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## Joint Innovation Projects

### Round II - 2024

With funding from the Alaska Mariculture Cluster (AMC), Alaska Fisheries Development Foundation (AFDF) is excited to announce a second cohort of applied research and development projects for the Joint Innovations Project (JIP) program. These projects are designed to partner with the private sector to accelerate innovation, address barriers to growth, and stand up Alaska's emerging mariculture industry.

The second cohort, totaling \$1.34 million in funding, comprises hatcheries, nurseries, aquatic farmers, researchers, and processors. Each of their projects falls under one of the following categories: innovations in seaweed farming, innovations in processing (oysters or seaweed), boosting oyster growth at nurseries or farms, shellfish enhancement, and de-risking farming through site suitability analysis and/or monitoring.

#### **About the Alaska Mariculture Cluster**

In September 2022, Southeast Conference (SEC) was awarded a \$49 million U.S. Economic Development Administration (EDA) Build Back Better Regional Challenge (BBBRC) grant to grow Alaska's mariculture industry. SEC leads the Alaska Mariculture Cluster (AMC) grant coalition, which includes members of Alaska's mariculture industry, tribal organizations, regulatory agencies, university system, Economic Development Districts, trade organizations, and others. A Governance Body, composed of AMC coalition leaders and Tribal representatives from each of the project regions, guides the grant's work and equity metrics.

The AMC grant has seven complementary components designed to break down barriers and develop a transformational, viable, and sustainable mariculture industry for the long-term benefit of Alaska's economy, environment, and communities. More information on the AMC is available at [alaskamariculturecluster.org](http://alaskamariculturecluster.org), including the [Overarching Narrative](#), which explains how the grant components work together to grow the mariculture industry in an equitable and responsible manner. The full project period for the AMC BBBRC project is October 1, 2022 to September 30th, 2026.

## About AFDF

Since 1978, the AFDF has broadly represented the Alaska seafood industry (harvesters, processors, and support service businesses) in the areas of research and development. Since 2014, AFDF has spearheaded the Alaska Mariculture Initiative, an effort to expedite the development of growing shellfish and seaweed in Alaska.

AFDF is a part of the AMC coalition and one of the subaward recipients. As part of its subaward, AFDF oversees a portion of the [Research and Development](#) component, and in particular, the Joint Innovation Projects.

## Joint Innovation Projects Round I

See [JIP Round I project summaries](#) awarded in 2023 and due to be completed by Spring 2025.

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## INNOVATIONS IN SEAWEED FARMING

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### **Building capacity for gametophyte generation and direct seeding techniques for the commercial kelp species *Saccharina latissima* (Sugar kelp) in Alaska**

**Lead Entity: Chugach Regional Resources Commission & Alutiiq Pride Marine Institute**

Category: Innovations in seaweed farming

Project Location: Seward, AK

Project Start Date: October 1, 2024

Expected End Date: February 28, 2026

Award Amount: \$99,473

### **PROJECT OVERVIEW**

The hatchery stage is crucial for the success of cultivated kelp, where juvenile kelp are reared under artificial conditions, significantly impacting their health and production in the ocean. Traditionally, kelp hatcheries use meiospores that attach to seed-lines and cycle through a sexual gametophyte stage to produce harvestable sporophytes. Although viable, this technique has limitations, including inconsistent sporophyte densities, a lack of genetic transparency, and potentially reduced growth performance compared to gametophyte seeding. Gametophyte seeding offers greater control over these variables and has been under considerable investigation, with increasing implementation in Europe and the Eastern United States. This project aims to establish protocols to maximize propagation efficiency for the native kelp species *Saccharina latissima* (Sugar kelp) using state-of-the-art photo-bioreactors designed for gametophyte propagation. The Southeast Conference has committed funding for procurement of Industrial Plankton™ bioreactors for the Alutiiq Pride Marine Institute, however, additional funding is required to operate the equipment and test culturing protocols for optimization. Optimization will increase the production capability of this system and decrease the cost per unit of outplanted line. Additionally, direct seeding methods will be tested to determine best practices for implementing this hatchery method for ocean cultivation. The project will see collaboration with Scott Lindell at Woods Hole Oceanographic Institution, including inter-lab travel and training in gametophyte hatchery techniques. The project's success will result in an outline of best practices for a commercial-scale Sugar kelp gametophyte hatchery and the establishment of

large-scale photo-bioreactor capabilities in Alaska, opening potential for future research involving genetic selection and year-round seeding.

