Board of Directors Meeting

WHEN: Friday, February 24, 2023
9:00 am – Noon, Alaska Time

Alaska Fisheries Development Foundation, Inc.

WHERE: APICDA Conference room
302 Gold Avenue, Juneau, Alaska
Hybrid ZOOM video-conference
Via computer https://us02web.zoom.us/j/81609736809
Via phone: 1-669-900-6833
Meeting ID: 816 0973 6809

AGENDA

1) Call Board meeting to order
2) Roll call; establish quorum and proxies on file (Julie Cisco)
3) Conflicts of interest declared (none anticipated)
4) Recognize AFDF members/staff/guests present
5) Review & approve agenda
6) Review and approve minutes (2022-10-07, 2022-11-16)
7) Review and approve new membership applications (none) & paid memberships

8) **Staff reports** (65 mins):
   a. Julie Decker, Executive Director, Org Overview (20 minutes)
   b. Ekaterina Ratzlaff, Finance Director (5 mins)
   c. Julie Cisco, Executive Administrator, Membership & Symphony (5 mins)
   d. Hannah Wilson, Development Director, Sustainability Certification & Mariculture (10 mins)
   e. Ben Americus, Science Policy Coordinator, Synthesis & contextualization of AHRP (5 minutes)
   f. Ann Robertson, Technical Facilitator, RFM & MSC, cod/halibut/sablefish certifications (10:30am – 5 mins)
   g. Robin McKnight, Mariculture Development Coordinator (5 mins)
   h. Garrett Evridge, Director, AFDF Startup Accelerator (10 mins)

Old Business:

9) Discussion & possible action: structure of Industry Advisory Committee (see draft attached)
   Recommended motion: *Approve the formation of the Industry Advisory Committee, as outlined, with initial appointments of Cusack, Singleton, and Trident (TBD).*

10) Discussion & possible action: EDA BBB Phase 2 – Alaska Mariculture Cluster - Research & Development Component - Joint Innovation Projects – RFP (see draft RFP – to be distributed)
    Recommended Motion: *Approve RFP to be submitted to SE Conference & EDA for final approval.*

New Business:

11) Discussion & possible action – investment of Grantham Foundation $1.25M match
    Recommended Motion: *Authorize ED to open a new AFDF checking account and CD at First Bank, and authorize signers to be Markos Scheer, Trevor Sande, Chris Mierzejek and Decker.*

12) Discussion & possible action – adhoc committee appointments
    Recommended motion: *Approve the formation of a Bylaw Review Committee, and re-activation of Alaska Symphony of Seafood Steering Committee*

13) Discussion & possible action: Crab enhancement
    Recommended motion: *Authorize the ED to work with AKCRRAB, act as potential lead entity to receive appropriations request to implement crab enhancement project, and/or support appropriations request to other entity.*

14) Discussion & possible action: Global Seafood Alliance (GSA) Board
    Recommended motion: *Authorize Decker to serve on GSA Board of Directors, as nominated by Bill Herzig.*

15) Discussion & recommendations: ARPA-E summit, Decker to serve on panel: Energy & the Blue Economy; input for seafood & aquaculture priority needs.

16) Discussion & recommendations: NOAA Draft National Seafood Strategy (attached)

17) Set date for next Board meeting – May and August, 2023?
18) Adjourn

AFDF

Alaska Fisheries Development Foundation, Inc.

Board of Directors / Membership Meeting Minutes
Friday, October 7, 2022 5:00 PM – 7:00 PM AST

AFDF Board Members Present:

Mark Scheer – President, Premium Aquatics
Tommy Sheridan – Vice President, Sheridan Consulting
Chris Mierzejek – Secretary, APICDA
Stefanie Moreland – Trident Seafoods
Matt Alward – Alward Fisheries
Mike Cusack – American Seafoods
John Sund – Stellar North
Keith Singleton – Alaskan Leader Seafoods
Richard Riggs – Silver Bay Seafoods (Zoom)
Buck Laukitis – Magic Fish Co.

Board Members not Present:

Trevor Sande – Treasurer, Marble Seafoods
Tom Enlow – UniSea

AFDF Staff, Guests, Members:

Staff: Julie Decker – Executive Director
Staff: Hannah Wilson – Development Director
Staff: Robin McKnight – Sea Grant Fellow
Staff: Ben Americus – Sea Grant Fellow
Staff: Julie Cisco – Executive Administrator
Garrett Evridge – AFDF Startup Accelerator
Jim Hunt, Whittier (Zoom)
Tomi Marsh, Mindspring (Zoom)
________________, Alaska Whitefish Trawlers
Stephanie Madsen, At Sea Processors Association
Jeff Regnart

1. Call Meeting to order 5:50 PM AST; roll call by Julie Decker and Markos Scheer; establish quorum (no proxies) – Board quorum present, membership quorum not

2. Review and approve agenda – ***<u>Motion</u> to approve by Tommy Sheridan, second by John Sund.*** Discussion – membership quorum not present so Board Elections and Office Elections tabled until November meeting. No opposition to agenda as amended.

3. Recognize AFDF members/guests/staff present – done during the roll call.

4. Review and approve minutes (2022-09-15 in packet) –***<u>Motion</u> to approve minutes by Matt Alward, second by Chris Mierzejek.*** All in favor to approve the minutes. (Board vote only)

5. Review and approve new membership applications (if any) & paid memberships – Ken Simpson, F/V LADY SIMPSON, rejoined. No opposition.

6. Staff reports:
   a. Staff members reported on current and upcoming projects and tasks (30 minutes)

7. Old Business:

   a. RFM Halibut & Sablefish Client Group – Presentation by Jeff Regnart.
   <u>Motion</u> to approve AFDF becoming Client for RFM certification of halibut & sablefish, including additional capacity for technical assistance, made by Stephanie Moreland, second by John Sund. No opposition. (Board vote only)

8. President Scheer opened the floor for Board and Members to provide input on priorities or issues that AFDF should focus on. There will be a separate summary of that discussion provided to Board and Members. No action required or taken.

9. Set date for next Board meeting – Board discussion on hybrid option. ***November 15, 2022 in Seattle, 1:00 – 5:00 PM PST, followed by Board dinner at 5:30pm. Added a Membership Meeting to this.***

10. Board comments – President Scheer said it was unfortunate a Membership quorum was not present and urged all in attendance to reach out to other Members to attend the Seattle meeting as well as Alaska Symphony of Seafood. He also thanked ED and all staff for informative presentations and welcomed all new staff on board.

11. Adjourn – meeting adjourned at 7:00 pm. ***Motion made by John Sund, second by Keith Singleton.*** No opposition

Alaska Fisheries Development Foundation, Inc.

Board of Directors / Membership Meeting Minutes
Tuesday, November 15, 2022 1:00 PM – 5:00 PM PST

AFDF Board Members Present:

Mark Scheer – President, Premium Aquatics
Tommy Sheridan – Vice President, Sheridan Consulting (via Zoom)
Chris Mierzejek – Secretary, APICDA
Stefanie Moreland – Trident Seafoods (via proxy to Matt Alward)
Matt Alward – Alward Fisheries
Mike Cusack – American Seafoods
John Sund – Stellar North
Keith Singleton – Alaskan Leader Seafoods (via proxy to Mike Cusack)
Richard Riggs – Silver Bay Seafoods
Buck Laukitis – Magic Fish Co. (via proxy to Markos Scheer)
Trevor Sande – Treasurer, Marble Seafoods (via Zoom)
Tom Enlow – UniSea (via proxy to Markos Scheer)

AFDF Staff, Guests, Members:

Staff: Julie Decker – Executive Director
Staff: Hannah Wilson – Development Director (via Zoom)
Staff: Robin McKnight – Sea Grant Fellow
Staff: Ben Americus – Sea Grant Fellow
Staff: Julie Cisco – Executive Administrator
Staff: Garrett Evridge – AFDF Startup Accelerator
Jim Hunt, Whittier (Zoom)
Tomi Marsh, Mindspring
________________, Alaska Whitefish Trawlers
Stephanie Madsen, At Sea Processors Association (via proxy to Matt Alward)
Ak Commercial Fishing & Agriculture Bank (via proxy to Julie Cisco)
Alaska Groundfish Data Bank (via proxy to Markos Scheer)
Alaskan Leader Seafoods (via proxy to Mike Cusack))
Alaskan Observers (via Zoom)
Alward Fisheries
American Seafoods Company
APICDA Joint Ventures
Copper River Seafoods (Via Zoom)
E & E Foods (via proxy to John Sund)

F/V McCrea
F/V Savage
Magic Fish Company (via proxy to Markos Scheer))
Marble Seafoods (via Zoom)
Marel Inc (via proxy to Markos Scheer))
Native Village of Eyak (via zoom)
Pacific Seafood Processors Association (via proxy to Matt Alward)
Sheridan Consulting (via Zoom)
Silver Bay Seafoods
Stellar North LLC
Trident Seafoods Corporation (via proxy to Matt Alward)
UAF Alaska Blue Economy Center (via zoom)
UniSea (via proxy to Markos Scheer)

1. Call Meeting to order 1:04 PM PST; roll call by Julie Cisco to establish quorum
2. Review and approve agenda – ***Motion* to approve by Matt Alward, second by Rich Riggs .** Discussion – minutes from October 7, 2022 meeting not included in packet, table approval until February meeting. No opposition to agenda as amended.

3. Recognize AFDF members/guests/staff present – done during the roll call.

4. Review and approve minutes (2022-10-07) tabled

5. Review and approve new membership applications (if any) & paid memberships – None

6. Board Elections:
   a. Tommy Sheridan, Vice President
   b. Chris Mierzejek, Treasurer
   c. Matt Alward, Director
   d. Mike Cusack, Director
   e. Keith Singleton, Director
   f. John Sund, Director
   g. Vacant, Service Sector

   Letter of interest and resume in packet from Tomi Marsh for the vacant seat. ***Motion to accept the slate as currently seated and Tomi Marsh made by Rich Riggs, seconded by Valdez rep . No opposition.***

7. Election of Officers
   a. President (Mark Scheer)
   b. Vice President (Chris Mierzejek)

c. Secretary (Tommy Sheridan)
d. Treasurer (Trevor Sande)

Motion made to accept the slate of officers as currently seated by John Sund and seconded by Matt Alward. No opposition.

8. Guest Presentation Dr. Nichole Price
9. Staff Reports (60 Minutes)
    a. Julie Decker, Executive Director, Org Overview
    b. Ekatrina Ratzlaff, Finance Director
    c. Julie Cisco, Executive Administrator, Membership & Symphony
    d. Hannah Wilson, Development Director, Sustainability Certification & Mariculture
    e. Tommy Sheridan, Technical Facilitator, RFM & MSC salmon certifications
    f. Ben Americus, Science Policy Coordinator, Synthesis & contextualization of AHRP
    g. Robin McKnight, Mariculture Development Coordinator
    h. Garrett Evridge, Director, AFDF Startup Accelerator

10. Old Business
    a. Discuss PSPS request/offer to Co-host UFA Legislative Reception/Symphony Awards Ceremony in February (Juneau) . Tabled until 2024 Symphony.
    b. Discuss structure of Industry Advisory Committee, to be continued
    c. Discuss EDA BBB Phase 2 – Research & Development Component – Joint Innovation Projects. Garrett to do more research and bring back to Board.
11. New Business
    a. Approve FY22 actual budget. ***Motion made by Matt Alward, seconded by John Sund to approve the FY22 actual budget. No opposition.***
    b. Approve FY23 projected budget. ***Motion made by John Sund, seconded by Mike Cusack to approve the FY23 projected budget.*** Discussion of increasing budget to allow for audited financials of both FY22 and FY23. Ekatrina Ratzlaff directed to get a quote for doing so and bring the amount back to the Board at its next meeting. ***No opposition to FY23 projected budget as is.***
    c. Potential for seaweed as a solution for fish waste – tabled
    d. Set date for next Board meeting for Friday, February 24, 9am-noon AST.
12. Executive Session
    a. ***Motion made by Mike Cusack, seconded by Rich Riggs, to go into Executive Session at 3:30. No opposition.*** Staff dismissed
13. New Business
    a. Action required: Recommendation from Executive Director to provide a 10% salary increase for all staff, effective January 1, 202 with a $5,000 business transfer payment to Garrett Evridge. ***Motion made by John Sund, seconded by Matt Alward to approve the increase. No opposition.***

b. ***Motion made by John Sund, seconded by Matt Alward, to increase Executive Director's salary by 12% effective January 1, 2023, and in recognition of her 10 years' service to AFDF, providing a tenure bonus of $5,000. No opposition***

14. Executive Session ends

a. ***Motion made by John Sund, seconded by Tomi Marsh, to end Executive Session at 5:04 PST. No opposition.***

15. General Meeting adjourns

A. Motion made by John Sund, seconded by Tomi Marsh, to end General Session at 5:04 PST. No opposition.

Alaska Fisheries Development Foundation, Inc.

Executive Session Meeting Minutes
Tuesday, November 15, 2022 3:30 PM – 5:04 PM PST

AFDF Board Members Present:

Mark Scheer – President, Premium Aquatics
Tommy Sheridan – Vice President, Sheridan Consulting (via Zoom)
Chris Mierzejek – Secretary, APICDA
Stefanie Moreland – Trident Seafoods (via proxy to Matt Alward)
Matt Alward – Alward Fisheries
Mike Cusack – American Seafoods
John Sund – Stellar North
Keith Singleton – Alaskan Leader Seafoods (via proxy to Mike Cusack)
Richard Riggs – Silver Bay Seafoods
Buck Laukitis – Magic Fish Co. (via proxy to Markos Scheer)
Trevor Sande – Treasurer, Marble Seafoods (via Zoom)
Tom Enlow – UniSea (via proxy to Markos Scheer)
Tomi Marsh, F/V Savage

AFDF Staff, Guests, Members:

None

1. Executive Session
    a. ***Motion made by Mike Cusack, seconded by Rich Riggs, to go into Executive Session at 3:30. No opposition.*** Staff dismissed.
2. New Business
    a. Action required: Recommendation from Executive Director to provide a 10% salary increase for all staff, effective when? With a $5,000 business transfer payment to Garrett Evridge. ***Motion made by John Sund, seconded by Matt Alward to approve the increase. No opposition.***
    b. ***Motion made by John Sund, seconded by Matt Alward, to increase Executive Director's salary by 12% effective January 1, 2023, and in recognition of her 10 years' service to AFDF, providing a tenure bonus of $5,000. No opposition***
3. Executive Session adjourned
    a. ***Motion made by John Sund, seconded by Tomi Marsh, to adjourn Executive Session at 5:04 PST. No opposition.***

Staff Reports
To: Board of Directors, AFDF
From: Executive Director
Date: February 24, 2023

AFDF
Alaska Fisheries Development Foundation, Inc.

Overall financial health: AFDF is continuing to grow revenues and maintain positive net income. The Board approved an increase of approximately 230% from FY22 to FY23. Katya will explain the FY23 budget to date. We also received the entire 4-year $1.25 million match from the Grantham Foundation & I will discuss that more later.

Staff: The new staff are turning into an excellent Team. The collaboration between GAPP and AFDF seems to continue to work well. We have formalized the relationship in a signed MOU. Our two Alaska Sea Grant fellows will work through June/July, 2023. AFDF has submitted a new application to host another Alaska Sea Grant fellow beginning in summer 2023, if picked.

New Website: We still have work to finish on AFDF's revamped site (adding photos and content, etc). If you find problems or needed edits, please let Hannah, Julie or myself know. Check it out! www.afdf.org

ASOS: This is Val's last year, and Julie Cisco's first year! The Juneau event will be Feb. 23 at 5-8pm at the Elizabeth Peratrovich Hall. Glenn Reed has agreed to be the emcee again. We have 15 entries, with one retraction.

AFDF continues to make small changes to the event with the goal of improving with each iteration. With Board approval, we intend to re-engage the Symphony Steering Committee toward that end.

PSPA approached AFDF and UFA with an offer/request to co-host the February event. PSPA received approval from its board to sponsor at the $7,500 level, plus help bring additional seafood donations, sponsorships, and staff the event. However, since the UFA EC is split on the topic at this time, PSPA will withdraw the offer for now, and we can continue casual discussions about possibilities for next year. However, PSPA will continue with additional sponsorship at the $5,000 level.

BBRSDA grant / sponsorship for ASOS: In November, the BBRSDA Board agreed to extend the contract timeline by 2.5 years (end May, 2025). $50,000 was invoiced and received by AFDF in January, 2023, with additional payments of $25,000 and $25,000 in 2024 and 2025. Additional metrics will be determined by both entities in April, 2023, in conjunction with the Symphony Steering Committee.

Certified Seafood Collaborative (CSC): CSC has seen some recent milestones. The Pacific Whiting fishery was the first fishery outside Alaska to be certified. Holland America cruise lines partnered to source RFM certified seafood onboard cruises in Alaska. On Jan. 3-5, I participated in a planning meeting with the CSC Board and staff, and the GSA Board and staff. Since then, CSC has approved a new partnership with Global Seafood Alliance (GSA) for mutual benefits. The major benefit CSC expects from the partnership is more commercial use of the RFM logo and program. GSA also became a new sponsor of the Symphony; AFDF and GSA are discussing ways they can help us amplify the event and promote the entrants/winners, as well as other AFDF programs, such as the AFDF Startup Accelerator. GSA has hired Tom Sunderland to help with the integration of wild seafood. Additionally, GSA founder Bill Herzig asked me to serve on the GSA Board of Directors. They have 2 in-person meetings (during SENA and the GSA annual conference), as well as a couple zoom meetings in between. From his description, I estimated my time commitment to be approximately 10-15 hours per year.

RFM certification of Halibut & Sablefish: Two new certificates have been issued showing AFDF as the Client (attached). AFDF received $146,250 from CSC to manage this client group over the next 1-2 years. AFDF signed a contract with Global Trust to complete the reassessment for both fisheries for $77,000.

AFDF drafted a contract with AKWA-DC for Matt Robinson's work on halibut, sablefish and cod certifications as technical facilitator. However, since that time, Matt has gone to work for Senator Murkowski. We interviewed two additional replacements, and decided to offer the contract to Ann Roberson, also with AKWA-DC. AFDF has a signed contract with AKWA-DC and Ann has already started working on the cod surveillance audit.

NON-CONFORMANCES: The draft report of the RFM Halibut and Sablefish re-assessment found two (one major, one minor) non-conformances. AFDF is required to develop a corrective action plan to address these, due March 24.

Salmon Hatchery Outreach: Ashley Heimbigner, Ben Americus, Robin McKnight, Tommy Sheridan and I are meeting for the first time to begin discussions about public outreach related to salmon hatcheries. Nicole Kimball is also interested in future meetings. We will identify others needed (e.g. ADFG).

BOF proposal #161: AFDF submitted this proposal in order to address a condition on the RFM and MSC cod certification. AFDF's RFM/MSC Cod Advisory Committee helped craft the proposal, joint letter of support, and verbal testimony in support during the Oct. BOF. The proposal will be deliberated during the March, 2023 BOF meeting. However, ADFG supports it and with the suggested changes, we do not know of any industry entity that does not support it. The BOF seemed impressed with the level of consensus and we do not expect problems getting adoption in March.

Faroe Islands & South Korea "knowledge exchanges" related to seaweed: WWF has provided AFDF with 2 separate travel grants for trips they sponsored and organized to the Faroe Islands in December, and to South Korea in April, 2023. I was invited to participate in both. In the Faroe Islands, the group consisted of 10 people and we visited the farms, hatchery, and processing facilities for the company, Ocean Rainforest. Ocean Rainforest (OR) is one of the companies that AFDF invited to Alaska for our tour of 6 different communities. Since that time, they have purchased and processed seaweed in Kodiak (80,000 lbs) and helped the Native Village of Eyak set up their seaweed farm near Cordova. OR has been very open about sharing many aspects of its business: harvest vessel, farm design, automated direct seeding machine, automated harvest cutter, and processing equipment. They also invited the group to a meeting of the SeaMark group which is collaborating on a 9 million Euro grant regarding seaweed product development and marketing.

The trip in April to South Korea will be a larger group of 18. We hope to have someone from the State of Alaska join, to represent the government's interest and support. We will visit seed facilities, farms and processing facilities, and meeting with seaweed companies. I hope to better understand the business structures and relationships, as well as, determine if there is interest in potential joint venture businesses between Korea and Alaska. I will report back what I learn.

KelpMEAL - *Product development research to evaluate the potential for existing fishmeal processing equipment to act as a primary stabilization of kelp prior to secondary value-added processing* - Phase 1 - funded by WWF ($50,000): AFDF a grant to run sugar kelp through a fishmeal facility and analyze the resultant products, as well as cost, production per hour, etc., and produce a final report to the public. WWF funded the first phase of the work, and project partners, including Seagrove Kelp Company, were able to complete processing trials in December, including collection of samples of six different products for analysis in phase 2. Initial discussions with Denali Commission show potential interest to fund phase 2. AFDF will submit a grant application in April.

ARPA-E - Phase 2 - The MARINER team working on this project decided to complete a fourth year with a no-cost extension to the grant timeline. AFDF has less than $10,000 remaining on this project budget. Our time on the project will be winding down. Robin has completed one outreach document related to the results of the project and has a second document drafted. See Robin's report for more info.

Potential new ARPA-E project: ARPA-E is interested in exploring using seaweed to biomining REE near Bokan Mountain / UCORE mine on POW in SE Alaska. An RFP/FFO will be issued Feb/March 2023 for a total pot of $5 million. We are considering participation in a group proposal for approximately $2 million for 2 years to sample wild seaweeds near Bokan and in other strategic locations, plus conduct initial work on the extraction processes. An initial group submitted an Interest Statement (MacroCash) last spring, and the next proposal would likely be similar.

ARPA-E Summit, Panel Discussion, March 24, 2023: Energy and the Blue Economy: I have been asked to sit on a panel to discuss energy and the blue economy, to represent the interests and needs of fisheries and aquaculture. Others on the panel are Richard Spinrad (NOAA), Tom Fu (Office of Naval Research), Jennifer States (Blue Sky Maritime Coalition). I believe this is a big opportunity to direct government investment and partnerships with the seafood industry into energy efficiency, decarbonization, and renewables. ***Are AFDF Board members interested in helping me frame my presentation?***

EVOS Mariculture ReCon: Project Kick-off meeting occurred in Anchorage Jan. 13

EDA BBB Phase 2 - AFDF Components - Green Energy, Research & Development: The combined total funding for these two component projects that AFDF will manage over the next 4 years is $5.5 million, plus interest earned on the Grantham Foundation $1.25M match. Later this week, I will be sending a draft RFP for the "Joint Innovation Projects" section $1.8 million, for your consideration.

The EDA BBB Phase 2 ($49 million, plus match) will also have a ***Governance Body*** to help guide the project. I have been asked to serve on that Governance Body, which will meet approximately 2-4 times per year.

Grantham Foundation to visit Alaska, May 20-27, 2023: I am working to organize site visits to seaweed and/or oyster farms, and seaweed processing.

Alaska Mariculture Alliance (AMA): Last week, during the first annual AMA membership meeting, I was elected to the AMA Board. I will serve in that capacity for a 3-year term. AFDF has been transitioning away from supporting the staffing of AMA, and will now, with me on the Board, play a role in directing its staff. Katya continues to do accounting work for AMA, however, it is very minimal at this time, as they have few expenses to date. This will change, as they begin managing their portions of the EDA BBB grant, a statewide planning grant, and the mariculture matching grant provided by the Alaska Legislature. AMA is continuing to work with ADCCED on development of a mariculture matching grant program structure that will be simple for AMA to administer.

Alaska Blue Economy Center (ABEC): Garrett and I participated with Gwen Holdman, Tommy Sheridan, and Justin Sternberg in our first AFDF/ABEC meeting to discuss areas of need and future collaboration/coordination. This was a good first step toward those goals.

King Crab Enhancement: Renewed interest in crab enhancement has re-kindled the work of AKCRRAB. I participated in a meeting last week and they are fully engaged in finding funds to begin enhancement efforts again in Kodiak, but adding a larger focus in Bristol Bay/St. Paul. The AKCRRAB group is not organized as a non-profit so they are looking for an entity to be able to receive funds, if the groups submit an appropriations request to Senators Murry and Murkowski (due next week). They are discussing a range of $5-10 million***. I would like to know if the AFDF is amenable to be that lead entity to receive and distribute funds to other partners in a new crab enhancement project.***

Reshoring Alaska Seafood Processing: Given Senator Murkowski's concepts regarding a Working Waterfront Bill, I think it is good timing to begin discussions around a new initiative related to secondary seafood processing. A good start would be with a short whitepaper. Garrett has included a draft for your consideration and feedback.

Equity considerations: We have been asked by two different funders recently about AFDF's equity policies. I included a document created by Ocean Strategies regarding equity that may spark some ideas. This is something we should think about for the future of the org, which could be incorporated either as a policy or integrated into future Bylaws changes, or a combination of both.

Grant projects closing out by Sept., 30, 2023:

- WWF – Alaska Mariculture Alliance – Increasing Social License for Seaweed Farms

- PSMFC (Pacific States Marine Fisheries Commission) – Alaska Mariculture Initiative – Phase 3
- NOAA SK – Hatchery Capacity & Technology Development to Secure Seed Supply for Oyster Farming in Alaska
- ARPA-E – Phase 2 - Seaweed Farming Demonstration in Kodiak

New grant applications submitted: MSC Ocean Fund - working on conditions related to seabirds and salmon hatcheries; NSF (although it was not eligible).

New grant applications coming soon: NOAA SK pre-proposals, PSMFC, Denali Commission, ARPA-E bio-mining

Alaska Fisheries Development Foundation

Financial Report

by

Ekaterina Ratzlaff, Finance Director

February 24, 2023

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FY 2023 Financial Report and Adjusted Net Income

Below is a FY 2023 Budget that was approved by the Board during our November 2022 meeting with the slight adjustment in payroll that reflects bonus employee payment and 10% payroll raise that were approved during the November Board meeting's Executive session and FY 2023 Profit and Loss Statement as of February 20, 2023.

According to FY 2023 Budget Projection (see below), we are planning to collect $3,103,320 in Revenues and spend $2,909,646 between all the projects, with the Net Income of ***$193,675*** *for all the programs. Net Income is a part of Overhead that we are billing almost to every program that we run, and it helps to grow our Indirect account. The breakdown for all grants and programs you can find in ("FY 2023 Budget Projection for All Programs (no match) as of 2023-02-20") attachment below as well.*

As you can see our projected Net Indirect as of September 30, 2023 is expected to be $130,280*.*

Profit & Loss

October 1, 2022 through February 20, 2023

	Oct 1, '22 - Feb 20, 23
Ordinary Income/Expense	
Income	
4000 · REVENUES	
4250 SOS Entry Fees	1,800.00
4255 SOS Sponsorship Revenues	130,549.00
4100 · Grant & Contract Revenues	1,523,932.29
4105 · Miscellaneous Income	21,080.63
4200 · Indirect Cost Recovery	23,580.90
4300 · Membership Dues	29,750.00
4310 · Contributions	406,884.00
4500 · Interest	13.60
Total 4000 · REVENUES	2,137,590.42
Total Income	2,137,590.42
Gross Profit	2,137,590.42
Expense	
5000 · EXPENSES	
5100 · Payroll Expenses	150,600.54
5200 · Business Insurance	2,837.00
5300 · Property/Space Rents	25,638.46
5400 · Professional Services	177,028.06
5450 · Advertising and Promotion	11,450.85
5500 · Telephone	2,182.06
5510 · Printing/Copying Svcs	1,566.15
5520 · Shipping & Postage	1,852.67
5530 · Subscriptions & Publication ...	1,078.57
5540 · Supplies & Materials	7,301.99
5550 · Parking	72.00
5560 · Memberships & Contributions	3,260.00
5610 · Meetings & Workshops	21,799.89
5700 · Bank Charges	330.69
5810 · Travel Expense	62,531.12
5830 · Project Supplies	41,393.03
5840 · Project Equipment	20,621.45
Total 5000 · EXPENSES	531,544.53
Total Expense	531,544.53
Net Ordinary Income	1,606,045.89
Net Income	**1,606,045.89**

FY 2023 Budget Projection for All Program

Last Revision 2023-2-20

	Indirect	Federal Programs									
		EDA AOC	EDA BBB Phase 1	EDA BBB - Research & Dev*	EDA BBB - Green Energy	USDOE - ARPA-E II	NOAA - Oysters	USDA - Bigelow	USDA	ASOS	Builders Vision+BSF
4000 · REVENUES											
4100 · Grant & Contractual Revenues		$ 180,000	$ 22,684	$ 673,335	$ 124,694	$20,144	$75,261	$72,929	$ 25,778		$ 116,000
4105 · Miscellaneous Income	$ 1,160		$ -	$ -						$ 7,910	
4300 · Membership Dues	$ 30,000		$ -	$ -							
4310 · Contributions			$ -	$ -						$ 131,549	
4500 · Interest	$ 15		$ -	$ -							
Indirect Cost		$ 20,000	$ 2,268	$ 6,572	$ 2,198	$ -	$ 1,943	$ 7,272			$ 10,000
Total 4000 · REVENUES	$ 31,175	$ 200,000	$ 24,953	$ 679,906	$ 126,892	$20,144	$77,204	$80,201	$ 25,778	$ 139,459	$ 126,000
5000 · EXPENSES											
Total 5100 · Payroll Expenses	$ 66,419	$ 57,000	$ -	$ 30,021	$ 8,819	$ -	$ 3,442	$ 4,679	$ -	$ 52,000	$ 55,000
5200 · Business Insurance	$ 9,000		$ -							$ 2,700	
5250 · Business License	$ 50		$ -								
5300 · Property/Space Rents	$ 1,140		$ -							$ 20,000	
5400 · Professional Services	$ 16,500	$ 100,000	$ 4,514	$ 627,750	$ 112,500	$20,144	$60,739	$67,200	$ -	$ 61,000	$ 10,000
5450 · Advertising and Promotion	$ 3,000		$ -	$ 3,750	$ 750				$ -	$ 10,000	
5500 · Telephone	$ 6,700		$ -								
5510 · Printing & Copying	$ 500	$ -	$ -	$ 1,125	$ 375				$ -	$ 1,000	$ -
5520 · Shipping & Postage	$ 500		$ -	$ 3,750						$ 210	
5530 · Subscriptions & Publication Fee	$ 2,000		$ -					$ 500			
5560 · Memberships & Contributions	$ 1,800		$ -								
5610 · Meetings & Workshops	$ 2,600		$ -							$ 1,700	
5700 · Bank Charges	$ 200		$ -							$ 90	
Total 5810 · Travel Expense	$ 900	$ 10,000	$ -	$ 6,000	$ 2,250	$ -	$ 3,000	$ 550	$ -	$ 10,000	$ -
5830 · Project Supplies and Equipment	$ 500	$ 5,000	$ -	$ 938			$ 8,079		$ -	$ 8,000	
Total 5000 · EXPENSES	$ 111,809	$ 172,000	$ 4,514	$ 673,334	$ 124,694	$20,144	$75,261	$72,929	$ -	$ 166,700	$ 65,000
Net Income	$(80,634)	$ 28,000	$ 20,438	$ 6,573	$ 2,198	$ -	$1,943	$7,272	$25,778	$(27,241)	$ 61,000
Overhead - helps to cover Indirect expenses	$ -	$ 20,000	$ 2,268	$ 6,572	$ 2,198	$ -	$1,943	$7,272	$ -	$ -	$ 10,000
Indirect Balance as of 09.30.2022											
Credit Card Liabilities											
Projected Expenses from Indirect account as of 09.30.2023											
Projected Net Indirect as of 9.30.2023											

*2.2.2023 AFDF received cash match funds from THE GRANTHAM FOUNDATION

Below are more detailed budgets breakdown for all these grants that you see in "FY 2023 Budget Projection for All Programs" attachment above.

This Profit and Loss statement shows the summary of all our current revenues and expenses as of February 20, 2023 for all programs. There are more detailed budgets for each program below. Recently we received $1,250,000 from Grantham Foundation as a

Ratzlaff as of February 24, 2023

cash match for EDA BBB Phase 2 R&D grant, that covers 5 years. As Julie mentioned previously, we would like to move these funds to a new business account at First Bank. First Bank has a 90-day variable interest rate CD that is currently earning 4.25%.

