ALASKA MARICULTURE WORKSHOP

PARTICIPANT RESOURCE BOOKLET

Ketchikan, Alaska
January 21st – 22nd, 2020

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This booklet was developed as an informational resource for participants of the Alaska Mariculture Workshop. The contents are aligned with the presentations and discussions scheduled during the workshop. Please be advised the various lists and tables of reference are not exhaustive.

CONTENTS:

Cover Photos: OA Hatchery Tanks at Sunset | Kodiak Kelp credit: Jennifer Nu | Alaria marginata credit: Lindeberg.

Alaska Mariculture Task Force & Mariculture Development Plan

In 2016, Governor Walker established the **Alaska Mariculture Task Force** through Administrative Order No. 280 to develop a comprehensive plan for the development of a viable and sustainable mariculture industry that produces shellfish and aquatic plants for the long-term benefit of Alaska's economy, environment, and communities. The eleven-member Task Force represents a partnership among a broad spectrum of stakeholders.

The Task Force subsequently developed the **Mariculture Development Plan**, published in 2018, which identifies these challenges and barriers to development in the areas of investment, regulations, research and development, coordination and leadership, workforce needs, marketing and public education. *The Task Force then makes detailed recommendations regarding the changes and additions needed to achieve the full potential of Alaska's opportunities.* The recommendations developed by the Task Force include details on public and private investments, regulatory issues, research and development needs, environmental changes, public education, and workforce development.

The Plan is intended to increase profitability for those already engaged in mariculture, to expand participation, and to provide coordination to refine regulations, access funding and conduct needed research.

VISION: Develop a viable and sustainable mariculture industry producing shellfish and aquatic plants for the long term benefit of Alaska's economy, environment and communities.

GOAL: Grow a $100 million mariculture industry in 20 years.

- **Alaska Mariculture Development Plan** *[Complete]:* https://www.adfg.alaska.gov/Static/fishing/pdfs/mariculture/ak_mariculture_devplan_06-29-18.pdf

- **Alaska Mariculture Development Plan** *[In Brief]***:** https://www.afdf.org/wp-content/uploads/In-Brief-Alaska-Mariculture-Development-Plan-FINAL-ONLINE.pdf

MADE IN ALASKA

MARICULTURE

PATHWAY TO A VIABLE AND SUSTAINABLE INDUSTRY

Priority Recommendations Highlighted in Red

Secure and Promote Investment In Mariculture

- Increase the Mariculture Revolving Loan Fund principal as utilization increases.
- Secure private investment.
- Coordinate federal and state funding sources.
- Fund business planning, start-ups, and structures.
- Leverage utilization of existing coastal infrastructure.
- Develop a web-based mapping tool.
- Encourage financial support for State agencies to properly manage and timely process farm applications.
- Develop options for self-assessments, taxation, or other fee mechanisms to support growth.

Establish an Alaska Mariculture Development Council (AMDC)

- **Extend the MTF and its advisory committees for three years, with a new directive to begin implementation of the comprehensive plan and creation of the AMDC.**

Maximize Innovation and Growth Through Research

- **Establish a Mariculture Research Center to address research priorities and continually update needs.**
- **Fill the UAF Alaska Sea Grant Mariculture Specialist position.**
- **Fill the Alaska Region NOAA Aquaculture Coordinator position.**

Develop New Mariculture Markets and Products

- Coordinate mariculture marketing through trade associations and consider joining with ASMI through self-assessment.
- Encourage ASMI to expand marketing to include mariculture products.
- Engage in product form research and development and market research.
- Support economic data collection and research.

Build Public Understanding and Support for Mariculture

- Inform about maintaining existing uses, preserving the environment, preventing genetic issues, and avoiding market competition with wild-caught seafood.
- Conduct public outreach to multiple audiences.
- Identify and communicate with all community stakeholders early in the process.
- Coordinate information and advocacy through a central body.

Promote Success Through Alaska Native Participation

- Conduct outreach to Alaska Native organizations related to mariculture opportunities and relevant technical and financial support.
- Seek tribal engagement through local outreach during the farm permitting process.
- Develop collaborative workforce development programs between tribes, Alaska Native Corporations, industry, and other relevant partners.
- Integrate mariculture topics and studies in relevant educational programs.

Align Laws, Regulations, and Agency Practices with Stakeholder Needs

- **Allow restoration, rehabilitation, and enhancement of shellfish stocks.**
- Create a single point of contact for permitting processes.
- Modify farm site lease requirements, including bonding requirements, lease fee structures, risk reduction, and best practices.
- Provide resources necessary to ADEC.
- Pursue clarification of regulations.

Secure Seed Supply Through Shellfish and Seaweed Hatcheries

- **Fund hatchery operating costs until the industry is self-sustaining.**
- Develop long- term funding options to support hatchery production.
- **Allow and encourage shellfish and seaweed hatcheries to utilize the Mariculture Revolving Loan Fund.**
- Provide technical assistance to existing and new hatcheries.

Grow and Develop the Mariculture Workforce

- Provide mariculture skill-building resources and professional development opportunities to growers, available both remotely and in-person.
- Offer an "Introduction to Shellfish/ Seaweed Farming" boot camp.
- Utilize the University of Alaska's Sea Grant Mariculture Specialist position.
- Develop a mariculture apprenticeship/ mentorship program.
- Participate in industry career awareness activities.
- Evaluate and track participant progress and include mariculture workforce impacts in economic and employment analyses.

'Made in Alaska Mariculture' graphic provided by Alaska Department of Commerce, Division of Economic Development and artist Craig Updegrove.

$100 Million Alaska Mariculture Industry in 20 Years

Long-Range (20-Year) Annual Production Goals

45 million	Pacific oysters (count)
500,000	Geoducks (count)
48 million	Kelp (lbs.–wet)
1.8 million	Blue mussels (lbs.)
565,000	Red king crab (lbs.)
1.9 million	Sea cucumbers (lbs.)