## INNOVATIONS IN SEAWEED FARMING

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### **Assessing Optimal Infrastructure and Seeding Approaches for Large-Scale Cultivation of Bull Kelp**

**Lead Entity:** Sea Quester Farms, LLC

Category: Innovations in Seaweed Farming

Project Location: Juneau, AK

Project Start Date: August 1, 2024

Expected End Date: January 31, 2026

Award Amount: \$100,000

### **PROJECT OVERVIEW**

Sea Quester Farms is dedicated to advancing commercially viable, food-grade bull kelp cultivation practices through field trials conducted at our farm site near Juneau, Alaska. Our research will assess two critical factors: the growth of bull kelp on enhanced arrays and the performance of different seeding techniques. Collaborating with farmers and representatives from Goldbelt, Spruce Root, Sustainable Southeast Partnership, Ecotrust, and CRTC, we aim to widely share the project's findings. In its natural habitat, bull kelp attaches to rocks on the seafloor and grows in dispersed small clusters, unlike continuous blankets seen in suspended cultivation arrays using densely seeded lines. These traditional farming methods have proven challenging and costly for scaling up bull kelp production in Alaska. Our approach involves strategically spacing seeded segments along cultivation lines and utilizing seafloor-tethered array systems to more closely mimic bull kelp's native growing conditions, thereby optimizing yield and economic viability. This initiative builds upon insights gained from our 2023 Joint Innovation Proposal, ("Evaluating Infrastructure and Seeding Methods for Scalable Bull Kelp Cultivation"), furthering innovations in producing food-grade, commercially viable bull kelp. Project partners will disseminate key findings from this study.

## INNOVATIONS IN SEAWEED FARMING

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### **From Hatchery to Harvest: Examining the effects of different hatchery environments throughout the bull kelp lifecycle**

**Lead Entity: University of Alaska Fairbanks- Dr. Michael Stekoll**

Category: Innovations in Seaweed Farming  
Project Location: Juneau & Kodiak, AK  
Project Start Date: August 1, 2024  
Expected End Date: October 31, 2025  
Award Amount: \$100,000

**PROJECT OVERVIEW**

While the abiotic limits of bull kelp growth at the microscopic stage are somewhat understood, there is still a lot we don't know about optimizing growth in hatcheries, especially in terms of light and temperature, and how different hatchery conditions may affect the final growth and yield of seaweed farms at harvest. This proposal aims to make progress in aquaculture by determining how to optimize microstage kelp growth while also taking into consideration hatchery costs such as the electricity needed for lighting and controlling water temperature. This project will investigate how varying light and temperature levels affect optimal bull kelp seed growth and hatchery process costs. Seed string grown under these different hatchery conditions will then be outplanted on two farms, one in Juneau and one in Kodiak, to determine how exposure to different abiotic conditions in the hatchery stage affect the adult stage of kelp and harvest outputs. Most studies of the effects of abiotic stress on bull kelp primarily focus on either the microscopic or the macroscopic stages of kelp. This study would provide a novel understanding of bull kelp growth and development over its entire life cycle by following individuals from hatchery to harvest.

INNOVATIONS IN PROCESSING

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**Novel Compound Discovery in Newly Domesticated Alaskan Kelp**

**Lead Entities: Alaska Ocean Farms, LLC & Marine Biologics, Inc.**

Category: Innovations in Processing Seaweed  
Project Location: Kodiak, AK  
Project Start Date: August 1, 2024  
Expected End Date: December 31, 2024  
Award Amount: \$99,875