Closed Federal Grants:

Southeast Conference
EDA BBB Grant - Alaska Mariculture Cluster - Phase 1
AFDF Subaward Budget 2022-03-07

Expense	# of Units	Unit Cost	Total	Request from EDA	In-Kind Match	Project Total	Cummulative Expenses	Available Balance
Personnel								
Executive Director (hours)	240	$ 42.88	$ 10,291	$ 10,291	$ -	**$10,291**	$ 12,464.04	$(2,172.84)
Finance Director (hours)	40	$ 31.54	$ 1,262	$ 1,262	$ -	**$ 1,262**	$ 2,680.90	$(1,419.30)
Development Director (hours)	120	$ 31.25	$ 3,750	$ 3,750	$ -	**$ 3,750**	$ 4,750.00	$(1,000.00)
Subtotal Personnel			**$ 15,303**	**$ 15,303**	**$ -**	**$15,303**	**$ 19,894.94**	**$(4,592.14)**
Fringe benefits							$ -	$ -
Executive Director		28.02%	$ 2,884	$ 2,884	$ -	**$ 2,884**	$ 3,483.15	$ (599.56)
Finance Director		28.13%	$ 355	$ 355	$ -	**$ 355**	$ 754.14	$ (399.25)
Development Director		29.18%	$ 1,094	$ 1,094	$ -	**$ 1,094**	$ 1,386.05	$ (291.80)
Subtotal Fringe Benefits			**$ 4,333**	**$ 4,333**	**$ -**	**$ 4,333**	**$ 5,623.34**	**$(1,290.61)**
Travel							$ -	$ -
Travel (round trips)	5.0	$ 1,000	$ 5,000	$ 5,000	$ -	**$ 5,000**	$ 8,413.28	$(3,413.28)
Subtotal Travel			**$ 5,000**	**$ 5,000**	**$ -**	**$ 5,000**	**$ 8,413.28**	**$(3,413.28)**
Supplies							$ -	$ -
Commercial printing (pgs)	819	$ 1.00	$ 819	$ 819	$ -	**$ 819**	$ 1,022.75	$ (203.75)
Subtotal Supplies			**$ 819**	**$ 819**	**$ -**	**$ 819**	**$ 1,022.75**	**$ (203.75)**
Contractual							$ -	$ -
Sea Change Technology Partners, LLC	200	$ 100	$ 20,000	$ 20,000	$ -	**$20,000**	$ 10,500.00	$ 9,500.00
Subtotal Contracual			**$ 20,000**	**$ 20,000**	**$ -**	**$20,000**	**$ 10,500.00**	**$ 9,500.00**
Total Direct Charges			**$ 45,455**	**$ 45,455**	**$ -**	**$45,455**	**$ 45,454.31**	**$ 0.22**
Indirect Charges (10% of MTDC*)	**1.0**	**10%**	**$ 4,545**	**$ 4,545**	**$ -**	**$ 4,545**	**$ 4,545.45**	**$ (0.00)**
Total Budget			**$ 50,000**	**$ 50,000**	**$ -**	**$50,000**	**$ 49,999.76**	**$ 0.22**

**MTDC = modified total direct costs do not include any portion of contracts above $25,000 or any portion of equipment*

Alaska Fisheries Development Foundation
USDA RBDG
Budget (2020-03-31)

Expense	# of Units	Unit Cost	Total	Request from USDA	In-Kind Match	Invoiced to Date	In-kind match to date	Match Remaining	USDA Balance Remaining
Personnel									
AFDF PI (months)	0.25	$ 6,200	$ 1,550	$ 1,550.00	$ -	$ 3,112.40	$ -	$ -	$ (1,562.40)
AFDF Operations Manager (months)	0.5	$ 4,400	$ 2,200	$ 2,200.00	$ -	$ 2,480.50	$ -	$ -	$ (280.50)
AFDF Development Director (months)	1.0	$ 3,910	$ 3,910	$ 3,910.00	$ -	$ 3,910.00	$ -	$ -	$ -
Subtotal Personnel			**$ 7,660**	**$ 7,660.00**	**$ -**	**$ 9,502.90**	**$ -**	**$ -**	**$ (1,842.90)**
Fringe benefits						$ -			
Fringe - AFDF PI		19.85%	$ 308	$ 307.68	$ -	$ 617.81	$ -	$ -	$ (310.14)
Fringe - AFDF Operations Manager		20.18%	$ 444	$ 443.52	$ -	$ 500.36	$ -	$ -	$ (56.84)
Fringe - AFDF Dev. Director		20.66%	$ 808	$ 807.81	$ -	$ 807.80	$ -	$ -	$ 0.01
Subtotal Fringe Benefits			**$ 1,559**	**$ 1,559.00**	**$ -**	**$ 1,925.98**	**$ -**	**$ -**	**$ (366.98)**
Travel						$ -			
Travel - in-state round trips	5.0	$ 2,000	$ 10,000	$ 7,000.00	$ 3,000	$ 4,113.13	$ 6,518.14	$ (3,518.14)	$ 2,886.87
Subtotal Travel			**$ 10,000**	**$ 7,000.00**	**$ 3,000**	**$ 4,113.13**	**$ 6,518.14**	**$ (3,518.14)**	**$ 2,886.87**
Supplies						$ -			
Commercial printing - hard copies	1000	$ 1.00	$ 1,000	$ 1,000.00	$ -	$ 995.23	$ -	$ -	$ 4.77
Flash drives	100	$ 5	$ 500	$ 500.00	$ -	$ 748.05	$ -	$ -	$ (248.05)
Advertising	5	$ 100	$ 500	$ 500.00	$ -	$ 199.00	$ -	$ -	$ 301.00
Subtotal Supplies			**$ 2,000**	**$ 2,000.00**	**$ -**	**$ 1,942.28**	**$ -**	**$ -**	**$ 57.72**
Contractual						$ -			
Erik Obrien/Tamsen Peeples	1	$ 63,000	$ 63,000	$ 63,000.00	$ -	$ 39,583.04	$ -	$ -	$ 23,416.96
SWAMC	1	$ 20,000	$ 20,000	$ 2,500.00	$ 17,500	$ -	$18,167.04	$ (667.04)	$ 2,500.00
APICDA	1	$ 11,000	$ 11,000	$ -	$ 11,000	$ -	$ 2,121.00	$ 8,879.00	$ -
Subtotal Contracual			**$ 94,000**	**$ 65,500.00**	**$ 28,500**	**$ 39,583.04**	**$20,288.04**	**$ 8,211.96**	**$ 25,916.96**
Total Direct Charges			**$ 115,219**	**$ 83,719.00**	**$ 31,500**	**$ 57,067.33**	**$26,806.18**	**$ 4,693.82**	**$ 26,651.67**
Indirect Charges (10% request)	**1.0**	**0%**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ -	$ -
Total Budget			**$ 115,219**	**$ 83,719.00**	**$ 31,500**	**$ 57,067.33**	**$ 26,806.18**	**$ 4,693.82**	**$ 26,651.67**

USDA grant was closed in December 2022, and we left $26,651.67 on the table.

Current Grants:

Federal Grants: As of January 1st, 2023, AFDF has few new grants EDA BBB Phase 2: Research & Development and Green Energy (4 years each) and USDA Bigelow (1 year). Budgets for each program are below:

Southeast Conference EDA BBB Phase 2
Alaska Mariculture Cluster - Research & Development Component
Alaska Fisheries Development Foundation Subaward
Budget FINAL 2022-03-14 - REVISED

Expense	# of Units	Base Unit Cost	Total	Request from EDA	Match	Project Subtotal	Year 1 EDA	Year 1 Match	Year 2 EDA	Year 2 Match	Year 3 EDA	Year 3 Match	Year 4 EDA	Year 4 Match	Total
Personnel *(includes 3% raise in years 2-4)*							**Personnel**								
AFDF ED (months)	8.0	$ 7,433	$ 62,196	$ 62,196	$ -	**$ 62,196**	$ 14,867	$ -	$ 15,312	$ -	$ 15,772	$ -	$ 16,245	$ -	**$ 62,196**
AFDF Finance Director (months)	4.0	$ 5,466	$ 22,868	$ 22,868	$ -	**$ 22,868**	$ 5,466	$ -	$ 5,630	$ -	$ 5,799	$ -	$ 5,973	$ -	**$ 22,868**
AFDF Development Director (months)	8.0	$ 5,417	$ 45,323	$ 45,323	$ -	**$ 45,323**	$ 10,833	$ -	$ 11,158	$ -	$ 11,493	$ -	$ 11,838	$ -	**$ 45,323**
Subtotal Personnel			**$ 130,387**	**$ 130,387**	**$ -**	**$ 130,387**	**$ 31,166**	**$ -**	**$ 32,101**	**$ -**	**$ 33,064**	**$ -**	**$ 34,056**	**$ -**	**$ 130,387**
Fringe benefits							**Fringe Benefits**								**$ -**
Fringe - AFDF ED		29.53%	$ 18,366	$ 18,366	$ -	**$ 18,366**	$ 4,390	$ -	$ 4,522	$ -	$ 4,657	$ -	$ 4,797	$ -	**$ 18,366**
Fringe - AFDF Finance Director		28.18%	$ 6,444	$ 6,444	$ -	**$ 6,444**	$ 1,540	$ -	$ 1,587	$ -	$ 1,634	$ -	$ 1,683	$ -	**$ 6,444**
Fringe - AFDF Dev. Director		27.06%	$ 12,264	$ 12,264	$ -	**$ 12,264**	$ 2,932	$ -	$ 3,019	$ -	$ 3,110	$ -	$ 3,203	$ -	**$ 12,264**
Subtotal Fringe Benefits			**$ 37,075**	**$ 37,075**	**$ -**	**$ 37,075**	**$ 8,862**	**$ -**	**$ 9,128**	**$ -**	**$ 9,402**	**$ -**	**$ 9,684**	**$ -**	**$ 37,075**
Travel							**Travel**								**$ -**
Travel - in-state round trips	16.0	$ 1,500	$ 24,000	$ 24,000	$ -	**$ 24,000**	$ 6,000	$ -	$ 6,000	$ -	$ 6,000	$ -	$ 6,000	$ -	**$ 24,000**
Travel - AK to Lower 48 rd trip	4.0	$ 2,000	$ 8,000	$ 8,000	$ -	**$ 8,000**	$ 2,000	$ -	$ 2,000	$ -	$ 2,000	$ -	$ 2,000	$ -	**$ 8,000**
Subtotal Travel			**$ 32,000**	**$ 32,000**	**$ -**	**$ 32,000**	**$ 8,000**	**$ -**	**$ 8,000**	**$ -**	**$ 8,000**	**$ -**	**$ 8,000**	**$ -**	**$ 32,000**
Equipment							**Equipment**								**$ -**
	0	$ -	$ -	$ -	$ -	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Subtotal Equipment			**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Supplies							**Supplies**								**$ -**
boxes, liners, vials, gel packs	200	$ 25.00	$ 5,000	$ 5,000	$ -	**$ 5,000**	$ 1,250	$ -	$ 1,250	$ -	$ 1,250	$ -	$ 1,250	$ -	**$ 5,000**
Printing (pgs)	2000	$ 3	$ 6,000	$ 6,000	$ -	**$ 6,000**	$ 1,500	$ -	$ 1,500	$ -	$ 1,500	$ -	$ 1,500	$ -	**$ 6,000**
Subtotal Supplies			**$ 11,000**	**$ 11,000**	**$ -**	**$ 11,000**	**$ 2,750**	**$ -**	**$ 2,750**	**$ -**	**$ 2,750**	**$ -**	**$ 2,750**	**$ -**	**$ 11,000**
Contractual							**Contractual**								**$ -**
1 - Alaska Shellfish Growers Association	1	$ 500,000	$ 500,000	$ 500,000	$ -	**$ 500,000**	$ 125,000	$ -	$ 125,000	$ -	$ 125,000	$ -	$ 125,000	$ -	**$ 500,000**
2 - Seaweed Tissue Analysis (unnamed contractor)	1	$ 858,000	$ 858,000	$ 858,000	$ -	**$ 858,000**	$ 214,500	$ -	$ 214,500	$ -	$ 214,500	$ -	$ 214,500	$ -	**$ 858,000**
3 - Site selection data & analysis (unnamed contractor)	1	$ 1,440,000	$ 1,440,000	$ 1,440,000	$ -	**$ 1,440,000**	$ 360,000	$ -	$ 360,000	$ -	$ 360,000	$ -	$ 360,000	$ -	**$ 1,440,000**
4 - Joint Innovation Projects (unnamed contractor)	24	$ 75,000	$ 1,800,000	$ 550,000	$ 1,250,000	**$ 1,800,000**	$ 137,500	$ 312,500	$ 137,500	$ 312,500	$ 137,500	$ 312,500	$ 137,500	$ 312,500	**$ 1,800,000**
Subtotal Contracual			**$ 4,598,000**	**$ 3,348,000**	**$ 1,250,000**	**$ 4,598,000**	**$ 837,000**	**$ 312,500**	**$ 837,000**	**$ 312,500**	**$ 837,000**	**$ 312,500**	**$ 837,000**	**$ 312,500**	**$ 4,598,000**
Other							**Other**								**$ -**
Shipping samples	200	$ 100	$ 20,000	$ 20,000	$ -	**$ 20,000**	$ 5,000	$ -	$ 5,000	$ -	$ 5,000	$ -	$ 5,000	$ -	**$ 20,000**
Web design/maintenance/communications	4	$ 5,000	$ 20,000	$ 20,000	$ -	**$ 20,000**	$ 5,000	$ -	$ 5,000	$ -	$ 5,000	$ -	$ 5,000	$ -	**$ 20,000**
	1	$ -	$ -	$ -	$ -	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Subtotal Other			**$ 40,000**	**$ 40,000**	**$ -**	**$ 40,000**	**$ 10,000**	**$ -**	**$ 10,000**	**$ -**	**$ 10,000**	**$ -**	**$ 10,000**	**$ -**	**$ 40,000**
Total Direct Charges			**$ 4,848,462**	**$ 3,598,462**	**$ 1,250,000**	**$ 4,848,462**	**$ 897,778**	**$ 312,500**	**$ 898,979**	**$ 312,500**	**$ 900,216**	**$ 312,500**	**$ 901,489**	**$ 312,500**	**$ 4,848,462**
Indirect Charges (10% of EDA request)	**1.0**	**10%**	**$ 35,046**	**$ 35,046**	**$ -**	**$ 35,046**	$ 8,762	$ -	$ 8,762	$ -	$ 8,762	$ -	$ 8,762	$ -	**$ 35,046**
Total Budget			**$ 4,883,508**	**$ 3,633,508**	**$ 1,250,000**	**$ 4,883,508**	**$ 906,539**	**$ 312,500**	**$ 907,740**	**$ 312,500**	**$ 908,977**	**$ 312,500**	**$ 910,251**	**$ 312,500**	**$ 4,883,508**

Southeast Conference EDA BBB Phase 2
Alaska Mariculture Cluster - Green Energy Component
Alaska Fisheries Development Foundation Subaward
Budget FINAL 2022-03-12

Expense	# of Units	Base Unit Cost	Total	Request from EDA	Match	Project Subtotal	Year 1 EDA	Year 1 Match	Year 2 EDA	Year 2 Match	Year 3 EDA	Year 3 Match	Year 4 EDA	Year 4 Match	Total
Personnel *(includes 3% raise in years 2-4)*							**Personnel**								
AFDF ED (months)	2.0	$ 7,433	$ 15,549	$ 15,549	$ -	$ 15,549	$ 3,717	$ -	$ 3,828	$ -	$ 3,943	$ -	$ 4,061	$ -	$ 15,549
AFDF Finance Director (months)	2.0	$ 5,466	$ 11,434	$ 11,434	$ -	$ 11,434	$ 2,733	$ -	$ 2,815	$ -	$ 2,899	$ -	$ 2,986	$ -	$ 11,434
AFDF Development Director (months)	2.0	$ 5,417	$ 11,331	$ 11,331	$ -	$ 11,331	$ 2,708	$ -	$ 2,790	$ -	$ 2,873	$ -	$ 2,959	$ -	$ 11,331
Subtotal Personnel			$ 38,314	$ 38,314	$ -	$ 38,314	$ 9,158	$ -	$ 9,433	$ -	$ 9,716	$ -	$ 10,007	$ -	$ 38,314
Fringe benefits							**Fringe Benefits**								$ -
Fringe - AFDF ED		29.53%	$ 4,592	$ 4,592	$ -	$ 4,592	$ 1,098	$ -	$ 1,130	$ -	$ 1,164	$ -	$ 1,199	$ -	$ 4,592
Fringe - AFDF Finance Director		28.18%	$ 3,222	$ 3,222	$ -	$ 3,222	$ 770	$ -	$ 793	$ -	$ 817	$ -	$ 806	$ -	$ 3,186
Fringe - AFDF Dev. Director		27.06%	$ 3,066	$ 3,066	$ -	$ 3,066	$ 733	$ -	$ 755	$ -	$ 778	$ -	$ 767	$ -	$ 3,032
Subtotal Fringe Benefits			$ 10,880	$ 10,880	$ -	$ 10,880	$ 2,601	$ -	$ 2,679	$ -	$ 2,759	$ -	$ 2,771	$ -	$ 10,809
Travel							**Travel**								$ -
Travel - in-state round trips	8.0	$ 1,500	$ 12,000	$ 12,000	$ -	$ 12,000	$ 3,000	$ -	$ 3,000	$ -	$ 3,000	$ -	$ 3,000	$ -	$ 12,000
Subtotal Travel			$ 12,000	$ 12,000	$ -	$ 12,000	$ 3,000	$ -	$ 3,000	$ -	$ 3,000	$ -	$ 3,000	$ -	$ 12,000
Equipment							**Equipment**								$ -
none	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Equipment			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Supplies							**Supplies**								$ -
Printing (pgs)	200	$ 10	$ 2,000	$ 2,000	$ -	$ 2,000	$ 500	$ -	$ 500	$ -	$ 500	$ -	$ 500	$ -	$ 2,000
Subtotal Supplies			$ 2,000	$ 2,000	$ -	$ 2,000	$ 500	$ -	$ 500	$ -	$ 500	$ -	$ 500	$ -	$ 2,000
Contractual							**Contractual**								$ -
1 - Green Energy Plan (unnamed contractor)	1	$ 250,000	$ 250,000	$ 250,000	$ -	$ 250,000	$ 62,500	$ -	$ 62,500	$ -	$ 62,500	$ -	$ 62,500	$ -	$ 250,000
2 - Renewable best practices (unnamed contractor)	1	$ 350,000	$ 350,000	$ 350,000	$ -	$ 350,000	$ 87,500	$ -	$ 87,500	$ -	$ 87,500	$ -	$ 87,500	$ -	$ 350,000
Subtotal Contracual			$ 600,000	$ 600,000	$ -	$ 600,000	$ 150,000	$ -	$ 150,000	$ -	$ 150,000	$ -	$ 150,000	$ -	$ 600,000
Other							**Other**								$ -
Advertising/social media	8	$ 500	$ 4,000	$ 4,000	$ -	$ 4,000	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 4,000
	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Other			$ 4,000	$ 4,000	$ -	$ 4,000	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 4,000
Total Direct Charges			$ 667,193	$ 667,193	$ -	$ 667,193	$ 166,259	$ -	$ 166,611	$ -	$ 166,975	$ -	$ 167,279	$ -	$ 667,123
Indirect Charges (10% of EDA request)	1.0	10%	$ 11,719	$ 11,719	$ -	$ 11,719	$ 2,930	$ -	$ 2,930	$ -	$ 2,930	$ -	$ 2,930	$ -	$ 11,719
Total Budget			$ 678,913	$ 678,913	$ -	$ 678,913	$ 169,188	$ -	$ 169,541	$ -	$ 169,904	$ -	$ 170,208	$ -	$ 678,842

ARPA-E: Cat 1 University of Alaska Fairbanks Team

Expense	REVISED Total ARPA-E Request	REVISED Total In-Kind Match	Cumulative Expenditures to Date as of 1.31.2023		Remaining Balance as of 1.31.2023	
			ARPA_E II	Cost Share	Remaining Balance	Remaining Balance on Cost Share
Personnel +$8,654						
AFDF - ED (months)	$ 25,236	$ -	$ 25,236.06	$ -	$ (0)	$ -
AFDF - DD (months)	$ 8,654		$ 8,653.68	$ -	$ -	$ -
AFDF - FD (months)	$ 20,199	$ -	$ 20,198.64	$ -	$ -	$ -
Subtotal Personnel	$ 54,088	$ -	$ 54,088.38	$ -	$ (0)	$ -
Fringe benefits +$1,909				$ -	$ -	$ -
AFDF - ED (months)	$ 5,146	$ -	$ 5,145.63	$ -	$ (0)	$ -
AFDF - DD (months)	$ 1,909		$ 1,909.00	$ -	$ 0	$ -
AFDF - FD (months)	$ 4,157	$ -	$ 4,156.88	$ -	$ (0)	$ -
Subtotal Fringe Benefits	$ 11,212	$ -	$ 11,211.52	$ -	$ (0)	$ -
Travel				$ -	$ -	$ -
In-state, round-trip, per person (airfare, hotel, per diem)	$ -	$ -		$ -	$ -	$ -
Subtotal Travel	$ -	$ -		$ -	$ -	$ -
Equipment -$10,000				0		
Vessel #1 package (large) - equipment, installation, modification, shipping			$ -	$ -		$ -
Modification and installation	$ 22,000	$ -	$ 27,500.00	$ -	$ (5,500)	$ -
Harvest block/seaweed stripper (manufactured & installed)	$ 25,000	$ -	$ 48,806.26	$ -	$ (23,806)	$ -
shipping of vessel equipment to Kodiak	$ 4,500	$ -	$ 2,579.84	$ -	$ 1,920	$ -
Subtotal - Vessel #1 package (Kodiak)	$ 51,500	$ -	$ 78,886.10	$ -	$ (27,386)	$ -
Vessel #2 package (small) - equipment, installation, modification, shipping				$ -	$ -	$ -
Equipment	$ 55,000	$ -	$ 40,132.15	$ -	$ 14,868	$ -
Modification/installation	$ 66,000	$ -	$ 84,796.24	$ -	$ (18,796)	$ -
shipping of vessel equipment to Kodiak	$ 4,500	$ -	$ 794.99	$ -	$ 3,705	$ -
Subtotal - Vessel #2 package (Kodiak)	$ 125,500	$ -	$ 125,723.38	$ -	$ (223)	$ -
SilkStream fish pump - lease (Kodiak)	$ 10,000	$ -	$ 3,870.90	$ -	$ 6,129	$ -
Storage of vessel/farm equipment (Kodiak)	$ -	$ 3,000	$ -	$ 1,400	$ -	$ 1,600
Farm equipment	$ 67,344	$ -	$ 81,440.35	$ -	$ (14,096)	$ -
Subtotal Equipment	$ 254,344	$ 3,000	$ 289,920.73	$ 1,400	$ (35,577)	$ 1,600
Supplies +$117+1525+1120+845=$3,607				$ -		$ -
Misc farm supplies (Kodiak)	$ 8,462	$ -	$ 7,269.73	$ -	$ 1,192	$ -
Misc vessel harvesting supplies (small & large)	$ 15,145	$ -	$ 8,205.14	$ -	$ 6,940	$ -
Subtotal Supplies	$ 23,607	$ -	$ 15,474.87	$ -	$ 8,132	$ -
Contractual						
Alf Pryor -$7,040						
1-Site assessment	$ 640	$ -	$ 640.00	$ -	$ -	$ -
2-Design & construct	$ 6,320	$ -	$ 6,320.00	$ -	$ -	$ -
3-Farm deployment	$ 9,200	$ -	$ 10,200.00	$ -	$ (1,000)	$ -
5-Develop Harvest & Transport Tech	$ 8,800	$ -	$ 8,800.00	$ -	$ -	$ -
6-Harvest	$ 11,520	$ -	$ 8,640.00	$ -	$ 2,880	$ -
8-Monitoring	$ 37,600	$ -	$ 31,660.00	$ -	$ 5,940	$ -
10-Project Management	$ 2,560	$ -	$ 2,880.00	$ -	$ (320)	$ -
Subtotal - Alf Pryor	$ 76,640	$ -	$ 69,140.00	$ -	$ 7,500	$ -
Nick Mangini +$7,040+$4,800=+11,840						
1-Site assessment	$ 640	$ -	$ 720.00	$ -	$ (80)	$ -
2-Design & construct	$ 6,320	$ -	$ 6,240.00	$ -	$ 80	$ -
3-Farm deployment	$ 9,200	$ -	$ 10,801.25	$ -	$ (1,601)	$ -
5-Develop Harvest & Transport Tech	$ 8,800	$ -	$ 8,800.00	$ -	$ -	$ -
6-Harvest	$ 11,520	$ -	$ 11,520.00	$ -	$ -	$ -
8-Monitoring	$ 40,800	$ -	$ 39,647.00	$ -	$ 1,153	$ -
10-Project Management	$ 7,680	$ -	$ 7,232.00	$ -	$ 448	$ -
Value of Farm Lease, plus misc costs of farm	$ -	$ 107,625	$ -	$ 101,646	$ -	$ 5,979
Subtotal - Nick Mangini	$ 84,960	$ 107,625	$ 84,960.25	$ 101,646	$ (0)	$ 5,979
Vessel Time - Large Vessel +$12,000+$12,000 (in-kind)						
Seasonal install & removal of equipment (vessel #1 days)	$ 25,200	$ 25,200	$ 26,799.00	$ 17,881	$ (1,599)	$ 7,319
Harvest 2 sites in Kodiak (vessel #1 days)	$ 48,000	$ 48,000	$ 21,600.00	$ 28,800	$ 26,400	$ 19,200
Subtotal - Lester - F/V Enterprise	$ 73,200	$ 73,200	$ 48,399.00	$ 46,681	$ 24,801	$ 26,519
Vessel Time - Small Vessel +$11,400 + $11,400 (in-kind)				$ -	$ -	$ -
Seasonal install, removal & monitoring of equipment (vessel #2 days)	$ 24,000	$ 24,000	$ 24,000.00	$ 24,000	$ -	$ -
Harvest 2 sites in Kodiak (vessel #2 days)	$ 36,000	$ 36,000	$ 39,200.00	$ 39,200	$ (3,200)	$ (3,200)
Subtotal - skiff owner/operator	$ 60,000	$ 60,000	$ 63,200.00	$ 63,200	$ (3,200)	$ (3,200)
Other Subcontracts -$3,925-$3,925(in-kind)						
Farmers (5) participation in planning & operational meetings (hours)	$ 18,575	$ 18,575	$ 11,075.00	$ 11,075	$ 7,500	$ 7,500
University of Alaska Foundation - Graduate Student Fellowship	$ -	$ -	$ -	$ -	$ -	$ -
Maine Marine Composites/Kelson Marine Co.	$ 69,997	$ -	$ 69,994.20	$ -	$ 2	$ -
Subtotal Contractual	$ 383,372	$ 259,400	$ 346,768.45	$ 273,266	$ 36,603	$ (13,866)
Other - TTO & T2M +$554+651=$1,729						
Management & reporting of TTO & T2M activities - AFDF (months)	$ 24,120	$ -	$ 24,120.11	$ -	$ (0)	$ -
Outreach presentations (in-state travel-trips)	$ 8,345	$ -	$ 8,638.22	$ -	$ (293)	$ -
ARPA-E annual reporting meetings (travel)	$ 15,000	$ -	$ 15,468.03	$ -	$ (468)	$ -
Creation of Quality Handling Guidelines (Alaska Sea Grant & processors)	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Other	$ 47,465	$ -	$ 48,226.36	$ -	$ (762)	$ -
Total Direct Charges	$ 774,087	$ 262,400	$ 765,690.31	$ 273,266	$ 8,397	$ (12,266)
AFDF Indirect Charges (10% of MTDC) $56,284-$27,995=$28,289	$ 27,995	$ -	$ 27,994.67	$ -	$ (0)	$ -
Total Budget	$ 802,082	$ 262,400	$ 793,684.97	$ 273,266	$ 8,397	$ (12,266)

U.S. DEPARTMENT OF AGRICULTURE
RESEARCH, EDUCATION, AND ECONOMICS

Bigelow **AGREEMENT BUDGET**

COOPERATOR:	Alaska Fisheries Development Foundation	AGE
AGREEMENT NO.:		T
TYPE OF ACTION:		REIM
A. Salaries and Wages		
1. Senior/Key Person . . . . JD		
2. Other Personnel (Alaska Sea Grant Fellow - Mariculture Development Coordinator)		
3. Support Personnel/Secretarial/Clerical . . . . .HW		
Total Wages and Salaries		
Fringe Benefits (If charged as Direct Costs) for Senior/Key . . . . JD		
Fringe Benefits (If charged as Direct Costs) for Support Personnel . . . . .HW		
B. Total Fringe Benefits (If charged as Direct Costs)		
C. Total Salaries, Wages, and Fringe Benefits (A plus B)		
D. Equipment (Provide supporting data; list items and dollar amounts for each item		
E. Materials and Supplies		
F. Travel (List destination and amount for each trip. See Notes 8.)		
1. Domestic (Include Canada, Mexico, and U.S. Possessions)		
2. Foreign		
G. Publication Costs		
H. ADP/Computer Services		
I. Subcontracts (5)		
J. All Other Direct Costs (Provide supporting data. List items and dollar amounts for each item.)		
K. Total Direct Costs (C through J)		
L. Indirect Costs (Specify rate and base) . . . . Rate: de minimus indirect cost rate (10% of MTDC) Base:		
M. Total Costs (K plus L)		

As of October 1, 2019 AFDF has the following programs/grants:

USDOE – ARPA_E Phase II – *total grant amount: $802,082 (for 3 years), invoiced 793,684.97 to date. The remaining balance to be collected in FY 2023 is $8,397.03.*

as of February 24, 2023

NOAA – Oysters – *total grant amount: $298,927 (for 2 years), invoiced $268,457. Remaining balance is $30,470.*

Expense	# of Units	Unit Cost	Total	Request from NOAA	In-Kind Match	Project Total	Total	Total Actual	Balance Remaining
Personnel									
AFDF PI (months)	1.2	$ 6,200	$ 7,440	$ 7,440	$ -	**$ 7,440**	**$ 7,440**	**$ 7,440**	**$ -**
AFDF Operations Manager (months)	1.2	$ 4,400	$ 5,280	$ 5,280	$ -	**$ 5,280**	**$ 5,280**	**$ 5,280**	**$ -**
AFDF Development Director (months)	1.3	$ 3,910	$ 5,083	$ 5,083	$ -	**$ 5,083**	**$ 5,083**	**$ 5,083**	**$ 0**
Subtotal Personnel			**$ 17,803**	**$ 17,803**	**$ -**	**$ 17,803**	**$ 17,803**	**$ 17,803**	**$ 0**
Fringe benefits							**$ -**	**$ -**	**$ -**
Fringe - AFDF PI		19.85%	$ 1,477	$ 1,477	$ -	**$ 1,477**	**$ 1,477**	**$ 1,477**	**$ (0)**
Fringe - AFDF Operations Manager		20.18%	$ 1,066	$ 1,066	$ -	**$ 1,066**	**$ 1,066**	**$ 1,065**	**$ 0**
Fringe - AFDF Dev. Director		20.66%	$ 1,050	$ 1,050	$ -	**$ 1,050**	**$ 1,050**	**$ 1,051**	**$ (0)**
Subtotal Fringe Benefits			**$ 3,592**	**$ 3,592**	**$ -**	**$ 3,592**	**$ 3,592**	**$ 3,593**	**$ (1)**
Travel							**$ -**	**$ -**	**$ -**
Travel - in-state round trips (applicant)	2	$ 1,500	$ 3,000	$ 3,000	$ -	**$ 3,000**	**$ 3,000**	**$ -**	**$ 3,000**
Subtotal Travel			**$ 3,000**	**$ 3,000**	**$ -**	**$ 3,000**	**$ 3,000**	**$ -**	**$ 3,000**
Equipment							**$ -**	**$ -**	**$ -**
Pure Biomass Algae System	1	$ 24,644	$ 24,644	$ 24,644	$ -	**$ 24,644**	**$ 24,644**	**$ 31,254**	**$ (6,610)**
Heat pump	2	$ 16,162	$ 32,324	$ 32,324	$ -	**$ 32,324**	**$ 32,324**	**$ 44,381**	**$ (12,057)**
Subtotal Equipment			**$ 56,968**	**$ 56,968**	**$ -**	**$ 56,968**	**$ 56,968**	**$ 75,635**	**$ (18,667)**
Supplies							**$ -**	**$ -**	**$ -**
Diploid Oyster Seed	1000	$ 15	$ 15,400	$ 15,400	$ -	**$ 15,400**	**$ 15,400**	**$ 4,913**	**$ 10,487**
Triploid Oyster Seed	1000	$ 20	$ 19,500	$ 19,500	$ -	**$ 19,500**	**$ 19,500**	**$ 13,381**	**$ 6,119**
Misc Lab Supplies	2	$ 2,557	$ 5,114	$ 5,114	$ -	**$ 5,114**	**$ 5,114**	**$ 13,793**	**$ (8,678)**
Subtotal Supplies			**$ 40,014**	**$ 40,014**	**$ -**	**$ 40,014**	**$ 40,014**	**$ 32,087**	**$ 7,928**
Contractual							**$ -**	**$ -**	**$ -**
Subtotal Contracual			**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Other						**$ -**	**$ -**	**$ -**	**$ -**
Sub-award - UAF & Dr. Ginny Eckert	1	$ 11,808	$ 11,808	$ 11,808	$ -	**$ 11,808**	**$ 11,808**	**$ -**	**$ 11,808**
Sub-award - Dr. Chris Langdon	1	$ 20,000	$ 20,000	$ 20,000	$ -	**$ 20,000**	**$ 20,000**	**$ 2,500**	**$ 17,500**
Sub-award - OceansAlaska	1	$ 120,122	$ 120,122	$ 96,000	$ 24,122	**$120,122**	**$ 96,000**	**$ 93,789**	**$ 2,211**
Sub-award - Premium Aquatics	1	$ 15,700	$ 15,700	$ -	$ 15,700	**$ 15,700**	**$ -**	**$ -**	**$ -**
Sub-award - Blue Starr Oyster Company	1	$ 15,000	$ 15,000	$ 15,000	$ -	**$ 15,000**	**$ 15,000**	**$ 15,000**	**$ -**
Travel - in-state round trips (sub-awards)	4	$ 1,500	$ 6,000	$ 6,000	$ -	**$ 6,000**	**$ 6,000**	**$ 6,253**	**$ (253)**
Travel - out-of-state round trips (sub-awards)	4	$ 2,050	$ 8,200	$ 8,200	$ -	**$ 8,200**	**$ 8,200**	**$ 4,031**	**$ 4,169**
Shipping	1	$ 5,000	$ 5,000	$ 5,000	$ -	**$ 5,000**	**$ 5,000**	**$ 2,225**	**$ 2,775**
Subtotal Other			**$ 201,830**	**$ 162,008**	**$ 39,822**	**$201,830**	**$162,008**	**$ 123,797**	**$ 38,211**
Total Direct Charges			**$ 323,208**	**$ 283,386**	**$ 39,822**	**$323,208**	**$283,386**	**$ 252,915**	**$ 30,471**
Indirect Charges - de minimus 10% of MTDC	**1**	**10%**	**$ 15,542**	**$ 15,541.79**	**$ -**	**$ 15,542**	**$ 15,542**	**$ 15,542**	**$ (0)**
Total Budget			**$ 338,749**	**$298,927.45**	**$ 39,822**	**$338,749**	**$298,927**	**$ 268,457**	**$ 30,470**

Non-Federal Grants: <u>EVOS</u> – *total grant amount: $26,375,105 (for 10 years), AFDF amount is $5,011,531*

EVOS Mariculture ReCon: AFDF Subaward Budget

Year		FY22	FY23	FY24	FY25	FY26		FY27	FY28	FY29	FY30	FY31	Subtotal
		Year 1	Year 2	Year 3	Year 4	Year 5		Year 6	Year 7	Year 8	Year 9	Year 10	
Personnel													
	Ex. Director	$14,000	$14,280	$14,566	$14,857	$15,154		$15,457	$15,766	$16,082	$16,403	$16,731	**$153,296**
	Finance Director	$13,000	$13,260	$13,525	$13,796	$14,072		$14,353	$14,640	$14,933	$15,232	$15,536	**$142,346**
	Deputy Director	$10,000	$10,200	$10,404	$10,612	$10,824		$11,041	$11,262	$11,487	$11,717	$11,951	**$109,497**
Travel													
	in-state PI meeting	$1,200	$1,230	$1,261	$1,292	$1,325		$1,358	$1,392	$1,426	$1,462	$1,499	**$13,444**
	farm site visits	$3,000	$3,075	$3,152	$3,231	$3,311		$3,394	$3,479	$3,566	$3,655	$3,747	**$33,610**
	workshop travel		$25,000	$25,000								$50,000	**$100,000**
Contractual													
	Expert farmer, first $25k	$25,000											**$25,000**
	Partner farmers, first $25k	$225,000											**$225,000**
	contaminant testing		$25,920		$26,568			$5,446	$5,446	$5,446	$5,446	$5,446	**$79,720**
	FLUPSY rearing			$13,376	$13,711	$14,053		$14,405	$14,765	$15,134	$15,512		**$100,956**
	Genetics experts		$10,000	$10,000									**$20,000**
Supplies													
	Production arrays	$36,000	$36,000	$36,000	$36,000	$36,000		$36,000	$36,000				**$252,000**
	Triploid oyster seed		$50,000	$50,000									**$100,000**
	Sampling supplies	$18,000	$18,000	$18,000	$18,000	$18,000		$18,000	$18,000	$18,000	$18,000		**$162,000**
	Workshop supplies	$630				$470						$5,000	**$6,100**
	Oyster broodstock		$250	$700	$275	$800		$800	$500	$500	$500		**$4,325**
	minidot sensors	$11,000		$1,000		$1,000							**$13,000**
	miniPAR sensors	$39,676	$2,834	$2,834		$2,834							**$48,178**
	cyclops Turbidity sensors	$19,250		$1,375	$1,375	$1,375							**$23,375**
	Hobo T/S sensors	$21,000				$5,600			$8,400				**$35,000**
	Tilt current meters	$40,500	$27,000			$13,500			$9,000				**$90,000**
MTDC		$477,256	$237,049	$201,193	$139,716	$138,318		$120,254	$138,650	$86,574	$87,927	$109,910	**$1,736,848**
F&A		$47,726	$23,705	$20,119	$13,972	$13,832		$12,025	$13,865	$8,657	$8,793	$10,991	**$173,685**
Contractual above $25k													
	Expert farmer	$14,000	$41,000	$41,000	$41,000	$41,000		$41,000	$41,000	$41,000	$41,000	$41,000	**$383,000**
	Partner farmer	$45,000	$297,000	$297,000	$297,000	$297,000		$297,000	$297,000	$297,000	$297,000	$297,000	**$2,718,000**
Total		$583,982	$598,754	$559,312	$491,688	$490,150		$470,280	$490,515	$433,232	$434,720	$458,901	**$5,011,533**
		$583,982	$598,754	$559,312	$491,688	$490,150		$470,280	$490,515	$433,232	$434,720	$458,901	**$5,011,533**