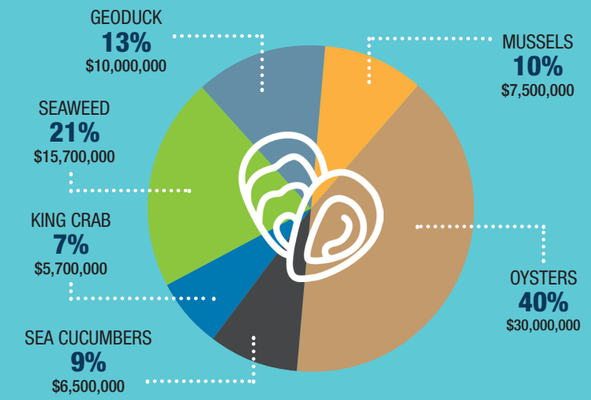
20-Year Annual Economic Impact

$100 million+
Annual output, including all direct, indirect, and induced effects

- **$75** million in industry sales
- **1,500** total jobs
- **$38 million** in direct wages
- **$49 million** in total labor income

Note: 2017 dollars

20-Year Annual Revenue Goals



NOAA Aquaculture Program

The **NOAA Aquaculture Program** leads NOAA's efforts to support cutting-edge science and research as well as federal policy making and regulation to grow sustainable marine aquaculture in the United States. Benefits include increasing the nation's seafood supply, creating jobs in coastal communities, enhancing important commercial and recreational fisheries, and restoring depleted species and habitats. The Program includes activities in three NOAA line offices – NOAA Fisheries, National Ocean Service, and NOAA Research - each with distinct and complementary roles.

NOAA Fisheries focuses on addressing the regulatory, technical, and scientific barriers to domestic marine aquaculture development. The headquarters office and regional aquaculture coordinators address regulatory bottlenecks by increasing permitting efficiency around the nation. NOAA Fisheries also comprises much of NOAA's in-house aquaculture research, with activities at six Regional Fisheries Science Centers. Research and development efforts focus on providing science information for management by addressing a number of issues including the culture of specific species, alternative feeds, animal health, and habitat benefits and impacts.

NOAA Fisheries Office of Aquaculture: **fisheries.noaa.gov/topic/aquaculture**

NOAA Sea Grant Program integrates aquaculture research, extension, and education through the national office and 34 university-based Sea Grant programs across the U.S. coasts and Great Lakes. Sea Grant manages NOAA's primary extramural grant competition for aquaculture industry development. These grants support research and extension activities within universities, industry, and environmental organizations. Sea Grant extension agents live and work in coastal communities, providing science-based information to local governments, citizen groups, and other stakeholders, transferring technologies to industry to increase sustainable aquaculture production.

NOAA Research Sea Grant Program: seagrant.noaa.gov

National Ocean Service (NOS) National Centers for Coastal Ocean Science (NCCOS) supports coastal managers and the aquaculture industry by developing coastal planning and management tools and services, including assessing potential environmental impacts of aquaculture. These efforts provide the scientific intelligence required for proper siting of marine aquaculture while maintaining healthy and resilient marine ecosystems.

NOS National Centers for Coastal Ocean Science: coastalscience.noaa.gov

NOAA established the **National Shellfish Initiative** in partnership with shellfish farmers and shellfish restoration organizations with the goal to increase populations of bivalve shellfish in our nation's coastal waters—including oysters, clams, and mussels—through both sustainable commercial production and restoration activities.

NOAA National Shellfish Initiative: fisheries.noaa.gov/content/national-shellfish-initiative

Photo: NOAA Crew Tours

2016 Aquaculture Production **Highlights**

Marine & Freshwater **National Totals**

VALUE

$1.5 billion

21% of U.S. seafood production & fishery products by value

MARINE	FRESHWATER
$418.3 million	$719.8 million

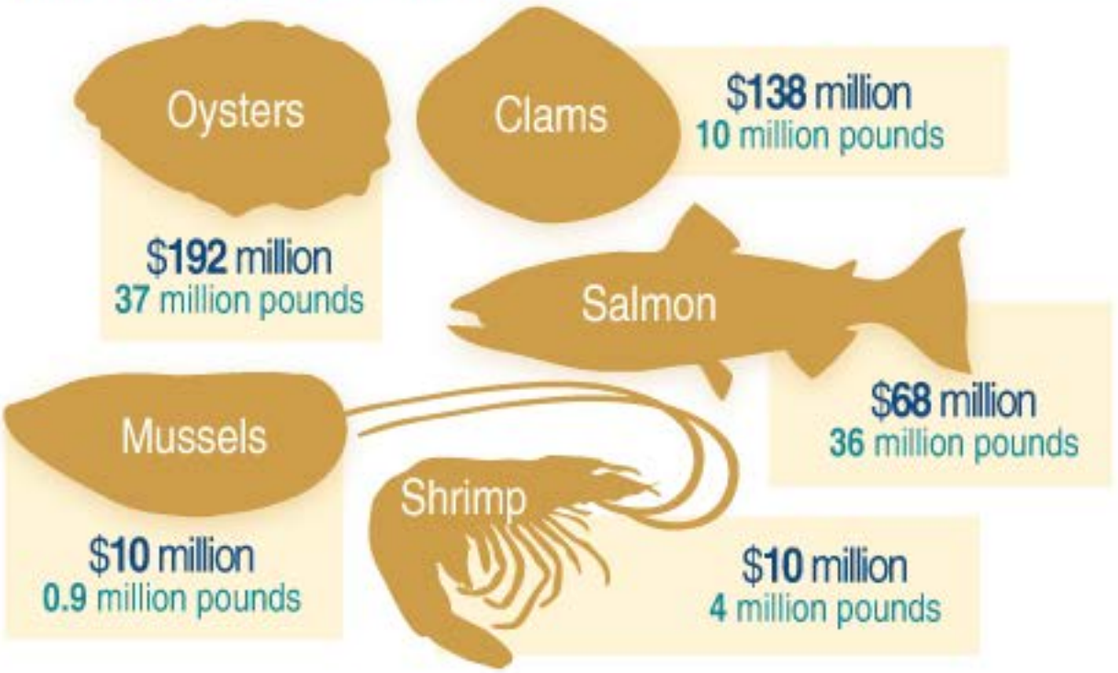
PRODUCTION

633 million pounds

16th in global aquaculture production

MARINE	FRESHWATER
86 million pounds	547 million pounds

Marine Species Totals



Regional Marine Totals

NOAA FISHERIES

* Alaska and Hawaii are included in the Pacific region for aquaculture production.