**PROJECT OVERVIEW**

Alaska, with its potential for rapidly scaling macroalgae cultivation in remote coastal regions, faces the challenge of needing industrial-scale supply and processing capabilities to meet the growing industrial demand for sustainable biomass. The primary objectives of this project are to

extract high-value molecules including, but not limited to fucoidan, laminarin, fucoxanthin and polyphenols from three kelp species in Kodiak, Alaska. The fucoidan market, valued at US\$33 million in 2022, is expected to expand at a CAGR of 7.97%, reaching US\$ 52.16 million by 2032, driven by its applications in dietary supplements, pharmaceuticals, and cosmetics. The laminarin market is valued at US\$2 million annually with a CARG of 8.40%, while the pigment fucoxanthin is valued at US\$ 200 million with a CARG at 1%. This project will demonstrate the feasibility of extracting multiple compounds, laying the groundwork for future scaling and commercialization efforts. Additionally, it will explore the variability of fucoidan content among different kelp species, noting that typical sugar kelp contains about 2-3% fucoidan depending on seawater nutrient conditions. Testing other kelps for potentially higher fucoidan concentrations will provide valuable insights for optimizing extraction processes and enhancing market potential. Furthermore, new species may lead to the potential of novel, interesting compounds to meet customer and market needs.

## INNOVATIONS IN PROCESSING

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### **Building a shipping route: Cost-reducing methods to transport stabilized kelp from Alaska to market**

#### **Lead Entity: Atlantic Sea Farms**

Category: Innovations in Processing

Project Location: Kodiak, AK

Project Start Date: September 1, 2024

Expected End Date: February 28, 2026

Award Amount: \$99,929

### **PROJECT OVERVIEW**

Alaska has enormous potential to support the growing domestic kelp farming industry thanks to its expansive coastline, government support, seafood industry infrastructure, skilled maritime workforce, and diversity of native, marketable kelp species. However, a massive barrier remains: an economic means of processing and transporting kelp to market. The ongoing “Building a product bridge: cost-effective primary stabilization for transportation of Alaska kelp to market” Joint Innovation Project has already identified methods of primary stabilization using USDA approved ingredients in a variety of different brine solutions without the need for expensive and resource intensive freezing or cold storage. As we continue primary stabilization optimization, Atlantic Sea Farms (ASF) is looking to address the outstanding barrier of transporting kelp out of Alaska at an economically viable price. ASF proposes a Phase 2 of this project that directly targets methods for reducing the transport cost of harvested kelp to the lower 48. It will build upon the Phase 1 primary stabilization trials and address how to prepare commercial quantities of kelp for shipment post-stabilization. This will be accomplished by 1) incorporating dewatering equipment into primary stabilization to reduce total water content 2) trialing a small-scale dehydrator more accessible to rural Alaskans than expensive commercial equipment, 3) determining how the different processing steps alter kelp composition and affect product end-use, and 4) delivering a public economic analysis outlining commercial potential for this process.

## **Mobile Seaweed Processing**

### **Lead Entity: Mothers of Millions (MOM), LLC**

Category: Innovations in Processing  
Project Location: Prince William Sound, AK  
Project Start Date: August 1, 2024  
Expected End Date: October 31, 2025  
Award Amount: \$100,000

## **PROJECT OVERVIEW**

Commercial kelp farmers in Southcentral Alaska face logistical obstacles for harvesting, stabilizing, and transporting large volumes of kelp biomass from aquatic farms to population centers; the primary objective of this project is to develop a mobile seaweed processor to optimize the harvest and stabilization of organic commercial kelp biomass to assist commercial kelp farmers in southcentral Alaska to meet scaled up market demand and kelp production for the 2024-2025 growing season. Mothers of Millions LLC (MOM) is a woman-owned and operated small business established to provide support to new and emerging seaweed farmers in rural, coastal communities in Southcentral Alaska. MOM seeks to address the current market gap in seaweed processors operating within Alaska, and provide a market for commercial seaweed farmers through the development of a mobile processing facility. Such a mobile facility supports rural Alaskan communities through reducing transportation costs for farmers with remote seaweed farms. This proposed project will develop an organic, mobile seaweed processor that: (1) works with Native Conservancy to establish a network of farms throughout Prince William Sound to ensure each participating farmer receives organic certification; (2) develops an optimized, mobile harvesting solution to provide farmers with on-water support for harvesting, stabilizing, and transporting large volumes of kelp biomass; (3) provides an anchor customer for commercial kelp farmers in Southcentral Alaska; (4) tests various stabilization and processing methods to match harvesting efforts with processors' end uses of kelp product; and (5) works with Native Conservancy to leverage traditional processing experience in the development of new and innovative methodologies for processing kelp.

