Phase 3. Consumer taste Panels and/or Value Chain Intermediary Product Evaluation											D				X	X			
Phase 4. Dissemination of Results and Outreach Activities																X	X		
Reporting																			
*Annual reports											C				X				X
Final report															X				X
Deliverables																			
Peer reviewed paper																X			
Data posted online																X			
Outreach Activities and Extension Publication															X	X	X	X	
Milestone: Product Development Cycle 3																			
Phase 1: Engagement, Secondary Information Sources and Advisory Committee																X	X		
Phase 2. Conduct Focus Groups and/or Expert to Define Product Attributes and Survey Design																	X	X	X
Phase 3. Consumer taste Panels and/or Value Chain Intermediary Product Evaluation																			X
Phase 4. Dissemination of Results and Outreach Activities																			
Reporting																			
*Annual reports																			X
Final report																			
Deliverables																			
Peer reviewed paper																			
Data posted online																			
Outreach Activities and Extension Publication																			

Table 9. These timelines, milestones, and tasks will be accomplished by PIs **Good, Huller,** and **Eckert**. They address objectives 6.1-6.4 from Component 6: Outreach.

	FY22				**FY23**				**FY24**				**FY25**				**FY26**			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone: Objective 1																				
Task 1: Farm site visits			C		C		C			C	C			X	X			X	X	

Task 2: Create and update information clearinghouse					C				C				X				X			
Task 3: Farmer extension and support	C	C	C	C	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X
Task 4: Training workshops - exact timing TBD	C			C	C			C	C			C	X			X	X			
Task 5: Annual meetings					C				C				X				X			
Milestone: Objective 2																				
Task 1: Create videos and outreach materials			C				C				C				X				X	
Task 2: Host listening sessions			D				C				C				X				X	
Task 3: Create FAQs or other docs				D				D				C				X				X
Milestone: Objective 3																				C
Task 1: Host workshops								D				C								
Reporting																				
*Annual reports					C				C			C	X				X			
Deliverables																				
Videos and outreach materials				D				C				C	C			X				X

Table 10. These timelines, milestones, and tasks will be accomplished by PI **Hoffman**. They address objectives 7.1-7.3 from Component 7: Administration.

	FY22				**FY23**				**FY24**				**FY25**				**FY26**			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone: Program planning & coordination																				
Annual program planning			C				C		C				X				X			
Circulate annual PI mtg. notes				C				C				C				X				X
Milestone: **Fiscal administration**																				
Issue subaward contracts		C			C				C				X				X			
Annual audit field testing				C				C				C				X				X
Milestone: Reporting																				
Annual reports					C				C				X				X			
Final report to sponsoring fiscal agency (5-year allocation)																				X

☒ Budget reallocation request.

Due to the delayed release of EVOSTC funds, we submitted a no-cost extension request to the EVOSTC Director, which was approved April 12, 2023. We plan to submit another no-cost extension request for FY24.

Components within the Mar ReCon project submitted budget reallocation requests during FY24. On February 28, 2024, PIs Eckert (Farm, Econ, Production, Outreach Component) and Hollarsmith (Oysters) requested rebudgets. These requests were approved April 9, 2024. On July

12, 2024, PI Hollarsmith (Oyster) requested a new budget reallocation, which was approved on August 15, 2024.

☒ **Personnel changes.**

Hannah Wilson, a former project PI and member of the project leadership team (Industry Lead), left her position with AFDF. Her role has been filled by Alex Huller, the Mariculture Development Program Manager for AFDF. Alex holds a Master's degree in Biodesign from Central St. Martins, where she concentrated her research on seaweed, working on a kelp farm in the Scottish Highlands. A 2-page C.V. for Alex Huller is included at the end of this document.

Caitlin McKinstry, the marine biologist and leader of the Native Village of Eyak's mariculture program, is now filling the role of Community Lead (previously filled by John Whissel). Caitlin has a Master's degree in Marine Biology from the University of North Carolina at Wilmington and brings more than a decade of experience in marine biology, conservation, and research. A 2-page C.V. for Cailtin McKinstry is included at the end of this document.

Other personnel changes include the departure of Henry Fleener from his position in support of Component 3B, and the addition of James Crimp in support of Component 1.

1. Summary of Work Performed:

Overview

The overarching goal of the Mariculture Research and Restoration Consortium (Mar ReCon) is to support restoration, habitat enhancement, and economic development through research and partnerships between scientists and seaweed and shellfish farmers. The project is comprised of seven components organized within three broad categories: Restoration, Farm and Business Development, and Program Management. Each component consists of several subcomponents that are linked with other subcomponents in the project.

The project has made progress toward achieving project objectives, including the continuation of fieldwork to monitor the impacts of mariculture on the environment and biological communities (and vice-versa), completion of the facilities for microalgae cultivation and shellfish production at the TSMRI hatchery, initiation of the economic feasibility analysis and product development work, delivering training workshops and outreach materials, submitting papers for peer-review,

and presenting at professional and community meetings. Additionally, kelp and oyster farmers have now completed a full year of sampling and data collection.

A summary of the work performed by Mar ReCon during the reporting period is presented for each component below.

Component 1: Mariculture and the Physicochemical Environment

All nine farms across the three regions are fully outfitted with production arrays and oceanographic sensors. Over the course of this year, the production arrays and sensors fared well. Environmental data were successfully downloaded and data QA/QC completed. Oysters and kelp were both successfully deployed in the production arrays (described further in Component 3A). Farm visits were conducted to all sites several times during the year for swapping of oceanographic sensors, which included offloading data and replacing with calibrated units. All of the array structures and lines were also cleaned and examined for wear. Offloaded sensor data is being QA/QC'ed and shared with collaborators as it becomes available. J. Crimp has been brought on to this component and has been managing data organization and flow, as well as assisting with production array fieldwork. Throughout the year, partner farmers have collected water samples and CTD casts. Water samples were filtered on site by farmers and analyzed for inorganic nutrients at the NOAA Ted Stevens Marine Institute. At the 2025 annual meeting, researchers worked with the farmers to provide continued training on use of the RBR CTDs and water collection protocols. Revised protocols and instructional videos were also made for farmers to view to enhance data collection.

Environmental data collected as part of this component reveal variations in temperature and salinity both seasonally and spatially. Farms in Kachemak Bay and Kodiak followed similar trends throughout the year, while farms in Prince William Sound (PWS) were found to be warmer and fresher.

Carbonate chemistry moorings were deployed at one kelp farm in each region in late fall 2023 through spring 2024 and measured parameters that were used to calculate overall net CO_2 flux from each farm. Integrated over the entire deployment, two sites demonstrated net negative air-sea CO_2 fluxes at the kelp farms while one was characterized as a net source of carbon: -84,397 mol m^2 in Jakolof Bay, -11,115 mol m^2 in Kalsin Bay, and 543 mol m^2 in Windy Bay. (Fig. 1). We believe these are the first values of farmed kelp carbon sequestration for the state of Alaska. We deployed all moorings for the second year of data collection for this component which we

will retrieve in spring 2025. The manuscript highlighting this research is in the final stages of editing and should be submitted for peer review to a research journal by May 2025.

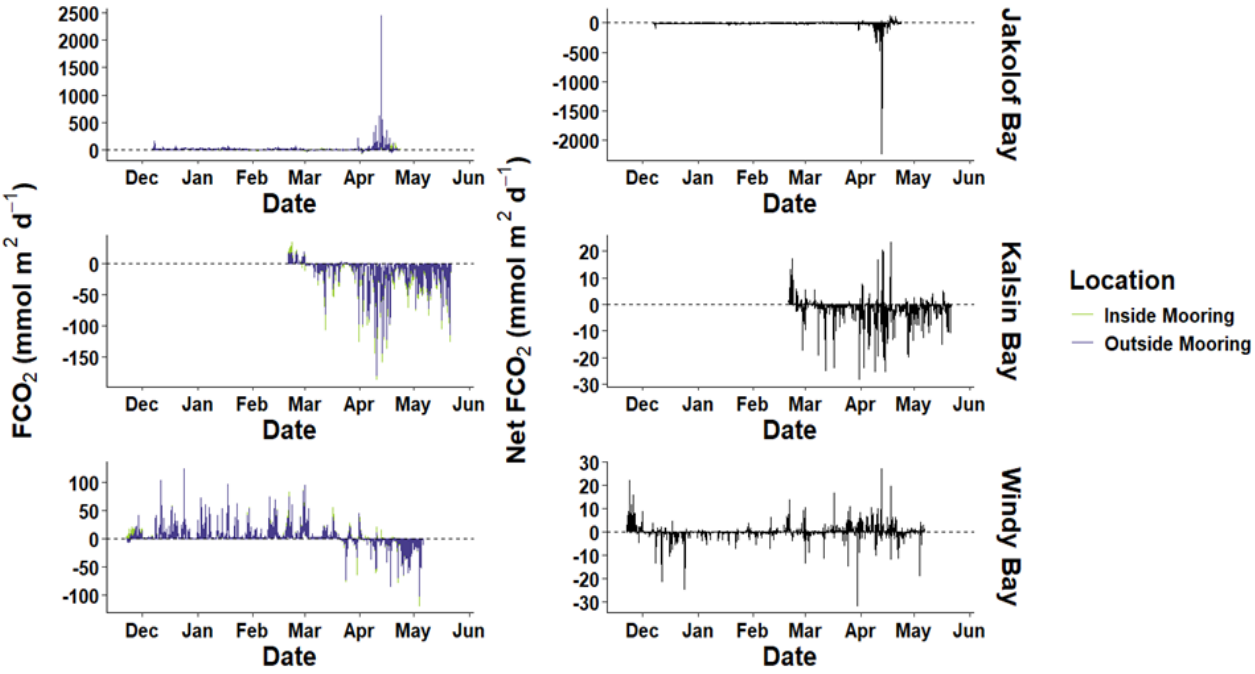


Figure 1. Variation in air-sea CO_2 fluxes (FCO_2) across the kelp growing season at three different sites and the net FCO_2 representing the inside versus the outside fluxes in the 23-24 kelp growing season.

Additionally, physicochemical sampling was conducted during the joint oceanographic/bird/mammal surveys in March, May, July, and November aboard the *M/V New Wave*. All data has been archived in the Gulf Watch Alaska Research Workspace.

Component 2A: Mariculture with Biological Communities, Plankton

PI Campbell completed surveys in PWS in March, May, July, and November and plankton were collected at all stations. Plankton identification is very time intensive and is generally done within a year of collection. The samples are in the analysis pipeline and will be processed in FY25.

Component 2B: Mariculture with Biological Communities, Benthic Communities

To examine benthic community structure, multiple kelp farms and matching control sites in Kodiak, Kachemak Bay and PWS were sampled in summer 2024 (resurveyed same sites from 2023). We also sampled one additional "planned" site in Kachemak Bay and two in PWS. Sampling included epibenthic percent cover, abundance and biomass, and also infaunal abundance and biomass. Substrate type, depth, and slope were also recorded. These samples have mostly been processed, and posters were presented at the 2025 Alaska Marine Science Symposium and the Alaska Mariculture Conference. To begin to explore bivalve growth differences between farm and control sites, traps with mussels were deployed at three oyster sites in Kachemak Bay, one oyster site in PWS, and four control sites (three in Kachemak Bay and one in PWS). Mussels were tagged with a section of monofilament line glued to the edge of the mussel so that they can be measured for new growth after one year. We are also continuing to monitor biofouling communities using photo-quadrats. For this, oyster farms were surveyed in Kachemak Bay in July and August 2024 and in PWS in September 2024. From Ulaski and Konar (2024) and our continued monitoring, we understand that oyster cage cleaning adds much variability in our biofouling community results. To try to address this, we deployed minnow traps at farms and their controls that will not be cleaned. We will survey these communities after one year to explore the use of this method for quantifying biofoulers without cage cleaning. Lastly, we will continue to explore site characteristics to determine if any of these can be used to correlate to benthic or biofouling communities.

Component 2C: Mariculture with Biological Communities, Pelagic Fish

Acoustic data (120 kHz) was collected for Objective 2C.1 during the joint oceanographic/bird/mammal surveys in March, May, July, and November. Data processing and statistical analysis will commence in 2025.