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	$21,583.33
Travel		$4,200	$29,305	$29,413	$4,523	$4,636	$72,077	$1,380.67
Contractual		$309,000	$373,920	$361,376	$378,279	$352,053	$1,774,628	$5,545.65
Commodities		$186,056	$134,084	$109,909	$55,650	$79,579	$565,278	$0.00
Equipment		$0	$0	$0	$0	$0	$0	$0.00
Indirect Costs	Rate = 10% MTDC	$47,726	$23,705	$20,119	$13,972	$13,832	$119,354	$27,840.17
	SUBTOTAL	$583,982	$598,754	$559,312	$491,689	$490,150	$2,723,887	$56,349.82
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	$56,349.82

Builders Vision: *$100,000 (2 years - $20,000 overhead and $90,000 – payroll) and BSFA (6 months) cash match $26,000 for payroll.*

PSMFC – AMI Phase 3: *$31,821.47 was collected in FY 2022, and planning to collect the remaining $68,538.53 in FY 2023.*

Alaska Fisheries Development Foundation
Alaska Mariculture Initiative - Phase 3
Budget 2021-08-20

January 1, 2022 - March 31, 2023								
Expense	**# of Units**	**Unit Cost**	**Total**	**Request from PSMFC**	**In-Kind Match**	**Project Total**	**Total Requested as of 1.17.2023**	**Outstanding Balance as of 1.17.2022**
Personnel								
AFDF PI (months)	1.0	$ 6,392	$ 6,392	$ 6,392	$ -	**$ 6,392**	$ 5,113.60	**$ 1,278**
AFDF Finance Director (months)	1.0	$ 4,760	$ 4,760	$ 4,760	$ -	**$ 4,760**	$ 3,808.00	**$ 952**
AFDF Development Director (months)	1.0	$ 4,800	$ 4,800	$ 4,800	$ -	**$ 4,800**	$ 3,840.00	**$ 960**
Subtotal Personnel			**$ 15,952**	**$ 15,952**	**$ -**	**$ 15,952**	**$ 12,761.60**	**$ 3,190**
Fringe benefits								
Fringe - AFDF PI		28.29%	$ 1,808	$ 1,808	$ -	**$ 1,808**	$ 1,446.64	**$ 362**
Fringe - AFDF Finance Director		28.49%	$ 1,356	$ 1,356	$ -	**$ 1,356**	$ 1,084.90	**$ 271**
Fringe - AFDF Deputy Director		27.61%	$ 1,325	$ 1,325	$ -	**$ 1,325**	$ 866.95	**$ 458**
Subtotal Fringe Benefits			**$ 4,490**	**$ 4,490**	**$ -**	**$ 4,490**	**$ 3,398.49**	**$ 1,091**
Travel								
Travel - In-state Round Trips	16.0	$ 1,200	$ 19,200	$ 19,200	$ -	**$ 19,200**	$ 13,623.21	**$ 5,577**
Subtotal Travel			**$ 19,200**	**$ 19,200**	**$ -**	**$ 19,200**	**$ 13,623.21**	**$ 5,577**
Supplies								
Training/Outreach Materials (Printing/Design/Purchase/Mailing)	500.0	$ 35	$ 17,500	$ 17,500	$ -	**$ 17,500**	$ 1,167.49	**$ 16,333**
Subtotal Supplies			**$ 17,500**	**$ 17,500**	**$ -**	**$ 17,500**	**$ 1,167.49**	**$ 16,333**
Contractual								
Alaska Sea Grant	1.0	$ 35,004	$ 35,004	$ 35,004	$ -	**$ 35,004**	$ -	**$ 35,004**
			$ -	$ -	$ -	**$ -**	$ -	**$ -**
Subtotal Contractual			**$ 35,004**	**$ 35,004**	**$ -**	**$ 35,004**	**$ -**	**$ 35,004**
Total Direct Charges			**$ 92,146**	**$ 92,146**	**$ -**	**$ 92,146**	**$ 30,950.79**	**$ 61,195**
Indirect Charges - de minimus 10% of MTDC	**1.0**	**10%**	**$ 8,214**	**$ 8,214**	**$ -**	**$ 8,214**	**$ 6,571.34**	**$ 1,643**
Total Budget			**$ 100,360**	**$ 100,360**	**$ -**	**$100,360**	**$ 37,522.13**	**$ 62,838**

<u>WWF – Social License</u> - *total budget $99,994, total requested as of 1.31.2023 $85,281.22. WWF is prepaying after quarterly financial reports are submitted.*

WORLD WILDLIFE FUND U.S. FINANCIAL REPORT SUMMARY					
RECIPIENT NAME : Alaska Fisheries Development Foundation					
PROJECT NAME : Alaska Mariculture Alliance - Increasing Social License for Seaweed Farms					
PROJECT PERIOD : February 15, 2021 – September 30, 2023					
CURRENT REPORTING PERIOD : July 1, 2022 - December 31, 2022					
Budget Categories	**Previous Total Expenditure** US$	**Total current Expenditures** US$	**Total Expenditures (Previous + Current)** US$	**Approved Budget** US$	**Balance** US$
Personnel costs	22,842.60	9,137.04	31,979.64	50,254.00	18,274.36
Third Party Agreements	0.00	0.00	0.00		0.00
Contractual	0.00	0.00	0.00	25,000.00	25,000.00
Travel , Meetings & W/shops	928.57	3,865.51	4,794.08	10,800.00	6,005.92
Supplies	2,500.00	2,511.78	5,011.78	3,850.00	-1,161.78
Other Direct Costs	1,307.50	0.00	1,307.50	1,000.00	-307.50
Administrative fees (Indirect Charges - 10%)	4,131.98	1,652.79	5,784.77	9,090.00	3,305.23
TOTAL	**31,710.65**	**17,167.12**	**48,877.77**	**99,994**	**51,116**

***<u>WWF – KelpMeal</u>* -** *$50,000 budgeted and $50,000 requested (contractual services).*

<u>2022 Membership</u> - *We still have an open balance of $2,500 for AFDF 2022 Membership dues. Reminders were sent.*

*AFDF **2023 Membership** invoices were sent at the end of January 2023 to our current members below and I highlighted our 1 new member.*

9:41 PM
02/18/23
Accrual Basis

Alaska Fisheries Development Foundation Inc.
2023 Membership Collection Report
October 2022 through September 2023

	Date	Name	Memo	Open Balance	Amount
4000 · REVENUES					
4300 · Membership Dues					
	01/20/2023	Alaska Groundfish Data Bank, Inc:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership		0.00
	01/20/2023	Northwest Fisheries Association:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membership		0.00
	01/20/2023	United Fishermen of Alaska (A/R):2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		0.00
	01/20/2023	Alaska Bering Sea Crabbers:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		0.00
	10/28/2022	Wild Blue Mariculture:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership		250.00
	01/20/2023	UAF - Alaska Blue Economy Center:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership		250.00
	01/20/2023	Alaskan Observers, Inc.:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership	250.00	250.00
	01/20/2023	Copper River Seafoods, Inc.:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership	250.00	250.00
	01/20/2023	Native Village of Eyak:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership	250.00	250.00
	01/20/2023	Alaska Seafood Company, Inc.:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership	250.00	250.00
	01/20/2023	F/V Raven Bay:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership	250.00	250.00
	01/20/2023	E.C. Phillips & Sons:MBR 2023 Individual	2023 AFDF Membership Dues - Individual Membership	250.00	250.00
	01/20/2023	Pearl Bay Seafoods, LLC:2023 MBR Individual	2023 AFDF Membership Dues - Individual Membership	250.00	250.00
	01/20/2023	City of Whittier, Alaska:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	City of Valdez:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	Pacific Seafood Processors Association:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	Sheridan Consulting, LLC:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	F/V Savage:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	AK Commercial Fishing & Agriculture Bank:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	Alaska Longline Fishermen's Association:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	Alaska Whitefish Trawlers Association:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	Alaskan Leader Seafoods, LLC:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	Alward Fisheries, LLC:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	APICDA Joint Ventures dba Bering:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	At Sea Processors Association:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	E & E Foods, Inc.:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	F/V McCrea:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	Frontier Packaging, LLC:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership	500.00	500.00
	01/20/2023	Magic Fish Co.:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	Northwest Farm Credit Services:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	Premium Aquatics, LLC:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	Stellar North LLC:2023 MBR Voting	2023 AFDF Membership Dues - Voting Membership		500.00
	01/20/2023	Bornstein Seafoods:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membershi	1,000.00	1,000.00
	01/20/2023	Marel Inc:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membership		1,000.00
	01/20/2023	Aleutian Longline LLC:2023 MBR Voting	2023 AFDF Membership Dues - Sustaining Membershi	1,000.00	1,000.00
	01/20/2023	American Seafoods Company:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membership		1,000.00
	01/20/2023	Kwikpak Fisheries, LLC:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membership		1,000.00
	01/20/2023	Marble Seafoods:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membershi	1,000.00	1,000.00
	01/20/2023	Rich Products Corporation:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membershi	1,000.00	1,000.00
	01/20/2023	Ocean Beauty Seafoods LLC:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membershi	1,000.00	1,000.00
	01/20/2023	UniSea Inc.:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membership		1,000.00
	01/20/2023	Kanaway Seafoods dba Alaska General Seafo:2023 MBR Sustaininç	2023 AFDF Membership Dues - Sustaining Membershi	1,000.00	1,000.00
	01/20/2023	North Pacific Seafoods dba AK Pacific Sea:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membership		1,000.00
	02/03/2023	Canadian Fishing Company:2023 MBR Sustaining	2023 AFDF Membership Dues - Sustaining Membership		1,000.00
	10/01/2022	F/V Lady Simpson:2023 MBR Partner	2023 AFDF Membership Dues - Partner Membership		2,000.00
	01/20/2023	Silver Bay Seafoods:2023 MBR Partner	2023 AFDF Membership Dues - Partner Membership	2,000.00	2,000.00
	01/20/2023	Trident Seafoods Corporation:2023 MBR Partner	2023 AFDF Membership Dues - Partner Membership	2,000.00	2,000.00
Total 4300 · Membership Dues				16,250.00	29,750.00
Total 4000 · REVENUES				16,250.00	29,750.00
TOTAL				**16,250.00**	**29,750.00**

ASOS 2012-2023 Actual Expenses by Year

	ASOS 2012	ASOS 2013	ASOS 2014	ASOS 2015	ASOS 2016	ASOS 2017	ASOS 2018	ASOS 2019	ASOS 2020	ASOS 2021	ASOS 2022	ASOS 2023	TOTAL
Ordinary Income/Expense													
Income													
4000 · REVENUES													
4250 SOS Entry Fees	2,850.00	1,650.00	1,500.00	2,920.00	2,904.45	2,250.00	1,950.00	1,500.00	2,850.00	0.00	1,050.00	1,800.00	23,224.45
4255 SOS Sponsorship Revenues	50,000.00	85,149.00	93,050.00	125,400.00	113,295.00	113,695.00	102,245.00	89,295.00	116,858.00	30,250.00	117,845.00	131,549.00	1,168,631.00
4105 · Miscellaneous Income	8,724.13	6,941.55	2,846.56	4,412.01	4,145.00	0.00	0.00	500.00	45.00	0.00	6,244.85	6,110.00	39,969.10
4200 · Indirect Cost Recovery	571.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	571.50
4310 · Contributions	0.00	0.00	0.00	0.00	6,300.00	0.00	1,000.00	500.00	500.00	0.00	0.00	0.00	8,300.00
4500 · Interest	3.39	0.55	1.26	3.11	2.68	2.11	0.00	0.00	9.00	0.00	0.00	0.00	22.10
Total 4000 · REVENUES	62,149.02	93,741.10	97,397.82	132,735.12	126,647.13	115,947.11	105,195.00	91,795.00	120,262.00	30,250.00	125,139.85	139,459.00	1,240,718.15
Total Income	62,149.02	93,741.10	97,397.82	132,735.12	126,647.13	115,947.11	105,195.00	91,795.00	120,262.00	30,250.00	125,139.85	139,459.00	1,240,718.15
Gross Profit	62,149.02	93,741.10	97,397.82	132,735.12	126,647.13	115,947.11	105,195.00	91,795.00	120,262.00	30,250.00	125,139.85	139,459.00	1,240,718.15
Expense													
5000 · EXPENSES													
5100 · Payroll Expenses													
Total 5100 · Payroll Expenses	6,215.00	9,374.00	9,740.00	13,274.00	12,665.00	11,595.00	13,340.30	16,528.39	13,016.70	871.16	10,548.81	12,703.86	129,872.22
5200 · Business Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	173.00	0.00	0.00	0.00	173.00
5300 · Property/Space Rents	5,000.00	9,547.10	2,036.78	11,700.00	14,600.00	14,671.98	14,040.00	1,854.00	7,190.90	0.00	17,977.44	23,892.03	122,510.23
5400 · Professional Services	78,406.26	66,010.00	69,568.86	82,562.18	78,242.52	53,936.56	56,035.85	55,049.30	60,660.49	600.00	64,320.67	34,976.59	700,369.28
5450 · Advertising and Promotion	300.00	3,800.00	3,225.00	7,162.25	8,969.80	4,208.99	5,429.78	4,375.58	3,234.97	0.00	13,632.47	9,428.22	63,767.06
5500 · Telephone	0.00	1.74	33.44	27.70	31.54	0.00	22.29	24.32	1.85	0.00	0.00	0.00	142.88
5510 · Printing/Copying Svcs	0.00	653.34	40.03	84.68	888.58	1,112.20	514.59	724.29	252.99	0.00	789.36	128.04	5,188.10
5520 · Shipping & Postage	1,881.54	1,522.44	1,715.50	3,081.33	1,723.38	888.56	970.08	785.41	354.33	0.00	972.73	0.00	13,895.30
5530 · Subscriptions & Publication Fe	2,928.25	2,928.25	2,570.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8,426.50
5540 · Supplies & Materials	14,125.69	16,170.72	14,118.16	17,320.02	17,383.07	10,857.11	15,381.76	7,764.00	7,648.10	0.00	14,810.23	6,025.00	141,603.86
5550 · Parking	62.00	143.51	14.00	64.75	124.25	0.00	38.50	20.00	20.35	0.00	290.00	0.00	777.36
5560 · Memberships & Contributions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,500.00	1,500.00
5610 · Meetings & Workshops	0.00	0.00	64.00	248.46	171.02	0.00	38.82	31.77	1,696.22	0.00	3,539.00	450.00	6,239.29
5700 · Bank Charges	105.54	99.37	59.10	23.86	32.78	6.00	0.00	0.00	86.06	73.33	278.61	212.63	977.28
5810 · Travel Expense													
5811 · Per Diem	781.00	568.00	590.85	1,176.63	634.53	1,204.75	818.75	934.98	892.22	0.00	897.94	904.36	9,404.01
5810 · Travel Expense - Other	7,873.43	8,701.98	8,120.47	11,466.24	9,370.25	9,942.90	9,502.36	6,801.50	6,128.22	0.00	9,223.21	7,586.44	94,717.00
Total 5810 · Travel Expense	8,654.43	9,269.98	8,711.32	12,642.87	10,004.78	11,147.65	10,321.11	7,736.48	7,020.44	0.00	10,121.15	8,490.80	104,121.01
Total 5000 · EXPENSES	117,678.71	119,520.45	111,896.19	148,192.10	144,836.72	108,424.05	116,133.08	94,893.54	101,356.40	1,544.49	137,280.47	97,807.17	1,299,563.37
Total Expense	117,678.71	119,520.45	111,896.19	148,192.10	144,836.72	108,424.05	116,133.08	94,893.54	101,356.40	1,544.49	137,280.47	97,807.17	1,299,563.37
Net Ordinary Income	-55,529.69	-25,779.35	-14,498.37	-15,456.98	-18,189.59	7,523.06	-10,938.08	-3,098.54	18,905.60	28,705.51	-12,140.62	41,651.83	-58,845.22
Net Income	**-55,529.69**	**-25,779.35**	**-14,498.37**	**-15,456.98**	**-18,189.59**	**7,523.06**	**-10,938.08**	**-3,098.54**	**18,905.60**	**28,705.51**	**-12,140.62**	**41,651.83**	**-58,845.22**

<u>ASOS 2023</u> – *This year is one of the most successful years for the sponsorship collection so far, our total revenues from Sponsorship, entry fees and tickets are $138,459 (current unpaid balance is $32,750). For example, in 2015 our total revenues were $132,735.12. Above I included ASOS 2012-2023 Profit and Loss statement for comparison.*

<u>MSC Salmon</u> – *In October of 2019, PSPA transferred $146,415.55 MSC Salmon funds to AFDF for taking over the project.*

Below I listed more detailed Profit and Loss Statements by Year and Collection Reports for MSC Salmon, RFM Salmon and MSC & RFM P. Cod.

MSC Salmon Actuals by Year

	MSC Salmon 2019-2020	MSC Salmon 2020-2021	MSC Salmon 2021-2022	MSC Salmon 2022-2023	TOTAL
Ordinary Income/Expense					
Income					
4000 · REVENUES					
4150 · Contract Revenues	178,366.96	0.00	14,816.25	20,575.76	213,758.97
4310 · Contributions	1,867.07	71,492.49	20,669.48	99,058.69	193,087.73
Total 4000 · REVENUES	180,234.03	71,492.49	35,485.73	119,634.45	406,846.70
Total Income	180,234.03	71,492.49	35,485.73	119,634.45	406,846.70
Gross Profit	180,234.03	71,492.49	35,485.73		287,212.25
Expense					0.00
5000 · EXPENSES					0.00
5100 · Payroll Expenses					0.00
Total 5100 · Payroll Expenses	14,809.61	11,705.20	11,798.14	25,075.28	63,388.23
Overhead	11,153.82	5,906.57	7,146.50	11,291.48	35,498.37
5300 · Property/Space Rents	756.41	0.00	0.00	228.57	984.98
5400 · Professional Services	61,582.25	26,151.75	28,507.49	81,629.17	197,870.66
5500 · Telephone	45.77	0.00	0.00	0.00	45.77
5510 · Printing/Copying Svcs	57.72	18.95	0.00	32.74	109.41
5560 · Memberships & Contributions	0.00	1,500.00	1,500.00	0.00	3,000.00
5610 · Meetings & Workshops	466.94	1.26	98.75	0.00	566.95
5700 · Bank Charges	0.00	0.00	33.17	104.86	138.03
5810 · Travel Expense					
5811 · Per Diem	1,827.96	0.00	610.94	1,742.33	4,181.23
5810 · Travel Expense - Other	8,728.24	0.00	5,094.85	11,463.57	25,286.66
Total 5810 · Travel Expense	10,556.20	0.00	5,705.79	13,205.90	29,467.89
Project Supplies	83.89	0.00	0.00	0.00	83.89
Total 5000 · EXPENSES	99,512.61	45,283.73	54,789.84	131,568.00	331,154.18
Total Expense	99,512.61	45,283.73	54,789.84	131,568.00	331,154.18
Net Ordinary Income	80,721.42	26,208.76	-19,304.11	-11,933.55	75,692.52
Net Income	**80,721.42**	**26,208.76**	**-19,304.11**	**-11,933.55**	**75,692.52**

MSC Salmon 2022-2023 Collection Report

All Transactions

Date	Num	Name	Open Balance
4000 · REVENUES			
4310 · Contributions			
06/02/2022	MSMS2022-01	Peter Pan Seafood Company, LLC:MSC Salmon 2022-2023	
06/02/2022	MSCS2022-03	Canadian Fishing Company:MSC Salmon 2022-2023	
06/02/2022	MSCS2022-04	Pearl Bay Seafoods, LLC:MSC Salmon 2022-2023	
06/02/2022	MSCS2022-05	Seafood Producers Cooperative:MSC Salmon 2022-2023	
06/02/2022	MSCS2022-06	OBI Seafoods, LLC:MSC Salmon 2022-2023	
06/02/2022	MSCS2022-07	Haines Packing:MSC Salmon 2022-2023	
06/02/2022	MSCS2022-09	Seanna Seafoods LLC:MSC Salmon 2022-2023	
06/02/2022	MSCS2022-10	Norton Sound Economic Development Corpora:MSC Salmon 2022...	
06/02/2022	MSCS2022-11	Pacific Seafood Group dba Island Seafoods:MSC Salmon 2022-2...	
06/02/2022	MSCS2022-12	E & E Foods, Inc.:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-13	Rogue Wave Processing:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-14	E.C. Phillips & Sons:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-02	Trident Seafoods Corporation:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-08	Alaska Glacier Seafoods, Inc.:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-15	Ekuk Fisheries LLC:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-16	Alaska Seafood Holdings/Icy Strait Seafoo:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-16	Alaska Seafood Holdings/Icy Strait Seafoo:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-16	Alaska Seafood Holdings/Icy Strait Seafoo:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-17	Alaska's Best Seafood LLC:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-18	Copper River Seafoods, Inc.:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-19	Whittier Seafood LLC:MSC Salmon 2022-2023	
06/06/2022	MSCS2022-20	Silver Bay Seafoods:MSC Salmon 2022-2023	
06/01/2022	MSCS2022-21	Camtu's Alaska Wild Seafoods:MSC Salmon 2022-2023	
06/27/2022	MSCS2022-22	Triad Fisheries (a/r):MSC Salmon 2022-2023	
08/12/2022	MSCC2022-31	FV Fishnpohl inc.:MSC Salmon 2022-2023	
10/28/2022	MSCS2022-32	Bornstein Seafoods:MSCSalmon 2022-2023	
Total 4310 · Contributions			
Total 4000 · REVENUES			99,058.69
TOTAL			

RFM Salmon Actuals by Year

	RFM Salmon 3rd & 4th ASA 2015	RFM Salmon Reassesment 2016	RFM Salmon 1st ASA 2017-2018	RFM Salmon 3rd ASA 2018-2019	RFM Salmon 4th ASA 2019-2020	RFM Salmon 2020-2021	RFM Salmon 2021-2022	RFM Salmon 2022-2023	TOTAL
Ordinary Income/Expense									
Income									
4000 · REVENUES									
4150 · Contract Revenues	44,386.28	96,992.66	53,364.74	26,535.00	61,209.60	50,532.27	0.00	0.00	333,020.55
4310 · Contributions	47,063.76	135,771.67	76,770.10	27,201.01	61,174.97	62,151.57	20,417.85	156,226.88	586,777.81
4500 · Interest	0.00	0.00	804.59	0.00	0.00	0.00	0.00	0.00	804.59
Total 4000 · REVENUES	91,450.04	232,764.33	130,939.43	53,736.01	122,384.57	112,683.84	20,417.85	156,226.88	920,602.95
Total Income	91,450.04	232,764.33	130,939.43	53,736.01	122,384.57	112,683.84	20,417.85	156,226.88	920,602.95
Gross Profit	91,450.04	232,764.33	130,939.43	53,736.01	122,384.57	112,683.84	20,417.85	156,226.88	920,602.95
Expense									0.00
5000 · EXPENSES									0.00
Total 5100 · Payroll Expenses	14,336.17	48,290.00	35,441.00	40,000.00	38,238.67	7,704.17	9,591.90	22,039.90	215,641.81
Indirect Rate	6,689.32	11,111.44	12,764.28	7,213.77	7,315.41	1,178.32	6,458.41	12,678.14	65,409.09
5200 · Business Insurance	0.00	0.00	0.00	776.25	0.00	0.00	0.00	0.00	776.25
5400 · Professional Services	63,958.75	101,670.55	74,019.62	31,794.38	66,647.10	40,909.93	29,888.19	131,443.15	540,331.67
5450 · Advertising and Promotion	0.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	250.00
5500 · Telephone	482.57	43.94	89.61	55.84	0.00	0.00	0.00	0.00	671.96
5510 · Printing/Copying Svcs	135.11	0.00	0.00	0.00	57.72	0.00	0.00	32.74	225.57
5700 · Bank Charges	135.00	95.00	106.95	0.00	48.15	48.15	48.15	96.30	577.70
5810 · Travel Expense									0.00
5811 · Per Diem	671.67	2,061.35	975.70	253.20	1,167.03	0.00	601.50	1,374.86	7,105.31
5810 · Travel Expense - Other	9,262.47	18,908.08	9,327.09	1,497.16	3,820.36	9,725.47	2,926.32	10,977.15	66,444.10
Total 5810 · Travel Expense	9,934.14	20,969.43	10,302.79	1,750.36	4,987.39	9,725.47	3,527.82	12,352.01	73,549.41
Total 5000 · EXPENSES	95,671.06	182,180.36	132,724.25	81,840.60	117,294.44	59,566.04	49,514.47	178,642.24	897,433.46
Total Expense	95,671.06	182,180.36	132,724.25	81,840.60	117,294.44	59,566.04	49,514.47	178,642.24	897,433.46
Net Ordinary Income	-4,221.02	50,583.97	-1,784.82	-28,104.59	5,090.13	53,117.80	-29,096.62	-22,415.36	23,169.49
Net Income	**-4,221.02**	**50,583.97**	**-1,784.82**	**-28,104.59**	**5,090.13**	**53,117.80**	**-29,096.62**	**-22,415.36**	**23,169.49**

RFM Salmon 2022-2023 Collection Report

All Transactions

Date	Num	Name	Open Balance
4000 · REVENUES			
4310 · Contributions			
05/31/2022	RFMS2022-01	Ekuk Fisheries LLC:RFM Salmon 2022-2023	
06/02/2022	RFMS2022-02	Peter Pan Seafood Company, LLC:RFM Salmon 2022-2023	
06/02/2022	RFMS2022-03	Canadian Fishing Company:RFM Salmon 2022-2023	
06/02/2022	RFMS2022-04	Triad Fisheries (a/r):RFM Salmon 2022-2023	
06/06/2022	RFMS2022-06	Trident Seafoods Corporation:RFM Salmon 2022-2023	
06/06/2022	RFMS2022-05	E.C. Phillips & Sons:RFM Salmon 2022-2023	
06/06/2022	RFMS2022-07	Alaska Seafood Holdings/Icy Strait Seafoo:RFM Salmon 2022-2023	
06/06/2022	RFMS2022-08	Silver Bay Seafoods:RFM Salmon 2022-2023	
06/09/2022	RFMS2022-09	OBI Seafoods, LLC:RFM Salmon 2022-2023	
Total 4310 · Contributions			
Total 4000 · REVENUES			$156,226.88
TOTAL			

MSC & RFM P. Cod Actuals by Year

	MSC & RFM Cod 1st ASA (2016)	MSC & RFM P. Cod 2017-2018	MSC & RFM P. Cod 2019	MSC & RFM P. Cod 2020	MSC & RFM P. Cod 2021	MSC & RFM P. Cod 2022	MSC & RFM P. Cod 2023	TOTAL
Ordinary Income/Expense								
Income								
4000 · REVENUES								
4150 · Contract Revenues	62,869.46	144,300.17	23,942.54	30,900.50	58,474.29	0.00	0.00	320,486.96
4310 · Contributions	27,537.00	78,341.00	109,248.71	86,762.00	43,692.00	61,054.00	2,515.00	409,149.71
4500 · Interest	0.00	37.45	0.00	0.00	0.00	0.00	0.00	37.45
Total 4000 · REVENUES	90,406.46	222,678.62	133,191.25	117,662.50	102,166.29	61,054.00	2,515.00	729,674.12
Total Income	90,406.46	222,678.62	133,191.25	117,662.50	102,166.29	61,054.00	2,515.00	729,674.12
Gross Profit	90,406.46	222,678.62	133,191.25	117,662.50	102,166.29	61,054.00	2,515.00	729,674.12
Expense								0.00
5000 · EXPENSES								0.00
5100 · Payroll Expenses								0.00
Total 5100 · Payroll Expenses	10,548.39	25,910.86	34,314.04	18,647.86	14,833.46	22,725.19	3,325.76	130,305.56
Overhead Cost - 15%	4,866.46	9,499.36	11,659.21	6,585.84	7,706.75	17,864.75	0.00	58,182.37
5200 · Business Insurance	0.00	776.25	0.00	0.00	0.00	0.00	0.00	776.25
5400 · Professional Services	79,525.71	174,850.17	74,730.05	59,643.41	29,161.25	152,036.77	180.00	570,127.36
5500 · Telephone	0.00	151.43	220.10	45.76	0.00	0.00	0.00	417.29
5510 · Printing/Copying Svcs	89.67	263.64	2.65	57.73	0.00	32.74	0.00	446.43
5520 · Shipping & Postage	6.45	0.00	0.00	0.00	0.00	0.00	0.00	6.45
5550 · Parking	0.00	0.00	129.38	0.00	8.67	0.00	0.00	138.05
5560 · Memberships & Contributions	3,000.00	3,000.00	3,000.00	3,000.00	1,500.00	1,500.00	0.00	15,000.00
5610 · Meetings & Workshops	31.76	77.65	0.00	43.63	0.00	298.16	0.00	451.20
5700 · Bank Charges	90.00	0.00	48.15	37.45	49.22	32.10	0.00	256.92
5810 · Travel Expense								0.00
5811 · Per Diem	401.69	951.22	565.48	251.88	103.25	2,404.97	124.83	4,803.32
5810 · Travel Expense - Other	1,618.86	7,198.04	7,360.74	859.30	472.46	10,666.55	784.62	28,960.57
Total 5810 · Travel Expense	2,020.55	8,149.26	7,926.22	1,111.18	575.71	13,071.52	909.45	33,763.89
Total 5000 · EXPENSES	100,178.99	222,678.62	132,029.80	89,172.86	53,835.06	207,561.23	4,415.21	809,871.77
Total Expense	100,178.99	222,678.62	132,029.80	89,172.86	53,835.06	207,561.23	4,415.21	809,871.77
Net Ordinary Income	-9,772.53	0.00	1,161.45	28,489.64	48,331.23	-146,507.23	-1,900.21	-80,197.65
Net Income	**-9,772.53**	**0.00**	**1,161.45**	**28,489.64**	**48,331.23**	**-146,507.23**	**-1,900.21**	**-80,197.65**

MSC & RFM P. Cod 2023 Collection Report

October 2022 through September 2023

Type	Date	Name	
4000 · REVENUES			
4310 · Contributions			
Invoice	02/13/2023	Seven Seas Fish Company:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Alaska Jig Association (C):MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Ocean Peace Inc.:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Fishermen's Finest, Inc.:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	North Star Fishing Company:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Glacier Fish Company (r):MSC & RFM P. Cod 2023	
Invoice	02/13/2023	O'Hara Corporation:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	United States Seafoods, LLC:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Alaskan Leader Fisheries:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Aleutian Longline LLC:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Alyeska Seafoods, Inc.:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	American Seafoods Company:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Arctic Sablefish, LLC:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Bristol Wave:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Coastal Villages Longline, LLC:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Copper River Seafoods, Inc.:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Big Creek Fisheries:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	E & E Foods, Inc.:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	North Pacific Seafoods dba AK Pacific Sea:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	OBI Seafoods, LLC:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Peter Pan Seafood Company, LLC:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Silver Bay Seafoods:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Tatoosh Seafoods, LLC (A/R):MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Trident Seafoods Corporation:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	UniSea Inc.:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Westward Seafoods, Inc.:MSC & RFM P. Cod 2023	
Invoice	02/13/2023	Cape Romanzof Fisheries:MSC & RFM P. Cod 2023	
Total 4310 · Contributions			
Total 4000 · REVENUES			
TOTAL			$260,081

Cash Flow As of February 20, 2023

1. **AFDF Current Account Balances**

Cash Account	Account Balance 2/22/2022	Account Balance 10/31/2022	Account Balance 2/20/2023
Unrestricted Checking XXXXXX1035	$36,493.14	$61,910.68	$29,450.27
MSC Salmon XXXXXX0955	$109,343.87	$99,313.26	$75,709.64
MSC RFM P. Cod XXXXXX9698	$78,803.84	$500	$20,975.87
RFM Halibut Sablefish XXXXXXX9594	$500	$500	$132,724.94
SOS XXXXXX9706	$113,533.70	$27,126.78	$41,273.78
EDA BBB_ ARPA-E XXXXXXXXXXXX9586	$500	$500	$500
Startup Accelerator XXXXXX7017	$500	$500	$91,762.06
AMI_WWF XXXXXX2156	$4,762	$500	$1,264,578.95
RFM Salmon XXXXXX3253	$74,350.32	$103,750.58	$15,113.54
EVOS_Bigelow XXXXXX1997	$500	$500	$500
Total	**$419,286.87**	**$295,101.30**	**$1,672,589.05**

Credit Account	Account Balance 2/20/2023
Visa CC XXXX-XXXX-XXXX-4128	$24,977.82
Available Credit	$30,000

2. **FY 2023 Cash Flow Summary for Operating Funds (also called unrestricted or indirect)**

   Handout: "FY 2023 Budget for all the programs", Columns: Indirect Total Expenses

$30,450	2/20/2023 Operating Unrestricted Cash Balance (sum of amounts highlighted in yellow above
+$157,598	Projected Overhead to cover indirect expense from "FY 2023 Budget Projection for all the programs"
- $80,634	Projected Net Indirect Income for FY 2023 from "FY 2023 Budget Projection for all the programs"
+ $22,866	Uncollected invoiced Membership and other invoices billed for payroll, transfers for FY 2022 and FY 2023
= $130,280	**Expected remaining operating balance on 9/30/2023.**

Alaska Fisheries Development Foundation Inc.
Balance Sheet

Accrual Basis

	Feb 20, 23
ASSETS	
Current Assets	
Checking/Savings	
1515 · Unrestricted Checking 1035	29,450.27
1520 · MSC Salmon 0955	75,709.64
1530 · Cod Certification 9698	20,975.87
1535 · RFM Halibut Sablefish 9594	132,724.94
1540 · ASOS 9706	41,273.78
1545 · EDA BBB_ARPA_E 9586	500.00
1570 · Startup Accelerator - 7017	91,762.06
1580 · AMI 2156	1,264,578.95
1585 · RFM Salmon 3253	15,113.54
1590 · EVOS_Bigelow 1997	500.00
Total Checking/Savings	1,672,589.05
Accounts Receivable	340,475.03
Total Current Assets	2,013,064.08
TOTAL ASSETS	**2,013,064.08**
LIABILITIES & EQUITY	
Liabilities	
Current Liabilities	
Accounts Payable	120,427.41
Credit Cards	24,977.82
Other Current Liabilities	14,046.42
Total Current Liabilities	159,451.65
Total Liabilities	159,451.65
Equity	1,853,612.43
TOTAL LIABILITIES & EQUITY	**2,013,064.08**

*This **Balance Sheet** shows how much we have in each account as of February 20, 2023 after all the current payables and transfers will be completed. We have $120,427.41 in accounts payables, $24,977.82 in Credit Card payments for February 2022, and $14,046.42 in other current liabilities, such as Employee Vacation, payroll taxes and benefits, etc.*

Overall Financial Health

According to the attached "FY 2023 Budget Projection for All Programs" above, you can see that we expect to have quite improved cash flow compared to our previous year.