Agencies, Organizations and Research Institutions

Alaska Department of Fish and Game (ADFG) https://www.adfg.alaska.gov/index.cfm?adfg=fishingaquaticfarming.main	University of Alaska Southeast http://www.uas.alaska.edu/career_ed/fisheries/
Alaska Department of Natural Resources (DNR) http://dnr.alaska.gov/mlw/aquatic/	University of Alaska Fairbanks College of Fisheries & Ocean Sciences https://www.uaf.edu/cfos/
Alaska Fisheries Development Foundation (AFDF) https://www.afdf.org/projects/current-projects/	Pacific Shellfish Institute http://pacshell.org
Alaska Department of Commerce, Community and Economic Development https://www.commerce.alaska.gov/web/	Oceans Alaska https://oceansalaska.org
Alaska Department of Environmental Conservation (DEC) https://dec.alaska.gov/eh/fss/shellfish/	Alaska Shellfish Growers Association https://asga.wildapricot.org
NOAA Fisheries Office of Aquaculture https://www.fisheries.noaa.gov/topic/aquaculture	Pacific Coast Shellfish Growers Association http://pcsga.org
SeaGrant Alaska Aquaculture http://aquaculture.seagrant.uaf.edu	Kachemak Bay Mariculture Association http://www.alaskaoyster.org
NMFS Alaska Regional Office https://www.fisheries.noaa.gov/about/alaska-regional-office	Alutiiq Pride Hatchery http://alutiiqpridehatchery.com
NMFS Alaska Fisheries Science Center https://www.fisheries.noaa.gov/about/alaska-fisheries-science-center	US Fish and Wildlife Service https://www.fws.gov
US Army Corps of Engineers (USACE) Alaska District https://www.poa.usace.army.mil	

Relevant Recent Legislation

- *May 2019*: **House Bill #41** - An Act relating to management of enhanced stocks of shellfish; authorizing certain nonprofit organizations to engage in shellfish enhancement projects; authorizing the Department of Fish and Game to collect fee revenue from applicants for certain salmon hatchery permits and from applicants for shellfish enhancement project permits; relating to application fees for salmon hatchery permits; and providing for an effective date:
  http://www.akleg.gov/basis/Bill/Detail/31?Root=HB%20%2041

  [HB41 was not moved forward last year. It will be resubmitted this year.]

- *May 2019:* **House Bill #116** - An Act relating to the renewal or extension of site leases for aquatic farming and aquatic plant and shellfish hatchery operations.
  http://www.akleg.gov/basis/Bill/Detail/31?Root=HB%20116

  [HB116 was not moved forward last year. It will be resubmitted this year.]

- *August 2018:* **House Bill #76** – allows shellfish and seaweed hatcheries to be eligible applicants for the Mariculture Revolving Loan Fund:
  http://www.legis.state.ak.us/PDF/30/Bills/HB0076Z.PDF

- *August 2018:* **Administrative Order #297** – extends MTF until year 2021:
  https://gov.alaska.gov/admin-orders/administrative-order-no-297/

- *February 2016:* **Administrative Order #280** – established the Mariculture Task Force (MTF): https://gov.alaska.gov/admin-orders/administrative-order-no-280/

Relevant Recent Publications

** All documents below are also referenced in the Mariculture Development Plan.*

Mar. 2015	**Economic Analysis to Inform the Alaska Mariculture Initiative: PHASE 1 Case Studies** Phase I is a set of case studies which looks at examples of successful mariculture industries around the world and how they may relate to the development of Alaska's industry. **https://www.afdf.org/wp-content/uploads/1c-Economic-Analysis-to-Inform-AMI-Phase-I-Case-Studies.pdf**
May 2015	**Alaska Shellfish Farm Size Feasibility Study** The Alaska Division of Economic Development completed the Alaska Shellfish Farm Size Feasibility Study which compares short and long-term profitability for oyster and/or geoduck farms of varying sizes. https://www.afdf.org/wp-content/uploads/2b-Alaska-Shellfish-Farm-Size-Feasibiliy-Study.pdf
Mar. 2016	**10-year SeaGrant Aquaculture Vision** http://masgc.org/assets/uploads/publications/1216/10-year_sg_aquaculture_plan_final_with_hyperlinks.pdf
Nov. 2017	**Alaska Mariculture Initiative Economic Analysis to Inform a Comprehensive Plan PHASE II** Phase 2 reviews Alaska's existing mariculture industry, markets for six most likely species, and existing industries in other similar regions. Given investments in critical infrastructure necessary, Phase 2 presents an economic framework for Alaska's future mariculture developments including production goals and annual values by species for 5, 10 and 20 years into the future, while also giving total economic impact projections for 5, 10, 20, 30, 40 and 50 years into the future https://www.afdf.org/wp-content/uploads/AMI-Phase-II-Final-Nov2017.pdf
Mar. 2018	**Alaska Mariculture Development Plan** https://www.afdf.org/wp-content/uploads/Alaska-Mariculture-Development-Plan-v2018-03-23-small-single-pg-view.pdf
Dec. 2019	**Ocean Acidification: An annual update on the state of ocean acidification science in Alaska 2019 Annual Update** https://oceansalaska.org/wp-content/uploads/2019/12/2019_OA_Science_Update_medres1.pdf

Mariculture Development Plan
5-Year Action Plan (2019-2023)

Policy and Permitting Action Items

State of Alaska - Statutory

1. **Pass legislation to allow shellfish enhancement**
    - *Objective*: Create a framework for management of restoration, rehabilitation & enhancement of shellfish
    - *Responsible entities:* Mariculture Task Force (MTF), Alaska Fisheries Development Foundation (AFDF), Alaska Department of Fish and Game (ADFG), industry, AK Legislature
    - *Status:* House Bill 41 (2019 session) to be brought before the 2020 AK State Legislature.