During this reporting period for Objective 2C.2, we:

- sampled 4 and 5 farms in PWS in spring and fall 2024, respectively,
- completed preliminary data processing and statistics for 2024 data,
- re-added control sites in fall 2024, and
- issued a letter of hire for a postdoctoral researcher to join the Mar ReCon project.

Sampling Methods Update: In addition to the Mar ReCon-selected farm sites, we added 2 farms to our imaging sonar sampling (Fig. 2), Wild Blue Mariculture and Noble Ocean Farms (NOF), which are both seaweed farms located in Simpson Bay of PWS. These additions will improve

our ability to resolve patterns in how fish interact with farms as they provide 3 similar style farms in the same bay in PWS and a total of 5 farms.

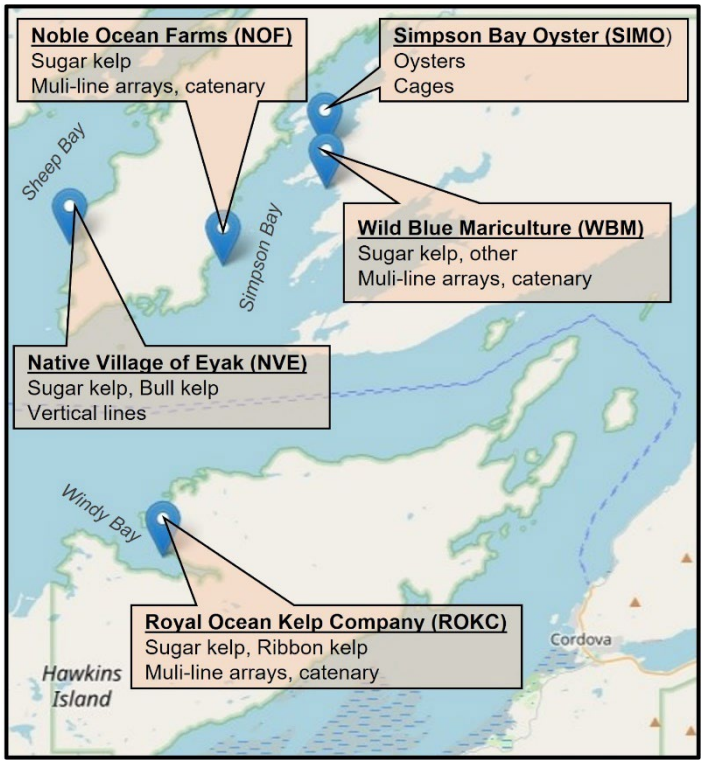


Figure 2. Map of eastern PWS showing the locations of all five farms included in imagining sonar deployments with the species grown and gear type used.

For each farm sampling, the imaging sonar with a mounted go pro camera was deployed off the side of farmer-operated vessels to a depth of 5-10 ft, depending on the depth of the farm. This occurred at two sites within each farm which was consistent between fall and spring sampling. After a 15-min acclimation period, the imaging sonar recorded 20-min files over the course of 2 hours (96 beams, 10-15 range, 2.5-9.2 frame rate). Transects were also conducted during the spring 2024 sampling point, but data processing of sonar imagery from a moving vessel had poor resolution and the movement and sound of the vessel was speculated to be disruptive to fish interactions with farms. Therefore, transects were omitted in exchange for additional time sampling from stationary sites. Once positioned, the sonar is oriented using an AR3 rotator to include part of the farm infrastructure in the viewing area. The position of the sonar viewing area was monitored throughout recording. Similar methods were utilized for control sites in fall 2024, which were chosen based on similar bottom depth and distance from shore as farm sites.

Data processing and statistics: Data processing of each sonar video file was completed using host software, ARISFish (Sound Metrics). Fish encounters were identified using the echogram feature which generates a visual representation of an entire video file so that each pixel represents a single frame. When a fish swims into the sonar field of view, a track is visible in the echogram (Fig. 3 for example). Each echogram was assessed for fish tracks and each fish was marked. After marking each fish, the length and thickness of each fish, in addition to their distance from farm infrastructure, was recorded. These data have not yet been standardized using objects of known length in the sonar field. When schools of >20 fish moved through the sonar field, it was difficult to generate accurate counts using this method. Each school was subsampled for 10 fish lengths and thickness measurements. Then, three screenshots of each fish school were taken and processed in Image J using the analyze particles tool to count fish and estimate the density of the fish school (area of fish/area of total school*100; data not displayed). In total, the following end points were collected from each sonar video file: type of fish encounter (e.g., individual, school), frame of first encounter, duration of encounter, range (distance from sonar), bearing (angle of movement), total length, thickness (at thickest point of body), distance to nearest visible farm structure, total area of school, summed area of fish, and density of fish school. This was also recorded with indicators of effort which include time spent sampling and the range/area that the sonar is sampling.

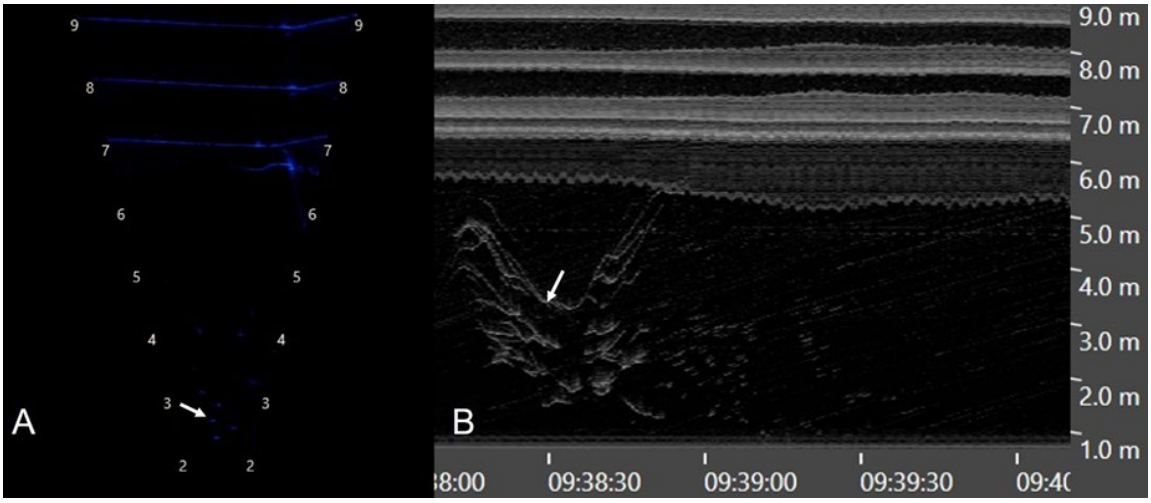


Figure 3. Example of a fish encounter when observed in the sonar field of view (A) and as a fish track on the echogram (B). White arrows indicate fish or fish track.

Go Pro videos are used to confirm fish encounters and attempt to identify to species. However, visibility is often a barrier due to storms in the fall and bloom cloudiness in spring.

For statistics, we used a size-spectra analysis as described in Olsen et al. (2023). This analysis offers a means to describe fish community structure when identification of fish species is difficult or not possible. Body sizes and abundances are used to produce spectra from linear regressions of log-transformed counts which are centered on the midpoint of total length bins. The slope of the resulting regression represents the size structure of the observed fish with negative slopes indicating a greater abundance of small fish. A positive slope indicates a greater abundance of larger fish, indicative of higher predation risk in the observed habitat.

Additional time points are necessary to provide better resolution of patterns. However, fish and school encounters (per unit of effort; Fig 4A, B) were higher during fall sampling at farms than in the spring. This was also indicated by raw fish count data (Fig. 4C). In total, 3,049 fish were observed during sampling in 2024 with 2,754 fish being observed in the fall. The remaining 295 fish were observed in a single school at the Native Village of Eyak (NVE) research farm in Sheep Bay. The size spectra analysis (Fig. 4D) indicated that the assemblage of fish observed for three farms during the fall of 2024 (Noble Ocean Farms, Royal Ocean Kelp Company, and Simpson Bay Oyster Farm) was represented by smaller fish species and thus a lower risk of predation. There was insufficient data to resolve a pattern for fish observations in the spring. Additional data collection will determine whether fish encounters continue to be higher in fall than spring or if the assemblage of fish interacting with farms is primarily smaller fish. We will continue to explore additional data processing and statistical methods for improving this analysis, including automating fish detections.

Control sites: Control sites were re-added to collection efforts for the fall of 2024 (See 'Response to EVOSTC Review, Recommendations and Comments' for rationale). Control sites were identified while in the field and chosen based on similar distance from shoreline and bottom depth to the respective farm. Chosen sites were 100-500 meters from the farm infrastructure. No fish were observed at a control site during the fall of 2024.

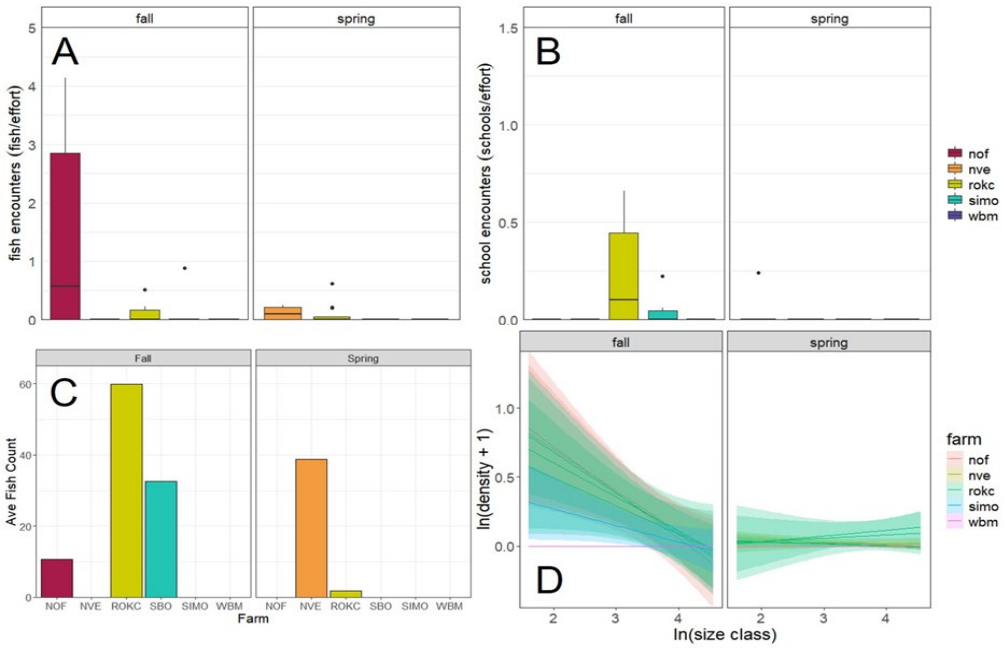


*Figure 4. Preliminary analysis of one year of imaging sonar sampling data for fish. The rate of individual fish encounters (A) and fish school encounters (B) per unit of effort (time*range) was higher in fall and spring. Average fish counts (C) were higher at farms in the fall and the averaged fish size-spectra (D) indicates that smaller fish comprise most of the fish encountered at farms. Farm abbreviations: NOF = Noble Ocean Farms, NVE = Native Village of Eyak, ROKC = Royal Ocean Kelp Company, Simpson Bay Oyster = SIMO, Wild Blue Mariculture = WBM.*

Letter of Hire: In April 2024, we issued an announcement to hire a postdoctoral researcher to assist with Objective 2C.4, which will conduct modeling work (e.g., EcoPath modeling) across the Mar ReCon project with the goal of quantifying farm effects on the spill-affected area. We have issued a letter of hire to Angela Korabik, who is currently an Alaska State Sea Grant Fellow with NOAA AFSC in Kodiak. She will begin working at PWSSC in April 2025 and attended the Mariculture ReCon project Annual meeting in January in Kodiak to meet the team and introduce herself. Hiring was delayed due to the overall delay in the start of the Mar ReCon project and in data collection by all PIs which will inform her work.

Additional changes: For Objective 2C.2, the use of an ROV for camera-mounting was changed to mounting the camera directly onto the imaging sonar. The ROV owned by PWSSC has not been available and we have found that video is more useful if recording in the same direction as the imaging sonar. The completion of Objective 2C.3 is hinged upon eDNA data collection (2A.1) and is tabled for a later year due to eDNA being slated for the latter five years of the Mar ReCon project, which may not occur.