After all the calculations, remaining operating balance as of September 30, 2023, is expected to be $130,280*. (See Cash Flow above). This is a slight increase from the last year and is an indication that the overall financial health of the organization is improving.*

Hannah Wilson, Development Director Staff Report
February 2023

AFDF Communications:
Staff is working on increasing AFDF's outward-facing communications. We have drafted a winter e-newsletter that will be sent out by the end of the month. We are also continuing to refine the new website. Please let us know if you notice any errors or omissions!

Alaska Sea Grant Fellows:
AFDF applied to host two Sea Grant Fellows from the upcoming cohort. The two positions (Mariculture Development Coordinator and AFDF Program Coordinator) would build on the excellent work done by Ben and Robin and provide staff support for the Startup Accelerator, seafood sustainability certification, and AFDF's variety of mariculture grant commitments. Position descriptions are included in the packet attachments. If AFDF is selected as a host, interviews for applicants will begin in March.

Mariculture:

- **Alaska Mariculture Cluster (BBB):** I gave a brief overview of the AFDF project components (Green Energy) and subawards (R&D: De Risking Farming, Seaweed Tissue Analysis, and Joint Innovation Project) at the Southeast Conference Mid Session Summit. There continues to be a lot of interest in and enthusiasm for the Cluster.
- **Mariculture Research Consortium (EVOS):** All farmers participating in the first three years of the MarRecon project have agreed to a scope of work and signed contracts with AFDF. We will continue to help facilitate work between farmers and researchers as data collection starts this summer.

New Grants:
We collaborated with the SkipperScience Partnership on a second funding opportunity with MSC's Ocean Stewardship Fund (see packet attachments for MSC proposal, update given on the first, the NOAA Saltonstall-Kennedy grant application at the November meeting) to use their app program to help better understand murrelet-gillnet interactions. Funding decisions for both grants will be announced in the spring.

Seafood Sustainability Certifications:

- **Cod Invoicing:** We are back on track with cod invoicing. Invoices have been sent out to the client group and payments are due February 21st. There is a significant increase in cost to industry this year due to the RFM reassessment costs last year, which must be covered retroactively this year. Further, as of this year, ASMI is no longer covering CSC administrative fees. We expect costs to return to near-average next year. (See packet for Cod Client Group Letter).
- **MSC Cod Surveillance:** A surveillance audit occurred in early February. Both conditions are on track and the Assessment Team has no significant concerns. The surveillance report is scheduled to be published in April.

- **New Technical Facilitator:** After interviewing two highly qualified and recommended candidates, Ann Robertson of AKWA-DC was hired as new cod, sablefish, and halibut Technical Facilitator. She did excellent work for the MSC cod surveillance!
- **BOF Groundfish Proposal:** Hannah and Julie have continued to conduct outreach and answer questions about RC8 (revised proposal #161) ahead of the March BOF meeting, during which any actions will be taken. AFDF plans to submit another Letter of Support on behalf of industry groups and will organize RMF/MSC Alaska Cod Steering Committee members to testify on behalf of the proposal during the meeting.
- **RFM Halibut & Sablefish:** AFDF staff was just informed that the RFM Assessment Team has IDed one major and one minor non-conformance. AFDF staff is currently working on a corrective action plan to address the non-conformances (sablefish pot ghost fishing and halibut spatial footprint), which is due 28 working days from the notification on Feb. 14th. (See packet for non-conformance language).
- **MSC/RFM Alaska Salmon:** See Site Visit Summary below for update

MSC/RFM Alaska Salmon Site Visit Summary

Joint Staff Report (Wilson, Americus, Sheridan, Decker)

In December 2022, AFDF staff Julie Decker, Hannah Wilson, Ben Americus, and Tommy Sheridan were involved with Marine Stewardship Council (MSC) and Responsible Fisheries Management (RFM) sustainability certification of Alaska Salmon. MSC and RFM held a joint meeting in Anchorage December 12th-13th and in Sitka on December 14th. For MSC certification, the December meeting was a combination of the fourth and final regular surveillance audit of the fishery, and the reassessment site visit for the current cycle. The December meeting begins a two-year reassessment process for a **recertification decision in May 2024**. For RFM certification, the December meeting was the second surveillance audit of a five-year cycle.

Prior to the December meeting, the Alaska salmon fishery had 10 conditions to be resolved for recertification. Nine of these were related to hatchery enhancement and one was related to potential for murrelet bycatch in gillnet fisheries. On October 24th, 2022, prior to the December audit, Hannah Wilson led an Ecological Risk Assessment (ERA) workshop for murrelet bycatch. In attendance were federal biologists, representatives from four Alaskan gillnet gear groups, and representatives from concerned ENGOs. Following the workshop, Hannah produced an Ecological Risk Assessment Report that was delivered to the MSC and RFM assessment teams and is publicly available on the AFDF website (see packet attachments).

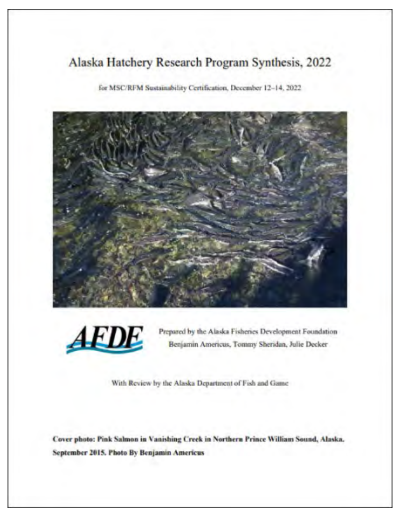
Activity	Month 2022-2024																		
	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M
MSC Announcement, team and assessment visit notification, publication of Announcement Comment Draft Report	■																		
Stakeholder consultation (ongoing)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Assessment visit, stakeholder meetings		■																	
Examination of evidence and scoring			■	■	■	■	■												
Consultation and confirmation of peer reviewers						■	■												
Client review of draft report								■	■										
Peer review of draft report								■											
Stakeholder review of draft report										■	■								
Final report/certification determination/objections period															■	■			
Certification decision (if no objection)																		■	■

In the lead up to the December meeting, Ben Americus and Tommy Sheridan collaborated with Alaska Department of Fish and Game biologists to draft a synthesis of the Alaska Hatchery Research Project. This document was likewise delivered to the MSC and RFM assessment teams and is publicly available on the AFDF website.

The three main areas of discussion at the December audit were 1: the effect and extent of straying hatchery fish, 2: the issue of endangered Southern Resident killer whales and Southeast trolling, and 3: Murrelet bycatch in gillnet fisheries.

Hatchery Straying

The December audit began with presentations by ADF&G Gene Conservation Lab staff on the Alaska Hatchery Research Program (AHRP). Five of the ten conditions on the salmon fishery relate to the rollout of information from this project, and the management decisions it informs. All five conditions are “on target” to close as scheduled. Tina Fairbanks of KRAA presented on the status of their marking program. Hatchery otolith marking is now fully implemented for all species released by Kodiak Regional Aquaculture Association. This rapid implementation of saltwater and dry marking technologies was made possible by $450,000 in 2016 Pink Salmon disaster relief funding that AFDF assisted KRAA in securing. In response to


Alaska Hatchery Research Program Synthesis, 2022

for MSC/RFM Sustainability Certification, December 12–14, 2022

AFDF

Prepared by the Alaska Fisheries Development Foundation
Benjamin Americus, Tommy Sheridan, Julie Decker

With Review by the Alaska Department of Fish and Game

Cover photo: Pink Salmon in Vanishing Creek in Northern Prince William Sound, Alaska. September 2015. Photo By Benjamin Americus

the KRAA update, the one condition related to Kodiak hatchery marking was closed as scheduled. The final two hatchery conditions are related to Cook Inlet and West Crawfish Inlet enhancement and straying. ADF&G staff shared operational plans for straying assessments in Lower Cook Inlet and AFDF collaborated with NSRAA to produce a short report on straying into West Crawfish Inlet. These two conditions are "on target" to close in 2023.

Orca ESA Issue

Brief Issue Summary:

Alaska Longline
FISHERMEN'S ASSOCIATION
ALASKA TROLLERS ASSOCIATION
ALFA: Post Office Box 1229 / Sitka, Alaska 99835 907.747.3400 alfafishak@gmail.com www.alfafish.org
ATA: 130 Seward #205 Juneau, AK 99801 (907) 586-9400 alaskatrollers@gmail.com www.aktrollers.org

Executive Summary

The following report prepared by the **Alaska Longline Fishermen's Association** (ALFA) and **the Alaska Trollers Association** (ATA) addresses factors that affect the Southern Resident orca and responds to the campaign waged by the Wild Fish Conservancy, a Washington State organization, to link orca decline to the Southeast Alaska troll fishery. This report is based on extensive review of the research, data, and published literature.

Pollution, industrial toxins, urbanization, habitat loss and human-caused disturbance are the primary factors limiting the recovery of the Southern Resident orcas. Any one factor – acoustic disturbances from vessel traffic, the orca observing industry, chemical contaminants, or habitat harms specific to Chinook, chum and coho salmon – may in itself be a significant cause of nutritional stress, higher death rates or failed pregnancies. In short, Southern Resident orcas are threatened primarily because of their prolonged residence each year in Puget Sound and Inland Southern British Columbia waters, all areas that are heavily used and contaminated by a growing human population.

ALFA and ATA are Southeast Alaska-based commercial fishing organizations that represent community-based, small commercial fishing businesses. Their members support science-based fisheries management and work to safeguard the health of the marine and freshwater environments that support salmon and other marine life. ALFA markets wild, sustainably caught Alaska seafood under the Alaskans Own label throughout Alaska and the U.S. to fund its Seafood Donation Program and Fishery Conservation Network. Alaskans Own is a leader in the sustainable seafood movement and has helped address food insecurity issues throughout Alaska and the Northwest, delivering more than 640,000 donated Alaska seafood meals in 2020-2021.

Chinook salmon produced by Southeast Alaska's troll fishery are the culinary world's salmon of choice, prized for their color, high oil content, firm texture, and succulent flesh. Trollers fish with hook and line gear on the open ocean and target individual adult salmon when they are "bright," or at their peak quality. Careful individual handling helps maintain this quality. No fish is treated with more care from the time it leaves the water until it arrives on a plate.

Troll fishery harvests are managed under the Pacific Salmon Treaty using annual catch limits based on the aggregate abundance of mixed, multiple Chinook stocks that feed in the Gulf of Alaska. Treaty harvest regimes are abundance-based and designed to be sustainable. Each year fishery managers develop annual abundance indices that respond to changes in stock productivity to meet biologically based escapement goals and exploitation rate objectives. Fishery managers have been successful at keeping catches below pre-season catch limits, consistent with Treaty obligations. Each year there is a post-season analysis of the fisheries and re-evaluation of harvest objectives. The Alaska troll fishery is one of the most carefully monitored fisheries in the world, with in season reporting and extensive dockside sampling. This management system ensures compliance with major seafood sustainability standards that require the harvest of sustainable fish stocks, minimal environmental impact on the marine ecosystem biodiversity, and an effective management system capable of responding quickly to environmental changes.

The Wild Fish Conservancy seeks to eliminate Southeast Alaska's troll fishery – a fleet of small fishing vessels operated by independent fishing families. Although there are many conservation groups concerned about orcas, the Wild Fish Conservancy acted alone to sue NMFS two years ago as part of its effort to eliminate the troll fishery. The court narrowly ruled NMFS needed to revise an incomplete plan to increase hatchery Chinook production that would provide additional prey for Southern Resident orcas.

The Wild Fish Conservancy is now misusing the court's decision in its campaign by targeting retailers, restaurants and seafood sustainability certifiers with misleading media materials that falsely fault a small and distant salmon fishery

The Wild Fish Conservancy (WFC) sued NMFS over NMFS' 2019 Biological Opinion (BiOp), which is the document that provides Endangered Species Act coverage to all Southeast Alaska's salmon fisheries. The Court found the BiOp to be inadequate on a number of counts that are largely technical, or process related. NMFS is currently revising the BiOp, which includes the Incidental Take Statement (ITS) essential to open a fishery that may impact an endangered species.

In the meantime, the WFC requested that the court suspend the ITS for the Southeast troll fishery and the prey enhancement program established to assist critical Puget Sound Chinook stocks and the Southern Resident Killer Whales (SRKW) that feed on them. The Magistrate Judge did not accept the WFC request to close the hatchery prey enhancement program but did recommend vacating the ITS for the troll fishery. A final ruling has not yet been made, however, trollers face the very real possibility of losing their 2023 salmon season.

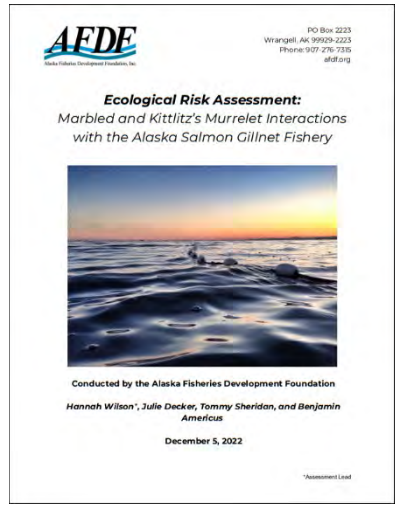
Impacts to MSC Certification:

Prior to the December audit, the assessment teams became aware of the lawsuit and potential economic and management impacts on the troll fishery and raised concerns to AFDF staff about being able to continue certification of the troll fishery. During the audit, Dani Evenson of ADF&G provided a comprehensive overview of the situation and described the support ADF&G is providing NMFS during the litigation. The assessment teams also met with Southeast troll fishermen in Sitka and discussed the Alaska Longline Fishermen's Association and Alaska Trollers Association joint White Paper on Southern Resident Killer Whales.

Considering the information provided and the state of litigation, the MSC assessment team determined that ***the lawsuit did not warrant action against certification*** for the Southeast Alaska troll fishery. From the perspective of MSC, if the ITP is vacated, then the fishery will not be prosecuted, which would be the "appropriate" management action and therefore certification would be maintained (despite no fish being harvested or sold). If the ITP is not vacated, then the fishery will continue as normal and certification will also be maintained because the court will have ruled that no change to management is necessary. Therefore, ***no conditions were placed on the fishery*** regarding this issue because the Assessment Team felt that either outcome of the lawsuit would result in an appropriate management action based on the findings of the court.

Murrelet bycatch

In the final day of the audit, in Sitka, the assessment teams met with US Fish and Wildlife Service and NMFS biologists to discuss the incidental take of murrelets in the Alaska salmon gillnet fishery. Hannah Wilson presented the results of AFDF's ERA. The ERA determined that gillnet fisheries in the regions of most concern, Prince William Sound and Southeast, presented low relative risk to Marbled and Kittlitz's Murrelet populations due to minimal spatial and temporal overlap. Considering the ERA and the perspectives of federal biologists, MSC determined the seabird condition to be "on target" for closure in 2023.


AFDF
Alaska Fisheries Development Foundation, Inc.

PO Box 2223
Wrangell, AK 99929-2223
Phone: 907-276-7315
afdf.org

Ecological Risk Assessment:
Marbled and Kittlitz's Murrelet Interactions with the Alaska Salmon Gillnet Fishery

Conducted by the Alaska Fisheries Development Foundation

Hannah Wilson*, Julie Decker, Tommy Sheridan, and Benjamin Americus

December 5, 2022

*Assessment Lead

Site Visit Summary

Altogether, the 2022 MSC/RFM site visit was a success. One condition was closed on schedule and the others were deemed "on target" to close within the next two years. At this time, **AFDF anticipated no barriers to MSC recertification or continuation of RFM certification**.

Ben Americus, Science Policy Coordinator
February 2023

Fisheries Sustainability Certification

Salmon

In early December, I worked with ADF&G staff and Tommy Sheridan to finalize the Alaska Hatchery Research Program Synthesis (2022) document. We provided it to the MSC and RFM assessment teams a week ahead of the site visit. The document is now publicly available on the AFDF website. I am currently collaborating with Dr. Samuel May at UAF to condense the document for submission to a peer-reviewed scientific journal. Publication of this document will satisfy an MSC condition for recertification and reflect AFDFs scientific prowess.

From December 12—13, I worked with Julie, Hannah and Tommy to facilitate MSC and RFM meetings. On December 13th, the assessment teams, Julie, Hannah, and Tommy traveled to Juneau for the last day of the audit. I stayed in Anchorage to attend the science panel meeting for the Alaska Hatchery Research Program. At this meeting, ADF&G staff and the science panel discussed the process of "docking the ship" of this 13-year project. The science panel voted to perform a final year of chum salmon sampling in Southeast Alaska. Final publications on the impact of straying on fitness will not be available until 2024 (PWS pinks) and 2025 (Southeast chums). These will be released after the MSC salmon reassessment (May, 2024), so it may be necessary to provide preliminary results to the assessment teams in the next two years.

Following the site visit, I collaborated with ADF&G staff and hatchery managers to provide supporting information to the MSC and RFM teams. I worked with Tommy, NSRAA, and ADF&G to summarize hatchery Chum Salmon straying that has been observed around the Crawfish Inlet remote release site. We produced a short document describing the historical sampling efforts that have occurred in the area and possible in-season mitigation efforts by ADF&G and NSRAA to reduce straying into West Crawfish Inlet.

Pacific cod, sablefish, and halibut

In early February I joined Hannah and Ann Robertson for the MSC reassessment of Pacific cod. I prepared a short summary of marine mammal interactions with the fishery. In the next month, I will help prepare a corrective action plan for RFM-certified halibut and sablefish. The two areas of nonconformance relate to sablefish pot ghost fishing and the spatial footprint of the halibut fishery in sensitive habitat.

Outreach

On February 8th, Garrett and I shared short presentations of our respective work with AFDF to Alaska Sea Grant State Fellows and staff. I presented an updated summary of my work on MSC/RFM Salmon reassessment.

On February 6th I attended and recorded notes at a mariculture session at the Alaska Forum for the Environment that was organized by Robin.

I have submitted abstracts to present a film and presentation at the American Fisheries Society Alaska Chapter Meeting in Fairbanks from March 26—31 in Fairbanks. The film will be a short overview of fieldwork for the Alaska Hatchery Research Project and will be vetted by ADF&G beforehand. The presentation will be on the costs and benefits of MSC/RFM certification to Alaska fisheries, and will be included in a symposium that Tommy is leading titled “Salmon Hatcheries 2.0”.

In early February I collaborated with Tommy to submit a pre-proposal to Alaska Seagrant to fund a scientific workshop in Cordova in 2024, with the theme “Alaska Salmon Hatcheries 2.0 Workshop – The Next 50 years”. Invitations to submit full proposals will be sent out on March 31st.

In late February I will prepare a 300 word article for the Prince William Sound Science Center’s annual publication. The short article will describe how the Alaska Hatchery Research Project, in which PWSSC was involved, is being used in fisheries sustainability certification

April Travel to Cordova

In early April I intend to travel to Cordova for two weeks to assist with mariculture harvests and research. In my time there, I plan to collaborate with the Prince William Sound Science Center, Noble Ocean Farms, and the Prince William Sound Economic Development District.

Annual Mariculture Conference of Alaska (AMCA):

● AFDF helped organize and plan AMCA which took place February 15th-17th in Juneau, Alaska (see attached photos).

● AFDF was able to support many conference activities and logistics through the conference planning funds from within the EDA Build Back Better project including catering and venue costs.

● Governor Dunleavy provided opening remarks for the conference.

● AFDF helped organize the Alaska Mariculture Meet and Greet on February 17th. This event took place in conjunction with the conference, but was primarily hosted by the Alaska Mariculture Alliance. The event was open to conference attendees and the public, as well as legislators in town for session. AFDF took part in the planning of this including coordinating catering, coordinating the attendance of Maylin Chávez of Nácar Oyster + Wine Pop-UP and chef/owner of Olympia Oyster Bar LLC, working with farmers and growers to secure kelp products and oysters, creating invitations for the event, and connecting with representatives about attending the event.

● Additionally, AFDF was able to support travel for eleven conference attendees through a variety of funding sources including the Build Back Better project. These attendees included speakers, Alaska Mariculture Alliance members from rural communities, and Alaska Native attendees.

Mariculture Outreach and Education Materials:

● Coordinated with the Alaska Mariculture Alliance (AMA) to create outreach materials on public interest topics related to mariculture in Alaska, including a series of infographics (see attached examples).

● Final feedback was received on the text and design styles of materials from a working group composed of representatives from different stakeholder groups and organizations with vested interest in mariculture.

● These infographics were then printed for the Annual Mariculture Conference of Alaska.

● Efforts continue for the curation of an annotated bibliography on current and relevant shellfish aquaculture literature which will supplement research compiled on seaweed and kelp culture for the Alaska Mariculture Alliance and Mariculture Research and Training Center websites.

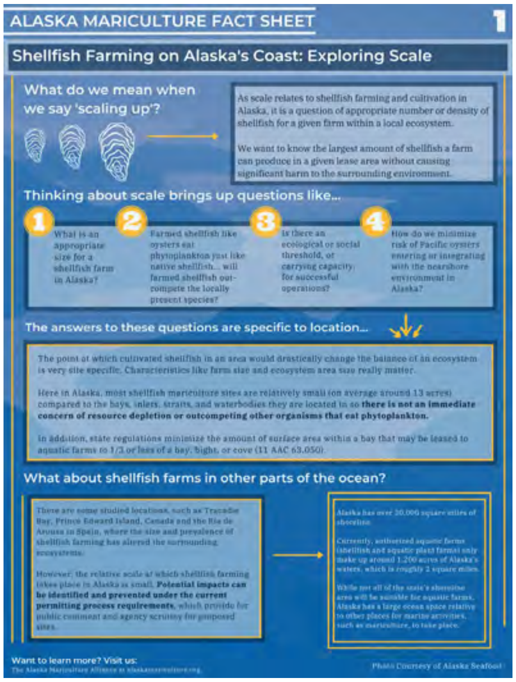
Bull Kelp Cultivation Workshops:

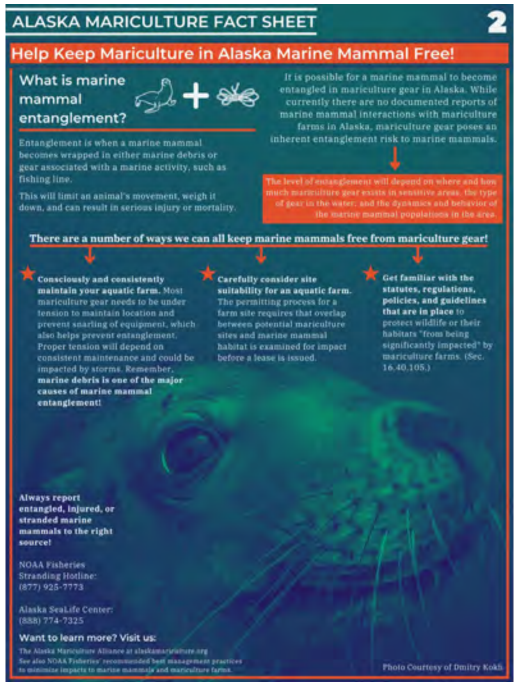
● A second bull kelp workshop took place at the Annual Mariculture Conference of Alaska. This was coordinated primarily by GreenWave with initial planning help from AFDF, in collaboration with the AMA. It focused primarily on informing farmers about topics such as cultivation, processing, and conservation efforts.

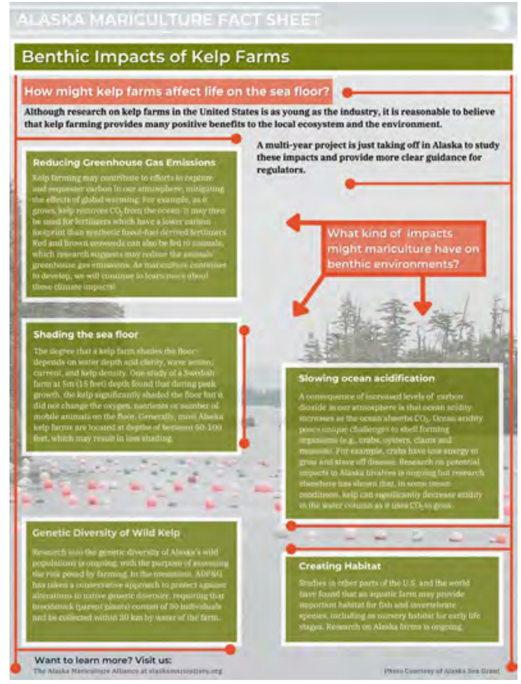
ARPA-E Outreach:

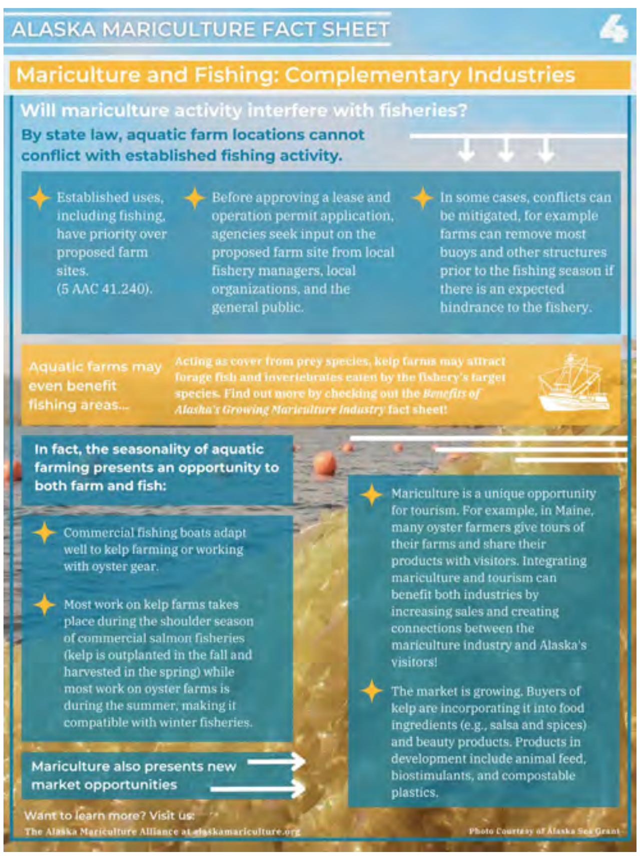
● The ARPA-E MARINER team's multi-year project at the farm site near Kodiak Island has produced several key findings related to the cultivation of kelp. Sharing out this information could be helpful for other producers entering the industry.
● AFDF, along with GreenWave, has interest in creating stakeholder outreach materials. Outreach materials are under development. The first informational pamphlet was released during the Annual Mariculture Conference.

Mariculture Outreach and Education Materials:


ALASKA MARICULTURE FACT SHEET
1
Shellfish Farming on Alaska's Coast: Exploring Scale
What do we mean when we say 'scaling up'?
As scale relates to shellfish farming and cultivation in Alaska, it is a question of appropriate number or density of shellfish for a given farm within a local ecosystem.
We want to know the largest amount of shellfish a farm can produce in a given lease area without causing significant harm to the surrounding environment.
Thinking about scale brings up questions like...
What is an appropriate size for a shellfish farm in Alaska?
Farmed shellfish like oysters eat phytoplankton just like native shellfish... will farmed shellfish out-compete the locally present species?
Is there an ecological or social threshold, or carrying capacity, for successful operations?
How do we minimize risk of Pacific oysters entering or integrating with the nearshore environment in Alaska?
The answers to these questions are specific to location...
What about shellfish farms in other parts of the ocean?
Want to learn more? Visit us:
Photo Courtesy of Alaska Seafood

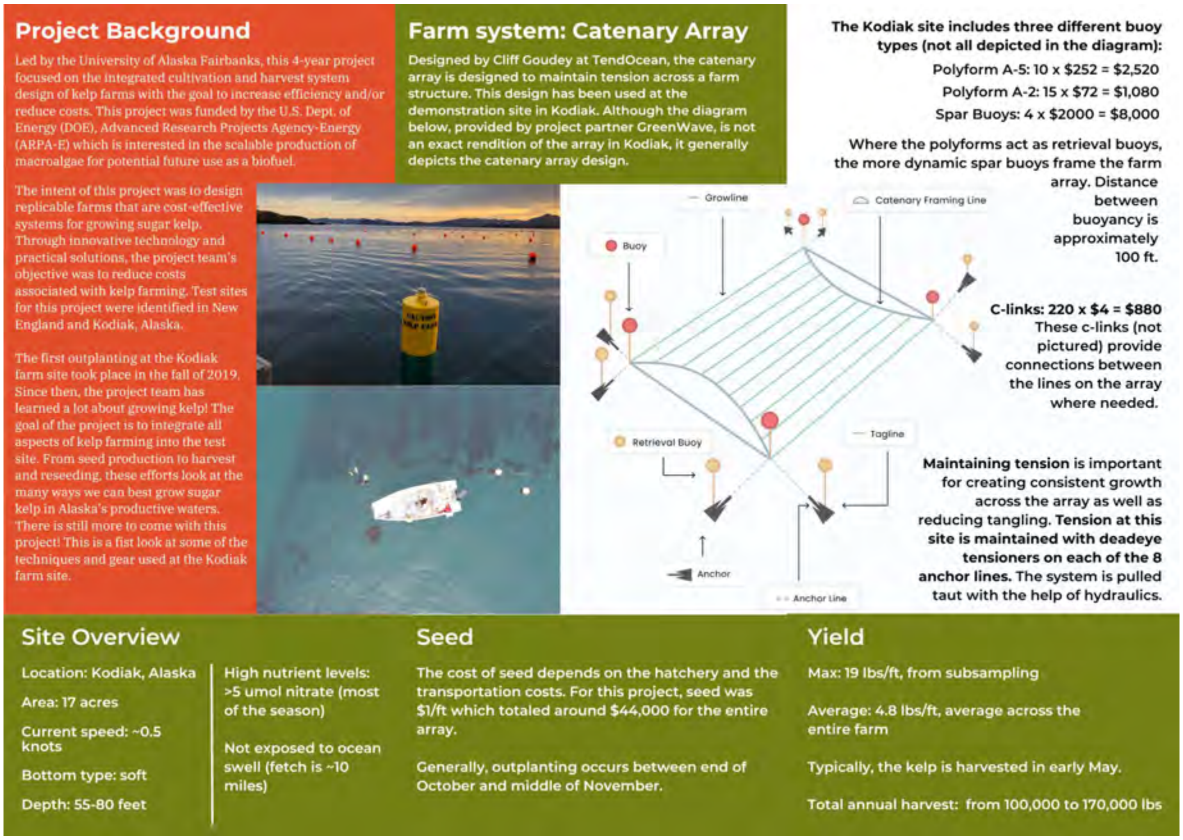

ALASKA MARICULTURE FACT SHEET
2
Help Keep Mariculture in Alaska Marine Mammal Free!
What is marine mammal entanglement?
There are a number of ways we can all keep marine mammals free from mariculture gear!
Always report entangled, injured, or stranded marine mammals to the right source!
NOAA Fisheries Stranding Hotline: (877) 925-7773
Alaska SeaLife Center: (888) 774-7325
Want to learn more? Visit us:
Photo Courtesy of Dmitry Kokh


ALASKA MARICULTURE FACT SHEET
Benthic Impacts of Kelp Farms
How might kelp farms affect life on the sea floor?
Although research on kelp farms in the United States is as young as the industry, it is reasonable to believe that kelp farming provides many positive benefits to the local ecosystem and the environment.
A multi-year project is just taking off in Alaska to study these impacts and provide more clear guidance for regulators.
Reducing Greenhouse Gas Emissions
What kind of impacts might mariculture have on benthic environments?
Shading the sea floor
Slowing ocean acidification
Genetic Diversity of Wild Kelp
Creating Habitat
Want to learn more? Visit us:
Photo Courtesy of Alaska Sea Grant


ALASKA MARICULTURE FACT SHEET
4
Mariculture and Fishing: Complementary Industries
Will mariculture activity interfere with fisheries?
By state law, aquatic farm locations cannot conflict with established fishing activity.
Established uses, including fishing, have priority over proposed farm sites. (5 AAC 41.240).
Before approving a lease and operation permit application, agencies seek input on the proposed farm site from local fishery managers, local organizations, and the general public.
In some cases, conflicts can be mitigated, for example farms can remove most buoys and other structures prior to the fishing season if there is an expected hindrance to the fishery.
Aquatic farms may even benefit fishing areas...
Acting as cover from prey species, kelp farms may attract forage fish and invertebrates eaten by the fishery's target species. Find out more by checking out the Benefits of Alaska's Growing Mariculture Industry fact sheet!
In fact, the seasonality of aquatic farming presents an opportunity to both farm and fish:
Commercial fishing boats adapt well to kelp farming or working with oyster gear.
Most work on kelp farms takes place during the shoulder season of commercial salmon fisheries (kelp is outplanted in the fall and harvested in the spring) while most work on oyster farms is during the summer, making it compatible with winter fisheries.
Mariculture also presents new market opportunities
Mariculture is a unique opportunity for tourism. For example, in Maine, many oyster farmers give tours of their farms and share their products with visitors. Integrating mariculture and tourism can benefit both industries by increasing sales and creating connections between the mariculture industry and Alaska's visitors!
The market is growing. Buyers of kelp are incorporating it into food ingredients (e.g., salsa and spices) and beauty products. Products in development include animal feed, biostimulants, and compostable plastics.


ALASKA MARICULTURE FACT SHEET
5
Benefits of Alaska's Growing Mariculture Industry
Mariculture has both environmental and economic benefits. Some are universal and others depend on the type of mariculture being practiced.
Environmental Benefits
Water Quality
In places with high levels of runoff from urban areas and agriculture, water filtration by shellfish farms draws down excess nutrients and improves overall water quality and decreases the risk of low or no oxygen zones.
Aquatic plants, including seaweed and kelp species, can help filter organic and non-organic nutrients in marine waterbodies.
Habitat Creation
Physical structures associated with aquatic farms may create three-dimensional midwater and surface habitat for wild species such as foraging fish and crustaceans, which may benefit their populations.
Buffer for Ocean Acidification
As seaweed and kelp species absorb carbon dioxide, they may buffer certain shell-forming creatures from the corrosive impacts of ocean acidification under certain oceanographic conditions.
Economic Benefits
Revenue Opportunity
Mariculture has the potential to bring increased revenue to coastal communities around Alaska. As this industry continues to grow there's never been a better time to get involved in mariculture in Alaska!
Commercial Value
In 2021, the commercial value of the mariculture industry in Alaska was estimated at just under $3 million (Alaska Sea Grant, State of Mariculture). Currently, the majority of this commercial value is related to oyster cultivation. However, the seaweed industry alone has the potential to experience incredible growth over the next 20 years.
Compatible Seasons
Certain types of mariculture are compatible with Alaska's existing seafood industry in many ways including multi-purpose equipment and technologies. Another example of compatibility is that cultivation and growing seasons for kelp species often fit within the offseason of some Alaska fisheries.
You can get involved in mariculture in many ways; farming, processing, hatcheries, market and product development, and sales!