2. **Pass legislation to simplify Alaska Department of Natural Resources (ADNR) lease renewal process**
    - *Objective*: Reduce uncertainty for farmers, the burden on state agencies, and backlog of applications.
    - *Responsible entity:* MTF, AFDF, ADNR, Alaska Shellfish Growers Association (ASGA), AK Legislature
    - *Status:* HB 116 (2019 session) to be brought before the 2020 AK Legislature

3. **Develop simplified application process for micro farms, up to 1 acre (e.g. Maine)**
    - *Objective*: Facilitate entry-level participation by creating simplified process for micro farms which allows new farmers to develop farms with less start-up capital and risk.
    - *Responsible entity:* Alaska Mariculture Development Council (AMDC)

4. **Allow subleasing of aquatic farms**
    - *Objective*: Allow for multiple public or private relationships to encourage new entrants into aquatic farming (i.e., communities, Alaska Native Corporations, others)
    - *Responsible entity:* ADNR

5. **Allow eco-tourism and education as allowable activities at aquatic farms**
    - *Objective*: Encourage tourism and mariculture partnership activities
    - *Responsible entities:* ADNR, MTF, ASGA, Legislature
    - *Status:* Being addressed this session in the AK Legislature

State - Regulatory Changes

6. **Amend and enforce the commercial use requirement**
    - *Objective*: Allow shorter or longer term for commercial use requirements, depending upon species; enforce new regs.
    - *Responsible entities:* ADNR, MTF

7. **Build tribal & local outreach into application process**
    - *Objective*: Avoid conflict and increase success rate of new farm applications
    - *Responsible entities:* MTF, ADNR, NOAA
    - *Status:* underway, ongoing

8. **Regulatory amendment to allow flexibility to increase term of lease from 10 to 20 yrs**
    - *Objective*: Allow both 10 or 20-yr term leases (20-yr requires additional site survey)
    - *Responsible entities:* ADNR, MTF
    - *Status:* Leases may be extended with an appropriate survey.

State - Policy issues

9. **State of Alaska commitment to support mariculture & comprehensive plan**
    - *Objective*: State will express clear commitment to support comp plan & defined state role & direct regulatory agencies to adopt advocacy approach to mariculture industry
    - *Responsible entity*: MTF, Governor, Alaska Development Team, Legislature
    - *Status*: Support is being provided through actions of Alaska Development Team toward implementation of the Action Plan. Gov. Dunleavy has stated, “We want to make Alaska the mariculture capital of the world.”

10. **Revise ADFG genetics policy**
    - *Objective*: Continue to develop relationships and understanding between industry and ADFG to allow advancement of mariculture techniques and practices while preserving genetic integrity
    - *Responsible entity*: MTF/AMDC, NMFS Alaska Fisheries Science Center (AFSC), ADFG, University of Alaska

11. **Revise aquatic farm application**
    - *Objective*: Adhere to actual language in statute/reg for application requirements
    - *Responsible entities:* ADNR, ADFG, MTF, Governor’s office

12. **Reduce bond rates for low risk operations**
    - *Objective*: Allow reduced bonds for farmers with demonstrated training or experience

- *Responsible entities:* Alaska Department of Commerce, Community, and Economic Development (ADCCED), AK Division of Insurance, ADNR

13. **Obtain legal authority for agreements between farmers for clean-up**
    - *Objective*: Support DNR offering bond & abandoned gear to other farmers for clean-up services
    - *Responsible entities:* Educational issue within industry, ASGA, etc.
    - Status: Underway

14. **Amend DNR leases application fees**
    - *Objective*: Change the three categories of lease fees to more closely align with the current range of application sizes being received which will help small farms (e.g. change categories from 0-1, 1-2, 2-3 acres to 1-50, 50-100, 100+ acres)
    - *Responsible entity*: ADNR

15. **Reduce application backlog**
    - *Objective*: ADNR lease application process completed for all applicants within one year
    - *Responsible entities*: ADNR, MTF
    - *Status:* Underway

16. **Allow Alaska Department of Environmental Conservation (ADEC) data to be visible**
    - *Objective*: Allow public access to data collected from water sampling & PSP testing that is important for farmers to access (either nearby or new start-ups)
    - *Responsible entity:* Axiom, ADEC
    - *Status:* work in progress to make these data available through the Mariculture Map

17. **Create new bond pool and insurance pool**
    - *Objective*: Commercial liability and workers comp insurance is expensive and insurers often do not understand what is needed for this new industry in order to write policies; may be addressed through creation of new pool
    - *Responsible entities:* ADCCED, ADNR, MTF

Federal Government - Policy

18. **Encourage NOAA to hire Aquaculture Coordinator in Alaska Region**
    - *Objective*: Provide leadership, coordination and support at the federal level for mariculture endeavors in Alaska
    - *Responsible entity:* NMFS AKR
    - *Status:* Complete

19. **Support Alaska Sea Grant hiring Mariculture Specialist**

- *Objective*: Fill the previous position that was not re-filled after a retirement
- *Responsible entities:* Alaska Sea Grant, University of Alaska, NOAA Aquaculture, Alaska Development Team, MTF, Alaska Congressional Delegation
- *Status:* funding uncertain

20. **Reinstate the U.S. Army Corps of Engineers general permit for aquaculture**
    - *Objective*: Instead of requiring each farmer to obtain individual Corps permits, reinstate general permit for all
    - *Responsible entities*: US Army Corps, NMFS AKR, Alaska Congressional Delegation, AMDC

21. **Support revision of marine mammal policy**
    - *Objective*: Ensure marine mammal policies are applied consistently and reasonably to protect wildlife and allow mariculture development (seals, sea lions, whales)
    - *Responsible entities*: NMFS AKR Protected Resources Division, ADFG, AMDC
    - Status: ADFG developed written policy in April 2019, National Marine Mammal Lab (NMFS) revising dataset for state to use

Other

22. **Strategy to support funding for ADEC lab testing fees**
    - *Objective*: Ensure farmers have access to markets through consistent funding and support for federal required testing to assure shellfish safety prior to commercial sales.
    - *Responsible entities*: ASGA, Southeast Alaska Regional Dive Fisheries Association, ADEC, staff for AK Congressional Delegation
    - *Status:* ADEC will conduct a fee study.

23. **Support certification of new testing labs and methods**
    - *Objective*: Enable efficiencies in transportation, test results & potential fee reductions
    - *Responsible entities:* Sitka Tribe of Alaska, ADEC, Interstate Shellfish Sanitation Conference
    - *Status:* ADEC is supportive particularly as industry grows and may exceed capacity at ADEC lab in Anchorage.