## **Reducing Impact of Heavy Metals in Seaweed to address Barriers of Growth**

### **Lead Entity: Four Corner Foods & Sun'Aq Tribal Enterprises/ Wildsource**

Category: Innovations in Processing  
Project Location: Kodiak, AK  
Project Start Date: August 1, 2024  
Expected End Date: March, 2025  
Award Amount: \$99,530

## PROJECT OVERVIEW

Seaweed for human consumption must comply with daily recommended allowances to manage intake of heavy metals and iodine. These compounds are present due to several factors – species, geographical location, sea water quality, time of harvest, and processing conditions. Processing, for stabilization (frozen or dehydrated) after harvest, has a significant impact on ‘leaching’ undesirable heavy metals and reducing iodine levels. This study is targeted at comparing the impact of water blanching and steam blanching with and without dehydration to quantify differences in its heavy metal and iodine content, to address limitations, and recommend a best practice for increased safe consumption. This will directly address barriers to growth where the goal is increased consumption of various forms of seaweed (dry or frozen or other). The results from these trials will point to choices that can be made by all processors in various locations, to influence the recommended daily amount that can be consumed with their particular seaweed and product application. Innovation and discovery of these pre-processing techniques that can apply to stabilization processes (like drying and freezing) will promote technological advancement, and best practices among industry stakeholders. When these challenges are addressed, the seaweed and mariculture industry in Alaska will enhance the quality, safety, and marketability of frozen and dried seaweed products while maximizing economic opportunities for local communities.

### INNOVATIONS IN PROCESSING

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## Solar Drying of Alaskan Seaweed and Use as a Sustainably Sourced Layer Hen Feed Ingredient

**Lead Entity: Premium Aquatics, LLC d/b/a Seagrove, World Wildlife Fund & Wilcox Farms, Inc.**

Category: Innovations in Processing and Product Utilization  
Project Location: Prince of Wales Island/ University of Arizona  
Project Start Date: August 1, 2024  
Expected End Date: January 31, 2025  
Award Amount: \$99,625

## PROJECT OVERVIEW

The overall project is designed to evaluate the suitability of Alaska-farmed sugar kelp (*Saccharina latissima*) as a feed ingredient for certified organic layer hens, resulting in an improved market for harvested seaweed. Various kelp species incorporated into poultry diets (both layers and broilers) at inclusion rates ranging from 0.5 to 10% have resulted in changes in



bird growth, intake, digestibility, and immune function, as well as altering egg quality (yolk coloration, omega-3 fatty acid content), weights and strength measurements. This study first investigates the use of an innovative solar tower drying system to maintain nutritional value and stabilize seaweed for longer transportation and shelf life as a functional feed ingredient. Dried kelp will then be incorporated into test diets at 3- 5% of dry matter and fed to test flocks for 6 to 8 weeks, with control birds maintained on conventional diets. Dietary composition, nutrient stability, and microbial loads will be assessed at the beginning and end of the trial. Animal responses measured will include intake and digestion, fecal consistency and microbiome characteristics. Egg production, quality parameters (size, weights, shell strength, yolk color, nutritional value) will be measured and compared between test and control hens. Economics and environmental metrics associated with the use of sugar kelp as a sustainable feed ingredient will be calculated. Results will be summarized, presented at an appropriate poultry conference, and submitted for publication in a peer-reviewed forum. For dissemination of results within Alaska WWF, with Seagrove's support and collaboration, will broadly present the information and results in Alaska, for the benefit of Alaskan farmers and Alaska Native groups. The results and information will also be made available to Alaska Mariculture Alliance and Alaska Mariculture Cluster sites for broader release.

## INNOVATIONS IN PROCESSING

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### **Expanding Markets through Differentiation: New Species and Product Lines**

#### **Lead Entity: Saltwater Inc. & Regeneration North, LLC**

Category: Innovations in Processing: Product Development & Innovations in Seaweed Farming

Project Location: Anchorage, AK

Project Start Date: September 1, 2024

Expected End Date: December 31, 2025

Award Amount: \$99,560

#### **PROJECT OVERVIEW**

Our ability to efficiently process farmed seaweed has improved, however current supply of Alaskan farmed sugar kelp exceeds demand, indicating the need to put greater emphasis on both expanding existing markets and creating new ones through species diversification, product differentiation, and development of diverse markets. To support a thriving seaweed mariculture industry, the link from processing to successful markets requires greater attention to fostering integrated market differentiation and product development. This project will build on learning from ongoing farming, processing and marketing activities in the three areas that are showing the most promise in our current JIP ("Testing Four Approaches to Small-Scale Primary Seaweed

Stabilization & Matching Methods to Markets”), including: promoting innovations in seaweed farming by helping to support four farms and two nurseries to grow three additional kelp species based on our current success selling diverse wild-set species; expanding salting trials and product testing for gourmet restaurant/specialty food markets, and; developing seaweed-based plant biostimulants targeting Alaska growers.