Component 2D: Mariculture with Biological Communities, Marine Birds

PI Schaefer conducted marine bird and mammal surveys in eastern PWS in March, May, July, and November as planned. Surveys were conducted from the PWSSC research vessel, *M/V New Wave* in three bays with varying levels of mariculture development. We now have over 2 years of sampling data (November 2022-November 2024). So far, Simpson Bay (highest level of mariculture development) has hosted the highest density of marine birds in each survey month (Fig. 5). Marine bird densities were highest in Simpson and Sheep Bays (intermediate level of mariculture development) during November, and highest for St. Matthews Bay (no mariculture development) during May. To date, *Brachyramphus* murrelets have dominated the marine bird community in Simpson Bay, while the community composition in Sheep and St. Matthews Bays has been much more mixed. All data have been QA/QC'ed and uploaded to the Research Workspace.

PI Rehberg conducted marine bird and mammal surveys near Kodiak Island in March, May, July, and November (Fig. 6), and in Kachemak Bay in July (Fig. 7). Surveys at Kodiak Island were conducted on the small landing craft *M/V Lady Sea* and surveys at Kachemak Bay on a 22-ft ADF&G Safeboat equipped with an observation perch 2.5 m above waterline. Transect surveys covered areas of higher, intermediate, and no mariculture development. Surveys at Kodiak Island were conducted by ADF&G and Sun'aq tribal biologists and Kachemak Bay surveys conducted by ADF&G biologists and technicians. Difficulty scheduling surveys at Kachemak Bay have been resolved for FY25 by securing the assistance of the ADF&G Homer office for the 4 survey months required.

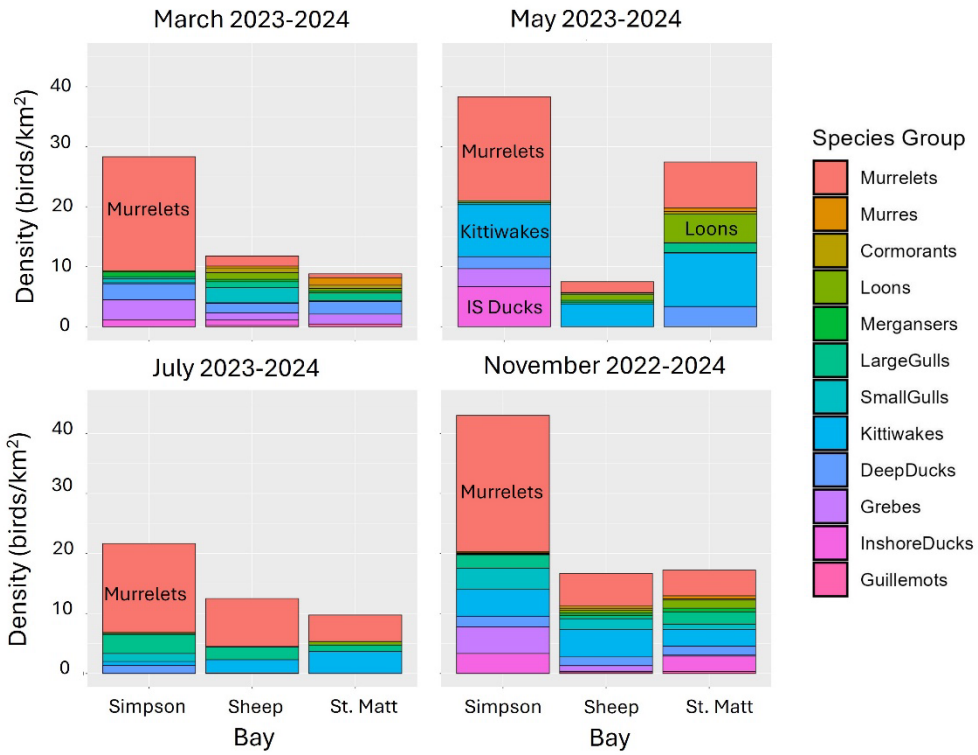


Figure 5. Marine bird community composition recorded during at-sea strip-transect surveys in Prince William Sound, Alaska, November 2022-2024.

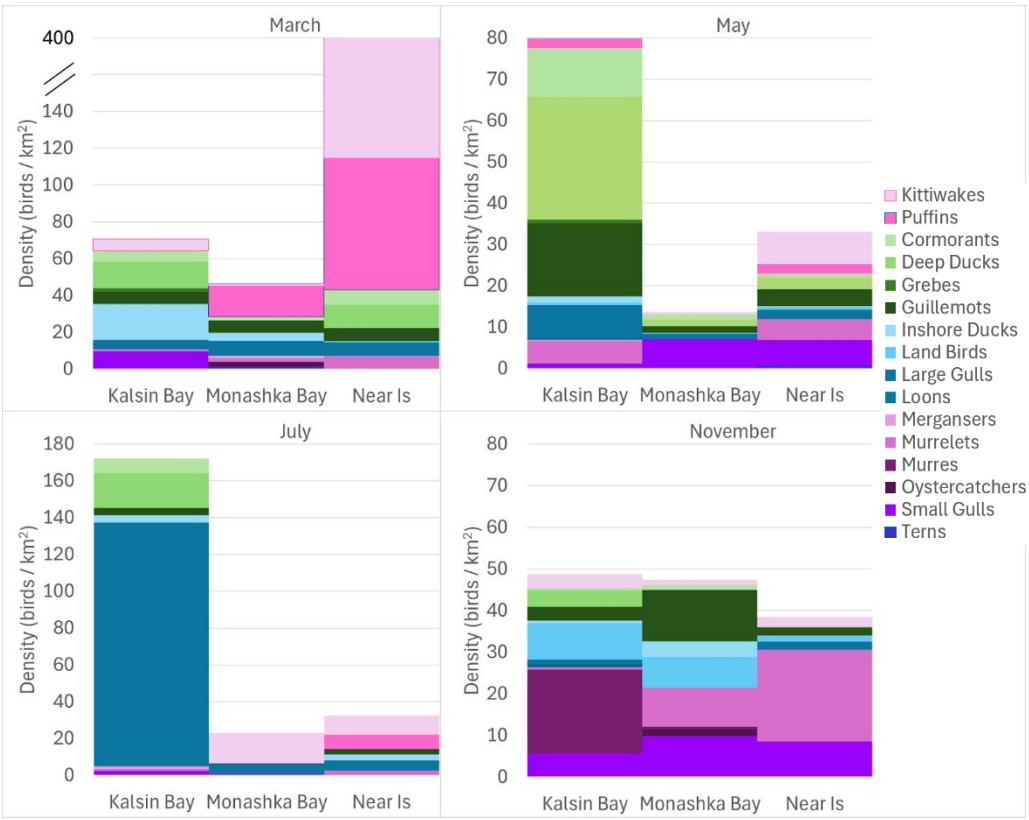


Figure 6. Marine bird community composition recorded during at-sea strip-transect surveys near Kodiak, Alaska during 20 24. March and July bird density axes are longer due to large rafts or colonies of black-legged kittiwakes, puffins, and large gulls observed at the Near Island tide rips and within the narrow Kalsin Island passage within 150 m of transect. March black-legged kittiwake density scale is broken to improve readability of other bird species group values.

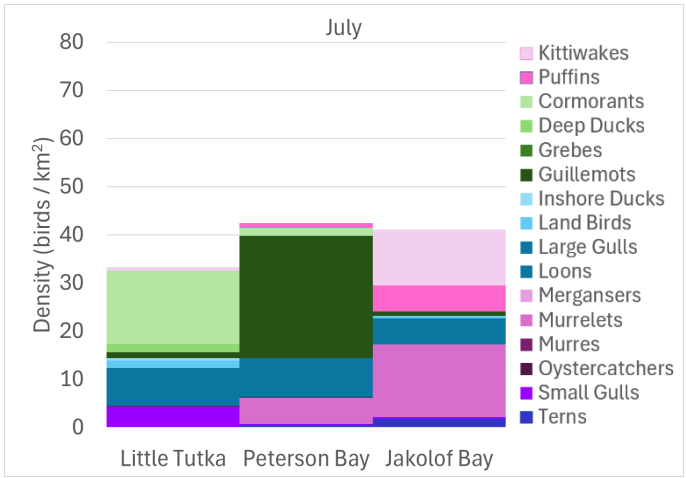


Figure 7. Marine bird community composition recorded during at-sea strip-transect surveys in Kachemak Bay, Alaska during July 2024.

Component 2E: Mariculture with Biological Communities, Marine Mammals

Objective 2E.1: PI Rehberg conducted marine bird and mammal surveys near Kodiak Island in March, May, July, and November, and in Kachemak Bay in July. PI Schaefer conducted at-sea strip transect surveys in Prince William Sound in March, May, July, and November. So far, sea otter encounter rates (otters/km) within the 300-m transect strip have been examined. Simpson Bay hosted the highest number of sea otters, with their distributions spread along the entire length of the survey transect (Fig. 8). In Sheep and St. Matthews Bays, sea otters tend to be distributed closer to shore and closer to the head of the bays. Further data processing and summarization (e.g., examining distribution patterns of other marine mammal species) is on-going. All data have been uploaded to the Research Workspace.

Objective 2E.2: Mariculture ReCon staff created a Survey 1-2-3 app to record geo-linked mammal observations which operates on the tablets provided to farmers for project use and records the data to ArcGIS Online. They included the ability to record farmer arrival and departure from the farm, providing a measure of observer effort. PI Rehberg has delegated testing and launch of this project to a Fish & Wildlife Technician IV (3 months during FY25) to evaluate and test the app during scheduled transect survey field trips in March and May 2025, determine changes to be made from their testing experience, and to engage and educate farmers on the app usage for mammal observations made while farmers are working on-site. Farmer observations include: presence/absence of marine mammal species in and near the farms, evidence of marine mammal interactions with farms (e.g., gear damage, depredation, actual sightings of interaction), and other incidental sightings or observations of interest to farmers outside the sampling period. Earlier progress on the work was delayed due to the PI not assigning sufficient staff time with relevant expertise to do the work. Plans to ramp up this part of the project were optimistic on the PI's part. During the January 2025 PI meeting, farmer feedback indicated they were eager to start receiving more information on mammal presence in and around their farms, and we will meet this need.

Objective 2E.3: The original method proposed to make continuous measurements of marine mammal presence and absence at farms and control sites was to purchase and deploy one high-end SLR camera-based unit at one farm per year (approximately $5,000 per unit), collecting data year-round. Since this project began, ADF&G as a whole has invested heavily in using lower-cost "trail cameras" (e.g., Reconyx, Inc.) to record wildlife presence/absence, and now holds expertise, data management ability, and analysis software to process trail camera images. Given

this pool of experience and tools developed to manage ADF&G's approximately 140 active cameras, and following advice of trail camera and image recognition program managers in Alaska, California, and at Google, Inc., we have acquired and are testing several units during March - July 2025. Potential camera placements were discussed with 2 farmers per region and requests to install cameras were granted. During FY24, an ADF&G Biometrician II assisted the PI with laying out a study design, sampling plan, and the proposed model for analyzing results. An ADF&G Fish & Wildlife Technician IV is presently assigned (4 months during FY25) to assist testing during Spring and to conduct full deployment as farmers become available mid-Summer to Fall 2025. Earlier progress on this work was delayed pending assignment of sufficient staff time to do the work. Plans to ramp up this part of the project were optimistic on the PI's part. During the January 2025 PI meeting, farmer feedback indicated they were eager to start receiving more information on mammal presence in and around their farms, and we will meet this need.

Reviewer comments regarding proposed changes to this objective are addressed below (see 'Response to EVOSTC Review, Recommendations, and Comments').