24. **Provide web-based central clearinghouse for mariculture information**
    - *Objective*: Create and maintain an easily accessible and regularly updated public information center.
    - *Responsible entities:* State of AK, Alaska Sea Grant, Alaska Region National Marine Fisheries Service (NMFS AKR)

Information on Permitting & Regulatory Processes

- **Alaska Department of Fish and Game (DFG)**
  - Alaska Aquatic Farming Statutes and Regulations: http://www.adfg.alaska.gov/index.cfm?adfg=fishingaquaticfarming.aquaticregs
  - Applicable ADFG Policies: http://www.adfg.alaska.gov/index.cfm?adfg=fishingaquaticfarming.aquaticregs_policy
  - ADFG Aquatic Farming Forms: http://www.adfg.alaska.gov/index.cfm?adfg=fishingaquaticfarming.aquaticregs_policy
  - Starting a Seaweed Farm in Alaska: https://www.afdf.org/wp-content/uploads/2018-08-13-Seaweed-Farming-in-Alaska.pdf
  - ADFG Marine Mammal Guidance

    https://www.adfg.alaska.gov/static/fishing/PDFs/aquaticfarming/mariculture_and_marinemammals.pdf
- **Alaska Department of Natural Resources (DNR) Aquatic Farming**: http://dnr.alaska.gov/mlw/aquatic/
  - Aquatic Farm Application Process: http://dnr.alaska.gov/mlw/aquatic/ApplicationProcess.pdf
  - Instructions and Application: http://dnr.alaska.gov/mlw/forms/land/Aquatic-Farming-Application-Form-and-Instructions.pdf
  - Aquatic Farm Operation and Development Plan: http://dnr.alaska.gov/mlw/forms/land/Aquatic-Farming-Operation-and-Development-Plan.pdf
- **U.S. Army Corps of Engineers (USACE) Permits**

  https://www.poa.usace.army.mil/Missions/Regulatory/Permits/
  - USACE Nationwide Permit 48: https://www.swf.usace.army.mil/Portals/47/docs/regulatory/Permitting/Nationwide/NWP48TX.pdf
- **National Marine Fisheries Service (NMFS)**
  - Endangered Species Act (ESA) Consultations: https://www.fisheries.noaa.gov/alaska/consultations/section-7-consultations-alaska

- Essential Fish Habitat (EFH) Consultations: https://www.fisheries.noaa.gov/national/habitat-conservation/consultations-essential-fish-habitat

- **US Fish & Wildlife Service (USFWS) Endangered Species Consultations**

  https://www.fws.gov/alaska/pages/endangered-species-program/consultation-endangered-species

Alaska Department of Natural Resources Aquatic Farming

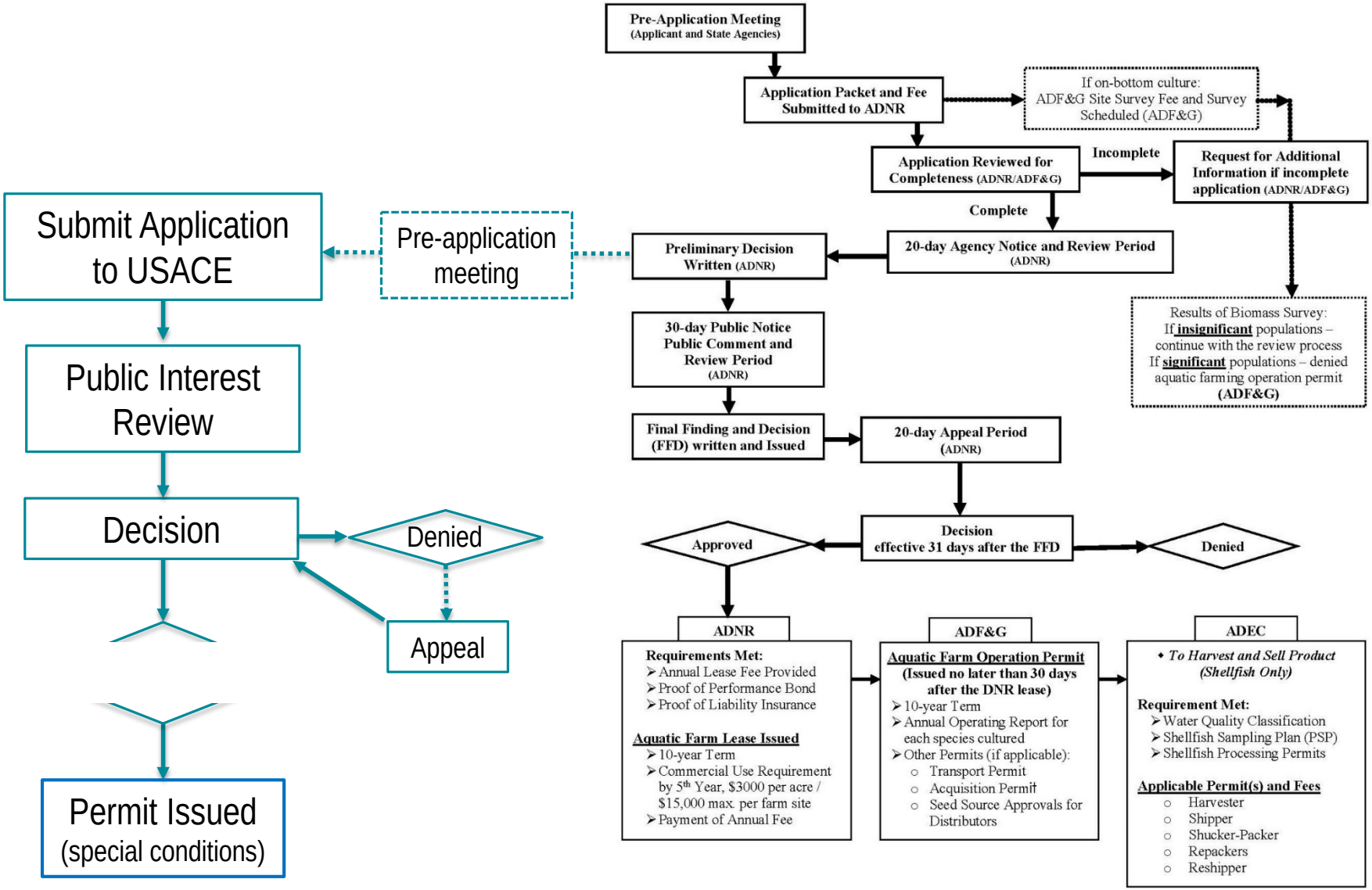
DNR issues authorizations for the use of tide and submerged land to support aquatic farming activities. To start an aquatic farm in Alaska, you must first apply for and receive authorizations from the State of Alaska and the U.S. Army Corps of Engineers. The Department of Natural Resources, Division of Mining, Land and Water (DMLW) currently holds an application opening every other year beginning January 1 and ending April 30. The process for aquatic farm applications takes approximately twelve months to complete after the opening ends. The applications are "batch-processed" in order to assess cumulative impacts and carrying capacity within a particular area.