## INNOVATIONS IN PROCESSING

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### **Simulation and Development of a Kelp Drying Prototype Using Existing Equipment**

#### **Lead Entity: Sea Quester Farms, LLC**

Category: Innovations in Processing  
Project Location: Juneau, AK  
Project Start Date: October 1, 2024  
Expected End Date: December 31, 2025  
Award Amount: \$67,429

#### **PROJECT OVERVIEW**

Bull kelp plays a crucial role in Alaska's marine ecosystem and has significant economic potential due to its applications in food, pharmaceuticals, and biofuels. Bull kelp holds a strong position in the market thanks to the Alaskan value-added seaweed company, Barnacle Foods. However, the high moisture content of harvested kelp presents substantial challenges in drying and storage, as existing methods often require specialized equipment that is not always accessible or affordable in southeast Alaska. This limitation prevents Alaska from tapping into larger kelp markets, adversely impacting the economic viability of kelp producers and limiting the industry's ability to meet the growing global demand for high-quality, sustainable seaweed products. There is a critical need for an innovative solution that leverages existing equipment to develop an efficient drying and storage technique tailored to Alaska's unique marine environment. Sea Quester Farms aims to develop an innovative kelp drying prototype to enhance the efficient drying and storage of bull kelp, utilizing equipment already transported across southeast Alaska. By utilizing a container-based freezer retrofitted with a heat pump unit, the system ensures efficient, low cost drying through the capture and utilization of waste heat from adjacent storage freezer units. This project will enhance the economic viability of kelp producers, support the growing demand for sustainable seaweed products, and contribute to the sustainable development of Alaska's mariculture sector. In partnership with Spruce Root, Sea Quester Farms aims to widely disseminate the project's findings, fostering sustainable practices and driving growth in the Alaskan mariculture industry.

## **Sea Otter Sound Mariculture Data Initiative: Collaborative Monitoring and Innovation in Southeast Alaska's Mariculture Industry**

### **Lead Entity: Kelp Blue 49, LLC & Craig Tribal Association**

Category: De-risking farming through site suitability analysis and/or monitoring & Innovations in mooring system technology, design and/or deployment

Project Location: Prince of Wales, AK

Project Start Date: August 1, 2024

Expected End Date: February 1, 2026

Award Amount: \$100,000

### **PROJECT OVERVIEW**

The Sea Otter Sound Mariculture Data Initiative aims to advance sustainable mariculture practices in Southeast Alaska by conducting bi-weekly and post-extreme weather environmental surveys and site assessments at our lease in Sea Otter Sound. Supported by continuous data collection from a Sofar Spotter Buoy, the initiative will monitor wave conditions and local climate, and map native giant kelp forests using the Mapping Canopy-Forming Kelps guidebook. Key objectives include evaluating site suitability for giant kelp farming, optimizing mooring system placements, and monitoring ocean health and marine mammals, including ESA-listed species. Recognized by USACE and NOAA for its innovative farm design, the project seeks to address regulatory concerns, integrate monitoring findings, and promote ecological stewardship. The findings will be shared with stakeholders to support informed decision-making and foster the growth of the Alaska mariculture industry, which requires new technology to prevent marine mammal entanglement and accommodate year-round farming.

## **Early Warning of Harmful Algal Blooms and Biofouling Larvae Using the PlanktoScope, A Low-Cost Automated Plankton Imaging and Analysis Tool**