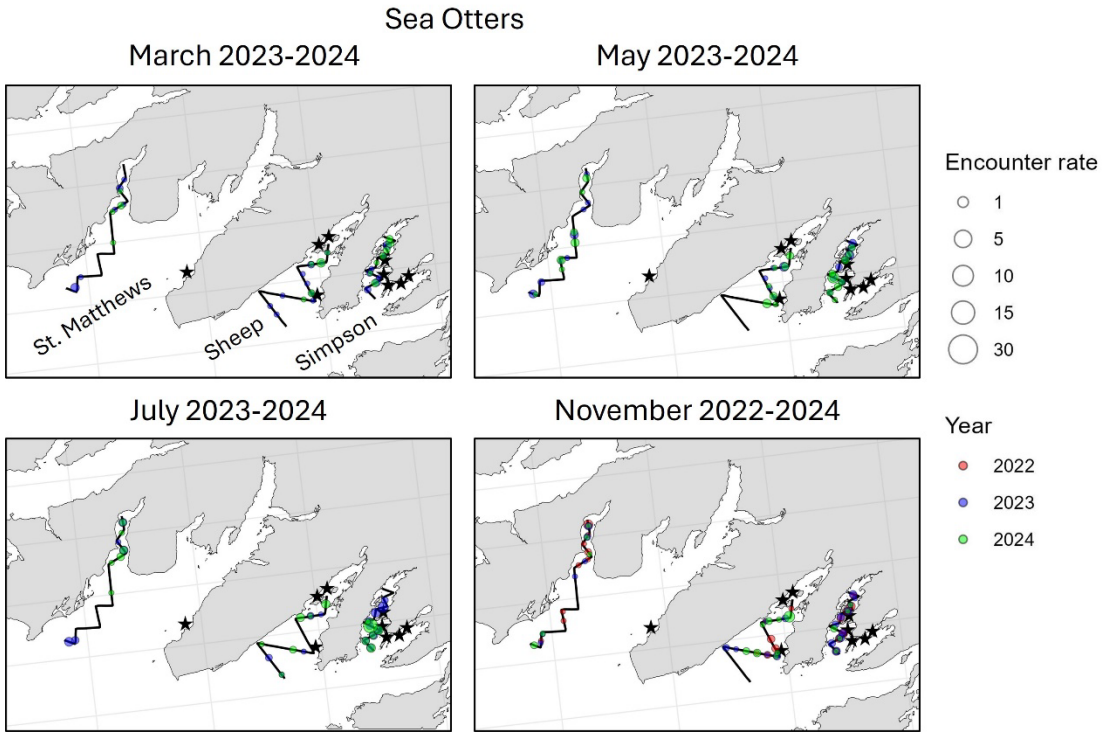


Figure 8. Sea otter encounter rates (otters/km) within the 300-m transect strip during at-sea surveys in Prince William Sound, Alaska, November 2022-2024. Active mariculture sites are indicated by the black stars.

Component 3A: Drivers of Regional Variation in Production

We explored a variety of commercially available oyster cages for use in the production arrays and selected OysterGro cages based on their durability and versatility of attachment. These cages are used throughout North America and are an innovation in oyster growing because of the combined ability to flip the cages and control growth of fouling organisms and to grow oysters at the surface. Cages were ordered from the parent company in eastern Canada and shipped to each region and installed in the arrays in May and June.

We deployed 14,040 oysters to all nine production arrays in May 2024 (540 sub-market size, 13,500 seed). In September 2024, we sampled 790 oysters (sub-market size and seed), representing all sites and one growing season. For each oyster, we collected morphometric data (shell length, width, height; total weight; meat weight; calculated cup ratio) and prepared samples for tissue chemistry analyses (lipids, isotopes, fatty acids, percent moisture). Chemistry analyses are delayed due to delays in deploying oysters to the arrays and trouble-shooting of methods in the chemistry labs. T0 samples (pre-deployment) are complete and T1 samples are currently being processed. We conducted initial statistical analyses and found significant differences in growth and morphology between regions and between farms in this first growing season.

The outplanting of kelp in 2023-2024 was considered a 'test' year to get farmers familiarized with all protocols. The 2023-2024 year included outplanting kelp at eight out of nine farms and collecting water samples for nutrient determination. Only two farms successfully grew kelp, and we determined that the main driver of such low recovery was unsuccessful kelp seeding at the source hatcheries. To address these challenges, we sourced kelp seed for 2024-2025 for all sites from one kelp hatchery and had excellent results. Kelp seed was outplanted in late 2024 and will be harvested in spring 2025.

To determine whether kelp provide a carbon subsidy to farmed oysters, *Crassostrea gigas*, and the Pacific blue mussel, *Mytilus trossulus*, we carried out a bulk stable isotope study ($\delta^{13}C$ and $\delta^{15}N$), sampling in April, June, August, and December 2023. While $\delta^{13}C$ values remained comparable for both bivalves across sampling periods, *C. gigas* had higher $\delta^{15}N$ values than *M. trossulus*, indicating that although both bivalves ultimately derive carbon from similar sources of primary production, *C. gigas* feeds at a higher trophic level. Mixing model results indicate that macroalgae contributed 4–58% of the assimilated carbon in *C. gigas* and 25–75% in *M.*

trossulus. These results suggest that farming shellfish in areas with macroalgae populations (i.e., farmed in co-culture or wild) could offer *C. gigas* and *M. trossulus* an additional source of organic matter. This work was recently published in Marine Ecological Progress Series, Haag et al. 2025 (see publication list below).

Component 3B: Oyster Selective Breeding

A crucial component of all successful oyster hatcheries is the production of clean seawater and marine microalgae for feed. In 2024 a filtration array was installed that includes multiple filtration stages, and UV treatment. The microalgae cultivation room at the TSMRI hatchery was completed. It is outfitted with all necessary equipment for sterile microalgae production to feed and grow shellfish. Pure Biomass 250L reactors are in the process of being installed to increase microalgae capacity. Marine microalgae strains were acquired from The Cultured Abalone, USDA, the NOAA Northwest Fisheries Science Center, and Bigelow Laboratories and are cultured at small volumes. High-tech production-scale microalgae in photobioreactors will begin in 2025 for hatchery production.

Progress was made in 2024 to install necessary hatchery equipment for shellfish production. Larval rearing tanks, bottle upwellers, upweller and downweller troughs, and spawning tables were installed. This space has been transformed and utilized as a research wet lab space capable of processing large volumes of shellfish for morphometric measurements and shellfish tissue. Progress in 2025 will include installing capacity to heat seawater before spawning of shellfish begins, as well as rehiring for a hatchery manager position and becoming a certified seed source.

In 2024, 30,000 juvenile Pacific oysters continued to be held in waters near the TSMRI hatchery for future broodstock use. These seed were delivered from the USDA-ARS Pacific Shellfish Research Unit in 2023 and included over 80 mixed groups of genetically distinct oysters with known pedigrees that have been tracked for over 25 years. Once grown to adults, these oysters will serve as a base population for future hatchery development for hatchery technology and breeding efforts. Additional broodstock was acquired from Hump Island Oyster Co.

To meet our objective of developing an Alaska-specific Pacific oyster broodstock for optimized growth in the EVOS region (Objective 3B.2), we have continued collaborations with the USDA-ARS Pacific Oyster Genomic Selection (POGS) program and Pacific Hybreed. In 2024, POGS sent approximately 12,000 oysters from their selective breeding program to the Blue Starr Oyster Co. FLUPSY in Naukati Bay. The genetic pool for these oyster strains has a broad-based origin,

with a mix of genetics from hatchery broodstock and wild-set oysters obtained in Oregon, Washington, California, and Japan over the past 30 years. The oysters were grown up in the FLUPSY for the fall and summer, overwintered in bags, and will be deployed to the production arrays in spring 2025. The same cohort of selected oysters were deployed by the POGS group to participating farms in California, Oregon, and Washington, which will allow for the first direct comparison of growth and survival of selected oysters grown in Alaska with those grown in the major US West Coast growing regions. This partnership also critically ensures that Alaska remains part of the conversation and consideration with POGS, since oysters from POGS form the basis for the majority of commercial oyster hatchery production on the US West Coast.

The oyster selective breeding goals are also being accomplished through collaboration between the AFSC mariculture team and Pacific Hybreed, a private shellfish breeding program, funded through the SEC Mariculture Cluster. In 2023, oysters representing 25 genetically distinct groups were outplanted to the NOAA Little Port Walter Facility. Final data were collected in September 2024 with data currently being analyzed to identify the best-performing families ("specialists") and families that performed well in Alaska and in Washington ("generalists"). Additional funds were obtained for farm deployments of high performing families in 2025.

Overall, the multiple fronts of progress in 2024 marks the first full-scale genetic selection effort in Alaska and greatly expands the current Mar ReCon oyster breeding project to further engage researchers with EVOS-region farms to make progress towards more productive and sustainable shellfish farming in the EVOS region.

Component 3C: Kelp Farming Method Development

This component includes three objectives. Objective 1 was completed by the end of 2023. It focused on assessing the effect of line spacing as a driver of biomass production and modifier of kelp morphology. All data have been uploaded to the Research Workspace and a formal thesis and scientific publication will be completed by the MSc. student, Alexandra Meyer. Objective 2, which focuses on assessing the effect of kelp trimming as a potential driver to increase biomass recovery over a growing season was completed in July 2024. Formal data processing will be completed by the next reporting period.

Component 4: Economic Feasibility Analysis

The team has begun reviewing information on best practices and technology for operating a shellfish hatchery. PI Good hosted and attended the Oyster Hatchery Workshop, sponsored by Oceans Alaska and Alaska Sea Grant, to facilitate hands-on learning on oyster hatchery operations. Topics covered included different hatchery production philosophies, oyster biology and life cycles, water quality and site selection, microalgae production, spawning and larval rearing, and seed setting. This knowledge will support the development of the conceptual design and cost estimates for the oyster hatchery feasibility study.

PI Fong has been familiarizing himself with oyster hatchery designs and operations through literature and media to understand the requirements for successfully establishing and running a hatchery. In Fall 2024, he plans to visit hatcheries in Ketchikan (Oceans Alaska), Juneau (NOAA), and Seward (Alutiiq Pride Shellfish Hatchery) for firsthand experience. He will also attend a hatchery operation workshop if the opportunity arises.

Delays in completion of project milestones are the result of Fong's unfamiliarity of the biological and technical process of hatchery operations. It took him much longer than expected to understand shellfish hatchery operations both from an experimental and commercial perspective. Due to his lack of confidence understanding shellfish hatchery operations, he did not feel comfortable moving forward with other components of the project. This deficiency has since been rectified.

An advisory committee has been formed to guide the development and analysis of this project, ensuring relevance and quality in its execution. The committee members include:

- Henry Fleener (NOAA)
- Jeff Hetrick (Alutiiq Pride Shellfish Hatchery)
- Eric Wyatt (Blue Starr Oysters)
- Sean Crosby (Kachemak Shellfish Mariculture Association)

The team is in the process of reaching out to Tomi Marsh to join the advisory committee.

Fong is scheduled to meet with the advisory committee in early February to define the scope and parameters of the feasibility analysis. Key considerations will include the scale of the hatchery, whether a modular format should be adopted for scalability, and the potential for incorporating mobile units. Site selection will also be a critical factor. The advisory committee will work

toward building consensus on these parameters, providing clear direction for the study. Once a consensus is reached, Fong will collaborate closely with committee members—leveraging their extensive hatchery design and operation experience—to develop a comprehensive feasibility analysis.

The component team remains committed to supporting Alaska's mariculture industry through research, training, and direct industry engagement to enhance business profitability and product quality.

Component 5: Product Development

Literature Reviews and Industry Engagement: The component team has conducted comprehensive literature reviews of both peer-reviewed and non-peer-reviewed publications. Additionally, they have engaged in meetings with professionals from all levels of the food and seafood value-adding chain. These efforts aim to develop a greater understanding of how farmed seaweed and shellfish contribute to the profitability of businesses.

Seaweed Processing Demonstration: The Alaska Sea Grant team hosted a seaweed processing demonstration at the Kodiak Seafood and Marine Science Center, showcasing a novel method for ambient temperature stabilization. This initiative aimed to advance knowledge on sustainable processing techniques for farmed seaweed.

Training and Workshops:

- Seaweed Stabilization Workshop: Conducted in Kodiak, Alaska on May 21, 2024, demonstrating a novel method of ambient temperature stabilization to 20 attendees.
- HAACP: Two Hazardous Critical Control Point (HACCP) Segment 2 classes were conducted in Kodiak, Alaska during this reporting period, leading to HACCP certification for all eight participants.
- An "Understanding Vibrio" webinar was hosted, attracting 84 participants and providing critical knowledge on food safety.
- A virtual workshop on "Operating a Seafood Direct Marketing Business" was attended by 20 individuals, equipping them with essential business skills.