Guide to Federal Aquaculture Programs and Services

https://coastalscience.noaa.gov/products/guide-federal-aquaculture-programs-services/

This document is a comprehensive list of available Federal agencies and services that can assist in the development and execution of aquaculture in the United States.

State and Federal Permitting Process



Information on Select Federal and State Loan and Grant Programs

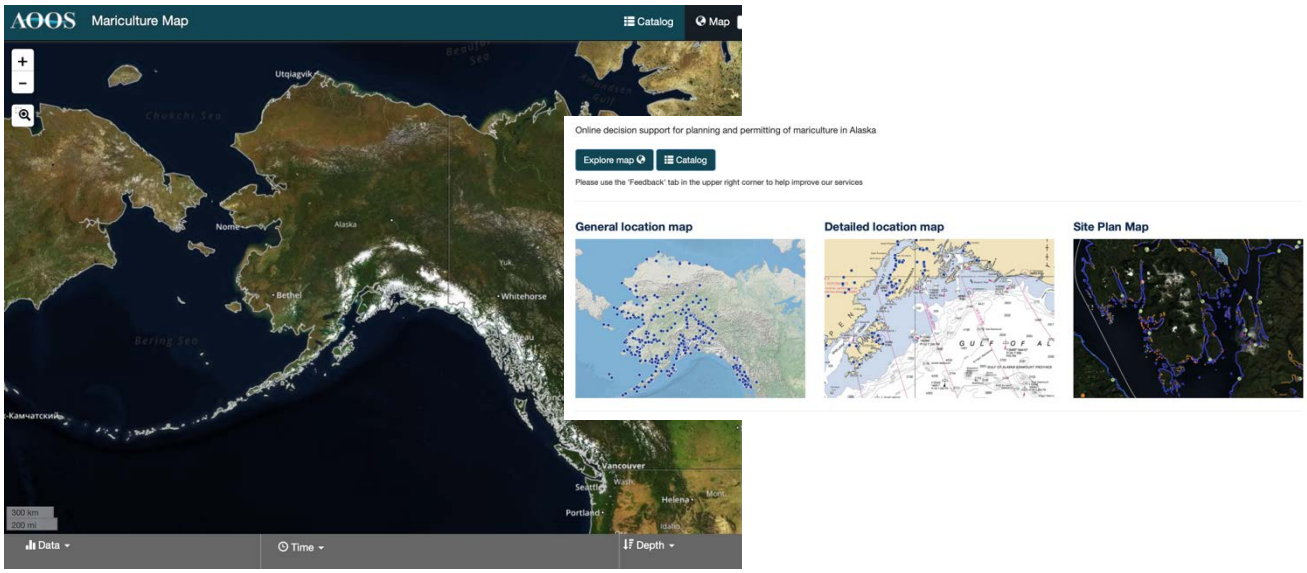
- Federal Fisheries Finance Loan Program: https://www.fisheries.noaa.gov/national/funding-and-financial-services/fisheries-finance-program
- Denali Commission: https://www.denali.gov/wp-content/uploads/2019/09/Funding-Assistance-Request-Form-9-26-19-2.pdf
- NOAA SeaGrant: https://seagrant.noaa.gov/Funding
- Alaska Department of Commerce: https://www.commerce.alaska.gov/web/
- Alaska Mariculture Revolving Loan Fund https://www.commerce.alaska.gov/web/ded/FIN/LoanPrograms/Mariculture.aspx
- Alaska Commercial Fishing and Agriculture Bank (CFAB) http://www.cfabalaska.com/
- USDA Farm Services Agency (FSA) https://www.fsa.usda.gov/programs-and-services/farm-loan-programs/index
- Federal Government Grants: https://www.grants.gov
- NOAA Fisheries Grants: https://www.fisheries.noaa.gov/funding-opportunities/closed-opportunities?title=&sort_by=field_closing_date_value&webdam_inserts=&page=3#funding-opportunities
- Small Business Innovation Research: https://www.sbir.gov
- Saltonstall-Kennedy Grant Program: https://www.fisheries.noaa.gov/grant/saltonstall-kennedy-grant-program
- National Fish and Wildlife Foundation Fisheries Innovation Fund: https://www.nfwf.org/fisheriesfund/Pages/home.aspx
- Environmental Protection Agency Grant Funding: https://www.epa.gov/research-grants
- North Pacific Research Board: https://www.nprb.org/
- Pacific States Marine Fisheries Commission: https://www.psmfc.org/program/marine-aquaculture-research-projects?pid=17

Alaska Mariculture Map [Prototype]

An Operational Platform to Inform Mariculture Siting in Alaska

The MaricultureMap is a web-based tool offering investors, regulators, and operators interactive access to pertinent environmental, oceanographic and social data to inform sustainable mariculture development including optimal siting, avoidance of conflicts with other ocean users, and reduction of potential toxicity risks. This project will enhance the MaricultureMap by integrating additional parameters that are important to mariculture development through a stakeholder gap assessment. Further, to help protect human and environmental health, the map will be enhanced with a data feed containing near real-time phytoplankton and shellfish toxicity data for nearly 40 communities across Alaska. This real-time data feed is leveraged from the Alaska Harmful Algal Bloom Network (AHAB), formed in 2016 by state and federal regulators, tribal and citizens' monitoring groups, and research partners to coordinate on HAB detection, monitoring, and early-warning communication to reduce the risk of shellfish consumption.

Prototype Mariculture Map: **https://mariculture.portal.aoos.org**



Will you provide your feedback on the beta version?

Your feedback is valuable and will help us to improve the beta version of the Maricultre Map to better serve your information needs.