ARPA-E Outreach:



Annual Mariculture Conference of Alaska (AMCA) Photos:

Governor Dunleavy provided opening remarks (left); Dave Bailey from Woods Hole Oceanographic Institute discusses scalable kelp farms and the ARPA-E work happening in Kodiak (below)

Conference attendees at the venue, the Juneau Arts and Culture Center.

Keynote speakers included Dana Morse, the Senior Extension Program Manager and Aquaculture Maine Sea Grant, and Robert Venables, Executive Director of the Southeast Conference.

Alaska Fisheries Development Foundation

Staff Update to the Board | February 2023 | Garrett Evridge

My activity since the last board meeting falls into three categories: Administration, Startup Support, and Project Development.

Startup Engagement & Support

I typically meet with 5-10 companies a week. The following is a sample of what these meetings have been focused on.

Thunder's Catch

Conducted onboarding with the Symphony of Seafood winner to define goals and objectives, develop basic financial understanding of their business model, and prepare for the Boston Seafood show. We have connected them with ASMI, Global Seafood Alliance, and mentors in the consumer packaged goods sector.

Foraged & Found

Reviewing their updated business model. Advising on bridge financing options.

Net Your Problem

Working closely with the founder to improve organization of financial information, reviewing 2023 projected expenses/revenue, and advising on her business plan.

AlaSkins

Connected them with mentors to support a business expansion plan. Reviewing business plans and discussing investment options.

Alaska Salmon Sisters

Held an onboarding meeting. We will be working with the company to define their business plan, strategic goals, and marketing strategy.

Ivaldi

Supporting their exploration of opportunities to provide manufacturing and inventory support to the Alaska seafood industry. Made introductions in the seafood industry.

TriJet Manufacturing

Supporting a high-end machine, fabrication, and coatings business identify opportunities in the Alaska seafood industry. Developing a cost-efficient engagement strategy that currently has them attending PME in 2023. Identifying product-market fit.

Kempy Energetics
We are incubating Chandler Kemp's electric deck gear business concept. Currently advising on basic business formation, pitch deck , and product-market fit. Helped him apply to the Alaska Angel Conference where he will be pitching his company in the hopes of winning a $100,000 investment.

Certified Quality Foods
Had exploratory conversations with CQF. **They are looking for another $250k-$300k as part of a $750k bridge round.** (I can share their pitch deck/terms if anyone is interested.)

Ladon Robotics
Advising on their go-to-market strategy. I was listed as a strategic advisor last month when they pitched to the 49th State Angel Fund.

I'm also meeting as needed with Noble Ocean Farms, BeadedStream, Saildrone, Blue Trace, HullBot, FlyWire, and PolArctic, among others.

Administration

We've completed the AOC/AFDF integration. Two documents were signed with BSFA which finished the process, a Project Transfer Agreement and a $26k contract to complete the requirements of the EDA award that funded AOC.

We sent out a press release and coordinated with Seafood News, Cordova Times, Fishermen's News, The Advocate (GSA), Peninsula Clarion, and Alaska Business Journal. These articles will come out through April.

The IAC continues to be refined and developed. A copy of the latest draft is included.

Projects under development

The following are projects and concepts at differing levels of development. I've been meeting with John Burrows at ASMI to see if there are opportunities to collaborate on these or other projects through the ASMI Technical Committee.

Cooperatively Owned Marine Collagen Plant
An idea to examine the feasibility of a cooperatively owned marine collagen plant in Alaska, similar to the ownership structure of the Kodiak Fish Meal plant. I've got two pages of rough notes on the idea - not ready to share.

Reshoring of Alaska Seafood Processing
A research concept dedicated to learning the technical and financial requirements of shifting offshore value-add reprocessing back to the United States. A two-page draft is included.

Alaska Scouting of Alaska Pollock

A ready-to-submit project dedicated to trialing the use of uncrewed vessels in the Bering Sea to scout for Pollock. The project will see the use of multiple Saildrone used in coordination with the pollock fleet to improve geographical understanding of pollock concentrations. This improved understanding of where fish are will result in less time-at-sea and save energy - initial estimates indicate savings of more than than 30 million gallons over a 10-year period. Partners & supporters include Saildrone, Coastal Villages Region Fund, At-Sea Processors, Phoenix Processor Limited Partnership, and Bering Sea Fishermen's Fund. Full proposal is available for review.

Fishing for the Cold Pool

A ready-to-submit proposal aimed at gathering temperature data in the Bering Sea using two methods: 1) seafloor-based temperature loggers located along a NW - SE transect with 15 stations gathering data year-round, and 2) a dynamic data collection protocol using temperature loggers mounted on fixed gear that accumulates data during fishing operations. Partners include Alaska Bering Sea Crabbers, Scott Goodman, Bering Sea Fishermen's Association, and PolArctic. Preliminary conversations have been held with Aleut Tribe of Saint Paul. Full proposal is available for review.

Julie Cisco Board update as of February 17, 2023

Symphony sponsorships are at $131,549. (Report in packet)

BBRSDA grant monies : the next installment of $50,000 will be received April, 2024

In August, we would like to have a Board meeting to discuss the future of the UFA/AFDF Legislative Reception in Juneau. Other associations have expressed interest in co-hosting and we will need Board approval and direction.

At Boston, Julie D and I will be spending some time identifying potential sponsors and entrants.

Membership – all members have been invoiced for 2023. Bering Sea Crabbers Association, PWSAC, and E&E Foods did not renew. The BSCA is not a surprise.   PWSAC is doing some restructuring this year and I'm hopeful we can get them back. E&E Foods has been bought by CanFisCo, who already is a member.

Billed: $29,750

Question: do we want to require anyone that enters the Symphony or is part of the Startup Accelerator to be an AFDF member?

Ocean Rainforest secures $6.2 Million in Series-A Funding for North Atlantic and Eastern Pacific Expansion

February 15, 2023

Ocean Rainforest has closed a Series-A investment round of USD 6.2 million. The funding round will enable further expansion of operations in the North Atlantic Ocean and the Eastern Pacific Rim, and accelerate product and market development.

Ocean Rainforest is a seaweed cultivation and processing company based in the Faroe Islands, Europe, and California, USA. Since 2010, the company has developed a proven "first of its kind" open ocean cultivation system and has consistently remained suitable for real offshore conditions in the North Atlantic and Pacific Oceans. Today the company is among the largest commercial seaweed cultivators in Europe and has obtained the first-ever offshore seaweed cultivation permit in United States federal waters located offshore of Santa Barbara, CA.

The new investment funding allows Ocean Rainforest to scale up seaweed production to supply the functional food and feed markets leveraging existing company facilities in the Faroe Islands while expanding its operations in California.

Marc von Keitz, director at the **Grantham Foundation,** said: "We are excited about Ocean Rainforest's capabilities to successfully grow seaweed in open ocean environments. This funding will significantly expand their production into off-shore waters and will be critical to meet growing market demand and to reach climate-relevant scale."

The funding was led by The Grantham Foundation for the Protection of the Environment who invested alongside **Katapult Ocean's Deep Blue fund**, **Builders Vision** and the **Ocean Born Foundation**. Existing shareholders **World Wildlife Fund (WWF-US**), **Norðoya Íløgufelag** and **Twynam Invest** also participated in this Series A round. –

"With limited environmental impacts and a low carbon footprint, seaweed absorbs CO2 and other excess nutrients from the ocean, making this fast-growing crop a climate-smart and nutritious food source," said **Paul Dobbins**, Senior Director of Impact Investing at **World Wildlife Fund - US.** "But seaweed can only thrive as a climate change solution if we create a market for the many food, feed and fossil-based replacement products seaweed can provide. Ocean Rainforest is addressing the feed market and their successful capital raise shines a spotlight on this growing opportunity."

Olavur Gregersen, Co-founder and CEO of **Ocean Rainforest**, said: "We are delighted that our existing shareholders as well as the new highly renowned investors within the sustainable ocean and climate impact contributed to the success of this financing round. The investment enables us to scale up operations in the Faroe Islands and continue to commercialize our cultivation and processing activities of Giant Kelp in California. Furthermore, we will investigate possibilities for replication of our business model in collaboration with local partners in specific locations in Europe and North America."

How does Ocean Rainforest make an impact?

Global shortages of sustainable, healthy feed and food represent among the most pressing challenges of our time. At the same time, the global community is in critical need of highly effective, economically feasible, and immediately accessible strategies to help mitigate the effects of climate change.

Ocean Rainforest intends to address these two challenges through sustainable, large-scale seaweed cultivation. Seaweeds are among the fastest-growing crops on the planet. They only require sunlight, carbon dioxide (CO_2), nutrients that are naturally occurring in the ocean, and a substrate to grow on. When this is utilized commercially and scaled up with open ocean cultivation systems, large quantities of CO_2 can be absorbed. This activity reduces ocean acidification, mitigates climate change through carbon uptake, and provides other ecosystem services.

Ocean Rainforest wants to demonstrate competitive business models of cultivated seaweed products to meet a growing demand from market segments such as functional food and feed ingredients and additives for multiple nutraceuticals, cosmeceuticals, biomaterials, beverages, texturing, and medical devices.

About Ocean Rainforest:

Ocean Rainforest's vision is to create local ocean rainforests around the world. Headquartered in the Faroe Islands, Ocean Rainforest is a leader in offshore seaweed cultivation with fully integrated production from seed to shelf-stable product in the North Atlantic, poised for significant expansion. The company is leading and participating in multiple, international R&D efforts in Europe and the United States to develop and optimize cultivation and processing strategies that will allow competitive supply of this sustainable biomass into a variety of products. Ocean Rainforest has also established a U.S subsidiary in Southern California, where it recently obtained an R&D permit for seaweed cultivation in federal waters, a critical step towards establishing commercial scale production and processing in the Eastern Pacific.

About The Grantham Foundation for the Protection of the Environment:

The Grantham Foundation for the Protection of the Environment is a private charitable foundation based in Boston, with a mission to protect and conserve the natural world via a broad range of scalable, but often neglected, climate solutions. The Foundation believes the world needs innovation and commercialization of new technologies. Along with environmental philanthropy, it makes investments in building green industries and systems.

https://www.oceanrainforest.com/blog-en/2023/2/15/ocean-rainforest-secures-62-million-in-series-a-funding-for-north-atlantic-and-eastern-pacific-expansionnbsp

MEMORANDUM OF UNDERSTANDING
Between Genuine Alaska Pollock Producers and
Alaska Fisheries Development Foundation
****Amended January 6, 2023****

This Memorandum of Understanding (MOA) is effective the 23rd of May, 2022, and hereby amended effective the 6th of January, 2023, between Alaska Fisheries Development Foundation (AFDF) and Genuine Alaska Pollock Producers (GAPP) as respects AFDF's employee Julie Cisco (Cisco). The MOU will be in place until one or both parties terminate the MOU in writing. This MOU may be terminated with 30-day notice in writing by either party.

AFDF and GAPP agree that Cisco is a full-time employee of AFDF who is responsible for all payroll taxes, insurance, workers compensation, health insurance reimbursement, and any other statutory requirements. Cisco will not be considered a GAPP employee. AFDF agrees that GAPP may utilize Cisco's services, up to **37 hours per month**. This number of hours per month may be subject to fluctuation, either higher or lower, as needs arise. Cisco will track time worked for both AFDF and GAPP and provide timesheets for review bi-weekly.

Work product produced by Cisco for AFDF will remain AFDF property. Work product produced for GAPP will remain GAPP property. If there are occasions for work product to be shared, Cisco agrees to discuss with the product owner and obtain permission prior to sharing.

Cisco may occasionally have access to proprietary or confidential information for both AFDF and GAPP. Cisco agrees to not share that information without prior authorization from AFDF Executive Director, Julie Decker, and/or GAPP Chief Executive Officer, Craig Morris.

AFDF will invoice GAPP **$1,636.63** for Cisco's services, on the 1st of each month, with payment due by the 15th. See the breakdown of monthly charges below for 2023:

Annual Salary = $71,500
Fringe (27%) = $19,305
Home office stipend = $1,200
Annual Total = $92,005

$92,005 / 2080 hrs = $44.23/hr

$44.23/hr * 37 hrs per month = **$1,636.63 per month AFDF charges GAPP in 2023**

Mutual Indemnification. Each Party shall indemnify, defend and hold the other Party harmless from all liabilities, costs and expenses (including, without limitation, attorney fees) that such Party may suffer, sustain or become subject to as a result any misrepresentation or breach of warranty, covenant or agreement of the indemnifying Party contained herein or the indemnifying

Party's gross negligence or willful misconduct in performance of its obligations under this Agreement.

Signed this 24 of January, 2023

Julie Decker, Executive Director
Alaska Fisheries Development Foundation

Craig Morris, Chief Executive Officer
Genuine Alaska Pollock Producers

From: Rogers, Daniel R. <daniel.rogers@hq.doe.gov>
Sent: Friday, February 17, 2023 8:37 AM
To: Freeman, Simon; Garson, Jennifer; Karen Hyun - NOAA Federal; Fu, Thomas C SES USN CNR ARLINGTON VA (USA); Blue Sky Maritime Coalition VP; jdecker@afdf.org
Cc: Alexander, Natalie (CONTR); NOS PCO - NOAA Service Account; OMAO PCO - NOAA Service Account; Invite UnderSecretary - NOAA Service Account
Subject: ARPA-E Summit "Blue Economy" Panel Prep

Hi all,

Thanks again for agreeing to participate in our "Energy and the Blue Economy" panel at the upcoming 2023 ARPA-E Energy Innovation Summit. Again, our panel is scheduled for **Friday, March 24, 9:00-10:00am EST** at the Gaylord National Resort & Convention Center in National Harbor, MD. You should have already received instructions from our event organizers on how to register for the Summit. (If not, please let Simon Freeman and I know.)

We have a fantastic group assembled for this panel, and we are very excited to strengthen the connections between you all and the ARPA-E/DOE community. Here is the list of everyone included here:

Moderator: **Jennifer Garson** – Director, DOE Water Power Technologies Office
Dr. Richard (Rick) Spinrad – Under Secretary of Commerce for Oceans and Atmosphere & NOAA Administrator
Dr. Tom Fu – Head, Sea Warfare and Weapons, Code 33, Office of Naval Research
Jennifer States – Vice President & Chief Strategy Officer, Blue Sky Maritime Coalition
Julie Decker — Executive Director, Alaska Fisheries Development Foundation

We would like to organize a **1-hour prep meeting** with all of the panelists (or their representatives) before the Summit for introductions and to discuss specific topics for the panel. To aid us with finding an agreeable date/time for this prep meeting, please fill out your availability on the When2Meet poll linked below by **no later than COB Tuesday, 2/21**:

Please fill out your availability on this When2Meet poll:
https://www.when2meet.com/?18846382-ELOkx

We can then confirm a date/time by COB Wednesday 2/22, and we will send out a calendar invitation with Teams meeting info.

Please feel free to reach out with any questions.

Thanks again,
Dan R.

Daniel R. Rogers
Tech-to-Market Advisor, Marine Technologies
Advanced Research Projects Agency - Energy (ARPA-E)
U.S. Department of Energy
950 L'Enfant Plaza SW, Suite 8000
Washington, D.C. 20024
Phone: 240.595.1729
Email: daniel.rogers@hq.doe.gov

Equity in U.S. Fisheries

With the ocean increasingly viewed as a frontier for economic development, small-scale fishermen, Indigenous peoples, women, and other minority groups are at risk for disproportionate harm and inequitable distribution of benefits across fisheries and throughout coastal communities.

Ocean Strategies combined equity scholar research within and outside ocean uses and marine resources to develop this fact sheet. It is not intended to be comprehensive, but rather to open the door to more conversations and lay the groundwork for policies that bolster industry needs, expand the commercial fishing workforce and help ocean-dependent communities thrive.

Ocean equity: a concerted study of how the ocean is used and how equitably its benefits are shared.

The **10 most commonly studied ocean inequities** include:

1. dispossession, displacement, and ocean grabbing
2. environmental justice concerns from pollution and waste
3. environmental degradation and reduction of ecosystem services
4. livelihood impacts for small-scale fishers
5. lost access to marine resources needed for food security and well-being
6. inequitable distribution of economic benefits
7. social and cultural impacts
8. marginalization of women
9. human and Indigenous rights abuses
10. exclusion from governance

Sources: Nathan James Bennett, et. al., "Blue growth and blue justice: Ten risks and solutions for the ocean economy," Marine Policy, Volume 125, 2021, 104387, ISSN 0308-597X, https://doi.org/10.1016/j.marpol.2020.104387.
High Level Panel for a Sustainable Ocean Economy, "Summary for Decision-Makers, Towards Ocean Equity," 2020.

There are **three primary dimensions of equity** to be considered in interventions and approaches: recognitional, procedural, and distributional equity. These dimensions allow us to organize our thinking and better understand inequity, though causes contributing to inequities are multifaceted and each facet may be characterized through a different one of the three dimensions. All to say, the three dimensions interact and propel one another.

- **Recognitional equity (whose voice matters):** the acknowledgment and incorporation of the rights, tenure, cultural identities, practices, values, visions, knowledge systems, and livelihoods of different stakeholders and actors in conservation governance, planning, and management.
- **Procedural equity (who is involved in decision-making):** the inclusion and effective participation of all relevant actors and groups in rule- and decision-making; accountability for conservation policies and programs; and systemic transparency.
- **Distributional equity (who wins or loses):** the level of fairness in the distribution of benefits, rights, costs, responsibilities, and risks between different groups, including current and future generations.

Guiding principles to categorize U.S. fisheries equity issues:

Improving **recognitional equity** in domestic fisheries starts with recognition of:

- Human rights under international and national law
- Statutory and customary rights
- Rights of Indigenous peoples, including Free, Prior and Informed Consent and self-determination
- All relevant actors and their diverse interests, capacities, and influence
- Different identities, cultures knowledge systems, values, and institutions

Improving **procedural equity** in domestic fisheries starts with:

- Full and effective participation of all relevant actors in decision-making
- Transparency supported by timely access to relevant information in appropriate forms
- Accountability for fulfilling responsibilities, and other actions and inactions
- Access to justice, including an effective dispute-resolution process and procedures for seeking redress

Improving **distributional equity** in domestic fisheries starts with:

- Identification and assessment of the distribution and impacts of costs, benefits, and risks
- Effective measures to mitigate negative impacts on Indigenous peoples and local communities
- Benefits equitably shared among relevant actors based on one or more targeting options

For more on this report and other updates from **Ocean Strategies:**

- **Check out** our Ocean Pulse blog on equity
- **Follow** us on LinkedIn
- **Subscribe** to our quarterly Fisheries Policy Reports

Sources: Bennett et. al., "Advancing social equity in and through marine conservation," 2021.
Franks, P et al. (2018) Understanding and assessing equity in protected area conservation: a matter of governance, rights, social impacts and human wellbeing. IIED Issue Paper. IIED, London. http://pubs.iied.org/14671IIED.

Board of Directors

MEMORANDUM OF UNDERSTANDING

BETWEEN

GLOBAL SEAFOOD ALLIANCE

AND

CERTIFIED SEAFOOD COLLABORATIVE

1. **Parties.** This Memorandum of Understanding ("MOU") is made and entered into this 20th day of January 2023 (the "Effective Date") between:
   a. Global Seafood Alliance (GSA), a nonprofit corporation with its principal place of business at 85 New Hampshire Ave., Portsmouth, NH 03801 which:
      i. Provides assurances to the marketplace through 3rd party certifications
      ii. Owns feed, hatchery, farm, processing plant, and vessel certification standards
      iii. Promotes certified responsible seafood (including seafood from aquaculture and wild capture fisheries) produced under
         1. SSCI benchmarked vessel standards
         2. GSSI benchmarked fishery standards
         3. GFSI benchmarked processing plant standards
      iv. Educates the marketplace, industry, and the public on the value of seafood assurances
      v. Advocates for responsibly sourced seafood; and
   b. Certified Seafood Collaborative (CSC), an Alaska 501 (c) (3) nonprofit corporation with its principal place of business at 311 N Franklin Street, Juneau, AK 99810, which
      i. Owns the Responsible Fisheries Management (RFM) program, a 3rd party certification of responsible wild capture fisheries, which is:
         1. GSSI benchmarked
         2. Defined by a common core set of elements based on the FAO Code of Conduct for responsible fisheries management
         3. Preserves regional identity through regional designations of products
         4. Provides traceability through a chain of custody standard
         5. Without logo license fees

GSA and CSC are hereinafter referred to individually by name or collectively as "the Parties."

2. **Purpose.** GSA and CSC acknowledge that their programs are complementary. The purpose of this MOU is to establish a partnership to support each other's programs, to strengthen those programs, and benefit participants and the markets we serve.

The partnership between GSA and CSC is to:
   a. Support and promote responsible seafood producing communities,
   b. Support and promote purchase, consumption, and awareness of responsibly sourced seafood,
   c. Establish and maintain certification programs:

i. that are public, stable, based on current data and established and accepted science, subject to 3rd party audit,
ii. in which participation is voluntary,
iii. that are simple and cost efficient,
iv. that provide broad/open/equitable access to certification,
v. with governance and funding structures that do not create incentives for growth beyond that necessary to advance the core missions of the organizations,
vi. to ensure that industry and the marketplace benefit from competition and choice of certification, and
vii. to make responsible fisheries common core certification available worldwide.

Under this partnership, GSA and CSC will maintain their certification programs independently, with each program defining its own messaging for its program(s) and retaining ownership of its program(s). GSA and CSC may to continue to develop partnerships independent of the other, so long as those partnerships are consistent with advancing the goals of the partnership established by this agreement.

Areas of Work

GSA and CSC hereby agree to the following:

1. To develop joint messaging for distribution to agreed audiences.
2. That each program will share its messaging concerning its program. Staff will work together to define the extent and content of messaging concerning the other's program, including sharing content for display on each other's websites and developing promotional and educational materials. Each party will define staff points of contact for sharing of messaging.
3. To develop materials for educating staffs on the other's program and related communications.
4. To develop a system for sharing of information concerning potential leads for participation in each other's program(s).
5. To regularly schedule joint meetings of representatives of the two boards to discuss progress on areas of work and future collaborations.
6. To regularly schedule joint meetings of staff to:
   a. ensure consistent understanding and messaging concerning the programs,
   b. discuss how messaging is incorporated into the existing outreach/marketing programs, and
   c. establish how/when it is appropriate to make referrals to the other staff (including to obtain expert advice and introducing potential new fisheries and markets)
7. CSC will continue to provide fisheries expertise to assist GSA with the development of relevant standards (including development of the plant standard for use in remote fisheries)
8. To develop an agreement to share a chain of custody and CSC will consult with its other partners in support of the establishment of that sharing.
9. To continued development of the table comparing content and costs of the various certification programs/standards.
10. To use each other as resources for board and staff development.
11. To continue to share content concerning their areas of expertise for promotional and educational communications.

3. **Confidential Information**. Neither party is obligated to share Confidential Information under this MOU. If either Party does share Confidential Information, the receiving party agrees to hold such Confidential Information in trust and confidence and will not use the Confidential Information without the disclosing party's prior consent. "Confidential Information" means any information learned by the receiving party from the disclosing party that is not available to the public concerning any matters relating to the business of the disclosing party that a reasonable person would understand, based on the nature of the information and the circumstances of disclosure, to be confidential.

4. **Term and Termination**. This MOU will be effective from the Effective Date and will continue for a term of one year and will renew automatically for an additional one-year term, unless terminated as set forth in this section. Either party may terminate this MOU at any time, for any reason or no reason, upon written notice to the other party. Obligations of confidentiality survive for five (5) years from the date of termination. The parties agree to review the terms of this MOU annually prior to any automatic renewal.

5. **Non-Binding Agreement**. Except for Section 3 (Confidential Information) which is binding, this MOU is intended to facilitate discussion and collaboration and does not create a legally binding or financial obligation on either party.

The parties have read and accepted all terms of the Memorandum of Understanding.

AGREED TO:

Global Seafood Alliance

DocuSigned by:
Brian Perkins
C00CEF189B1E4C1...

Signature

Name: Brian Perkins

Title: CEO

Date: 1/20/23

Certified Seafood Collaborative

DocuSigned by:
Mark Fina
14B32C69F0CA4CB...

Signature

Name: Mark Fina

Title: President

Date: 1/20/23

Immediate work products and timelines

Work and progress will be overseen by Alison and Jeff with a goal of meeting the following target dates:

Finalize the MOU for board review – January 10
Board approvals of the MOU – January 20
Share introductory/orientation materials for cross training of staff – January 31
Draft talking points/PowerPoints, and marketing sales materials concerning the MOU for staff and boards – January 31
Develop press plan including timeline, distribution, content, spokespersons – January 31
Cross training of teams – February 10
Approval of shared chain of custody – February 20
Issue public announcement of MOU – March 10
GSA stakeholder meeting – March 12

Post-Boston debriefing to define tasks and timeline for Barcelona – March 20

Alaska Sea Grant Mariculture Development Fellow

This position will work directly with the Executive Director (Julie Decker) on projects within the Alaska Mariculture Initiative (AMI). Work will include collaborating with farmers and researchers to collect samples for the Seaweed Tissue Analysis project as part of the Alaska Mariculture Cluster (a four-year $49 million grant awarded by EDA to Southeast Conference, with AFDF as one of several sub awardees) and other tasks as needed and based on the Fellow's skills and interests. Scope of work may also include outreach and management components for other grant projects including hosting meetings, public education and social research, regulatory/statutory reviews, tribal outreach, support for aquatic farmer training, support for seaweed and shellfish hatcheries.

Alaska Sea Grant AFDF Program Coordinator Fellow

The AFDF Program Coordinator position will work directly with the Executive Director (Julie Decker) and AFDF Startup Accelerator Director (Garrett Evridge) on a variety of AFDF projects to support research, innovation, and sustainable development in the Alaska seafood industry. Project assignments will depend on the fellow's skills and interests.

Project areas could include:

- Working with the AFDF Startup Accelerator to support Blue Economy businesses by providing research support in areas such as automation, vessel decarbonization, ocean data collection, marine transportation, seafood quality, ocean modeling, mariculture, and marine coatings.

- Assisting in management of seafood sustainability certifications for Alaska salmon and cod with the Marine Stewardship Council (MSC) and Alaska salmon, cod, halibut, and sablefish for the Responsible Fisheries Management (RFM) program. As the manager of these client groups, AFDF facilitates annual audits, site visits, client updates and invoicing, and addresses conditions on the certification of each fishery through research, policy tracking and advocacy, and collaboration with managers and other stakeholders.

- Collaborating with AFDF staff on communications and outreach surrounding AFDF programs such as the Alaska Symphony of Seafood (an annual contest for new products made from Alaska seafood).

RE: RFM & MSC certifications of Alaska cod and cost share for 2023

To: RFM & MSC Alaska Cod Client Group January 26, 2023

I am writing on behalf of AFDF to provide an annual update regarding the RFM and MSC certifications of Alaska cod and cost-sharing information for the Client Group for the coming year.

Status of RFM & MSC Certifications

During the annual surveillance audits, the third-party certification bodies concluded that all non-conformances/conditions are on target and the Alaska cod fishery continues to meet the standards of both the RFM and MSC certifications for all regions and gear types, and will remain certified through the extended expiration deadline of the RFM certificate through February 5th, 2023 (at which time the new certificate will be in place, see note on RFM Alaska Cod webpage), and the MSC certificate on Dec. 16, 2026 (certificates attached).

Review of AFDF's work as Client

Since 2009 and 2015, AFDF has served the Alaska seafood industry as the Client for the sustainability certification of Alaska cod for MSC and RFM, respectively. As the Client, AFDF is responsible for management of the certification of the Alaska cod fishery. To fulfill this role, AFDF undertakes at least 10 different activities, including management of the third-party certification body, facilitation of annual surveillance audits and five-year re-assessments, providing information to Assessment Teams during site visits, completion of conditions, management of the Client Group, collection of fees and payment of expenses.

New AFDF Staff & Technical Facilitator

After the unexpected departure last year of Development Director Riley Smith due to health reasons, Hannah Wilson took over the role in April 2022. This is Hannah's second round of cod Client Group billing and we are happy to be back on track after a delayed billing cycle last year. In March 2021, AFDF also hired Tommy Sheridan of Sheridan Consulting to replace Dave Gaudet as the Technical Facilitator for AFDF's Alaska cod and salmon certification programs. Tommy was able to fill in gaps in 2021-2022 which allowed AFDF to continue to meet all requirements to keep certifications current. However, Tommy recently accepted a full-time position with the University of Alaska Fairbanks and is phasing out of his role at AFDF. We wish Tommy the best in his next chapter and look forward to continued collaboration. After interviewing several excellent candidates to fill the Technical Facilitator role, we offered the position to Ann Robertson of AKWA-DC. With the organization fully staffed, we look forward to continuing to provide a valuable resource to the industry as the RFM and MSC Alaska cod Client.

Coordination between RFM and MSC Alaska cod Certifications

As the Client for both certifications, AFDF continues to pursue efficiencies that result in less cost to industry through coordination between the RFM and MSC programs. For example, conducting the cod, pollock, flatfish and POP fishery surveillance audits in parallel reduces cost to industry and time requirements to regulators. AFDF will continue to look for more ways to find efficiencies.

Surveillance Schedule 2020-2025

On January 18-21, 2022, AFDF coordinated a combined remote site visit for the annual audits of both RFM and MSC, in coordination with other groundfish fisheries. Below is the tentative schedule of annual audits leading up to the five-year reassessment:

- Jan. 18-21, 2022: Combined surveillance audits conducted (RFM = 4th surveillance & re-assessment; MSC = 1st); completed reports (MSC on March 22; RFM on June 9)
- February 5, 2023: RFM reassessment report to be completed
- Jan. 30th-Feb. 3rd, 2023: Combined surveillance audits for MSC cod and other groundfish fisheries scheduled; reports to be completed by March 2023
- Jan. 2024: Combined surveillance audits to be scheduled; reports to be completed by March, 2024; MSC re-assessment report to be completed by Dec. 2025
- RFM Alaska cod certificate expires Dec. 2027; MSC Alaska cod certificate expires Dec. 16, 2025.

Update on MSC Certification & Conditions

The MSC Alaska cod certification remains valid through December 16, 2025, and can be applied to catches taken from this fishery by companies with appropriate MSC Chain of Custody (CoC) certification in place, which includes participation in the MSC Alaska Cod Client Group. Overall, the scores remain high, however, three conditions were issued by the Assessment Team in the report published on December 17, 2020. Below is a table from the report summarizing the three conditions.

Table 5 Summary of Conditions

Condition number	Condition	Performance Indicator (PI)	Related to previous condition?
1	By the 4th year surveillance audit, it needs to be highly likely that the GOA stock is above the PRI.	1.1.1	**No**
2	By the 4th year surveillance audit, short and long-term objectives need to be explicit within the State's fishery specific management system.	3.2.1	**No**
3	By the 4th year surveillance audit, recent evidence needs to be provided on how the State's fishery-specific management is externally reviewed.	3.2.4	**No**

<u>Condition #1:</u> *The condition is on target*. This condition was a result of the 2018-2020 downturn in the GOA stock. The Action Plan related to this condition will simply be to continue tracking stock status with an annual review of the stock surveys and resulting NMFS management actions in accordance with the existing NMFS management plan. The condition is expected to remain until the GOA stocks show continued improvement and are fluctuating around B35%.

<u>Condition #2:</u> *The condition is on target*. This condition requires explicit management objectives for the State of Alaska's cod fishery. AFDF's research found that the State had explicit fishery objectives in the 1990's, but rescinded them in 2013 for unknown reasons. As a part of the Action Plan, AFDF worked with an industry steering committee and ADFG to draft and submit a proposal to the Board of Fisheries (BOF) in April 2022, which outlines a policy on groundfish fishery management including fishery-specific objectives (see attached draft). A letter of support on behalf of the Steering Committee and other industry partners was submitted on October 11th (see Supporting Documents, attached). ADFG also supports the proposal.

In response to suggestions from industry for improvements, a slightly modified version of the proposal (RC #8) was submitted during the BOF Alaska Peninsula, Aleutian Islands, Bering Sea, and Chignik Pacific Cod Meeting in Anchorage on October 27-28th, 2022 (see Supporting Documents, attached). Testimony in favor of the revised proposal was given to the Committee of the Whole during the meeting on October 27th. Julie Decker (AFDF Executive Director), Nicole Kimball (PSPA Vice President), and Hannah Heimbuch (Under 60 Cod Harvesters Executive Director) represented the Steering Committee, providing verbal testimony.

Deliberations and action on the proposal will occur during the BOF Statewide Finfish and Supplemental Issues meeting in Anchorage on March 10-13th, 2023. Representatives of the Steering Committee will provide further testimony in support of the Proposal during the Deliberations and actions on the proposal will occur at this meeting. In preparation for the March meeting, in February, representatives of the Steering Committee will provide information to and answer questions from the ADFG Advisory Committees in Kodiak and Chignik, as they were the source of suggested changes to the original BOF proposal.

<u>Condition #3:</u> *This condition is satisfied and now closed.* This condition required an internal and external review of the state management system. During the January 2022 surveillance, the Assessment Team allowed the RFM Alaska Cod Assessment Report to satisfy the condition.

<u>Update on RFM & Non-Conformance</u>

The RFM Alaska Cod certificate remains valid until an extended deadline on February 5th, 2023. RFM is on track to have the new certificate in place at that time and it can be applied to catches taken from this fishery by companies with appropriate RFM Chain of Custody (CoC) certification in place, which includes participation in the RFM Alaska Cod Client Group. Overall, the scores remain high, however, <u>one minor non-conformance was issued by the Assessment Team in the report published on June 9, 2022 (pgs 20-23)</u>, which is essentially the same as Condition #2 under the MSC certification (above), and will be satisfied by the same action – adoption of the BOF proposal adopting a policy on groundfish fishery management, including fishery-specific objectives. See actions to address the non-conformance in the above section on MSC Condition #2. The RFM program will not be conducting an annual surveillance audit this year, because RFM just completed a five-year reassessment of the fishery. A finalized report from the reassessment will be available here.

Adopted changes to MSC Standard

As a standard protocol, MSC conducts a Fisheries Standard Review (FSR) every five years. The process takes approximately five years to complete, so essentially the organization is perpetually involved in a review of its fisheries standard. In 2022, MSC concluded the most recent FSR and the Board unanimously voted to adopt a slate of proposed changes. As AFDF highlighted to the client group during the last billing cycle, we continue to have concerns regarding proposed changes to evidence requirements (trueness and precision), Endangered, Threatened & Protected species (ETP), Out of Scope species (OOS), ghost gear, habitats, and scope. We plan to continue monitoring these issues and how they are affecting both our fisheries in Alaska and others globally.

Association of Sustainable Fisheries (ASF)

The Association of Sustainable Fisheries (ASF) is an international group that represents the interests of all MSC certified fisheries worldwide. AFDF is a member of ASF, and pays annual membership dues of $3,000, which is split between the Alaska salmon and cod Client Groups. ASF coordinates responses from the MSC Clients regarding potential changes to the MSC certification program and other challenges for Clients. ASF also facilitates at least two meetings each year with upper-level MSC staff to discuss challenges to the program. ASF holds its annual in-person meeting during the Seafood Expo Global, which AFDF staff plans to attend. This meeting offers a time for the membership to discuss issues related to the MSC Standard amongst themselves and with MSC staff.