Business Consultation and Product Development Research: Alaska Sea Grant specialist Chris Sannito continues to provide consultation services and product development research for businesses developing new food products. These services include:

- Offering shelf-stability testing for test products from mariculture businesses at the Kodiak Seafood and Marine Science Center.
- Conducting one-on-one consultations with 13 Alaskan mariculture businesses on products under development for production and sale.
- Performing shelf-stability testing on six new food products at the Kodiak Seafood and Marine Science Center for commercial production.
- Assisted ADEC with recommendations on testing and calculating total iodine content of new kelp products to ensure product delivers under the RDA of 150 mcg iodine per day as recommended by FDA.

This component has experienced significant delays because of the difficulties in recruiting a post-doc for product development. The university conducted three searches for a seafood safety position to support mariculture product development and all were unsuccessful. The pool of candidates with this kind of expertise is small. We will submit a budget revision, change in scope, and new Deliverables Table to reflect that this position has not been and is not anticipated to be filled.

Component 6: Outreach

During this reporting period, Alaska Sea Grant engaged in a variety of outreach efforts. Information and findings from the Mariculture ReCon project were integrated into these activities to share valuable insights with stakeholders and the public.

Mariculture Conference of Alaska: Presented a poster and handed out informational flyers about the project during the Mariculture Conference of Alaska held in Anchorage, Alaska, February 27-29, 2024.

Oyster Cultivation and Deprivation Technology Transfer: Conducted in Homer, Alaska, with nine farmers in attendance occurred March 1 - 2, 2024. A statewide webinar followed for further discussion.

Oyster Hatchery Training: Held in Ketchikan, Alaska, on March 26-28, 2024.

Seaweed Genetics Workshop: Held in Juneau, Alaska, on April 1-2, 2024, with 58 participants. The 2024 Alaska Seaweed Genetics Workshop brought together seaweed genetics experts from around the country to share their knowledge and explore the potential application of genetic

techniques within Alaska mariculture. One of the key takeaways from the workshop was the need for a more thorough genetic understanding of Alaska's wild seaweed populations. Research could be implemented on small regional scales, particularly near current mariculture operations, as well as across a variety of species as different seaweed species have varying population structures across geographic regions. Since one of the major concerns addressed by the 50-50 rule is the impact on wild populations, information on the existing genetic structure of wild stocks is essential. Gametophyte farming as well as nonreproductive kelp provides intriguing approaches to limiting the genetic impacts of kelp farming.

The workshop revealed many of the pros and cons of farming gametophytes, rather than sporophytes, as well as selectively bred non-reproductive kelp. While there is much enthusiasm for these alternative methods on the eastern coast of the United States, implementing gametophyte and/or non-reproductive kelp cultivation in Alaska would require more research and a thorough discussion with state agencies. In addition, Alaskan kelp farmers have expressed concern that the cultivation and farming of these kelp forms would not only be a financial barrier to upcoming kelp farmers from entering the industry but would also lead to ownership discrepancies.

Workshop attendees were supportive of seedbanking Alaskan macroalgae species for both mariculture benefits and environmental concerns amidst a changing climate. If Alaskan farmers were willing to collect additional sorus tissue, there was interest in establishing partnerships with seed banking organizations on the West Coast.

Kodiak Kelp Festival: Hosted in collaboration with Kodiak Island Brewing Company and Still, Southwest Alaska Municipal Conference, and Kodiak Ocean Growers, this three-day celebration highlighted Alaska's burgeoning kelp industry July 24-26, 2024. Festival activities included educational sessions on kelp harvesting, cultivation, and farming, with information shared from the Mar ReCon project. Community members also enjoyed live music, locally made seaweed-based foods and beverages, and a showcase of kelp-focused arts and wares.

Oyster Industry Knowledge Exchange Tour: A webinar held on July 31, 2024, informed 66 participants about a knowledge exchange with farmers from Prince of Wales Island and Cordova with farmers in Kachemak Bay, Alaska. Findings from the Mar ReCon project were shared, including insights into oyster production and deprivation.

Cook Inlet Regional Advisory Council: Gave a project update during the Cook Inlet Regional

Advisory Council annual meeting which was held in Kodiak, Alaska, September 6, 2024. *Alutiiq Museum Fall Lecture Series:* Gave a presentation during the Alutiiq Museum Fall Lector Series, which included a Mariculture ReCon project update on October 18, 2024.

Cultivating Bull Kelp Workshop: This workshop, held in Kodiak, Alaska on November 12–13, 2024, attracted 42 participants. Discussions incorporated results from the Mar ReCon project, emphasizing kelp cultivation techniques and environmental considerations critical to successful farming.

Annual Mar ReCon Meeting: Annual Mariculture ReCon Meeting: Held in Kodiak, Alaska from January 8-10, 2025, with the majority of project partners in attendance.

Additional initiatives:

CORaL Network (project 24220400): Members of the Outreach Component have been working closely with the EVOSTC-funded CORaL Network. Component members attend monthly meetings to give updates on the Mar ReCon project and to help develop mariculture-related outreach opportunities. M. Good attended the CORaL Network annual meeting in Cordova in October 2024 and presented an update on the Mar ReCon project. Further, the team participated in the Community Coastal Experience, providing an introductory seaweed cultivation and processing event for nine participants. Finally, component members developed and released a video highlighting the role of cooperatives in mariculture as part of the "Know Your Farmer" video series. A second video is planned for early 2025. These videos draw on findings from the Mar ReCon project to provide real-world examples of industry collaboration and innovation and are funded by the CORaL Network.

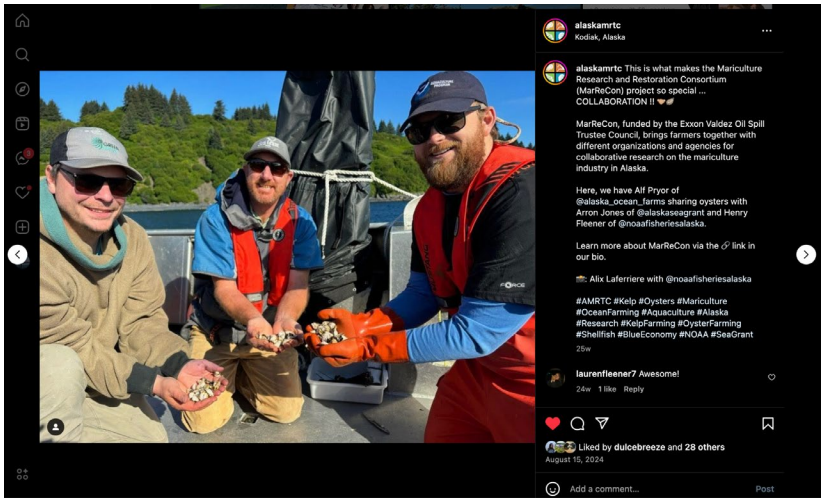
Business Planning for Kelp Farms: Alaska Sea Grant collaborated with authors to develop economic tools and guidance for kelp farmers. Feedback meetings were conducted to refine these resources, and a virtual workshop is scheduled for January 21–24, 2025. These tools incorporate data and insights from the Mar ReCon project to assist farmers in strategic business planning. Project information was incorporated into the development of Kelp Farm Business Tools, which can be found here.

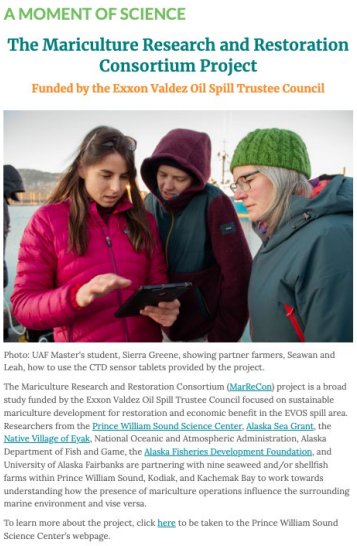
*Alaska Oyster Grower's Manual Update***:** A Mariculture Fellow was hired to lead the year-long effort to update the Alaska Oyster Grower's Manual. Interviews with farmers, site visits, and data from the Mar ReCon project are informing extensive updates to the manual, ensuring it

reflects the latest practices and knowledge.

Alaska Mariculture Research and Training Center (AMRTC) frequently shares updates on project components through social media posts on Facebook, Instagram, and LinkedIn, and "Moments of Science" on AMRTC monthly newsletters.

Example of posts and newsletter highlights:




A MOMENT OF SCIENCE

The Mariculture Research and Restoration Consortium Project

Funded by the Exxon Valdez Oil Spill Trustee Council

Photo: UAF Master's student, Sierra Greene, showing partner farmers, Seawan and Leah, how to use the CTD sensor tablets provided by the project.

The Mariculture Research and Restoration Consortium (MarReCon) project is a broad study funded by the Exxon Valdez Oil Spill Trustee Council focused on sustainable mariculture development for restoration and economic benefit in the EVOS spill area. Researchers from the Prince William Sound Science Center, Alaska Sea Grant, the Native Village of Eyak, National Oceanic and Atmospheric Administration, Alaska Department of Fish and Game, the Alaska Fisheries Development Foundation, and University of Alaska Fairbanks are partnering with nine seaweed and/or shellfish farms within Prince William Sound, Kodiak, and Kachemak Bay to work towards understanding how the presence of mariculture operations influence the surrounding marine environment and vise versa.

To learn more about the project, click here to be taken to the Prince William Sound Science Center's webpage.

Farmer Support: Our expert farmer and team member Good continue to provide assistance to new farmers and those interested in the industry. Additionally, component team members have maintained the management of farmer and expert farmer contracts, ensuring quarterly invoices are paid and supporting farmers with travel arrangements to the annual project meeting.

Component 7: Administration

During this reporting period, Component team members processed invoices from subawardees. Staff planned and attended the annual Mar ReCon meeting in Kodiak, January 8-10, 2025. There were 37 attendees who participated in-person and virtually (Fig. 9). Component team members submitted the annual EVOSTC report in March 2024 and semi-annual reports to NOAA in July 2024 and January 2025. We provided a presentation to the EVOSTC Public Advisory Committee meeting in October 2024. PWSSC conducted an annual audit, the fieldwork for which was performed in December 2024. This grant is part of the audited financials. Hoffman regularly engaged with other members of the leadership and administration team (Eckert,

Whissel/McKinstry, Huller, Schaefer) in communications and planning about the administrative aspects of the project.

Figure 9. Attendees of the annual Mar ReCon meeting in Kodiak, January 8-10, 2025. Credit: Alice van Veenendaal

2. Products:

Peer-reviewed publications:

Ulaski, B. P., and B. Konar. 2024. Seasonal and site-specific differences in biofouling communities on Pacific oyster Mariculture farms. Journal of Experimental Marine Biology and Ecology 578:152031.

Haag, J., S. L. Mincks, J. Jossart, and A. L. Kelley. 2025. Seasonal trophic resource partitioning by Pacific oyster *Crassostrea gigas* and Pacific blue mussel *Mytilus trossulus* in an Alaskan estuary. Marine Ecology Progress Series 754:65-76.

Reports:

Eckert, G., K. Hoffman, J. Whissel, and H. Wilson. 2024. Sustainable mariculture development for restoration and economic benefit in the EVOS spill area. FY23 Annual Report to the *Exxon Valdez* Oil Spill Trustee Council (project number 23220302).

Hoffman, K. 2024. Sustainable mariculture development for restoration and economic benefit in the EVOS spill area. Semiannual Report to NOAA, July 2024 (project number 24220302).

Hoffman, K. 2025. Sustainable mariculture development for restoration and economic benefit in the EVOS spill area. Semiannual Report to NOAA, January 2025 (project number 24220302).

Popular articles:

Cypher, A. 2024. Science with Your Neighbors. Delta Sound Connections 2024-2025. Prince William Sound Science Center.

Greene, S. 2024. Mariculture CTDs: Farm to Table(t). Delta Sound Connections 2024-2025. Prince William Sound Science Center.

McKinstry, C. 2024. Floating Seaweed: How Buoyant is Bull Kelp? Delta Sound Connections 2024-2025. Prince William Sound Science Center.

Schaefer, A. and A. Cypher. 2024. The Mar ReCon Project. Delta Sound Connections 2024-2025. Prince William Sound Science Center.

Ulaski, B. 2024. Farmers and Scientists Team Up to Study Biofouling Communities on Oyster Farms. Delta Sound Connections 2024-2025. Prince William Sound Science Center.