LINK TO SURVEY: https://l.axds.co/mari-map-survey

Public-Facing Spatial Planning Products

OceanReports Tool

The new OceanReports web tool provides specialized "ocean neighborhood analyses," including maps and graphics, by analyzing more than 100 ocean datasets instantaneously. The most advanced automated ocean neighborhood analysis tool in the U.S. Draw a box in the ocean and OceanReports delivers a custom spatial analysis.

- **OceanReports Tool:** https://oceanservice.noaa.gov/ocean/ocean-reports/
- **Video:** https://coast.noaa.gov/data/digitalcoast/video/oceanreports-overview.mp4

Marine Cadastre

The largest public facing marine geodatabase/map viewer in the U.S., Marine Cadastre provides spatial data, visualization, and analytical tools in one location, making it an essential tool for ocean energy and marine planning. The website provides authoritative and regularly updated information on offshore boundaries, infrastructure, human uses, natural resources, energy potential, Bureau of Ocean Energy Management-funded research projects, and many other data sets. Users can create and customize maps to share with ocean-planning partners.

- **Marine Cadastre**: https://marinecadastre.gov

National AquaMapper

The National AquaMapper provides aquaculture-relevant data for offshore waters of the United States in one easy-to-use map viewer. This tool is designed to support and inform screening of ocean areas for aquaculture through visualization of numerous siting parameters.

- **National AquaMapper:** https://noaa.maps.arcgis.com/home/item.html?id=2055a046331a4e20ba8b579d5d37ddf2

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The establishment of a **Mariculture Research Center** (MRC) housed in the University of Alaska would ideally have two key personnel. One position would be the Director of the MRC and would need to be a PhD level new hire (who could be an invertebrate physiologist/culturist) who could translate industry needs into research projects in a variety of fields from biology, to food sciences, to engineering. The Director would also host an annual **Mariculture R+D Forum**, where growers and researchers would interact to decide on research priorities and turn these priorities into projects, teams, grant proposals, funded research and outcomes. The Director will also write grant proposals to bring in funding from NOAA (mariculture program, SK program, Sea Grant), National Science Foundation, USDA, Economic Development Administration, Small Business Innovative Research and others.

The MRC Advisory Board would involve industry members in setting priorities and guiding projects.

The University of Alaska MRC would also need a mariculture extension agent to work on applied research projects with growers, take the results from projects to the field, and interact with other stakeholders. This person could be housed under Alaska Sea Grant's Marine Advisory Program, and would be an integral part of the MRC and ideally co-located with the MRC Director.

Funding for the MRC staff and support staff should be via "hard" money with a long-term commitment. Initial funding would be necessary for salaries for the MRC Director, extension agent and an administrative assistant, plus funding for travel and for the initial Mariculture R+D Forum.

The staff of the MRC could build a core competency in the University system, eventually resulting in mariculture minor, major, and graduate degree programs. Combined with the guidance of the AMDC and the outcomes of the annual Mariculture R+D Forum, the MRC would bring together industry, university, state, Alaska Native and other groups in Alaska, and a network of cooperators and cooperating facilities, giving the required support to accelerate and fully develop the mariculture industry in Alaska.

In addition to the Alaska Mariculture Development Council and the Mariculture Research Center, Alaska needs:

- **Lead government agency** – within both the state and federal governments, a lead agency with a single point of contact is necessary to streamline and facilitate responsive permitting.
- **Mariculture R+D Forum** – an annual forum where research priorities are set with strong industry input, and action plans are developed to achieve outcomes.
- **Funding** - to facilitate mariculture industry development by supporting applied research determined as necessary during the annual Mariculture R+D Forum. This will be inclusive of federal, state, private and non-profit funding sources and people and facilities needed to implement the research.
- **Network of facilities** – these existing facilities are capable of doing mariculture research and development as part of their mission statements, including the NOAA Kodiak Lab, Juneau UAS Lab, Juneau NOAA Lab, UAF-CFOS, Kasitsna Bay Laboratory, APSH, OceansAlaska, Alaska Sea Life Center, Sitka Sound Science Center , Kodiak Seafood and Marine Science Center and others. The Mariculture Research Center director pulls together available resources like these ("Alaska Mariculture Network") to assist in meeting the research priorities.

Sea cucumber juvenile survival research completed by Charlotte Regula-Whitefield, by SARDFA.

A Summary of Near-Term Research Needs

Near-term priorities are defined as priorities for species of immediate interest (1-2 years) for mariculture in Alaska along with specific issues that need to be addressed to create a viable commercial enterprise for each species. For an overview of the near, intermediate, and long-term priorities for mariculture in Alaska, see **Appendix H - Completed Research and Future Research Needs**. The lists were prepared by the Research and Development Advisory Committee.

I. Near-term research priorities for shellfish farming in Alaska

Oysters, Pacific

1. Research focused on oyster spawning in Alaska
2. Research focused on oyster larvae setting and growth to nursery size in Alaska.
3. Research focused on oyster nursery stage
4. Research focused on oyster farms and shellfish processing.

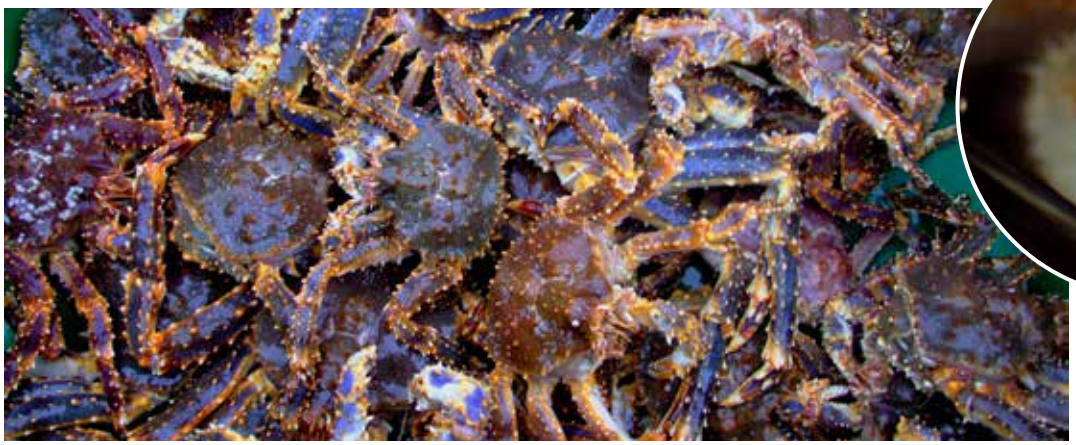
Mussels, Blue

1. Identify genetic and disease issues that prohibit/inhibit the growing of blue mussels to market size in Southeast Alaska. **High**
2. Continue research on production technology.
3. Develop frozen product form and other value added products and methods.
4. Develop improvements in production and processing methods to increase throughput.