MSC Seal and Chain of Custody (CoC)

The MSC Program offers a tracking code available to companies that pay their fair and equitable share of fishery certification costs and obtain a MSC Chain of Custody (CoC) certification. Additionally, if you pay MSC a logo-licensing fee, MSC offers a seal that can be used on your website, marketing, and POS materials. If you would like more information about using the MSC seal or the CoC requirements, please visit here, or contact Dan Averill of MSC.

RFM transitioned from ASMI to the CSC

Ownership of the RFM program transferred from ASMI to the Certified Seafood Collaborative (CSC) on July 1, 2020. This change furthers the credibility of the program, by separating it from the marketing function that ASMI serves. The program will retain a strong relationship with ASMI, thereby helping to coordinate its message that RFM demonstrates Alaska's commitment to sustainable fisheries. The CSC Interim Board, upon which I serve, hired a program manager, Jeff Regnart, created a strategic plan, and is making progress towards its goals set forth.

For example, this past year, CSC has expanded the scope of the program from Alaska fisheries to any well managed fishery in North America, with the Pacific Whiting fishery as the first fishery outside Alaska to become RFM certified. Additionally, the RFM programs in North America, Iceland, and Japan are working together towards a future vision for a global RFM Program that is cost-effective (***no logo licensing fees***) and will eventually represent 6,000,000+ metric tons of certified sustainable seafood. Additionally, through its partnership with ASMI, Walmart has promoted RFM-certified seafood, alongside, MSC and BAP (Best Aquaculture Practices) in stores. New in 2022, Holland

America Cruise Lines is now sourcing and promoting RFM-certified Alaska seafood while in Alaska waters. This includes promotions onboard the ships, as well as continued email promotions to their customers. These are significant and exciting changes to the program that will bring greater market awareness, which will in turn benefit all RFM participants.

CSC Administrative Fee

As ASMI transitions away from ownership of the RFM Program, their financial support is also being reduced accordingly. In the attached letter, ASMI Board Chair, Allen Kimball, discusses in more detail ASMI's continued commitment to retain a strong relationship to the program, such as the completion of recent consumer research regarding the RFM program (more info below and attached). However, each fishery will now need to pay for the costs associated with the third-party audits/assessments, and in addition, a portion of the administrative costs for running the RFM Program. The CSC has created a cost-sharing model based on ex-vessel value ($8,500 per $50 million of ex-vessel value). ***For the Alaska cod fishery, this CSC administrative fee for FY2023 will be $42,000*** (see attached budget).

RFM Seal, Chain of Custody (CoC) & No Logo Licensing Fees

The RFM Program offers a certification seal available to companies that pay their share of fishery certification costs and obtain a RFM Chain of Custody (CoC) certification. Unlike the MSC program, ***the RFM program does NOT charge logo licensing fees*** *for using the RFM seal*. *This is important, because it means lower overall cost for the industry.* For example, one major processor operating in Alaska spends more on logo licensing fees for use of the MSC logo than the cost of the annual budget of the entire RFM program. For more information, see the ***Why RFM? Fact Sheet*** (attached). The seal can be used on your website, marketing and point-of-sale materials. Participating companies need only to sign a "Terms of Use Agreement" with the CSC. If you would like more information about using the RFM seal or the CoC requirements, please visit here, or contact Jeff Regnart, at jrregnart@gmail.com.

RFM Chain of Custody (CoC) is cost-effective

If your company has not obtained RFM CoC yet, we highly encourage you to do so, as it is much more cost effective than you may realize. For example, a typical single site CoC runs about $2,000 or less, but if you have MSC CoC already, adding RFM CoC into the mix with the same Certification Body (CB), ***will only increase your cost by approximately 15%, or $300 extra for having two CoCs*** (MSC and RFM).

Cost-Sharing and Invoicing

The current Client Group is composed of 27 member companies. Per industry direction, the Client Group billing cycle is every January, following the December Council meeting and announcement of Total Allowable Catch (TAC) and Allowable Biological Catch (ABC). Annual invoicing allows for regular expectations and budgeting for companies and regularly updated cost sharing. Therefore, membership to the RFM & MSC Cod Client Group is one calendar year.

Annual budget and cost sharing spreadsheets are enclosed. ***The total cost for 2023 is estimated to be $260,000.*** Collections from industry are projected to be higher this year than last year due to the higher costs of the 4th surveillance audit and five-year reassessment for RFM occuring at the same time and the need to cover those costs retroactively. Next year, costs are projected to fall back to the average. AFDF has a separate bank account for this program and the funds are accounted for separately. If any funds remain after the work is completed, then the funds will be rolled forward to the next year. For more details on the budget, please see the attachment titled, ***Budget & Cost Sharing for 2023***.

Cost-sharing for the 2023 budget was based on the 2023 Acceptable Biological Catch (ABC) in Bering Sea / Aleutian Islands (BSAI) and Gulf of Alaska (GOA) as decided by the NPFMC in December of 2022. Please note that AFDF is committed to transparency and has included in this packet a spreadsheet which compares the 2022 budget vs. actual and the projected budget for 2023. AFDF always rolls forward any surplus funds or shortfalls into the next year's budget.

Please review the following packet, double-check your company's listing on the enclosed Client Group List (i.e. eligible areas, number of vessels and gear types) and email a signed Letter of Commitment to AFDF (hwilson@afdf.org) via email **by February 6th.** In response to receiving Letters of Commitment, AFDF will email invoices ASAP. **AFDF must receive payment by February 21st .**

IMPORTANT: As a matter of fairness, AFDF will strictly enforce payment for participation in the Client Group. Consequently, if a company has not paid its cost share by February 21st, AFDF will remove the company from the Client Group List and post the revised list on the websites of AFDF, RFM and MSC for verification during Chain of Custody audits. Any company paying after February 21st may also be assessed an additional 10% surcharge.

Below is a re-cap of what is required of members of the MSC and RFM Alaska cod Client Group:

1) Review the attachments, including the Budget and Cost Sharing, Invoicing, and Client Group List;
2) Complete the revised Letter of Commitment, and email Hannah Wilson (hwilson@afdf.org) a copy by February 6th, 2023;
3) Once the updated Letter of Commitment is emailed to AFDF, AFDF will email an invoice;
4) Mail a check or wire payment to AFDF by February 21st, 2023.

If you have any questions about the program, or AFDF's management of the RFM & MSC Alaska Cod Client Group, please do not hesitate to call or email myself or Hannah Wilson.

I look forward to continuing this work on behalf of the Alaska seafood industry to provide continued MSC and RFM certification of Alaska cod and sharing of the certificate through an open and transparent Client Group.

Sincerely,

Julie Decker, Executive Director

Attachments:

- Budget & Cost-Sharing for 2022/2023
- Invoicing Spreadsheet ****PLEASE NOTE THESE ARE APPROXIMATE COSTS, EXACT COSTS WILL BE DETERMINED AFTER RECEIPT OF LOC****
- Letter of Commitment – RFM & MSC Alaska Cod Client Group
- Client Group List – RFM & MSC Alaska Cod
- RFM Alaska Cod Certificate ****EXTENDED UNTIL FEBRUARY 5th, 2023****
- MSC Alaska Cod Certificate
- 2022 – BOF Proposal RC8 – Policy on Groundfish Fishery Resources Management
- BOF Proposal Strategy outline
- BOF Joint Industry Letter of Support
- Letter from ASMI Board Chair, Allen Kimball
- Why RFM? - Fact sheet
- ASMI All Hands RFM Q&A Presentation
- Progressive Grocer RFM article

Crawfish Inlet Report to MSC/RFM Assessment Teams

Benjamin Americus[1], Benjamin Adams[2], Tommy Sheridan[1], Scott Wagner[2]

[1]Alaska Fisheries Development Foundation (AFDF)
[2]Northern Southeast Regional Aquaculture Association (NSRAA)

This document was prepared in response to an information request from the MSC and RFM assessment teams following the 2022 Site visit for Alaskan Salmon. The request is as follows: "*additional information on assessment and management efforts and plans for Crawfish Inlet Hatchery Straying*"

Straying Assessment

Stream surveys and chum salmon otolith sampling was performed in West Crawfish Head River from 2013 to 2015 for the Alaska Hatchery Research Project. In 2015, a new remote release site was established in Crawfish Inlet (Figure 1). In 2018 and 2019, hatchery Chum Salmon from this site returned in unprecedented numbers to Crawfish Inlet (Piston & Heinl, 2020). In both years, many fish were observed straying into West Crawfish Inlet rather than returning directly to the release site.

In 2013–2015 surveys, West Crawfish Head had a weighted hatchery proportion of 1–2% (Josephson et al., 2021). In 2018, 2019, and 2022, the stream was surveyed for carcasses after the peak of wild returns, which is typically mid-August (Piston & Heinl, 2020; Table 1). In 2018, otoliths collected from West Crawfish Head River were 63% hatchery-origin on August 27th, then 99% on September 28th. In 2019, surveys detected only 8% hatchery fish on August 27, 2019, and then 94% on September 4th, (Piston & Heinl, 2020). No sampling occurred in 2020 and 2021 due to low carcass numbers and personnel shortages. One visit in 2022 on August 23rd recovered 64% hatcher-origin fish. These data suggest hatchery Chum Salmon returns to Crawfish Inlet did result in increased hatchery proportion in West Crawfish Head River, and the hatchery proportion increases in September, after the peak of wild returns. Surveys from two other nearby rivers (Northwest Crawfish Head and Whale Bay Great Arm Head) suggest a similar trend and timing (Table 1).

Figure 1. Map of Crawfish Inlet on Baranof Island, Alaska

Table 1. Marked % from carcass sampling of three streams near Crawfish Inlet. Data from Josephson et al. 2021 and ADF&G.

Year	Date sampled	Stream	Total fish collected	Marked fish collected	% Marked	Survey count	Estimated hatchery contribution
2013	8/13/2013	W. Crawfish Head	380	11	2.9	-	-
2013	8/25/2013	W. Crawfish Head	375	0	0.0	-	-
2014	8/21/2014	W. Crawfish Head	256	2	0.8	-	-
2014	8/28/2014	W. Crawfish Head	177	2	1.1	-	-
2015	8/20/2015	W. Crawfish Head	240	4	1.7	-	-
2015	8/28/2015	W. Crawfish Head	328	1	0.3	-	-
2018	8/27/2018	W. Crawfish Head	92	57	62.0	-	-
2018	9/28/2018	W. Crawfish Head	87	86	98.9	-	-
2019	8/27/2019	W. Crawfish Head	63	5	7.9	4,400	349
2019	9/4/2019	W. Crawfish Head	95	89	93.7	9,910	9,284
2022	8/23/2022	W Crawfish Head	94	60	63.8	3,370	2,151
2019	8/29/2019	N.W. Crawfish	95	79	83.2	3,280	2,728
2019	9/5/2019	N.W. Crawfish	96	89	92.7	7,170	6,647
2019	8/19/2019	Whale Bay G.A. Head	29	0	0.0	4,300	0
2019	8/28/2019	Whale Bay G.A. Head	72	43	62.3	5,250	3,272
2022	8/24/2022	Whale Bay G.A. Head	94	0	0.0	4,200	0

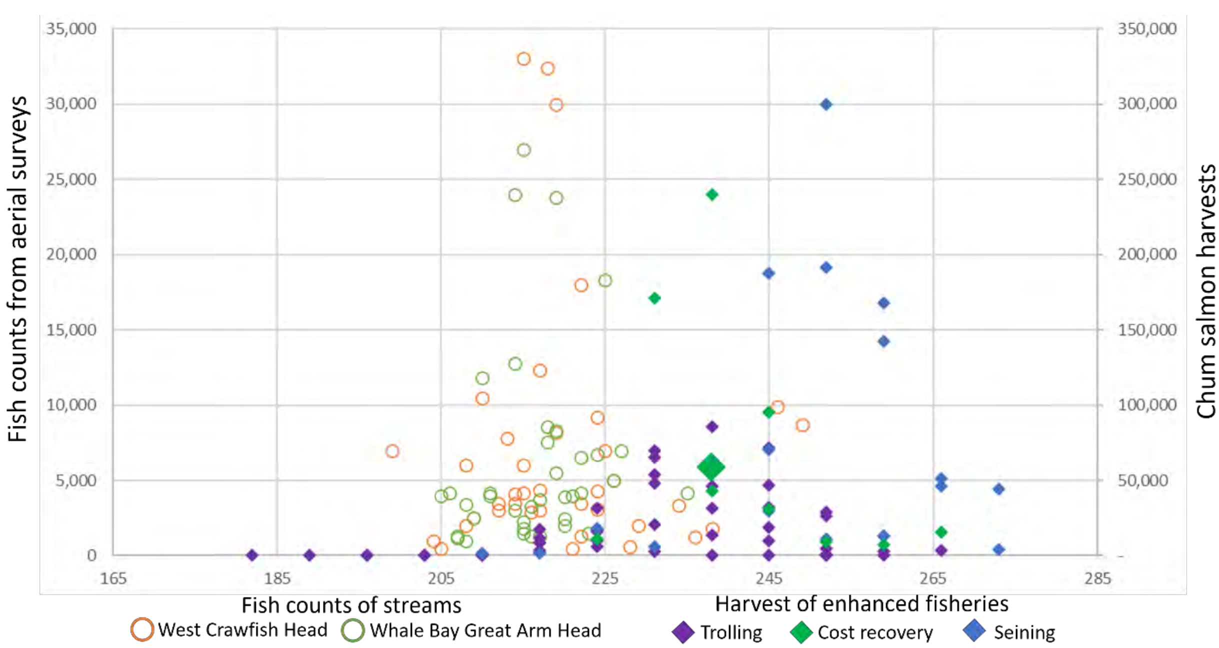


Figure 2. Survey counts and harvest of chum salmon by day of year. Circles indicate fish counts in streams from aerial surveys. Diamonds indicate fisheries harvests.

Aerial surveys of West Crawfish Head and Whale Bay Great Arm Head show peak counts approximately August 7th (Figure 2). Harvests of enhanced fisheries from trolling, seining and cost recovery peak around August 21st. Aerial surveys count live fish in the intertidal, mouth and stream, whereas the surveys used to calculation hatchery-proportion include only carcasses. Instream lifespan for Chum Salmon in another Southeast Alaska stream is approximately eight days (McConnell et al., 2018). When considering approximate peak run timing, time spent outside of the stream mouth, and 8-day instream survival, late August carcass surveys in West Crawfish Head likely captured fish from the peak of returns to the stream. Surveys conducted after this peak would be expected to have higher hatchery fractions than those conducted earlier in the year, because hatchery fraction is influenced by both presence of hatchery origin as well as absence of wild origin Chum Salmon. This is most evident in 2019 surveys, when the hatchery fraction increased from 8 to 94% in the period of eight days (Figure 3).

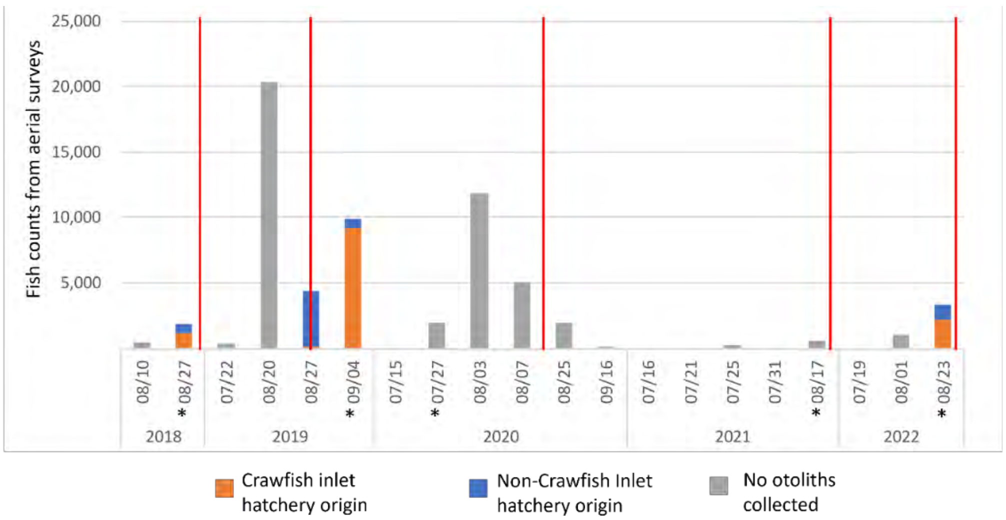


Figure 3. West Crawfish Index Stream counts conducted since 2018 and their hatchery fractions. "*" Indicate surveys used to calculate the hatchery contributions for each year. Vertical red lines indicate the beginning of seine fisheries in West Crawfish Inlet for each year.

From the surveys sampling conducted in 2018, 2019, and 2022, temporal overlap of wild and hatchery-origin Chum Salmon in West Crawfish Inlet is apparent. The extent and effects of this, particularly early in the season, remain unknown. For hatchery and wild chum salmon in Prince William Sound, the rate of introgression in several streams is more closely tied to the degree of temporal overlap between hatchery and wild fish than proximity to hatcheries or the intensity to straying (Jasper et al. 2013).

Future Straying Assessment Work:

ADF&G staff are in discussions to assess whether additional data collection is warranted in 2023. If necessary, NSRAA is willing to assist with additional stream surveys and read otoliths in real time to evaluate run composition during key weeks of stock change and overlap. Future sampling efforts should include location data, to assess the spatial as well as temporal overlap of wild and hatchery-origin fish. Ben Americus (AFDF) will collaborate with Ben Adams (NSRAA) to analyze historical data on spatial overlap of hatchery and wild fish in West Crawfish Head River. These data were recorded for stream visits from 2013-2015 as part of the Alaska Hatchery Research Program but have not yet been presented. Similar work on Chum Salmon in Sawmill Creek identified that hatchery-origin fish arrive on average 10 days later than wild fish but overlapped spatially in a 300m spawning reach (McConnell et al. 2018).

Responsive Management

Scott Wagner, the general manager of NSRAA is in discussion with the ADF&G Sitka Area Management Biologist, Aaron Dupuis to further develop a strategy for responsive management of Crawfish Inlet chum salmon returns. If ADF&G aerial surveys indicate large returns in the area (as occurred in 2018 and 2019), NSRAA can be designated to perform cost recovery operations and/or ADF&G may direct commercial seine openings to harvest fish in West Crawfish as necessary under Advisory Announcement issued by ADF&G. Note that proactive measures have been taken since 2019 in the form of more days of commercial seine operation in West Crawfish Inlet in response to greater return numbers. (Figure 4, Table 2). This responsive management led to increased chum salmon harvest fraction in West Crawfish Inlet in 2019, 2020, and 2021. In 2022, low Chum Salmon returns led to limited fishing opportunities in West Crawfish Inlet.

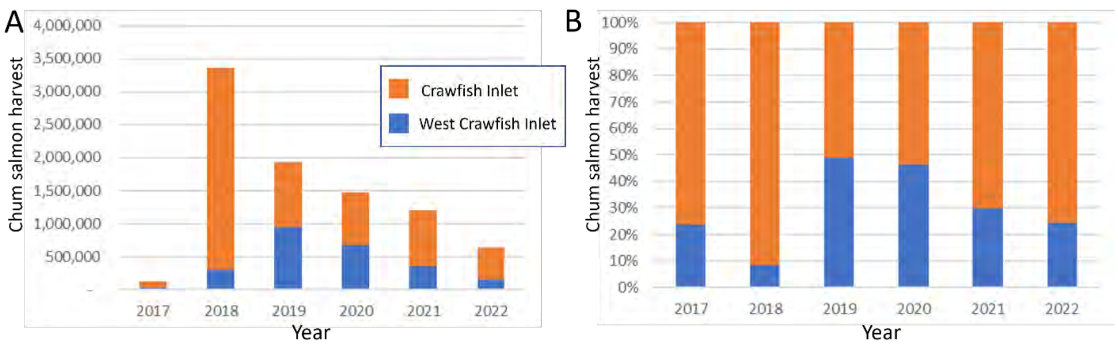


Figure 4. Chum salmon harvests in Crawfish Inlet and West Crawfish since hatchery release site returns began in 2017. A: total fish harvested in both areas. B: harvest proportion by area. Since 2019, a more responsive approach has been taken to harvest hatchery strays in West Crawfish Inlet.

Table 2. Relative harvest statistics for Crawfish Inlet and West Crawfish Inlet by year.

Year	Total returns to Crawfish and West Crawfish	Days of seining in Crawfish Inlet	Days of seining in West Crawfish Inlet	Fraction of total harvests in Crawfish	Fraction of total harvests in West Crawfish
2017	79,485	14	7	76.4%	23.6%
2018	3,432,459	22	1	91.3%	8.7%
2019	2,014,750	15	8	51.0%	49.0%
2020	1,535,342	21	29	53.6%	46.4%
2021	1,191,417	18	11	70.3%	29.7%
2022	601,450	20	5	75.6%	24.4%

Future Proactive Management Work:

The strategy of responsive management may be discussed at the 2023 Joint Southeast Regional Planning Team (RPT) meeting in April. This annual meeting will involve hatchery operators and ADF&G research and management staff. Following discussion at the RPT meeting, the responsive management strategy may be codified in the 2023 Southeast Alaska Purse Seine and/or NSRAA Annual Management Plans.

References

1. Piston AW, Heinl SC. 2020. Chum Salmon Stock Status and Escapement Goals in Southeast Alaska Through 2019. Alaska Department of Fish and Game.

2. Josephson RP, Wertheimer A, Gaudet D, Knudsen EE, Adams B, Bernard DR, Heinl SC, Piston AW, Templin WD. 2021. Proportions of hatchery fish in escapements of summer-run chum salmon in southeast Alaska, 2013–2015. *North American Journal of Fisheries Management* 41:724–738.

3. Jasper JR, Habicht C, Moffitt S, Brenner R, Marsh J, Lewis B, Fox EC, Grauvogel Z, Rogers Olive SD, Stewart Grant W. 2013. Source-Sink Estimates of Genetic Introgression Show Influence of Hatchery Strays on Wild Chum Salmon Populations in Prince William Sound, Alaska. *PLoS ONE* 8:e81916. DOI: 10.1371/journal.pone.0081916.

4. McConnell CJ, Westley PAH, McPhee MV. 2018. Differences in fitness-associated traits between hatchery and wild chum salmon despite long-term immigration by strays. *Aquaculture Environment Interactions* 10:99–113. DOI: 10.3354/aei00261.

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11. **<u>Fishery - Seabird Interactions</u>**
    a. AMMOP Data Analysis Project Proposal
    b. MSC Seabird Interactions Research Application
    c. Murrelet Ecological Risk Assessment
    d. NOAA SK Seabird Interactions Project
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12. **<u>Implications of 2020 and 2021 Salmon Fisheries Disaster Determination</u>**

13. **<u>Closing Minutes, Client Action Plans</u>**

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a. Chris Habicht AHRP Presentation
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f. Andrew Munro Statewide Escapement Presentation
g. Jennifer Ferdinand AMMOP Presentation
h. Liz Labunski Murrelet Presentation

Other

SEAK harvest composition local vs non-local

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Ecological Risk Assessment:

Marbled and Kittlitz's Murrelet Interactions with the Alaska Salmon Gillnet Fishery

Conducted by the Alaska Fisheries Development Foundation

Hannah Wilson*, Julie Decker, Tommy Sheridan, and Benjamin Americus

December 5, 2022

*Assessment Lead

Executive Summary

An Ecological Risk Assessment (ERA) consisting of a qualitative Scale, Intensity, Consequence Analysis (SICA) and a semi quantitative Productivity-Susceptibility Analysis (PSA) was used to determine relative risk to Marbled murrelets and Kittlitz's murrelets from the Alaska salmon gillnet fishery. The ERA framework is hierarchical and used to understand relative risk in data-limited fisheries. Despite relatively little information about murrelet-bycatch, it was possible to rule out major risks in many regions of the state based on relatively low fishing effort, low murrelet density, or both.

The analysis was conducted considering the following Operational Objective: *There must be a reasonable level of confidence that if the birds are depressed, the fishery would not prevent them from recovering given favorable environmental conditions.* It is important to identify an objective(s) that is logical to stakeholders and quantifiable. In this case, the Operational Objective comes from the MSC Assessment standards.

The ERA evaluates the source of the risk, the potential consequences of the risk and the likelihood of those consequences occurring. Consequences and likelihood are assessed against specific criteria such as life history characteristics and the likelihood of, in this case, murrelets encountering salmon gillnets. Consequence and likelihood are then combined to produce an estimated level of risk (low, medium, or high) associated with the potential hazard.

Of the 13 Commercial Salmon Management Areas in Alaska, all of which were evaluated for relative risk to murrelets from interactions with the salmon gillnet fishery, 11 were ruled out as low risk during the scoping process or the SICA. Two Management Areas were moved forward from the SICA to the PSA and assigned a risk level of "low" at the end of the analysis. Based on these findings, the authors of this report believe that the Operational Objective is met by the status quo of gillnet-murrelet interactions in the Alaska gillnet salmon fishery. However, the authors also recognize that due to the data-limited nature of this issue, continuing to collect data on interactions and murrelet population distribution when possible will be beneficial to both the industry and bird conservation efforts. Therefore, the authors are currently working with seabird researchers and software developers of the data collection application, SkipperScience, to fund data collection from gillnet fishermen regarding seabird distribution and interactions with the fishery.

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Glossary of Terms

ADF&G: Alaska Department of Fish and Game
AMMOP: Alaska Mammal Marine Observing Program
AT: MRAG Assessment Team
BRMU: *Brachyramphus* murrelet genus (includes both Kittlitz's and Marbled murrelet)
ERA: Ecological Risk Assessment
IBA: Important Bird Area
KIMU: Kittlitz's murrelet
MAMU: Marbled murrelet
MRAG: private consulting body that assesses fisheries for the MSC
MSC: Marine Stewardship Council
PSA: Productivity, Susceptibility Analysis
SICA: Scale, Intensity, Consequence Analysis
US Fish and Wildlife Service: USFWS

Background

The Alaska Fisheries Development foundation currently serves as the Client for the Marine Stewardship Council (MSC) Alaska Salmon Client Group. The current version of the MSC standard requires assessment teams to consider bycatch of endangered, threatened, or protected (ETP) species. ETP designation applies to the International Union for the Conservation of Nature (IUCN) red listed seabirds which include Kittlitz's Murrelets (KIMU) and Marbled Murrelets (MAMU) for Alaska. The IUCN lists these two species as near threatened and endangered, respectively. However, neither KIMU nor MAMU in Alaska are formally designated as an endangered, threatened or sensitive species under the US Endangered Species Act or the State of Alaska. In response to this update to the MSC standard, a condition was set on the Alaska salmon fishery regarding seabird-gillnet interactions and the potential for bycatch. The performance indicator for the condition requires that "there is a regular review of the potential effectiveness and practicality of alternative measures to minimize UoA and enhancement related mortality of ETP species and they are implemented as appropriate." (Stern-Pirlot et al., 2020, p. 35).

The following Ecological Risk Assessment (ERA) serves to address this condition by creating a framework for analyzing the risk to murrelets based on available data and information from key stakeholders. The ERA framework was chosen for this fishery due to the relative lack of data regarding seabird population distributions in Alaska and interactions with gillnets in the Alaska salmon fishery and provides a precautionary approach to uncertainty. The ERA provides a way to analyze what data does exist along with collecting additional information from key stakeholders in order to provide as complete a picture as possible. The Scale, Intensity, Consequence Analysis and the Productivity-Susceptibility analyses, used in combination with a stakeholder workshop, provide a way for experts and other stakeholders to reach consensus on the level of risk to murrelets from entanglement in gillnets by combining consequence and likelihood to produce an estimated level of risk.

Much of the basis for this ERA has already occurred through information gathered during the Seabird Workshop hosted by AFDF in 2019 along with background research conducted by the MRAG Assessment Team during the 2019 assessment.

The ERA report will be provided to the AT in order to help them determine whether or not the condition on seabird bycatch for the Alaska Salmon fishery can be closed or must be continued. The ERA process takes a precautionary approach to uncertainty and is a commonly used methodology for understanding relative risk of impacts for data-poor fisheries. It draws heavily on expert and stakeholder input to reach reasonable conclusions about relative risk. The ERA is a hierarchical process consisting of three steps that narrow down to units that are potentially high(er) risk. The following descriptions come from Bell, et al. (2016). All other scoring rubrics and methodology come from Hobday, et al. (2007 or 2011) with the exception of the PSA scoring guide, which is the new MSC standard specifically for birds as of October 26th, 2022 (Marine Stewardship Council, 2022).

1. Scoping

   The scoping process provides background information relating to the fishery and the potential risks. It allows stakeholders to agree on the scope of the issue and identifies and removes irrelevant components (i.e., regions) from further analysis.

2. Scale, Intensity, Consequence Analysis (SICA)

   The SICA is a qualitative screening process that further helps to remove low risk components while identifying those that need further analysis. The SICA aims to identify which hazards may lead to a significant impact on species or habitat of concern. Where judgments about risk are uncertain, the highest level of risk that is still regarded as plausible is chosen. For this reason, the measures of risk produced during the SICA cannot be regarded as absolute. SICA scores were reviewed during a stakeholder workshop and stakeholder feedback informed the final consequence scores included in this document, which in determined which regions were moved forward to the PSA.

3. Productivity, Susceptibility Analysis (PSA)

   The PSA is a semi-quantitative process using available biological and spatial data as well as expert opinion when data is not available to further evaluate potential risk from components identified during the SICA. Where there is no published information and expert opinion cannot make a reliable judgment, a precautionary approach to uncertainty is taken and the highest score (3) is given for that component. Thus, PSA analysis is more likely to result in false positives than in false negatives and the list of high-risk species should not be interpreted as all being at high risk from fishing, rather that these are species that require a more detailed exploration before they can be classified as low risk (Walker et al., 2007a). **Assessment of the <u>actual impact</u> of the fishery on the species is not made. If fisheries are identified as medium or high risk in the PSA, this only indicates a need for further information in order to understand absolute risk.** The final categorization of fisheries as relatively low, moderate, or high risk is calculated from the PSA scores and will occur after the workshop following Hobday, et al. (2007) methodology.

Much of the information used in the following ERA came from the 2019 and 2022 AFDF Seabird Workshops including both verbal and written materials such as PowerPoint presentations, from participants. Other sources include existing research and reference documents identified during the workshop and while conducting research for this Assessment. These sources are included (with links to PowerPoint presentations, which can also be found here) in the References section at the end of this document. It is important to note that comparison between regions is challenging due to the lack of consistent data between regions about bird abundance, fishing effort, and recorded bycatch.

2022 Workshop and Stakeholder Involvement

As part of the ERA process, AFDF hosted a virtual workshop with stakeholders on October 24th, 2022 to review draft scores for the SICA and PSA as well as to receive updates on research progress such as for the Alaska Marine Mammal Observing Program from NOAA Fisheries and about other relevant projects from USFWS. Workshop participants were given the opportunity to comment verbally during the workshop and AFDF staff took notes as well as recording the meeting in order to capture this feedback. A workshop recording is available upon request. The Workshop Agenda and a list of participants can be found in Appendix 1. Workshop participants were invited to submit further, written feedback about the ERA by November 7th, 2022 to make sure that they had sufficient opportunity to share their thoughts. One fishermen from Southeast Alaska submitted further comments (see Appendix 4). There was general agreement with the SICA and PSA scores suggested by AFDF during the workshop, although several participants provided valuable feedback and different data sources that did impact revised scoring after the workshop.

Some key stakeholders were unable to attend the workshop, however a survey (Appendix 2) was sent out to fishermen in Prince William Sound and Southeast Alaska in order to gather more information. The Yakutat Area Biologist also verbally provided answers to the survey questions for Yakutat during a phone conversation with AFDF staff but was unable to attend the Workshop.

Scoping

Context of the Analysis:

- This ERA focuses solely on drift and set gillnetting, which has been identified in the literature as the primary fishery of concern for seabird entanglement.
- For the purpose of this ERA, the units of analysis are the 13 Commercial Salmon Management Areas for Alaska as laid out by the Alaska Department of Fish and Game (see map, below).
- Both Kittlitz's (KIMU) and Marbled (MAMU) murrelets are of concern. Due to their nearly complete overlap of global populations (see PowerPoint slide below from Kuletz, et al.,

2019), very similar life history, difficulty in differentiating the two species, and similar risk from bycatch, this ERA considers the *Brachyramphus* murrelet (BRMU) genus, to which both species belong.

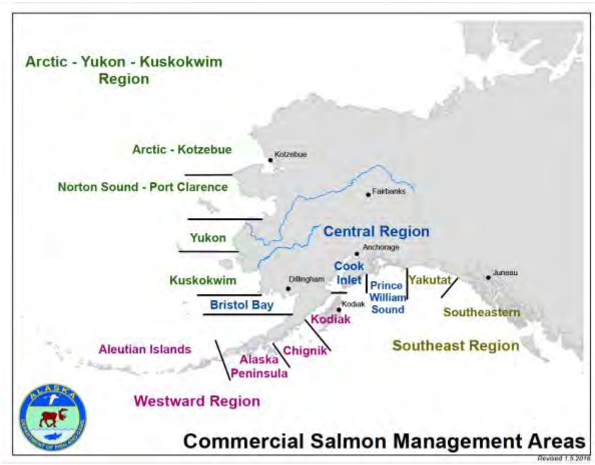

Figure 1: Alaska Commercial Salmon Management Areas (ADF&G).

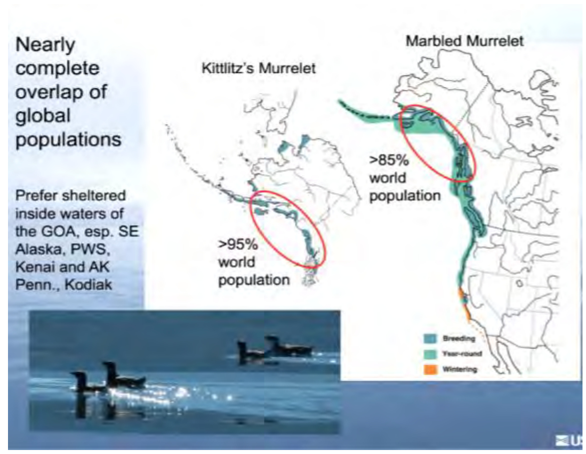

Figure 2: KIMU and MAMU populations (Kuletz et al., 2019).

Summary of AMMOP Data

The Alaska Mammal Marine Observing Program (AMMOP) recorded bycatch of seabirds in its studies in several relevant regions, during two-year study periods over 10 years. While the AMMOP data does not specifically fit into any of the scoring categories for the ERA, we believe that it is valuable data to consider as part of the Assessment. A presentation on the results of the AMMOP study was provided during the 2019 workshop and a summary is provided below. Note that the last three columns are based on extrapolated take rather than observed take unless otherwise noted. For example, while there were no BRMU taken in the South Unimak AMMOP, it was extrapolated that 21 BRMU may be taken by the fishery in a season. We provided the table below to summarize the study findings. All data below are from Manley (2006, 2007, 2009, 2015, 2019) and Wynne, et al. (1991 & 1992).