Whitney, J. 2024. Meet Royal Ocean Kelp Co. Delta Sound Connections 2024-2025. Prince William Sound Science Center.

PWSSC Breakwater Newsletter articles related to mariculture and the Mar ReCon Project:

- February 2024: Mariculture ReCon Meeting
- April 2024: Mariculture ReCon
- August 2024: Community Coastal Experience in Cordova

- August 2024: Interns reflect on their summer experience

Conferences and workshops:

Cates, R. 2024. Culturing microalgae in Alaska to support shellfish production. Alaska Mariculture Conference. Anchorage, Alaska.

Cates, R. 2024. Creating the Alaska oyster: innovations for growing the Pacific oyster at high latitudes. CICOES 5 Year Review Panel.

Fleener, H. 2024. Alaska oyster seed supply and genetics. Alaska Mariculture Conference. Anchorage, Alaska.

Greene, S. 2024. Environmental drivers of production across Gulf of Alaska mariculture sites. Alaska Mariculture Conference. Anchorage, Alaska.

Greene, S. 2024. Environmental drivers of production across Gulf of Alaska mariculture sites. American Fisheries Society, Alaska Chapter. Seward, Alaska.

Greene, S. 2024. Water column stratification of mariculture sites across the Gulf of Alaska. 78th Annual Pacific Coast Shellfish Growers Association Conference. Lynnwood, Washington.

Greene, S. 2024. Oceanographic variability across Gulf of Alaska mariculture sites. Alaska Marine Science Symposium. Anchorage, Alaska.

Hollarsmith, J. 2024. Oyster research at the Alaska Fisheries Science Center. 78th Annual Pacific Coast Shellfish Growers Association Conference. Lynnwood, Washington.

Laferrier, A. 2024. Advancement of Pacific oyster research capacity in Alaska through research hatchery development and field testing. Aquaculture America. San Antonio, Texas.

Pan, F. 2024. Breeding shellfish for climate change resilience. Alaska Mariculture Conference. Anchorage, Alaska.

Ulaski, B. and B. Konar. 2024. Seasonal and site specific differences in biofouling communities on Pacific Oyster mariculture farms. Alaska Marine Science Symposium. Anchorage, Alaska.

Workshops developed and delivered by Mar ReCon PIs

Oyster Cultivation and Deprivation Technology Transfer: Held in Homer, Alaska, March 1-2, 2024 with 9 participants.

Oyster Hatchery Training: Held in Ketchikan, Alaska, March 26-28, 2024.

Seaweed Genetics Workshop: Held in Juneau, Alaska, April 1-2, 2024 with 58 participants.

Oyster Industry Knowledge Exchange Tour: A webinar held on July 31, 2024 with 66 participants.

Cultivating Bull Kelp Workshop: Held in Kodiak, Alaska, November 12-13, 2024 with 42 participants.

Public presentations:

Eckert, G. L. October 2024. Update on the Mariculture Research and Restoration Consortium (Mar ReCon). EVOSTC PAC.

Fleener, H. May 2024. NOAA AFSC Mariculture Research Hatchery Update. Alaska Shellfish Growers Association.

Fleener, H. May 2024. EVOS Mariculture: Oyster Deployment. EVOSTC Mar ReCon Farmers.

Greene, S. and J. Haag. October 2024. Mariculture Recon, Environmental drivers of growth on aquatic farms: an update! Prince William Sound Science Center, Cordova, Alaska.

Hollarsmith, J. April 2024. Mariculture ReCon: Oyster selective breeding, regional variation in farm production. Kachemak Bay National Estuarine Research Reserve, Homer, Alaska.

Nicholson, E. and B. Konar. November 2024. Biofouling communities on oyster farms in

Kachemak Bay. Oral Presentation at the Kachemak Bay and Lower Cook Inlet Marine Ecosystem Workgroup.

ONeil, R. and B. Konar. November 2024. Benthic communities around oyster farms in Kachemak Bay. Oral Presentation at the Kachemak Bay and Lower Cook Inlet Marine Ecosystem Workgroup.

Data and/or information products developed during the reporting period:

Nothing to report.

Data sets and associated metadata:

PIs are collecting, QA/QC-ing, and uploading data to the Research Workspace in cooperation with Axiom Data Management. There have been some delays in data upload to the Workspace due to the late project start and funding delays. For example, there are no fatty acid or isotope analyses data from 2023 (Table 1) due to delays in deploying oysters to the arrays and trouble-shooting of methods in the chemistry labs. The kelp data for the regional variation component (Table 3) will be uploaded soon. Aside from the delay in funding, it took some time to train farmers in data collection protocols and to get the sample processing system in place. Methods have now been polished so the data uploads will occur more promptly.

Additional Products not listed above:

"Know your Farmer" video series: Released first video highlighting the role of cooperatives in mariculture.

Websites:

https://pwssc.org/mar-recon/
https://pwssc.org/mariculture-envdrivers/
https://pwssc.org/mariculture-co2flux
https://pwssc.org/mariculture-benthic/
https://pwssc.org/mariculture-fish/
https://pwssc.org/mariculture-birds/
https://pwssc.org/mariculture-mammals

https://pwssc.org/mariculture-kelpmethods/
https://amrtc.org/

3. Coordination and Collaboration:

The Alaska SeaLife Center or Prince William Sound Science Center

Prince William Sound Science Center (PWSSC) staff are core participants in both the leadership and research aspects of PWSSC and Mar ReCon. PWSSC provides administrative, fiscal management, logistics, and coordination services to the overall project team, as well as employs scientists who conduct research to meet the goals of this project's approach.

PWSSC provided members of the Mariculture and Physicochemical Environment team with affordable housing while they were in Cordova in May and October. The Benthic Component also used the PWSSC lab facilities for three days while sampling PWS farms.

PWSSC has also provided multiple avenues for disseminating Mar ReCon work to the public. PWSSC hosts the Tuesday Night Talk seminar series at which S. Greene and J. Haag presented their work. PI Cypher participated in "Kelp Month" activities hosted by the PWSSC education department. PIs shared multiple articles in the PWSSC *Breakwater* newsletter and annual science and natural history periodical, *Delta Sound Connections*. PWSSC has also developed a project website (www.pwssc.org/mar-recon) and worked with PIs to develop several component-specific pages that link from the main project page.

Mar ReCon PIs are collaborating with the CORaL Network, which is led by the Alaska SeaLife Center. Multiple PIs have participated in outreach activities with the CORaL Network, including Teach Through Technology (T3), which provides middle and high school students with opportunities to engage with community partners through the lens of technological problem-solving. PIs also hosted interactive booths at the Ocean Sciences Festival (held in Cordova, November 2024) and engaged with the Community Coastal Experience. Additionally, PI Good (Outreach Component) gave a presentation about Mar ReCon at the CORaL Network annual meeting.

EVOSTC Long-Term Research and Monitoring Projects

There is direct overlap between members of the Mar ReCon team and the LTRM (PIs Campbell, Konar, Hoffman, Schaefer), and PI Hoffman also sits on the LTRM program management team. The LTRM team collects data and has knowledge of the ecosystems that will be useful to this team and vice versa. Multiple PIs from the Mar ReCon project attended the Gulf Watch Alaska PI meeting in Cordova in October 2024. Similarly, PIs from Gulf Watch Alaska virtually attended the annual Mar ReCon PI meeting in January 2025 to provide an overview of Gulf Watch Alaska and continue communication between the projects.

LTRM Environmental Drivers Component: Campbell is PI of the Gulf Watch Alaska project 24120114-G (Oceanographic conditions in PWS) of which this project is an extension (stations were added near mariculture sites, using the same methods as are done by the Gulf Watch Alaska project). Mar ReCon shares a PWSSC research vessel *(M/V New Wave*) and uses the equipment of the GWA project. LTRM environmental monitoring data will provide important spatial context for the data from the production arrays.

LTRM Pelagic Monitoring Component: The Mar ReCon marine bird and mammal components (Components 2D and 2E) will complement the PWS Marine Bird Summer Surveys conducted every two years by U.S. Fish and Wildlife Service (PI Kaler, 24120114-M), the Seward Line surveys (PI Hopcroft, 24120114-L), and the Humpback Whale project (PI Moran, 24120114-O). The Mar ReCon marine bird and mammal surveys use the same methods for recording and processing data as the marine bird projects listed above, facilitating region-wide comparisons.

LTRM Nearshore Monitoring Component: LTRM Nearshore co-PI Konar is also a co-PI of Mar ReCon Component 2B, Benthic Communities. Because most mariculture efforts occur in nearshore waters, the conceptual link and information exchange between the two projects is natural. Nearshore monitoring in the vicinity of eDNA sampling sites across the three regions will be used to contextualize eDNA findings. Mar ReCon data will complement the marine bird and mammal data collected as part of the nearshore surveys in Kenai, Katmai, and PWS (PI Coletti; 24120114-H) which use the same methods for recording and processing data, facilitating region-wide comparisons of marine bird and mammal survey data.

LTRM Herring Research and Monitoring (HRM): The monitoring efforts of the Mar ReCon project will complement several HRM projects that will be operating in the same bays and at

similar times during the FY22-31 program. Mar ReCon will use data from aerial forage fish surveys conducted annually in June to assess the number and size of forage fish schools in Simpson, Sheep, and St. Matthews Bays. Our fish, marine bird, and marine mammal observations will also inform data synthesis projects within the HRM program by quantifying abundance of potential predators in relation to herring rearing bays and spawning areas. We will share our results of benthic fish sampling with the HRM component to ascertain if any of our results may be of interest to them. Herring monitoring data will be compared to the eDNA and zooplankton analyses.

EVOSTC Mariculture Projects

Members of the Mar ReCon Outreach Component are working with the Social, Cultural and Economic Assessment of Kelp Mariculture Opportunities for Coastal Villages within the EVOS Spill Zone project (24220301) to make connections and coordinate community listening sessions. PI Good presented at the annual meeting in 2024. A representative from this project was invited to provide an update at the Mar ReCon annual meeting held January 2025.

Representatives from the Chugach Regional Resource Commission (CRRC) who are involved with the PWS Kelp Mariculture Development for Habitat Restoration and Local Economy (project 24220200) were invited to provide a project update at the Mar ReCon annual meeting in January 2025. PI Eckert met in person with CRRC PIs and staff working on this mariculture project in October 2024. They discussed each project to share information on methods, approaches, results, and data availability.

EVOSTC Education and Outreach Projects

The Mar ReCon team has integrated our education and outreach activities with the Community Organized Restoration and Learning (CORaL) Network. The outreach framework as defined by the CORaL Network will connect scientists with educators and community members with our proposed EVOSTC-funded mariculture projects happening across the region. Alaska Sea Grant is fulfilling the role of liaison between Mar ReCon and the CORaL Network. Alaska Sea Grant will coordinate with mariculture component leads during the building phases of these two projects to develop network pathways that will continue to be available to EVOSTC-funded mariculture projects over the life of the projects. Mariculture component leads will be members of the network and will actively participate in online resources and discussions, use of the online data portal, community events, cultural and communication learning opportunities, the intern

institute, new and existing community science resources, and/or the collaborative mini-grants projects.

Representatives from the CORaL Network attended the Mar ReCon annual PI meeting in January 2025 to discuss ways we can work together to disseminate information about the project to target audiences. Multiple PIs have participated in outreach activities with T3, at the Ocean Sciences Festival (held in Cordova, November 2024), and with the Community Coastal Experience. Additionally, PI Good (Outreach Component) attended the CORaL Network annual meeting in Cordova in October 2024 and presented an overview of the Mar ReCon Project.

Individual EVOSTC Projects

Nothing to report.

Trustee or Management Agencies

Project funding is routed from the EVOSTC via a Trustee Agency (NOAA) to the PWSSC to administer non-Trustee agency awards. PWSSC streamlines and simplifies the Trustee Council's grantsmanship needs by serving as a central node between the sponsoring agency and many subawardees. This reduces administrative burden on the Trustee Council and the agency through which funds are delivered. NOAA staff are also members of the Mar ReCon project (e.g., Hollarsmith, Long).