### **Lead Entity: Ostrea Marine**

Category: De-risking farming through site suitability analysis and/or monitoring

Project Location: Juneau, AK

Project Start Date: September 1, 2024

Expected End Date: February 28, 2025

Award Amount: \$75,727

Shellfish farmers and subsistence harvesters in Alaska gravely need tools that can provide them with actionable information regarding blooms of harmful algae and biofouling larvae. Harmful Algal Blooms (HABs) in Alaska present a significant risk to human health for shellfish consumers, and to the bottom line for shellfish growers. Shellfish farms may be closed for sales for weeks to months when their product tests above the limits for biotoxins produced by the blooms. Further expense to farmers comes from larval mussels and barnacles settling on gear and competing with farmed organisms. Blooms of HABs and biofouling organisms are exceptionally difficult to predict along the large, complex coastline of Alaska. Furthermore, tools and techniques used to monitor blooms at an individual farm site are either too expensive or too time consuming for most farm operations. We propose to trial the PlanktoScope, a low-cost (<\$5k), open-source digital microscopy platform designed to image and identify plankton, as a HAB and biofouling early warning tool for Alaskan shellfish farmers and harvesters. This technology has the potential to provide farmers and harvesters with actionable information regarding the presence of HAB and biofouling organisms, which would allow them to take mitigation steps to reduce impact on farm operations and human health.

## SHELLFISH ENHANCEMENT

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### **Developing increased survival techniques for shellfish enhancement of two species (*Clinocardium nuttallii* and *Mya arenaria*) through implementing predator protection in Southeast Alaska**

**Lead Entity:** Organized Village of Kake (OVK)

Category: Shellfish enhancement

Project Location: Kake, AK

Project Start Date: August 1, 2024

Expected End Date: January 31, 2026

Award Amount: \$97,725

### **PROJECT OVERVIEW**

Increased sea otter populations threaten shellfish populations throughout Southeast Alaska, and necessitate innovative solutions for “grow-out” techniques for shellfish on subsistence and personal use beaches. The primary purpose of this project is to develop and implement innovative grow-out and predator control techniques using predator control blankets to maximize growth and survival for cockles and soft-shell clams on subsistence beaches adjacent to the community of Kake, Alaska. The objectives of this JIP supported project are to: (1) work with the shellfish hatchery as they refine techniques to maximize growth and survival for cockles and soft-shell clams; (2) determine optimum installation and tending techniques for predator control blankets after seeding; (3) complete 12 months of trial grow-out period, with 4 controlled scenarios. Additionally, The Organized Village of Kake has been engaged in a pilot study to support this work over the past 12 months, including out-planting 2 rounds of cockles. Additionally, the project will include 4 community engagement events with community residents in Kake to facilitate community engagement in pre-survey of study areas, out-planting, monitoring, and post-study survey.

## Developing Hybrid Oyster Seeds for Alaska Shellfish Growers

**Lead Entity: Pacific Hybreed, Inc. & NOAA Alaska Fisheries Science Center**

Category: Boosting oyster growth at nurseries or farms

Project Location: Juneau, AK

Project Start Date: August 1, 2024

Expected End Date: January 31, 2026

Award Amount: \$100,000

### PROJECT OVERVIEW

Oyster farming in Alaska relies on seeds produced using broodstock that have not been optimized for growth in Alaska. This practice can result in inconsistent yield performances of farmed oysters that hinder growth of the industry. Pacific Hybreed and NOAA scientists are conducting a Joint Innovation Project to select families with improved yields in Alaska waters. This proposal is an opportunity to build on these initial efforts by performing additional crosses of the best-performing oysters identified from the initial experiment, and outplant them in Alaska oyster farms. Specific hybrid lines will be produced using families from a long-term breeding program for the Pacific oyster, *Crassostrea gigas*, that consists of a broodstock repository, two hatcheries, and test sites along the U.S. Pacific Coast. Based on the results from ongoing fieldwork, we propose to (1) produce 'elite single-hybrids' (i.e., best-performing, 1st-generation hybrids) for on-farm trials and (2) develop 'double-crosses' by crossing unrelated, elite single-hybrids as a marketable product. Double hybrids are known for their overall improved performances and better biological resilience to the environment. Production of the new hybrid families will be conducted in hatcheries operated by Pacific Hybreed, using genotyped oysters from family lines held in the broodstock repository. Hybrid seeds will be evaluated at Little Port Walter and in shellfish farms in Southeast and Southcentral Alaska for on-farm trials to evaluate the farm yield of hybrid oysters. In situ environmental parameters will be recorded, in addition to the yield and genotype data for the animals. We anticipate identification of specific double hybrids for the colder growing environments in Alaska and development of single-hybrid lines for consistent production of the double-hybrid varieties for the Alaska shellfish industry.