Table 1: Summary of AMMOP Data

Region	**Year**	**Observed Number of Seabirds taken**	**Observed Number of Murrelets taken**	**Estimated Total Seabird Take**	**Estimated Total Murrelet Take**	**% of Murrelet Take out of total Estimated Take (two-year average)**	**Estimated Annual Mortality Rate of MAMU** (Av. annual estimated MAMU take/Kuletz et al. 2019 pop estimates)	**Notes**
South Unimak	1990	16	0	337	21	6%	No data	Only one year of observer coverage
Kodiak	2002	34	4	529	56	12%	99/10,350=.95%	BRMU all taken in Uganik Bay; no take of any birds in Alitak Bay District
	2005	55	7	1091	142			

Cook Inlet	1999	4	0	272	0	11%	18.5/35,660=.05% *Note that USFWS biologists said this was not a valid calculation because of low observer coverage and therefore low confidence in mortality numbers.	BRMU observed in proximity to nets on only 4 of 2,194 sets.
	2000	2	2	74	37			
Prince William Sound	1991	53	23	993	260	60% (calculated based on two-year averages of observed take due to lack of data on extrapolated BRMU take for 1990).	750/33,745=2.2%	Because of the low take rates, extrapolation of the observer data is statistically difficult and results in wide confidence intervals. The vast majority of fatalities were in the Copper River District.
	1990	41	31	1468	1110 (calculated by AFDF staff, not provided in AMMOP report)			
Yakutat	2007	19	11	305	176	55%	115/5,980=1.9%	Over both years, 27/29 takes occurred in Yakutat Bay area. Factors that influenced take: 1) late in the season 2) sets hauled between midnight and 6:00 am
	2008	10	5	137	54			
Southeast	2012	12	0	165	0	5%	39/144,180=.03%	Take tended to occur later in the fishing season, number of birds in areas was best explanation for differences between two years
	2013	92	6	1360	78			

Scoping: Presence or Absence of Risk

In the Scoping process, each Commercial Salmon Management Area was considered for presence or absence of risk. Five regions were determined to have the potential presence of risk and were therefore carried forward to the SICA.

Table 2: Presence or Absence of Risk

Region	Presence or Absence of risk 0=no, 1=yes	Rationale
Arctic-Kotzebue	0	Outside MAMU range during fishing season; minimal occurrence of KIMU during fishing season (Kuletz et al., 2019 and Day et al., 2011)
Norton Sound - Port Clarence	0	Outside MAMU range during fishing season; minimal occurrence of KIMU during fishing season (Kuletz et al. 2019 and Day et al., 2011)
Yukon	0	Outside MAMU range during fishing season; minimal occurrence of KIMU during fishing season; fishery primarily occurs in rivers where murrelets are not foraging (Kuletz et al., 2019 and Day et al., 2011)
Kuskokwim	0	Outside MAMU range during fishing season; minimal occurrence of KIMU during fishing season (Kuletz et al. 2019 and Day et al., 2011)
Bristol Bay	0	On the edge of MAMU range during fishing season; agreement between biologists that the turbid water, super high density of boat activity, and large tidal swings do not support murrelet foraging and therefore murrelet bycatch is of exceedingly low concern (Stern-Pirlot et al., 2020, Carter et al., 1995).
Aleutian Islands	0	Very low proportion of MAMU and KIMU populations; currently no fishery in this region (Madison et al. 2011 & Kuletz et al. 2019)
Chignik	0	Purse seine only, not of concern for bycatch of BRMU in this region (Stern-Pirlot et al., 2020)
Alaska Peninsula	0	Very small part of BRMU population (Madison et al. 2011 & Kuletz et al. 2019)
Kodiak	1	Overlap of fishing area with important bird area; BRMU nesting on KI (Audubon et al., 2011)
Cook Inlet	1	CI is part of region containing 95% of global BRMU population along with high fishing effort in UCI (Kuletz et al., 2019, Gaudet, 2019)
Prince William Sound	1	High populations of BRMU; high fishing effort (Kuletz et al., 2019, Gaudet, 2019)
Yakutat	1	High populations of BRMU overlapping with fishing area (Kuletz et al., 2019, Gaudet, 2019)
Southeast	1	High populations of BRMU; high fishing effort (Kuletz et al., 2019, Gaudet, 2019)

Scale, Intensity, Consequence Analysis (SICA)

The table below is the summary of the SICA scores. Guidelines for assigning scores as well as scoring rubrics were from Hobday et al. (2007). When relevant, methodology and additional justifications for determining each component of the SICA based on the available information as well as other information that was considered relative to understanding scale, intensity, or consequence is included in the section after Table 3. The scale, intensity, and consequence scores are considered in regard to the Operational Objective. In this case, the Operational Objective comes from the MSC requirements:

There must be a reasonable level of confidence that if the birds are depressed, the fishery would not prevent them from recovering given favorable environmental conditions.

Per Hobday, et al. (2007) these scores are qualitative in nature and rely on expert opinion along with available data. Further, while the Spatial, Temporal, and Intensity scores help to inform the Consequence score, they are not directly used in its calculation and "the score should be based on existing information and/or the expertise of the risk assessment group." (Hobday, et al., 2007, p. 64). As discussed below, we did not feel that all components of the SICA were particularly applicable or useful in understanding relative risk. However, based on available published information as well as expert opinions and feedback shared during the workshop (and captured in the Rationale column), we believe it is appropriate to move Prince William Sound and Southeast Alaska forward to the PSA, and rule out the other regions from further analysis.

Table 3: SICA Scores and Rationales

Region	1. Spatial Scale of Hazard (1-6)	2. Temporal Scale of Hazard (1-6)	3. Intensity score (1-6)	4. Consequence Score (1-6)	5. Confidence Score (1-2) (low-high)	Rationale
Prince William Sound	4	3	3	3	2	The PWS fishery takes place at a moderate Spatial and there is a well-documented high population of BRMU in PWS (see Appendix 3); areas also has relatively high intensity of fishing effort; AMMOP data suggests high percentage of BRMU taken versus other seabird species and shows by far the highest actual and estimated number of BRMU takes.
Cook Inlet	5	3	2	2	2	Fishery occurs primarily during daylight (lower risk to BRMU), drift fleet gathers primarily as far from shore as possible (according to fishermen during 2019 survey and AMMOP data); minimal overlap with preferred foraging habitat for BRMU, low effort (about 20 permits fished/year) in LCI and where high effort occurs in UCI, much lower bird population. Little overlap of the fishery with IBAs according to AMMOP location data (see maps in Appendix 3). According to AMMOP, even observing BRMU while fishing was very uncommon (only 4 of 2,194 sets); BRMU was only taken during year two of the program; and total bird take was very low (6 birds over 2 seasons). This indicated minor intensity

						and consequence. However, we recognize that this region had low observer coverage, so there is potentially less confidence in extrapolation of this data.
Kodiak	4	3	2	2	2	While BRMU were taken in moderate numbers in the AMMOP studies, the intensity of the fishery is relatively low (av. 147 permits). Of those, about 100 fish in the area where any seabird take was recorded (none recorded in Alitak Bay District where approx. 70 permits are fished) (Manly, 2019). BRMU take was all recorded in Uganik Bay, indicating a very small spatial scale of potential risk. According to the Piatt et al. (2006) MAMU distribution map (see Appendix 3 for maps), the highest bird density occurs on the east side of the island, while the fishing effort occurs on the west side in areas with very low murrelet density. Low estimated mortality rate of .95%. However, we recognize that the Piatt et al. (2006) is missing data for some relevant areas of west Kodiak. Refer to Cocoran, 2016 & 2020 for additional population data.
Yakutat	3	3	1	2	2	Relatively low effort (10 yr av=117 permits fished/year), low effort also demonstrated by maps of Unique Gillnet Vessel Deliveries per Week hotspot maps (high of 542 for Yakutat versus 28,737 and 24,104 for SE and PWS respectively, see maps in Appendix 3). In AMMOP study, over both years 27/29 takes occurred in Yakutat Bay area signifying a likely very small geographic area of concern. Further, BRMU take accounted for approx. 1.4% of Yakutat Bay estimated population (Schane et al., 2011) or MAMU take of 1.9% according to Kuletz et al. (2019) population estimates. According to ADF&G Yakutat Area Biologist, 2/3rd of permits don't start fishing until August (coho season), fishery almost exclusively occurs in Yakutat Bay (approx. 20 permits, early in season (June, July) and Situk River estuary (most of rest of effort, August, Sep., Oct..) with low to effort at the Alsek River (approx. 10 permits). Low overlap other than one area near Pt. Manby for reported fishing focus and high densities of BRMU (Schane et al. 2013). See Appendix 3 for maps.
Southeast	5	3	3	3	2	High fishing effort and relatively large area fished (10-year av=426 permits fished/year). High, extensively distributed BRMU population (see maps in Appendix 3).

1. **Spatial Scale of Hazard:** The spatial scale is calculated using the approximate perimeter of the fishing area. In this case, a combination of AMMOP data (showing locations where sampling occurred and therefore fishing) and expert opinion (fishermen and Alaska Department of Fish and Game Area Biologists) was used along with the Mariculture Map tool to calculate fishing area perimeter. The Mariculture Map allows users to draw polygons on maps and provides a perimeter in miles. Perimeters of all polygons in each region were added and then perimeters were then converted to

nautical miles to reflect the units of the scoring rubric. Note that perimeters of fishing areas were areas where fishermen reported that fishing actually occurred or where fishing was recorded using GPS data from the AMMOP studies (Kodiak and Cook Inlet) rather than based on Alaska Department of Fish and Game (ADF&G) management areas. See example maps below.

We believe that the method that we used to calculate perimeter, while using the best tools available to our team, was inherently very conservative because of the detail with which we drew fishing area polygons. This detail likely increased perimeter artificially while having a minimal effect on area (we believe the area calculations are accurate based on available data). There was concern from AFDF staff as well as workshop participants about the accuracy of using perimeter rather than area to calculate spatial scale, however, the Hobday et al. methodology rubrics used perimeter and we did not believe it was appropriate to try and develop an alternative scoring method.

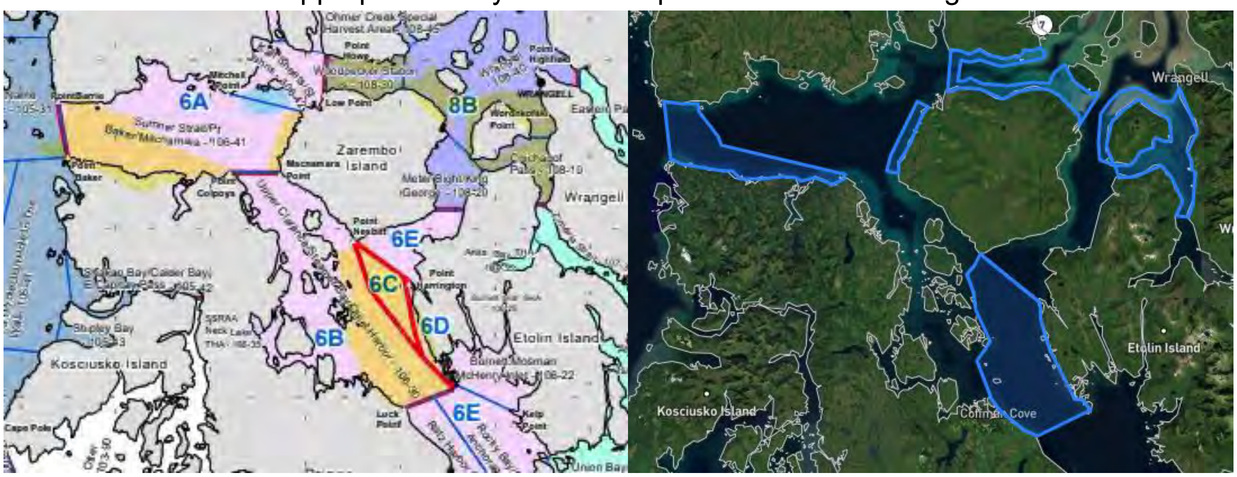

Figure 3: The left-hand map shows a portion of areas highlighted by a Southeast fisherman as areas where fishing occurs, and the right-hand map shows those areas as drawn on the Mariculture Map in order to get an approximate perimeter calculation. See other fishing area maps in Appendix 3.

2. **Temporal Scale of Hazard:** To calculate temporal scale (number of days of fishing per year) of the fishery in each region, data from fishermen identifying length of the season as well as an average of how many days fished was used. For regions where this data was unavailable, data from ADF&G Area Management Reports was used. For example, see the Kodiak Management Area Commercial Salmon Fishery Annual Management Report, 2019, p. 50 for open days of the fishery in 2019. It is important to note that this is an approximation only, and that all regions analyzed in the SICA fell into the Annual category or 1-100 days per year and scored a 3. While we recognize that openings vary significantly from year to year, for the purpose of this analysis, in these regions we believe that those days do not deviate outside the range of 1-100 days.

3. **Intensity Score:** Because in this case, Temporal Scale does not provide a helpful comparison between fisheries, we suggest number of permits fished per year be considered when calculating intensity to get a better comparison between regions.

Therefore, we suggest the following table, based on ranges from the average permits fished in each region over 10 years. Average number of permits were calculated and shared during the 2019 workshop by then AFDF Technical Facilitator David Gaudet. We were given feedback from fishermen in the 2022 Workshop that the following table overestimates fishing effort significantly primarily because the number of permits fished throughout the season varies significantly, with many less than the averages in the table being fished for much of the season. Therefore, total number of permits artificially makes overall effort appear higher than it is. Particularly, it is important to note that fishing effort decreases for Southeast Alaska later in the season, which is when murrelet take was more common. See written comments from a Southeast Fishermen (Appendix 4). However, despite this feedback, we kept table 4 as a basic, albeit over-simplified way of understanding fishing effort *relative to* other regions.

Table 4: 10 Year Average Total Gillnet Permits Fished

Area	Gillent Type	10 Year Average
Kotzebue	Set	80
Norton Sound	Drift or Set	120
Yukon	Lower River Drift or Set	456
	Upper River Set	1
Kuskokwim	Drift of Set	467
Bristol Bay	Drift	1,714
	Set	869
North Peninsula	Area T Drift	-
	Area T Set	-
South Penisula	Drift	120
	Set	67
Kodiak	Set	149
Lower Cook Inlet	Set	20
Upper Cook Inlet	Drift	569
	Set	736
Prince William Sound	Drift	517
	Set	28
Yakutat	Set	117
Southeast	Drift	426
Average Total Permits Fished		6,455

Productivity-Susceptibility Analysis (PSA)

Prince William Sound and Southeast Alaska were moved forward to the PSA section of the ERA based on the consequence scores of 3. Other regions received consequence scores of 2 and were therefore not moved forward in the analysis. The following tables use the Marine Stewardship Council *MSC Fisheries Standard Toolbox v1.0* productivity and susceptibility attributes identified for birds.

Table 5: PSA Scores and Rationales for Prince William Sound

Productivity	***Brachyramphus* murrelet (genus)**	
Attribute	**Rationale**	**Score (1-3)**
Average Age of First breeding	2-3 years old (ADF&G). Average is 2.5, therefore we gave this a score of 1.	1
Average 'optimal' adult survival probability:	We were unable to find a survival probability that was specifically labeled as "optimal", however Boulanger, et al. (2001) shared a range of adult survival rates that averaged 0.84 from other studies. The study further stated that murrelets may have lower survival probability than other small alcids. Therefore, we believe that a score of 2 is appropriate.	2
Fecundity	1 chick/year (ADF&G)	2
Susceptibility	**Region: Prince William Sound**	
Attribute	**Rationale**	**Score (1-3), (low-high)**
Availability	Calculated at approximately 3.6% overlap. However, it is important to note that we did not include the Copper River and Bearing River regions in this calculation of overlap because there is no BRMU distribution data for these areas. While those two regions do see significant fishing and there is also likely a significant BRMU population in that area, based on distribution in other places we believe the overlap would still be under 10%, which is the threshold for increasing the availability score to 2. For PWS, based on the scale of the region and bird distribution data, we calculated overlap by drawing polygons representing the groupings of BRMU in the Piatt, et al (2006) map, polygons representing area actually fished (from fishermen data), and calculated the percentage overlap. Note that according to fishermen, there is an area around Montague Island (Port Chalmers) that is fished by a small number of boats every four years based on ADF&G regulation. We did not include a polygon for this area as we beileve it is a very minimal contribution to the overall availability score. See map in Appendix 3. This is an approximate estimate, but we believe accurately demonstrates low availability.	1
Encounterability	Based on MSC guidelines for air breathing species (MSC, 2022)	3
Selectivity of Gear Type	Based on MSC guidelines for air breathing species (MSC, 2022)	3

Post capture mortality	Post capture mortality rate unknown	3

Table 6: PSA Scores and Rationales for Southeast

Productivity	***Brachyramphus* murrelet (genus)**	
Attribute	**Rationale**	**Score (1-3), (low-high)**
Average Age of First breeding	2-3 years old (ADF&G)	1
Average ‘optimal’ adult survival probability:	We were unable to find a survival probability that was specifically labeled as “optimal”, however Boulanger, et al. (2001) shared a range of adult survival rates that averaged 0.84 from other studies. The study further stated that murrelets may have lower survival probability than other small alcids. Therefore, we believe that a score of 2 is appropriate.	2
Fecundity	1 chick/year (ADF&G)	2
Susceptibility	**Region: Southeast Alaska**	
Attribute	**Rationale**	**Score (1-3), (low-high)**
Availability	The Southeast Alaska management district measures approximately 10,455 sq miles of water. The map from Piatt et al. (2006) in Appendix 3 shows widespread distribution of murrelets throughout the region during summer months. Therefore, we believe 10,455 sq miles is an accurate number to use for calculating murrelet density overlap with fishing. This is also based on the overall extremely relatively high density of murrelets in the region with an estimated nearly 50% of the global population of BRMU. The area actually fished by fishermen is approximately 500 sq miles or approximately 4.8% of the regional waters (based on calculations from fishermen’s maps, methodology explained in SICA section for Scale scores) of the total area. Therefore, we believe a score of 1 or 10%< is appropriate with the overlap of 4.8% far below the threshold of 10%, which is the threshold for increasing the availability score to 2.	1
Encounterability	Based on MSC guidelines for air breathing species (MSC, 2022)	3
Selectivity of Gear Type	Based on MSC guidelines for air breathing species (MSC, 2022)	3
Post capture mortality	Post capture mortality rate unknown	3

Risk Category Determination

To determine the Risk Category for Prince William Sound and Southeast Alaska, Productivity and Suceptability scores were automatically calculated using the MSC RBF Worksheets v3.0, which is included in the MSC Fisheries Standard Toolbox v1.0. A summary of that worksheet including the automatically calculated total Suceptability score and PSA score are in Table 7, below. The low risk category was determined for both regions because the PSA score falls below 2.5, the upper threshold for a low risk rating.

Table 7: Summary of PSA Scores and Risk Category Determination

Region	**Productivity Scores**			**Total (av.)**	**Susceptibility Scores**				**Total (multiplicative)**	**PSA Score**	**Risk Category Name**
Prince William Sound	1	2	2	1.67	1	3	3	3	1.65	2.35	LOW
Southeast	1	2	2	1.67	1	3	3	3	1.65	2.35	LOW

Conclusion

The lack of data available not only about gillnet-murrelet interactions and bycatch, but also for murrelet population distribution in Alaska was a significant challenge in conducting this analysis, despite ERAs being considered suitable for data-limited fisheries. Frustration with lack of data was a common theme brought up by fishermen, biologists, and conservationists during the 2022 Seabird Workshop. Therefore, the authors of this paper recommend continued efforts to collect information on seabird-gillnet interactions, as well as more efforts to understand murrelet population distribution and density throughout their Alaska range. Better understanding murrelet-gillnet interactions is important for an industry that is the international gold standard for sustainable fisheries management, as well as for seabird conservation efforts. Projects including log-book style data collection with electronic tools such as the SkipperScience app to help understand bird distributions and interactions (or lack thereof) from fishermen and re-starting the AMMOP program were discussed at the workshop and strongly supported by stakeholders.

However, despite the challenges with adequate data, the authors of this ERA believe that there is sufficient information available to support the PSA results of a “low” relative risk rating for Prince William Sound and Southeast Alaska. Particularly, the Availability score within the PSA, which requires a 10%> overlap of murrelet habitat and areas fished for a “low” score, or score of 1, was far below the 10% threshold (approximately 3.6% overlap for PWS and 4.8% for SE). These percentages demonstrate that the low risk rating for each region is a conservative scoring, as overlap could be double what it is estimated at and still fall within the low risk rating. Other Commercial Salmon Management Areas were removed from further analysis as relatively low risk prior to the PSA step of the analysis. We believe that this ERA shows that the Alaska salmon gillnet fishery meets the Operational Objective that: *There must be a reasonable level of confidence that if the birds are depressed, the fishery would not prevent them from recovering given favorable environmental conditions.* The outcome of a “low” relative risk rating for these two regions is in large part due to the relatively small areas actually fished in each management area of the fishery compared with the murrelet density data that is available. Consequently, either relatively low fishing effort, or low overlap between the areas fished and areas of high murrelet density resulted in the overall determination of low relative risk to KIMU and MAMU within the bounds of the Operational Objective.

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Appendix 1: Workshop Materials and Stakeholder Involvement

Murrelet Species Interaction with Alaska Salmon Gillnet Fisheries

Agenda

Monday, October 24th, 2022 @ 1:00am – 5:00pm AST on Zoom

Join via Internet:

https://us02web.zoom.us/j/83675089370?pwd=NnA3QlpWQlltRVhXUkFKOXdVL1Vpdz09

Join via Phone: +1 253 215 8782

Meeting ID: 836 7508 9370

Participants

Client

- Julie Decker, AFDF
- Tommy Sheridan, Technical Facilitator and Workshop Facilitator
- Hannah Wilson, AFDF
- Ben Americus, AFDF

Biologists/Researchers

- Kathy Kuletz, USFWS
- Robb Kaeler, USFWS
- Liz Labunski, USFWS
- Shannon Fitzgerald, NOAA
- Jennifer Ferdinand, NOAA
- Josh Moffit, NOAA
- Hannah-Marie Garcia, SkipperScience
- Lauren Divine, SkipperScience

Gear Group Representatives

- Kathy Hansen, Southeast Alaska Fishermen's Alliance
- Max Worhatch, United Southeast Alaska Gillnetters
- Darin Gillman, Cordova District Fishermen United
- Dan Anderson, United Cook Inlet Drift Association

ENGOs

- Yann Rouxel, Birdlife International
- Brad Keitt, American Bird Conservancy

Agenda

1. Welcome (Sheridan, 15 minutes)
    a. Meeting particulars (breaks, opportunity for questions/discussion, etc.)
    b. Participants – introductions
2. Workshop Purpose and Background (Wilson, 15 minutes)
    a. Previous workshop recap
    b. Brief Introduction of ERA process
    c. Workshop Goals
3. AMMOP Update (Ferdinand, 15 minutes)
4. Murrelet Life History and Research updates (USFWS Staff, 45 min)
    i. Life history overview
    ii. Research Updates
        1. Bycatch analysis (AMMOP data)
        2. Exxon Valdez Oil Spill (EVOS) Trustee Council's funded research of Kittlitz's and Marbled murrelet population and distribution in EVOS regions
        3. EVOS Trustee Council biennial July PWS marine bird surveys
5. BREAK (15 minutes)
6. SkipperScience Application (Garcia, 15 min)
7. ERA Data Review and Scoring (Wilson, 1 hr 45 min)
    a. Overview
    b. Review of spatial data (new and existing)
    c. SICA/PSA Scoring
8. Closing Comments (Sheridan/Wilson,15 min)
    a. Reminder to provide written feedback by Nov. 7th
    b. General comments from the group
    c. Thank you!

Appendix 2: Survey Form and Summary of Results*

*Note that maps in which fishermen drew areas of actual fishing effort were not included but can be made available upon request. The maps used in this ERA were aggregates of this information and can be seen in Appendix 3.

Survey (Example from Prince William Sound)

To Prince William Sound Fishermen,

The Alaska Fisheries Development Foundation is currently the Client for MSC and RFM certification for Alaska Salmon, and the goal of this survey is to collect information on specific areas of fishing effort throughout the season in Prince William Sound and potential murrelett interactions. This data collection is part of our work to satisfy a condition on the fishery about gillnet-seabird interactions and bycatch. The more information you are willing to provide, the better we will be able to address this issue, hopefully demonstrating that there is minimal threat to Marbled and Kitletzes murrelets from the Alaska gillnet salmon fishery. We plan to present and confirm this information at our Seabird Workshop on October 24, 2022. We hope that you are able to attend to provide further insight into this issue. Thank you for your assistance in this important issue for the fishery and please don't hesitate to contact me with any questions!

Sincerely,

Hannah Wilson
Development Director
Alaska Fisheries Development Foundation
hwilson@afdf.org
907-276-7315 ext.103

Instructions: Please fill out the following questions with as much detail as possible. For the mapping section, please outline the areas where your (and your member group's) fishing is concentrated and you've seen murreletts as specifically as possible. Note that these questions

1. Approximately what hours of the day do you fish?
2. Which months of the year do you fish?
3. On average, how many days per week do you fish during the season?
4. Seabird Interactions:
    a. How often during the season do you see murreletts?
    b. What time of day do you see them most often?
    c. How often (if ever) do you catch murreletts in your net?
    d. Any other information about murrelett interactions or sightings that you would like to share:

5. On the map on the following page (source: ADF&G), please draw in as much detail as possible the areas where:
    a. You fish. If these locations change throughout the season, please note what months you are in which areas.
    b. Where you have seen murreletts (please use a different color).

Summary of Survey Results

Region	Approximately what hrs of the day do you fish, what months of the year, days per week during the season?	How often do you see murrelets during the season?	What time of day do you see them most often?	How often do you catch murrelets in your net?	Other murrelet information
Southeast	Generally, and this is true for most of the fleet, daylight hours. Certain areas, particularly district 6, effort is low during certain stages of the tide. Common property fisheries begin in late June and run through the end of September. Fishing days is dependent on abundance of fish. High abundance sees more days, low abundances sees less. If I were to guess it would be about 3 days per week.	Pretty often. Seems to be plenty around.	Never noticed a particular time of day I see them most.	Very rarely. In forty years I've caught maybe a dozen. I can't remember the last time I caught one. On those rare occasions I don't remember catching more than one.	In September of 2020 and September 2021, I observed large concentrations of Murrelets. They were remarkable, because in my lifetime I had never seen anything like it. One was in district 6 while returning to port after a gillnet opening. The other was in district 10 while longlining…Both places are similar in that they are large upwellings due to strong tides and drastic depth changes. I have fished throughout the region for 4 decades, and see Murrelets throughout the region, in all months of the year.
	No response	I see murrelets from Nemo Pt to North Clarence and all the way to Pt. Baker. I fish in these areas at different times.	I see them at all times day and night. June, July and August I've seen them.	I catch 3-5 a year.	One year at Limestone, out in the main drag, we were catching 4-6 murrelets a set during the day! The water was a brownish color and they couldn't see our nets. There was a constant trail of floating murrelets during the 3-day opening. It was about 12 years ago.
	No response	Daily	No response	I catch one every few years. It is very rare.	They are quite common. I most often see them in pairs.
	3 am-10pm, May 20^{th}-Oct. 1^{st}. Fishing 3-4 days/week.	Some seasons 5-10 murrelets throughout the season. Some seasons, zero.	Dusk	I have gillnetted salmon 49 years in a row, [in] SE, WA and Bristol Bay. I rarely catch seabirds. I have not caught one in over 10 years. However, I [have] occasionally	It seems like the times I caught them, I was fishing more towards the outer coast. They seem to be following bait.

				[caught] them: from 1-12 in a set.	
	We did not fish in 2022 and the following information is from gillnetting 1985 to 2021. We tended to fish between 4:00 am to 10:00 pm. Most of our fishing has been in district 11…not much recently would sometimes fish in District 15. We only fished District 1 for a couple of openings in 1985 and District 6, 2 weeks each in 1985 & 1986. Gillnetting starts on the third Sunday of June and goes until the end of Sept/first week of October. We fish 2-4 days/week.	None in the last five or so years, since the 2000's with the significant increase in air pollution from cruise ships we are not seeing many sea birds of any kind, particularly scoters where in the fall we would see large rafts of them let alone any type of interaction	Mid afternoon	Normally you only catch one of the pair if you actually catch one. Since 1985 we have never caught many, probably a handful over all those years, but we work our net constantly and don't let it soak for more than 20 minutes generally.	We have seen more murrelets in areas outside of the gillnet area when traveling or prosecuting other fisheries such as in District 11 you see them at Olivers Inlet and Greens Cove. Within the gillnet fishing area our personal sighting has been generally around Grand Island and the West side of lower Stephens Passage. The murrelets tend to stay out of turbid water.
Prince William Sound	I fish 7 am-7 pm May-September. On the Copper River Flats an average of two days a week. In the Prince William Sound area is on average about three and half days a week.	Semi-frequent. Every few days I have seen a few pairs swimming around.	In the daylight hours, mid-day till dusk	Never have I caught a Marbled or Kittletz's Murrelet.	Often see Murrelets near Glacial Moraines, Pakingham Area and North of Coghill Point up towards Yale and Harvard Glaciers.

Appendix 3: Fishing Effort and Murrelet Population Distribution Maps by Region

Southeast Alaska

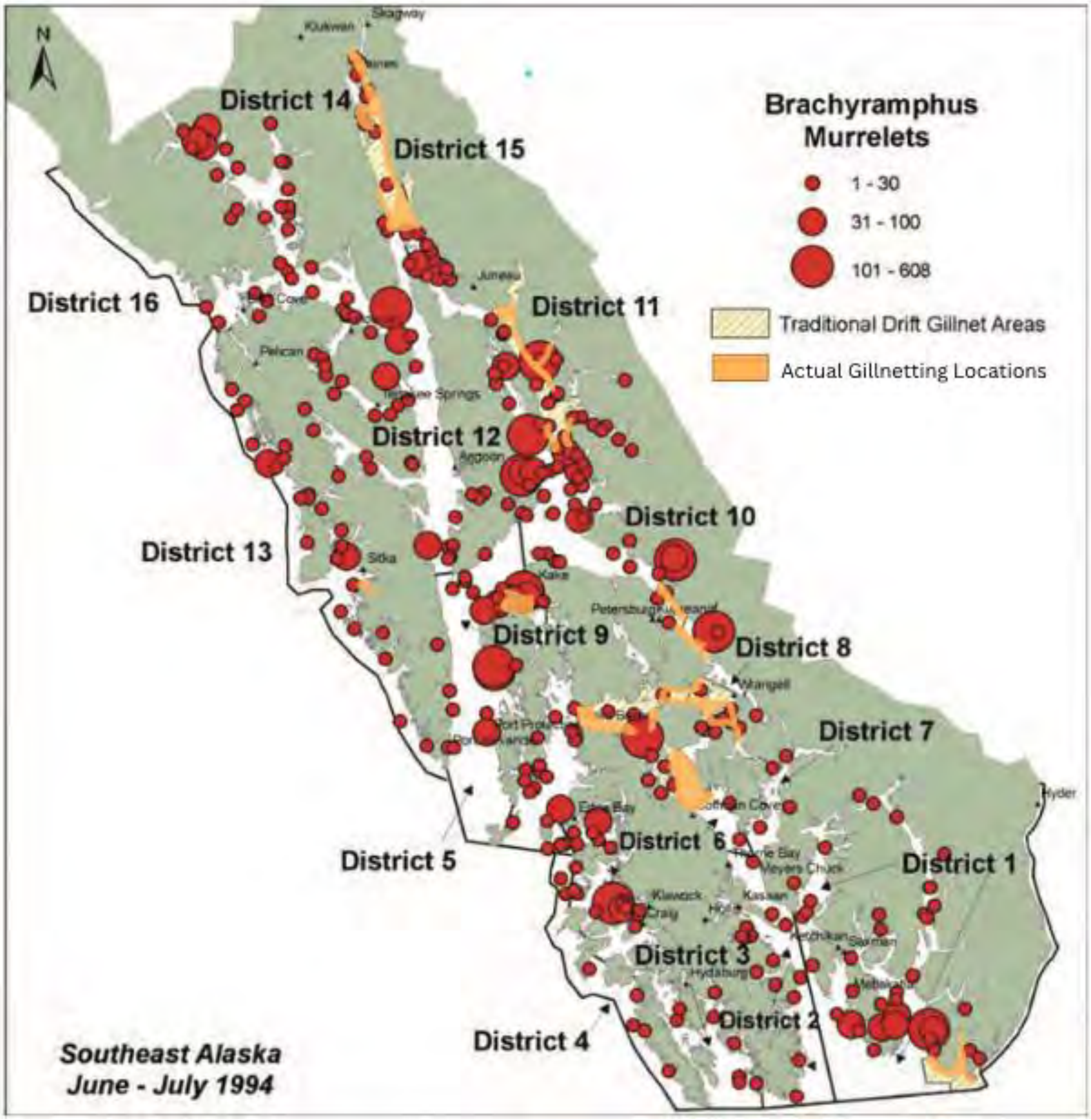

Figure 4: Brachyramphus *murrelet distribution in Southeast Alaska in June and July 1994 relative to gillnet fishing districts in Southeast and overlaid with actual area fished (base map from Piatt, et al. 2006).*

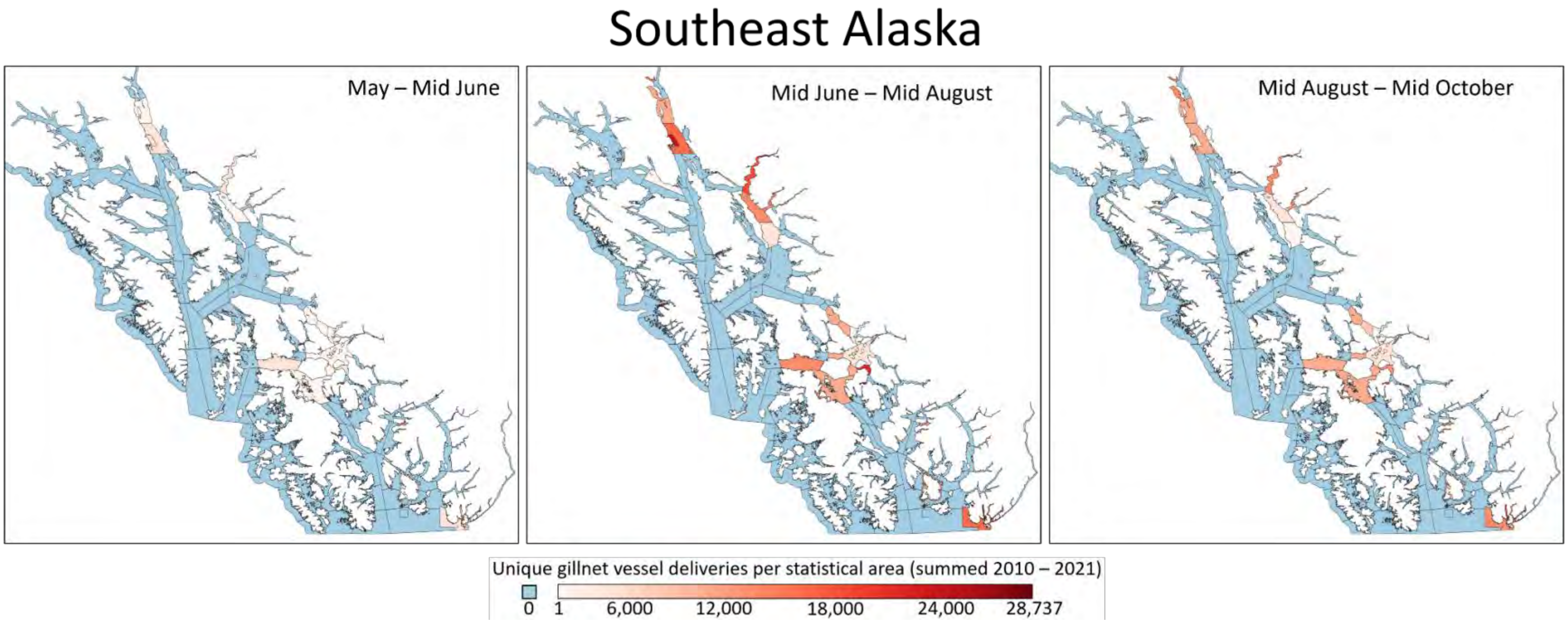

Figure 5: Unique gillnet vessel delivers per ADF&G statistical area for different months of the fishing season (ADF&G data).