ADF&G, an EVOSTC trustee agency, is leading the evaluation of marine mammal interactions and mitigation measures. The need for this work is informed by: the ADF&G Marine Mammal Program's previous experience responding to farm permit application review requests; direct requests by NOAA Fisheries to ADF&G for new marine mammal - mariculture research, marine mammal management agency questions and community feedback to our project regarding mariculture and marine mammals, knowledge of marine mammal species' conservation status, and our ongoing research projects in the regions covered by this proposal. ADF&G staff with particular birding and boat operator skills are recruited and compensated to assist with bird and mammal surveys. Time-lapse trail camera work was planned with the advice and assistance of biometricians, biologists and an ADF&G-contracted consulting agency who are performing similar field data collection, image analysis and modeling work for population studies near Fairbanks, Anchorage, Juneau, Homer and at remote locations.

Project data and outcomes from all components will be made available to other agencies for data synthesis and/or collaboration to support EVOSTC Trustee agency work.

Native and Local Communities

The Native Village of Eyak (NVE), Cordova's federally recognized Alaska Native Tribe, is a core participant in this project, serving the role of Community Lead. Caitlin McKinstry of the NVE Department of the Environment and Natural Resources serves on the Mar ReCon leadership team, and the NVE's kelp farm is one of the study areas for the farmer-led research component. Project funds for NVE's role as Community Lead are disbursed via PWSSC, and project funds to NVE as a farmer partner are disbursed by the Alaska Fisheries Development Foundation. As a place-based community benefit organization, PWSSC is deeply embedded in Cordova. PWSSC and NVE have a mutually beneficial relationship. While the two entities operate autonomously, lines of communication are open, and NVE Department of the Environment and Natural Resources staff and PWSSC science and education staff are accustomed to supporting each other when possible. Historically, this has occurred via partnering on research proposals and research logistics; by trading technical staff; and by promulgating community programming. In the Mar ReCon project, it occurs via fiscal administration, project co-leadership, and research collaboration.

Two biologists from the Sun'aq Tribe of Kodiak Department of Natural Resources participated in Kodiak surveys, provided logistical support, and assisted planning and adjustments to the survey transect locations. This collaboration continues during the May, July, and November 2025 surveys.

Further, key Alaska Native entities in the spill affected region are members of the CORaL Network core team: specifically, the Alutiiq Museum and the Chugach Regional Resources Commission. Mar ReCon is collaborating with the CORaL Network, whose core team members help direct information exchanges between Alaska Native communities and EVOSTC-funded programs as necessary and appropriate. We are also exchanging information with other EVOSTC-funded mariculture projects, such as by having project representatives attend their meetings, and inviting them to present and share at the Mar ReCon annual meeting (January 2025). Those projects have an Alaska Native community focus.

We have also communicated with the Gulf Watch Alaska LTRM program that will be engaging Tribal communities via CRRC. Working with the CORaL Network and Gulf Watch Alaska to

identify nodes for engagement with Alaska Native communities will help decrease the potential for burdensome, high-volume requests for participation or information exchanges with small villages. Rather, we will coordinate between and among EVOSTC-funded projects and programs to ensure preferred communication channels and frequencies in villages in the region are not overwhelmed. EVOS had long-lasting effects on subsistence resources upon which Alaska Native community members depend, and the Mar ReCon project has the potential to document outcomes and practices that may offer cultural, social, and economic benefits to Alaska Native communities in the wake of goods and services that were lost to the spill.

Additionally, the integration of farmers as research partners ensures direct local involvement (and benefit) as a result of the Trustee Council's investment in mariculture, and this will happen throughout the spill affected region as our farmer partner locations are geographically distributed among PWS, Kachemak Bay, and Kodiak. Lastly, CORaL Network partners budgeted for kiosks in which to display information such as data visualizations and videos about EVOSTC-funded research. PWSSC will host one of these kiosks in Cordova; other kiosks will be in Seward, Homer, Kodiak, and possibly even Valdez in the future. These kiosks will provide an informal learning opportunity about Mar ReCon that local community members can pursue on their own time, in addition to more formal stakeholder engagement activities in which the project will participate.

4. Response to EVOSTC Review, Recommendations and Comments:

2024 Science Panel Comments:
The overarching goal of the Mariculture Research and Restoration Consortium (Mar ReCon) is to support restoration, habitat enhancement, and economic development through research and partnerships between scientists and seaweed and shellfish farmers. The project is comprised of seven components organized within three broad categories: Restoration, Farm and Business Development, and Program Management. Each component consists of several subcomponents that are linked with other subcomponents in the project.

Considering funding delays, the project has made progress toward achieving project objectives, including developing partnerships with nine farms across the spill-affected region, initiating fieldwork to monitor impacts of mariculture on the environment and biological communities and vice-versa, developing kelp cultivation methods, presenting training workshops and forums, submitting papers for peer review, and presenting at professional and community meetings.

The Science Panel raised some concerns about key aspects of the project that were supposed to have been completed at this point, especially work related to product development, which is supposed to have been completed by a postdoc. The product development work is critical to the success of the program – without a greater sense of market opportunities it is hard to know how to evaluate whether further development of the industry is warranted. The PIs state that the postdoc has not been hired due to delays by UAF, but no further explanation was provided.

PI Response:
We added information on product development activities that are being conducted by existing personnel in this year's report and apologize for leaving this important information out of last year's report. Chris Sannito at UAF is conducting important consultation and product development research in connection with existing businesses. This work is described in the report above. UAF conducted two searches last year for seafood safety specialists, both of which were unsuccessful. Candidates for these kinds of positions are in high demand in the food industry and government agencies, and thus there is a small pool of qualified candidates, and they are able to obtain higher salaries in locations outside of Alaska with lower cost of living. UAF is in the process of conducting another search this year for a product development postdoc. We are submitting a budget and proposal amendment to reflect the change in scope of work due to the delay in recruiting this post-doc.

2024 Science Panel Comment:
We also noted that the PIs have abandoned the use of control sites for fish surveys (and mammal haul out locations) due to inability to locate appropriate control sites. We understand and agree with their rationale for these decisions, but this limits their ability to assess some potential impacts or co-benefits of aquaculture as described in the proposal. It was unclear whether this should also necessitate a reduction in funding due to reduced scope of work.

PI Response:
We appreciate the science panel's input on this aspect of our methodology. It has taken more time than anticipated to identify the most appropriate methods to address the objectives of this component. Part of this difficulty stemmed from surveying farms that differ in farm infrastructure, that identification of fish using the imaging sonar is difficult, and that other components also removed potentially shared control sites. Now that a complete data collection, processing, and statistical analysis has been completed, we feel confident that the methods described in Component 2C are suitable for addressing our proposed hypotheses. We agree with the science panel's point that the removal of control sites prevents us from assessing the effects

of mariculture and that it was premature to remove them. Because this work continues to rely upon the availability of farmers, we will now survey farms and control sites twice a year as originally proposed, but continue to survey 5, rather than 3, farms in PWS.

Regarding Objective 2E.3, EVOSTC reviewers recommended retaining the original pinniped haulout camera monitoring plan as proposed. Namely, to monitor counts at harbor seal or sea lion haulouts within 2 km of study farms. PI Rehberg has identified pinniped haulouts at Kodiak Island and Kachemak Bay as monitoring sites to include this work as planned. There are no pinniped haulouts within reasonable distance of the study farms in eastern Prince William Sound. These cameras will be installed at locations farther away than the proposed 2 km radius from farms because nearby haulouts are ephemeral or nonexistent. A single trail camera will be installed to monitor each haulout and follow ADF&G's existing protocol for counting pinniped numbers on their haulouts using time-lapse images.

2024 Science Panel Comment:
The Science Panel has concerns about this project and would like clarification on the status of the product development related work and if a budget amendment will be forthcoming given the reduced scope of work described above.

PI Response:
This component has experienced significant delays because of the difficulties in recruiting a post-doc for product development. The university conducted three searches for a seafood safety position to support mariculture product development and all were unsuccessful. The pool of candidates with this kind of expertise is small. We will submit a budget revision, change in scope, and new Deliverables Table to reflect that this position has not been and is not anticipated to be filled.

2024 Executive Director Comments
Due to the delay of initial project funds and complex logistics, some component activities are behind schedule. Annual reports were submitted on time. Reports are well-organized and comprehensive. The PI and project manager are responsive and easy to work with. Funding for this project is managed by ADF&G and NOAA. For a project with several agency components, the expenses for each budget category are well documented. The expenses on the annual reports are easy to track. Both PI and Fiscal Manager are responsive to budget questions. Staff don't have any concerns at this time, except for the issue raised by the Science Panel.

2024 PAC Comments

Stekoll asked about restricting product development to food. Eckert clarified they are looking at food and non-food products. Stephens asked if the size of test sites are large enough to detect changes in water chemistry. Eckert stated a colleague is leading the CO2 work, looking at sites, and has sensors embedded both in farms and away from them. They will learn about carbonite chemistry in those areas, and the project will make great contributions to this big question.

Stekoll introduced a motion to proceed with no concerns. Borer seconded, and Stephens and Whissel recused themselves. There was no opposition, and the motion passed with unanimous support from all voting members.

5. Budget:

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5-YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$696,746	$1,072,885	$1,126,395	$1,209,194	$1,237,922	$5,343,141	$1,245,384
Travel	$80,138	$172,078	$150,180	$138,395	$112,654	$653,445	$136,554
Contractual	$506,081	$625,474	$626,953	$657,655	$673,796	$3,089,959	$854,416
Commodities	$493,406	$193,834	$179,074	$123,078	$150,487	$1,139,879	$558,945
Equipment	$442,642	$165,860	$121,758	$112,718	$68,253	$911,231	$470,488
Indirect Costs (rate will vary by project)	$200,980	$189,801	$183,472	$188,785	$198,458	$961,497	$216,774
SUBTOTAL	$2,419,993	$2,419,932	$2,387,832	$2,429,824	$2,441,570	$12,099,151	$3,482,562
General Administration (9% of subtotal)	$217,799	$217,794	$214,905	$218,684	$219,741	$1,088,924	NA
PROGRAM TOTAL	**$2,637,792**	**$2,637,726**	**$2,602,737**	**$2,648,508**	**$2,661,311**	**$13,188,075**	**$3,482,562**
Other Resources (In-Kind Funds)	**$60,239**	**$62,333**	**$53,622**	**$67,787**	**$111,360**	**$355,341**	**$33,111**

COMMENTS: Due to the delay in funding inititation, many projects within the component are underspent. We anticipate catching up on spending in the subsequent years of the project.

Due to the delay in funding initiation, many components within the project are underspent on personnel salaries, equipment purchasing, and field activities. We anticipate catching up on spending in the subsequent years of the project. The summary budget by category is provided above. Component summaries by category are provided below. Additional detail has been provided in accompanying tabs on the spreadsheet submitted to the EVOSTC.