II. Near-term research priorities for shellfish enhancement in Alaska

King crab (Paralithodes camtschaticus; Paralithodes platypus) (priorities developed by the Alaska King Crab Research Rehabilitation and Biology Program)

1. Refine rearing protocols for red and blue king crab by:
2. Understand the behavioral, morphological, and physiological differences between hatchery-reared and wild juvenile king crab and potential competitive interactions.
3. Determine optimal nursery habitats to maximize growth and survival of juvenile king crab in both the hatchery and once outplanted.
4. Assess likelihood of outplanting success based on biological and environmental interactions.
5. Investigate fate of hatchery-produced juvenile king crab during release experiments.
6. Project operational costs for producing juvenile red and blue king crab for enhancing depressed wild crab stocks, including hatchery, nursery, and stocking phases.
7. Determine funding mechanisms and identify any potential changes in state law and regulations necessary to allow crab harvesters and/or coastal communities to conduct king crab rehabilitation activities.
8. Work with potential user groups to develop preliminary collaborations with community and/or industry groups interested in forming rehabilitation associations.



Above: Juvenile King Crab, by Celeste Leroux.

Left: Blue King Crabs, by Celeste Leroux.

III. Near-term research priorities for seaweed mariculture in Alaska

Saccharina latissima (sugar kelp) and *Alaria marginata* (ribbon kelp)

1. Research the population genetics of seaweeds of current and future commercial importance in order to better understand how seaweed farms might affect the natural populations.
2. Research to determine the best practices for obtaining parent plants for seed production.
3. Research on strain selection.
4. Market and product research for sugar and ribbon kelp
5. Research on hatchery optimization for large scale production of seeded string
6. Research needed on optimal timing of outplanting and harvest (at different sites in Alaska).
7. Research on the optimal conditions for growth (depth of outplant, nutrients, temperature, light, salinity, current).
8. Site selection research.
9. Oceanographic monitoring at existing growing sites, including nitrogen, phosphate, salinity, temperature, turbidity and currents.

IV. Near-term research priorities for new species mariculture in Alaska

General

1. Begin the process to identify new species that present potential economic opportunity in Alaska based on previous studies or successful mariculture in other regions.

V. Near-term research priorities for environmental data collection to support mariculture in Alaska

Bivalves and public health issues

1. Rigorously research and develop methods to monitor and mitigate Vibrio P. occurrences.
2. Research and develop methods to mitigate harvest disruptions due to wild animal fecal coliform in remote areas.
3. Develop public platform to access Paralytic Shellfish Poisoning (PSP) data.
4. Research and develop low cost PSP testing methods.
5. Identify appropriate regions to increase spatial extent of PSP testing (e.g. Kodiak Island) to address potential for underdeveloped opportunities for shellfish farms.
6. Develop a data base of the occurrence of PSP and causation in Alaskan waters.

Site selection

1. Develop prioritized physical and biological data collection necessary for site selection by species (bivalve, crab, seaweed) or method (farm, enhancement) of interest. This would include information to avoid areas with PSP, large wildlife populations, anadromous streams, higher freshwater influx etc.
2. Do basic oceanography studies of existing growing areas in cooperation with the farmers to understand biophysical factors contributing to shellfish growth rates and meat yields.
3. Identify and support research to assess mechanism of PSP loading (cyst density) in different species (e.g. oysters, geoducks).

Site specific measurements

1. Develop prioritized physical and biological data collection necessary for site operation by species (bivalve, crab, seaweed) or method (farm, enhancement) of interest.
2. Develop an active list of what is currently being monitored at each site and work with regional groups (e.g. AOOS) to host the database and website for public data access.

Photo above: adult geoduck at a hatchery for spawning in Seward, by Cynthia Pring-Ham.

Regional measurements

1. Develop prioritized physical and biological data collection necessary to provide regional and seasonal information to assist with farm or enhancement operations.
2. Identify regional groups (e.g. AOOS) to host a mariculture database and website for access by the farmers and the public.
3. In addition to other physical measurements, develop or maintain carbonate chemistry monitoring in all coastal regions with feasible mariculture opportunities that may be affected by ocean acidification. Locations include:

A nursery operator checks oyster spat in a FLUPSY in Halibut Cove, by Cynthia Pring-Ham.

VI. Near-term research priorities for economic data collection to support mariculture in Alaska

General

1. Development of a web-based break-even analysis planning tool that can be used to explore the effects of farm scale, production intensity, scope, and location on financial viability of shellfish mariculture operations. Includes an analysis of production efficiency related to farm operation and technology.
2. Development of regional and social impact models to highlight the role of aquatic farms in local and regional economies including employment and income impacts.
3. Development of risk management tools to integrate consideration of production risk (survival, growth, etc.) and financial risk (input costs, price volatility, etc.).
4. There is need for research designed to identify strategies for management of production and price risk.
5. Studies to explore role of horizontal and vertical integration or coordination as mechanisms for developing stronger markets, reducing input factor costs, and mitigating risk.
6. Outlook and trends for product prices and demand for Alaskan mariculture products.
7. Economic profile of the existing mariculture industry, including the number of farms, the years of operation, the species grown, farm size, region, etc.
8. Establish goals for industry growth.
9. Investigate existing fisheries infrastructure for possible use in mariculture.

VII. Near-term research priorities for education to promote regional scale mariculture opportunities in Alaska

1. Identify educational opportunities in coastal communities
2. Identify and develop workshops on particular mariculture opportunities.
3. Provide training opportunities in multiple aspects of farms or enhancement operations
4. Identify mechanisms for technology transfer to interested entities.
5. Integrate mariculture into STEM education.
6. Investigate possibility of personal use oyster mariculture (gardening), including regulatory issues.

Photo above: King crab juvenile, by Celeste Leroux.