PWS Restoration (Cypher): Components 1, 2A, 2C, 2D

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$109,793	$211,380	$217,690	$224,258	$230,940	$994,061	$250,026
Travel	$1,610	$7,370	$8,430	$8,460	$9,620	$35,490	$17,273
Contractual	$21,780	$78,680	$81,980	$81,280	$84,580	$348,300	$51,318
Commodities	$17,000	$5,750	$7,750	$5,750	$5,750	$42,000	$14,149
Equipment	$160,000	$20,000	$0	$0	$0	$180,000	$145,816
Indirect Costs Rate = 0%	$0	$0	$0	$0	$0	$0	
Indirect waived							
SUBTOTAL	$310,183	$323,180	$315,850	$319,748	$330,890	$1,599,851	$478,582
General Administration (9% of subtotal)	$27,916	$29,086	$28,427	$28,777	$29,780	$143,987	N/A
PROJECT TOTAL	$338,099	$352,266	$344,277	$348,525	$360,670	$1,743,838	$478,582
Other Resources (In-Kind Funds)							

Farm Sampling & Outreach (Huller): Components 3, 6

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$37,000	$37,740	$38,495	$39,265	$40,050	$192,550	$95,900
Travel	$4,200	$29,305	$29,413	$4,523	$4,636	$72,077	$13,174
Contractual	$309,000	$373,920	$361,376	$378,279	$352,053	$1,774,628	$544,672
Commodities	$186,056	$134,084	$109,909	$55,650	$79,579	$565,278	$261,911
Equipment	$0	$0	$0	$0	$0	$0	
Indirect Costs Rate = 10% MTDC	$47,726	$23,705	$20,119	$13,972	$13,832	$119,354	$70,667
Indirect waived							
SUBTOTAL	$583,982	$598,754	$559,312	$491,689	$490,150	$2,723,887	$986,325
General Administration (9% of subtotal)	$52,558	$53,888	$50,338	$44,252	$44,114	$245,150	N/A
PROJECT TOTAL	$636,540	$652,642	$609,650	$535,941	$534,264	$2,969,037	$986,325
Other Resources (In-Kind Funds)							

Farm Sampling, Economics, Production & Outreach (Eckert): Components 1, 3, 4, 5, 6

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$167,650	$253,965	$299,590	$302,580	$337,495	$1,361,279	$66,963
Travel	$33,514	$49,103	$46,995	$48,044	$51,493	$229,150	$25,124
Contractual	$9,400	$14,900	$10,850	$36,400	$61,400	$132,950	$7,034
Commodities	$143,300	$12,500	$12,500	$12,500	$12,500	$193,300	$130,206
Equipment & F&A Exempt	$129,949	$28,350	$15,000	$13,000	$0	$186,299	$147,949
Indirect Costs Rate = 25%	$90,128	$82,617	$92,484	$99,881	$115,722	$480,832	$57,147
(non-equipment)							
SUBTOTAL	$573,942	$441,435	$477,419	$512,405	$578,609	$2,583,810	$434,422
General Administration (9% of subtotal)	$0	$0	$0	$0	$0	$0	NA
PROJECT TOTAL	$573,942	$441,435	$477,419	$512,405	$578,609	$2,583,810	$434,422
Other Resources (In-Kind Funds)						$0	$0

***Exxon Valdez* Oil Spill Trustee Council**

Long-Term Research and Monitoring, Mariculture, Education and Outreach

Annual Project Reporting Form

Pelagic Interactions (Hollarsmith): Component 1

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$0	$0	$0	$0	$0	$0	$0
Travel	$0	$8,807	$5,620	$8,495	$2,887	$25,808	$9,296
Contractual	$0	$0	$69,002	$72,262	$74,636	$215,900	$52,597
Commodities	$18,000	$0	$9,665	$9,928	$18,408	$56,001	$0
Equipment	$0	$15,000	$0	$0	$0	$15,000	$15,000
Indirect Costs Rate = 0%	$0	$0	$0	$0	$0	$0	$0
Indirect waived							
SUBTOTAL	$18,000	$23,807	$84,287	$90,685	$95,931	$312,709	$76,893
General Administration (9% of subtotal)	$1,620	$2,143	$7,586	$8,162	$8,634	$28,144	N/A
PROJECT TOTAL	$19,620	$25,950	$91,872	$98,846	$104,565	$340,853	$76,893
Other Resources (In-Kind Funds)	$21,836	$22,569	$23,332	$36,565	$75,280	$179,582	

Pelagic Interactions (Kelley): Component 1

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$28,317	$115,284	$88,523	$106,366	$109,342	$447,831	$98,211
Travel	$0	$25,273	$20,178	$26,424	$0	$71,874	$31,462
Contractual	$35,000	$22,500	$17,500	$2,500	$0	$77,500	$21,915
Commodities	$65,500	$7,000	$4,500	$7,000	$6,000	$90,000	$64,884
Equipment & F&A Exempt	$95,000	$48,005	$49,914	$40,418	$41,168	$274,505	$124,755
Indirect Costs Rate = 25%	$32,204	$42,514	$32,675	$35,572	$28,835	$171,801	$53,923
(non-equipment)							
SUBTOTAL	$256,021	$260,576	$213,290	$218,280	$185,345	$1,133,512	$395,150
General Administration (9% of subtotal)	$0	$0	$0	$0	$0	$0	$0
PROJECT TOTAL	$256,021	$260,576	$213,290	$218,280	$185,345	$1,133,512	$395,150
Other Resources (In-Kind Funds)						$0	

Oyster Breeding (Hollarsmith): Component 3

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$60,960	$121,920	$144,190	$190,497	$178,994	$696,561	$233,734
Travel	$2,488	$4,976	$4,976	$4,976	$4,976	$22,392	$4,440
Contractual	$49,000	$50,470	$0	$0	$0	$99,470	$37,501
Commodities	$25,250	$4,000	$4,750	$2,000	$6,250	$42,250	$50,432
Equipment	$0	$0	$0	$0	$0	$0	$0
Indirect Costs Rate = 0%	$0	$0	$0	$0	$0	$0	$0
SUBTOTAL	$137,698	$181,366	$153,916	$197,473	$190,220	$860,673	$326,107
General Administration (9% of subtotal)	$12,393	$16,323	$13,852	$17,773	$17,120	$77,461	N/A
PROJECT TOTAL	$150,091	$197,689	$167,768	$215,246	$207,340	$938,134	$326,107
Other Resources (In-Kind Funds)	$19,758	$20,746	$10,892	$11,436	$24,016	$86,848	

Oyster Breeding (Kelley): Component 3 - this component is scheduled to begin in FY29.

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$0	$0	$0	$0	$0	$0	$0
Travel	$0	$0	$0	$0	$0	$0	$0
Contractual	$0	$0	$0	$0	$0	$0	$0
Commodities	$0	$0	$0	$0	$0	$0	$0
Equipment & F&A Exempt	$0	$0	$0	$0	$0	$0	$0
Indirect Costs Rate = 25% (non-equipment)	$0	$0	$0	$0	$0	$0	$0
SUBTOTAL	$0	$0	$0	$0	$0	$0	$0
General Administration (9% of subtotal)	$0	$0	$0	$0	$0	$0	$0
PROJECT TOTAL	$0	$0	$0	$0	$0	$0	$0
Other Resources (In-Kind Funds)						$0	$0

Benthic Ecosystem (Konar): Component 2B

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$68,115	$69,948	$71,835	$73,779	$75,782	$359,459	$30,619
Travel	$15,730	$23,207	$10,369	$10,543	$10,447	$70,296	$13,067
Contractual	$3,300	$4,350	$3,300	$3,300	$8,500	$22,750	$4,907
Commodities	$13,500	$11,500	$11,500	$11,500	$5,500	$53,500	$1,609
Equipment & F&A Exempt	$29,993	$31,107	$32,277	$33,505	$27,085	$153,967	$0
Indirect Costs Rate = 25% (non-equipment)	$25,161	$27,251	$24,251	$24,781	$25,057	$126,501	$12,397
SUBTOTAL	$155,799	$167,363	$153,532	$157,408	$152,371	$786,473	$62,599
General Administration (9% of subtotal)	$0	$0	$0	$0	$0	$0	N/A
PROJECT TOTAL	$155,799	$167,363	$153,532	$157,408	$152,371	$786,473	$62,599
Other Resources (In-Kind Funds)						$0	

Benthic Ecosystem (Long): Component 2B

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$8,000	$8,000	$8,000	$8,000	$0	$32,000	$7,180
Travel	$4,916	$1,666	$1,666	$1,666	$3,078	$12,992	$8,695
Contractual	$0	$0	$0	$0	$0	$0	$3,154
Commodities	$4,000	$4,000	$4,000	$4,000	$0	$16,000	$14,018
Equipment	$0	$0	$0	$0	$0	$0	$0
Indirect Costs Rate = 0%	$0	$0	$0	$0	$0	$0	$0
SUBTOTAL	$16,916	$13,666	$13,666	$13,666	$3,078	$60,992	$33,047
General Administration (9% of subtotal)	$1,522	$1,230	$1,230	$1,230	$277	$5,489	N/A
PROJECT TOTAL	$18,438	$14,896	$14,896	$14,896	$3,355	$66,481	$33,047
Other Resources (In-Kind Funds)	$18,645	$19,018	$19,398	$19,786	$12,064	$88,911	$33,111

Marine Mammals (Rehberg): Component 2E

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$102,734	$105,817	$104,851	$108,326	$104,947	$526,675	$112,152
Travel	$15,480	$16,100	$16,100	$16,100	$16,100	$79,880	$7,682
Contractual	$9,401	$5,698	$6,664	$3,188	$6,568	$31,519	$16,875
Commodities	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000	$3,000
Equipment	$0	$0	$0	$0	$0	$0	$0
Indirect Costs Rate = 0%	$0	$0	$0	$0	$0	$0	$0
Indirect waived							
SUBTOTAL	$137,614	$137,615	$137,615	$137,614	$137,615	$688,073	$139,707
General Administration (9% of subtotal)	$12,385	$12,385	$12,385	$12,385	$12,385	$61,927	N/A
PROJECT TOTAL	$150,000	$150,000	$150,000	$150,000	$150,000	$750,000	$139,707
Other Resources (In-Kind Funds)							

Kelp (Umanzor): Component 3C

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$14,240	$45,889	$47,176	$47,017	$45,535	$199,857	$73,357
Travel	$0	$4,966	$5,098	$7,799	$8,012	$25,875	$0
Contractual	$0	$2,000	$2,000	$2,000	$5,000	$11,000	$2,027
Commodities	$8,800	$2,000	$1,500	$1,500	$1,500	$15,300	$15,181
Equipment & F&A Exempt	$27,700	$23,398	$24,567	$25,795	$0	$101,460	$36,968
Indirect Costs Rate = 25%	$5,760	$13,714	$13,943	$14,579	$15,012	$63,008	$22,641
(non-equipment)							
SUBTOTAL	$56,500	$91,966	$94,284	$98,690	$75,059	$416,500	$150,174
General Administration (9% of subtotal)	$0	$0	$0	$0	$0	$0	
PROJECT TOTAL	$56,500	$91,966	$94,284	$98,690	$75,059	$416,500	$150,174
Other Resources (In-Kind Funds)						$0	

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EDUCATION:

M.Sc. in Marine Biology
University of North Carolina Wilmington, Wilmington, NC 2011

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SELECT PROFESSIONAL EXPERIENCE

2021-Present: Marine Biologist II, *Native Village of Eyak*
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SELECT PUBLICATIONS & PRODUCTS

Legget, V., **C. McKinstry**, et al. 2024. People, Places, and Plastic: Environmental Justice and Local Action. *Environment.* 66:29-34.

Shew, E. and **C. McKinstry**. 2024. Cordova Priority Climate Action Plan. Environmental Protection Agency. 51 pgs. https://www.epa.gov/system/files/documents/2024-04-chugach-eyak-pcap.pdf

McKinstry, C. A. E. R. W. Campbell, and K. Holderied. 2022. Influence of the 2013-2016 marine heatwave on seasonal zooplankton community structure and abundance in the lower Cook Inlet, Alaska. *Deep Sea Research II.* 195:105012.

Suryan, R. M., **C. McKinstry**, et al. 2021. Ecosystem response persists after a prolonged marine heatwave. *Scientific Reports*. 11: 6235.

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B.A. Interior Architecture. 2015 School of Design, Architecture, Art and Planning. The University of Cincinnati.

Professional Experience:

Oct 2024- Present. **Mariculture Development Program Manager.** *Alaska Fisheries Development Foundation.* Expanding existing programs and developing new initiatives to support a sustainable mariculture industry in Alaska. Overseeing numerous projects within research and development, de-risking investments, green energy, restoration, and more.

2022-2024 **Regenerative Food Systems Consultant.** *Terra Genesis International*
Designer and consultant at global regenerative design and development firm. TGI works at the intersection of ecology, agriculture and enterprise. Collaborating with brands and farmer cooperatives to create sustainable supply systems that scale regenerative land stewardship and improve farmers livelihood. Role included: stakeholder engagement, strategic planning, grant writing, data analysis, living systems design.

2021-2022 **Aquaculture Research Apprentice.** *Kelp Crofters- Scotland*
Apprentice on start-up Kelp Farm in Scottish Highlands. Sorus collection, gametophyte and seeding, harvest, array assembly, and benthic/zooplankton sampling. Research part of thesis on ecosystem benefits and cascade of post-life industrial applications of polyculture kelp farming. Lab research and analysis, material, culinary, and bio-stimulant prototyping completed. Collaborated with scientists, chefs, distributors and facilitated educational workshops.

2017-2020 **Agricultural Specialist.** *River Run Farm, Little Owl Biodynamic Farm.*

2014-2015 **Agro-Ecological Designer**. *Rancho Mastatal + Elemental Ecosystems*

Recent Reports + Collaborators:

Close, A., Huller, A. 2024. *Towards Zero Waste Event Planners Toolkit.* Waste Loop. https://www.wasteloop.org/towards-zero-waste

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