This map series shows unique gillnet vessel delivers per ADF&G statistical area for different months of the fishing season. It is helpful in showing relative effort in different parts of Southeast Alaska throughout the fishing season. It particularly helps to exemplify that effort changes dramatically throughout the season and that the highest effort occurs from mid-June through mid-August, a much shorter amount of time than the duration of the entire fishing season.

Kodiak

Figure 6: Actual areas fished on Kodiak Island based on AMMOP data.

Figure 5—Distribution of Marbled Murrelets around the Kodiak Archipelago in summer (April-September). Density contour polygons calculated from data grouped in 5' latitude-longitude blocks and scaled geometrically.

Figure 7: Distribution of Marbled Murrelets around the Kodiak Archipelago (April-September). (Piatt & Nasuland, 1995).

Cook Inlet

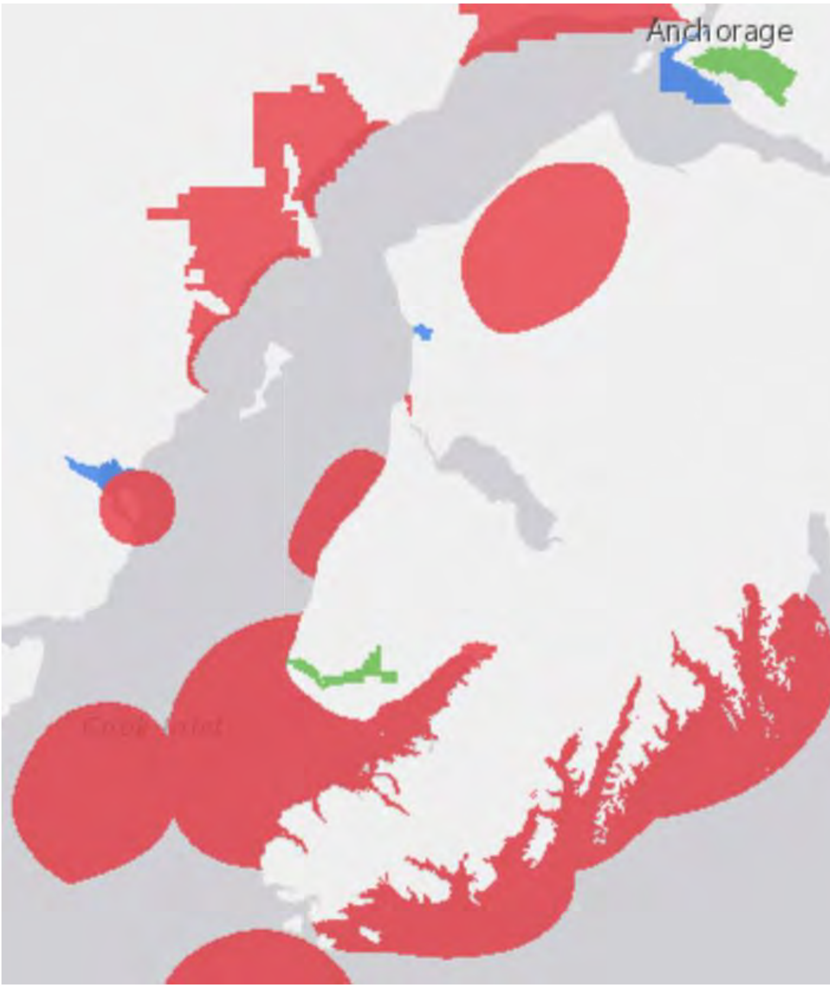

Figure 9: Important Bird Areas in Cook Inlet (Audbon Society).

Figure 8: Actual area fished in Cook Inlet (note that approximate 20 setnet permits are held in Kachemak Bay, which are not reflected in this map).

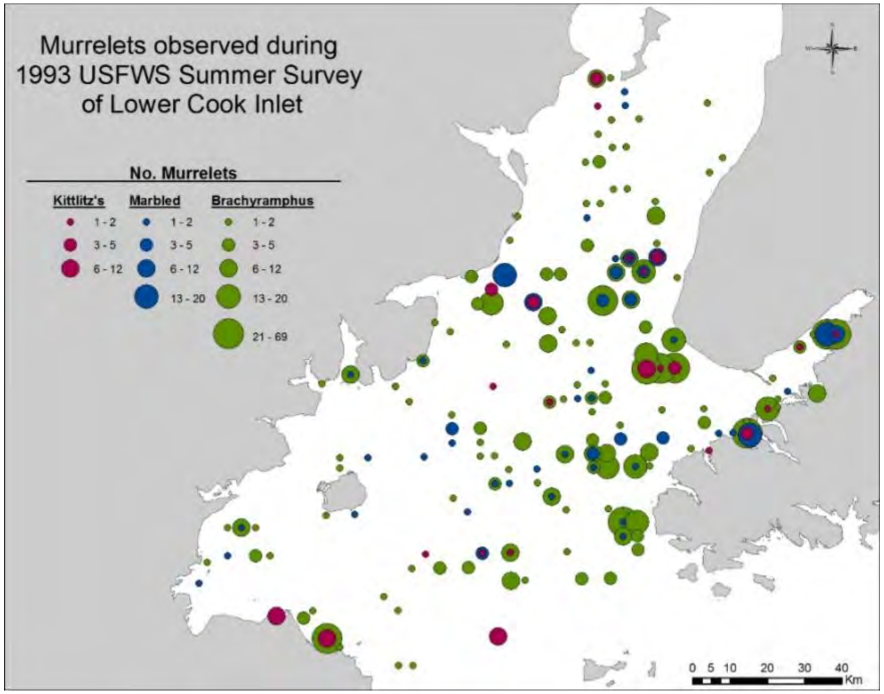

Figure 10: Murrelets observed during the 1993 USFWS Summer Survey of Lower Cook Inlet (Kuletz, et al, 2019).

Prince William Sound

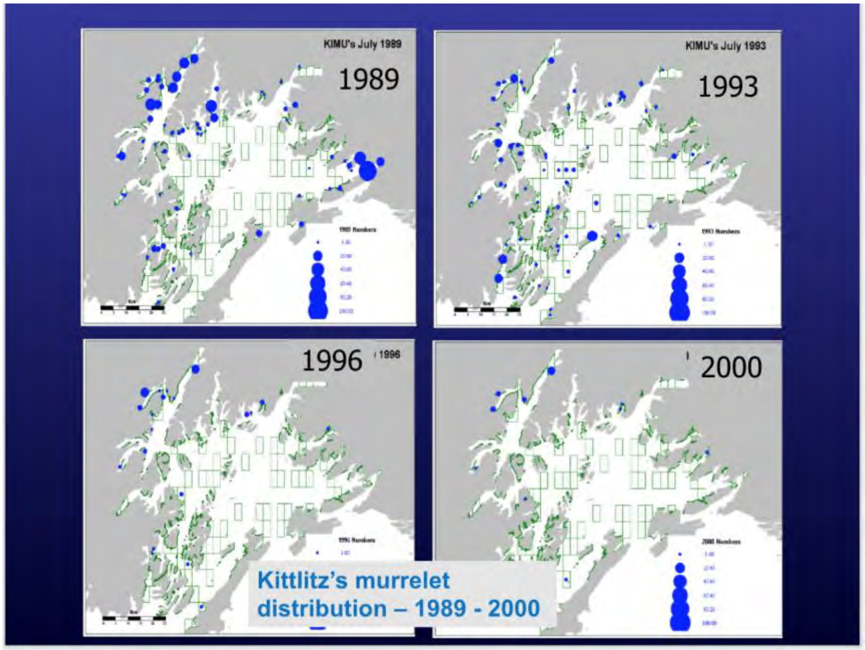

Figure 11: KIMU Distribution 1989-2000 (Kuletz et al., 2019).

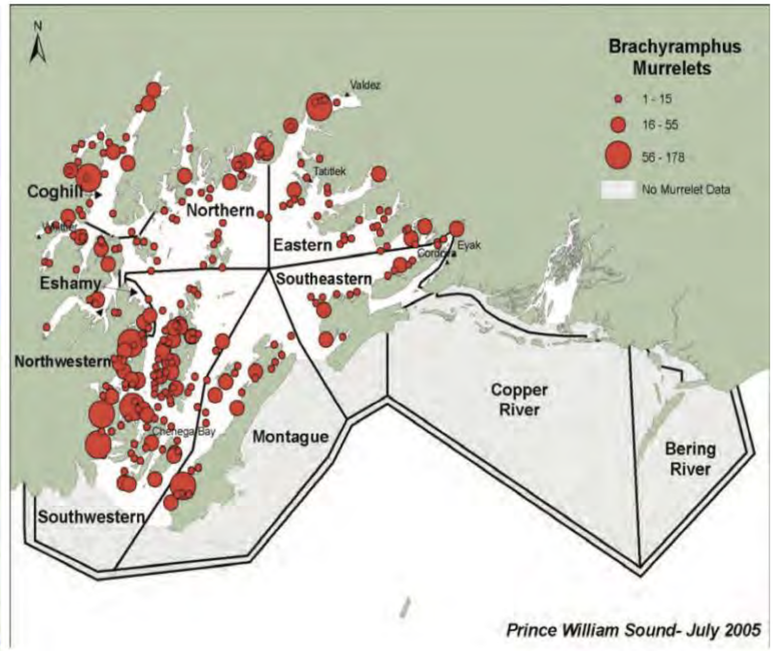

Figure 12: Brachyramphus *murrelet distribution in PWS in July 2005, relatival to salmon fishing districts. Does not include outer waters of the Sound, nor the Copper River and Bering River districts. (Piatt et al., 2006).*

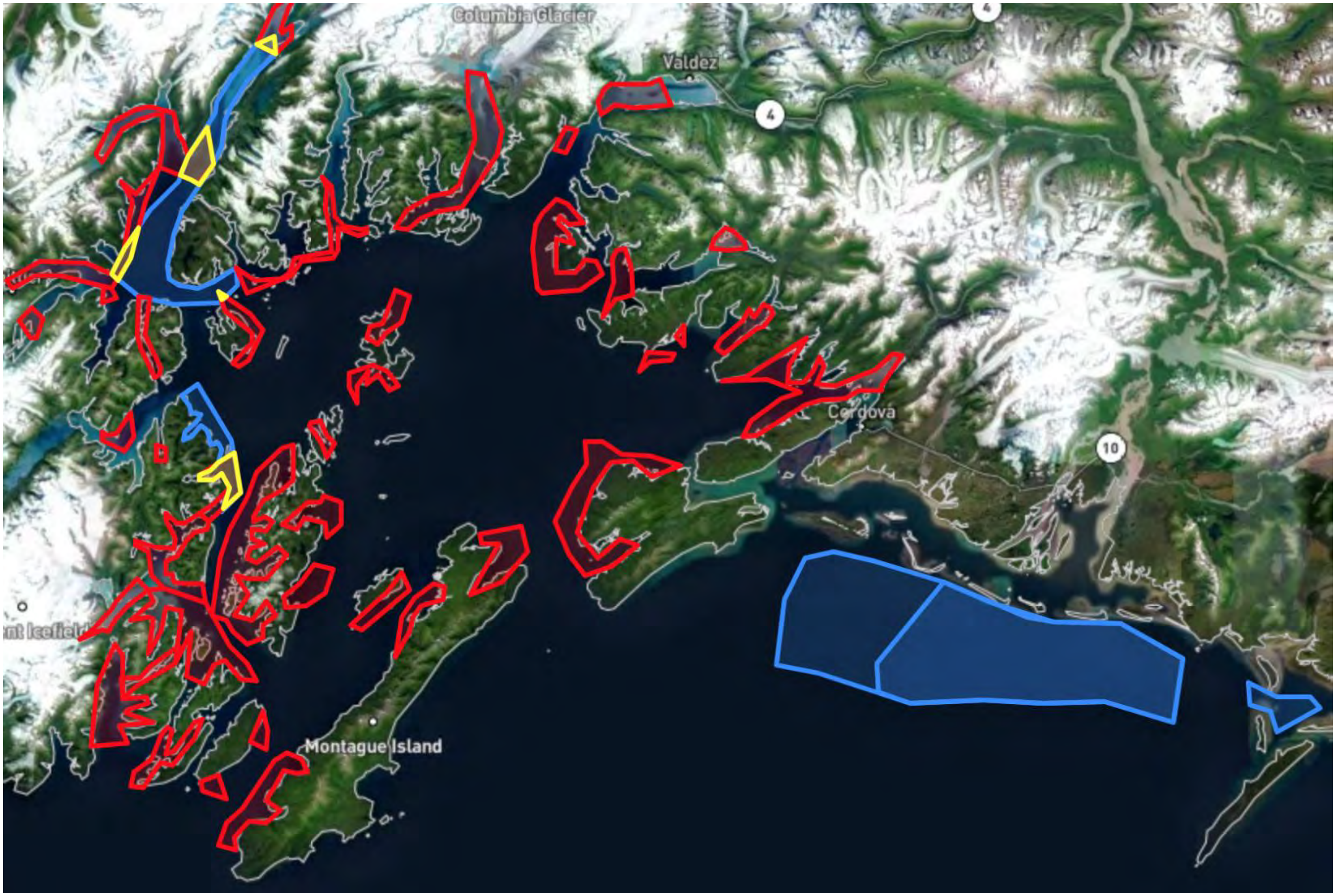

Figure 13: Polygons of significant BRMU density from Figure 12 (Piatt, et al., 2006) in, actual areas fished in blue, and overlap of fishing and bird areas in yellow.

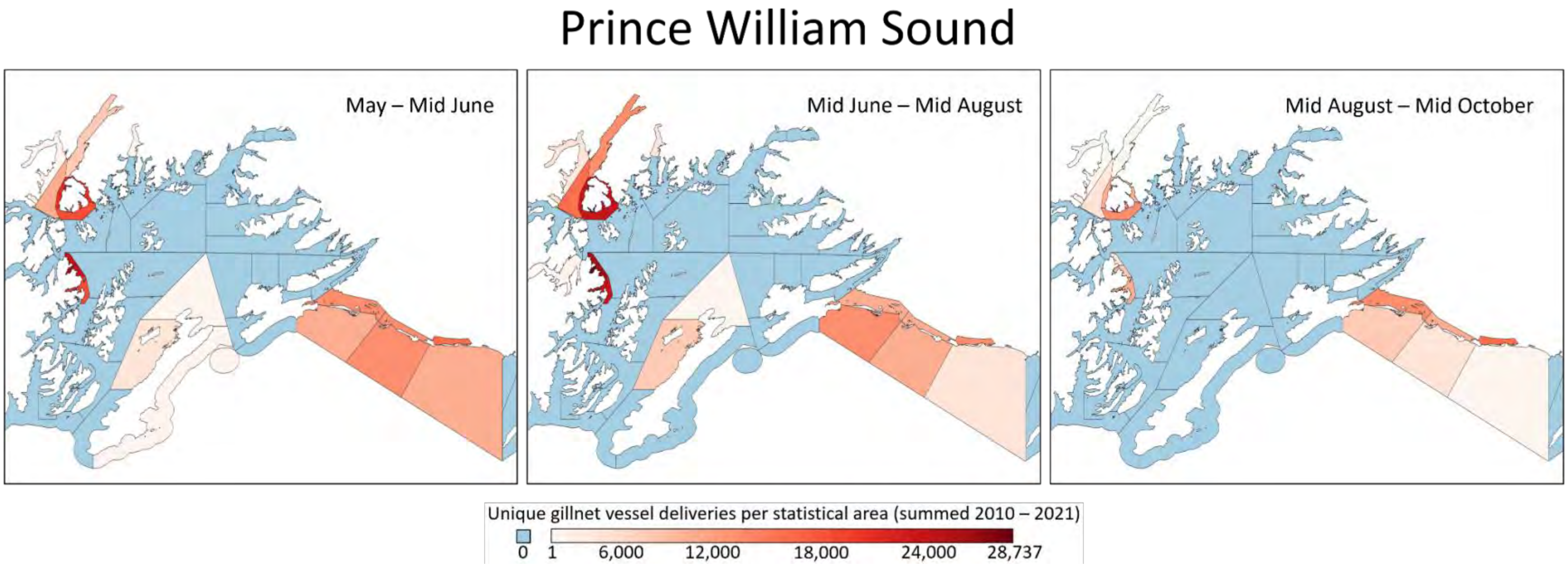

Figure 14: Unique gillnet vessel delivers per ADF&G statistical area for different months of the fishing season (ADF&G data) in Prince William Sound.

Yakutat

Figure 15: Actual areas fished in Yakutat area. Information from Yakutat Area Biologist.

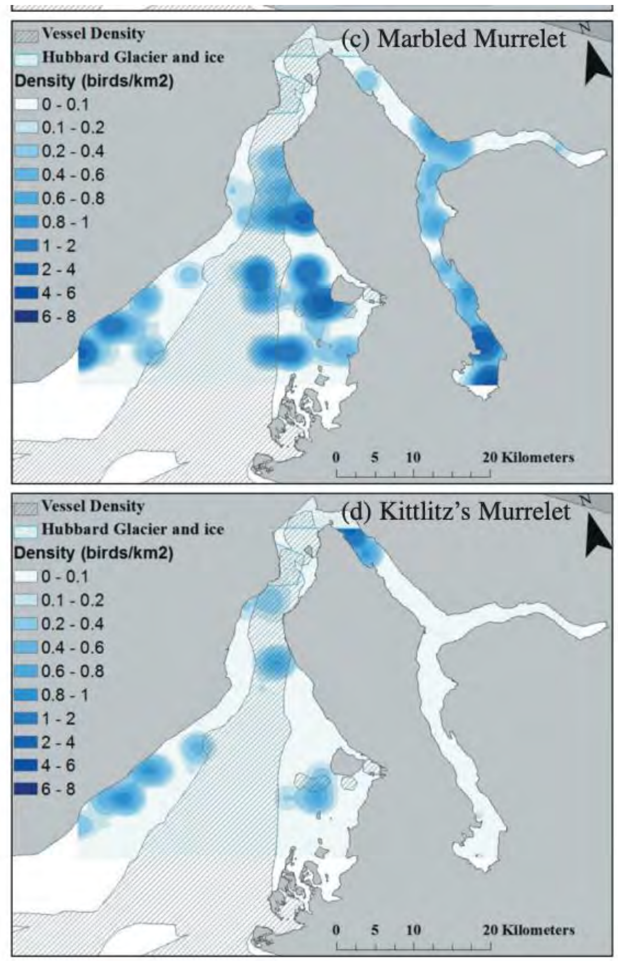

Figure16: Densities of KIMU and MAMU in Yakutat Bay. (Schane, et al., 2013).

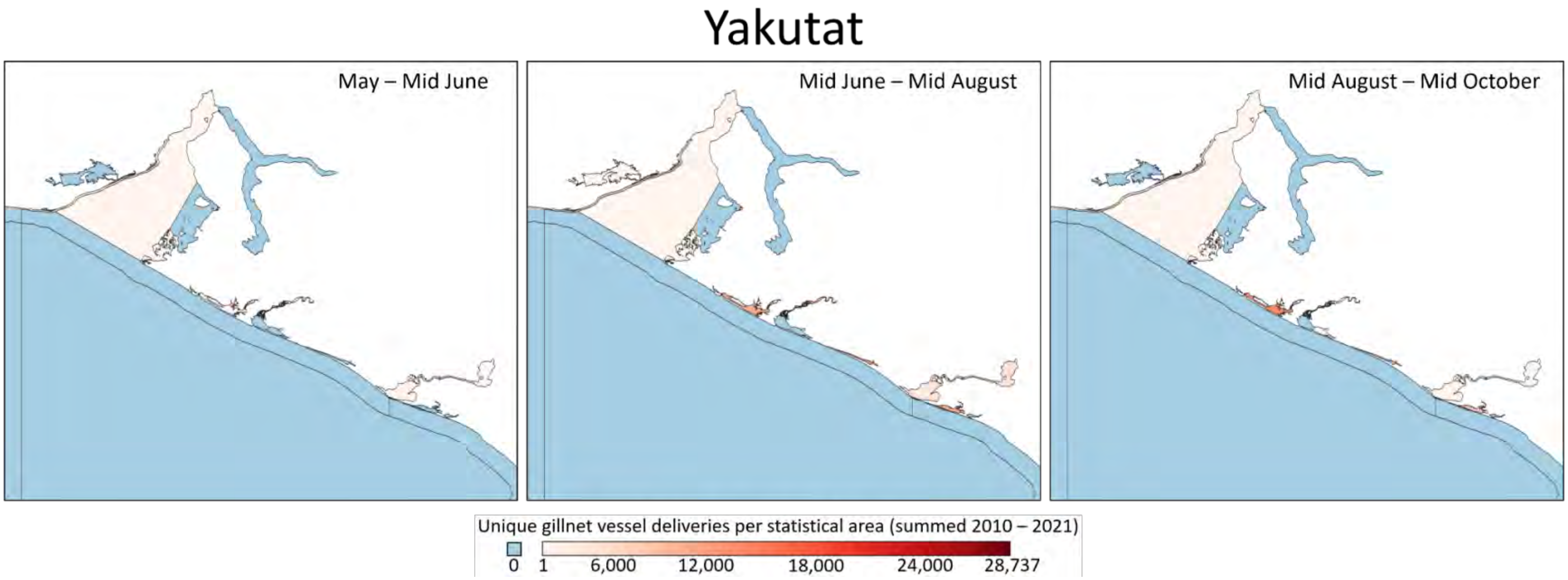

Figure 17: Unique gillnet vessel delivers per ADF&G statistical area for different months of the fishing season (ADF&G data) in Yakutat Area.

Appendix 4: Workshop Written Feedback

United Southeast Alaska Gillnetters Comments Regarding Murrelet Workshop October 24, 2022

I would like to express my appreciation for being included in this and the past workshop that occurred in December 2019. It has been very enlightening, and I appreciate all that I have learned about these birds.

It appears to me that there is an assumption that since there has been a notable population decline in PWS, that it is applicable to the southeast Alaska region as well. In the December 2019 workshop, I asked if there were a lack of food sources, would the birds leave for better forage areas. Kathy Kuletz said that these birds had a strong propensity to return to the same area to nest year after year, and if there were a lack of food available, they would just not be as successful in breeding. This would in my mind, lead to a digression in the population just on a generational basis. I will add here that there has been a remarkable lack of herring in the PWS since the inception of this survey.

In reading the draft provided me prior to this meeting, I have to question the Spatial Scale of Hazard. Scores based on linier nm makes little sense, and square milage would be a better measure. The southeast Alaska management area, basically all state waters in the region, districts 1-15, measures 13,810 square miles. The area gillnets can prosecute their fishery by regulation measures 1,549 square miles, or 11.2% of the region. It is also noteworthy that not all of the area represented by the 11.2% is open to fishing all the time, for instance, section 11-c of district 11 hasn't been open for the last nine years. District 8 has seen very little fishing time through the month of July since 2018, due to king salmon management concerns. Very large portions of district 15 have also been closed due to king salmon conservation. This is far below the >30% attributed to our fishery in the scoring. It is not logical that our fishery bycatch of these birds would lend itself to the inability to recover from catastrophic population declines, given the small area we actually fish.

The data used in Table 6 of the draft, using an average of permits fished is simplistic and represents at best a worse case scenario. As I mentioned in the October meeting, it merely represents the unique permits fished in a season. I took the liberty to refine it.

Number Of Gillnet Permits fished By SW for Traditional and Hatchery Terminal Areas in SEAK

	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013
19						2	4	1	3	1
20					10	3	10	2	6	2
21					14	8	16	9	19	17
22				21	28	30	10	13	20	41
23	21	32	33	39	59	58	27	39	58	67
24	34	39	40	53	75	74	42	60	68	80
25	45	77	69	258	293	303	116	122	329	356
26	215	192	234	336	374	360	317	336	370	406
27	283	262	293	360	388	387	364	373	394	425
28	294	284	317	390	400	390	387	379	408	435
29	300	317	315	391	396	387	386	389	401	430
30	325	313	300	389	390	385	402	392	398	427
31	337	299	273	372	369	352	377	371	388	416
32	320	278	286	341	335	320	362	364	349	390
33	301	214	239	316	290	298	328	339	318	345

34	279	251	230	271	294	222	283	297	241	337
35	260	254	151	297	299	272	265	294	288	316
36	226	247	190	295	293	292	287	264	298	310
37	201	227	189	254	246	247	283	273	283	304
38	146	180	153	189	216	196	257	243	253	239
39	119	110	76	96	67	121	175	170	164	166
40	59	41	3	53	5	59	113	70	93	86
41	14	12		9	4		25	4	8	10
Total	373	371	368	419	421	421	425	421	432	451

One can plainly see in the spreadsheet above, the highest effort of our fleet occurs in statistical weeks 26-31. The average for those particular weeks over the last ten years shows that the most vessels are in stat week 30 with 372, followed by stat week 29 with 371. There is less in the earlier weeks, inclining, and less in the latter weeks, declining as the season progresses. The 6 assigned to our fishery should likely be a 5, and if all weeks were accounted for, may actually be a 4.

It has been noted that murrelet interactions occur later in the season. The declining effort shown above reduces those interactions, especially if you consider that Deep Inlet, a terminal harvest area near Sitka draws many boats most years, reducing the number of vessels fishing in traditional common property areas.

Number Of Gillnet Permits fished By SW for Deep Inlet Hatchery Terminal Area

	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013
22						9				21
23	6	11	12	15	9	17	15	17	28	29
24	14	16	18	21	11	18	20	24	32	29
25	15	22	25	22	20	20	20	24	29	23
26	15	25	24	21	14	20	24	20	25	22
27	15	27	23	21	10	10	27	20	22	14
28	11	23	24	19	9	13	25	22	24	17
29	10	20	24	26	14	21	0	24	24	36
30	13	21	23	18	19	24	27	32	22	29
31	20	17	25	20	28	24	39	42	30	56
32	31	17	25	42	33	28	40	42	42	99
33	62	40	35	55	63	64	0	62	46	103
34	92	92	60	63	69	0	0	90	24	90
35	98	94	0	76	84	83	0	85	24	81
36	71	68	36	68	56	84	72	65	20	36
37	45	39		38	28	17	67	35		16
38		15		15	19	13	39	14		
39				7	0	1				
40					0					
41					4					

The above sheet shows effort in Deep Inlet for the last ten years. All the vessels in this table are also represented in the previous table. It shows that later in the season, even as effort is waning throughout the region, a large component of that effort is concentrated in one area, minimizing impacts in those traditional areas.

The statistical data used above in the spreadsheets was courtesy of ADF&G. The Geographic Information System (GIS), was also ADF&G, using ArcGIS Pro.

I believe the risk assessed our fishery has been amplified in the draft. Reliable data that reflects actual effort and area is important. I feel the refinements expressed and shown in these comments represents the real effort and shows the areas we actually fish compared to the range of murrelets in our region gives a more realistic snapshot of risk. Based on this alone should, in my mind, reduce our draft score of 3 to a 2.

Again, I appreciate the allowance to participate in this matter. If I can be of further assistance in the future, let me know.

Max Worhatch, Executive Director United Southeast Alaska Gillnetters

Alaska Salmon Hatcheries 2.0 Workshop – The Next 50 years

Tommy Sheridan – Alaska Blue Economy Center
Benjamin Americus – Alaska Fisheries Development Foundation

Background

There are 30 production salmon hatcheries operating in Alaska, with approximately 1.5 billion smolt released annually. Most releases are pink salmon from Prince William Sound and chum salmon from Southeast Alaska. In both regions, hatchery salmon are utilized by commercial salmon fisheries and shore-based seafood processors. Elsewhere in the state, in Norton Sound, the Kenai Peninsula, and Anchorage, smaller hatcheries for Chinook, Coho, and Sockeye support sport and subsistence fisheries. When considering total statewide involvement, hatchery-produced salmon provide more than 16,000 jobs and account for $600 million in economic output. State Fish taxes generate approximately $3.6 million in annual revenues, half of which goes to local communities.

Need for project

In contrast to the economic success of Alaska's hatchery program, many concerns exist today as to the environmental sustainability of the program. Straying (the presence of hatchery-origin fish in wild streams) has been documented in Prince William Sound, Southeast Alaska, Kodiak, and Cook Inlet, particularly in streams near hatcheries and remote release sites. In Prince William Sound, straying hatchery-origin Pink Salmon produce less offspring than their wild-origin counterparts, and hybridization is observed. In the marine environment, hatchery-origin pink salmon may compete with other salmon species for resources, reducing population sizes of wild stocks. To address these concerns, the Alaska Department of Fish and game undertook a 13+ study on straying , the Alaska Hatchery Research Program. ADF&G is beginning a new study program on marine competition between hatchery and wild origin salmon.

Simultaneously, in Prince William Sound and Southeast Alaska, mariculture presents an exciting avenue for growth, with potential to match the salmon hatchery program in terms of economic output and employment. Integrating salmon hatcheries into Alaska's expanding mariculture industry may provide a win-win scenario. Existing hatchery sites are zoned for aquaculture with extensive infrastructure, energy, and staff already in place to support the growing demands of the mariculture industry. In turn, mariculture may provide hatcheries with more diversified economic assets and longer work terms for seasonal employees.

Relevance to Alaska Sea Grant Strategic Plan Four Focus Areas

1. Environmental Literacy and Workforce Development: Hatcheries in Alaska employ mostly seasonal workers, with peak demands during egg-take in August and September.

For kelp farming, peak workforce demand occurs during April—May harvest. Integrating current hatchery employees in kelp farming would expand the length of seasonal employment and provide aquaculturists with new skills.

2. Sustainable Fisheries and Aquaculture: This workshop will review findings from the Alaska Hatchery Research Program and other scientific research to identify areas in which Alaska's hatchery can improve practices. Areas of improvement will be codified in an action plan to guide a more sustainable future for fisheries and aquaculture.
3. Resilient Communities and Economies: Given the economical variability that has occurred in salmon fisheries in recent years, coastal Alaskan communities are seeking to diversify their economies. Integrating salmon hatcheries into Alaska's expanding mariculture industry may provide a rare win-win scenario. In Prince William Sound and Southeast Alaska, hatchery areas are zoned for aquaculture with extensive infrastructure, energy, and staff already in place to support the growing demands of the mariculture industry. Mariculture can provide more consistent work and economic stability for hatchery operations.
4. Healthy Coastal Ecosystems: Kelp farming near hatchery net pens and in areas of past eutrophication may remediate high nitrate levels, and kelp farming in bays may locally reduce the effects of ocean acidification.

Statement of Objectives

With funding from Sea Grant, the Alaska Fisheries Development Foundation and the Alaska Blue Economy would collaborate to organize a public workshop in Cordova, Alaska. Cordova is the regional headquarters of PWSAC, the largest producer of pink salmon in Alaska, and is the site of major mariculture expansion. The workshop would be held in Fall 2024 and have two objectives: 1.) document the history of the Alaskan hatchery salmon program and 2.) plan for its sustainable future. 2024 is the 50th anniversary of the passage of the Private Non-Profit (PNP) Hatchery Act, a unique milestone to craft the workshop around.

Role of graduate student

This project would involve a graduate student enrolled in the new UAF Blue MBA program. The student would assist in planning and facilitating the workshop and producing conference proceedings documents.

Intended outcomes

- Record the history of the Alaska hatchery program, especially in regard to decision making processes behind site and broodstock selection.
- Identify areas to reform current hatchery practices
- Develop plans to integrate mariculture at hatcheries
- Produce an action plan to guide the next decades of hatchery operation

Engagement Plan

The Alaskan hatchery program is relatively unknown to most Alaskans, particularly given its scale, history, and the economic benefit it provides. This workshop will be open to the public and is intended to provide relevant information to coastal Alaskan communities. The workshop will include technical sessions with presentations from invited participants as well as listening sessions to receive input from stakeholders and community members.

Invited participants will include the following:

- Longtime and/or retired hatchery operators, especially those involved with establishing regional hatchery organizations.
- Native peoples of areas with hatcheries
- Local administrators of communities with hatcheries
- Current managers and employees from the eight non-profit regional hatchery organizations in Alaska.
- Researchers on mariculture, salmon straying and homing, large-scale aquaculture, and other relevant fields
- Management from Alaska fish processors
- Kelp and oyster farmers, and others engaged in the mariculture industry
- Alaska Department of Fish and Game staff

Following the workshop, organizers from the Alaska Fisheries Development Council, the Alaska Blue Economy Center, and the UAF Blue MBA graduate student will collaborate to produce 1.) education materials for broad audiences a 2.) technical action plan directed towards hatchery operators and fisheries management.

The Cordova Center workshop venue. Photo by the Alaska Center for Energy and Power.

Previous Sea Grant Support

Neither Benjamin Americus (AFDF) nor Tommy Sheridan (ABEC) have received Sea Grant Funding in the last five years. Benjamin Americus is a current Alaska Sea Grant State Fellow with the Alaska Fisheries Development Foundation. His fellowship involves work on salmon hatcheries in relation to seafood sustainability certification.

Benefits of Alaska's Growing Mariculture Industry

Mariculture has both environmental and economic benefits. Some are universal and others depend on the type of mariculture being practiced.

Environmental Benefits

Water Quality

In places with high levels of runoff from urban areas and agriculture, water filtration by shellfish farms draws down excess nutrients and improves overall water quality and decreases the risk of low or no oxygen zones.

Aquatic plants, including seaweed and kelp species, can help filter organic and non-organic nutrients in marine waterbodies.

Habitat Creation

Physical structures associated with aquatic farms may create three-dimensional midwater and surface habitat for wild species such as foraging fish and crustaceans, which may benefit their populations.

Buffer for Ocean Acidification

As seaweed and kelp species absorb carbon dioxide, they may buffer certain shell-forming creatures from the corrosive impacts of ocean acidification under certain oceanographic conditions.

Economic Benefits

Revenue Opportunity

Mariculture has the potential to bring increased revenue to coastal communities around Alaska. As this industry continues to grow there's never been a better time to get involved in mariculture in Alaska!

Commercial Value

In 2021, the commercial value of the mariculture industry in Alaska was estimated at just under $3 million (Alaska Sea Grant, *State of Mariculture*). Currently, the majority of this commercial value is related to oyster cultivation. However, the seaweed industry alone has the potential to experience incredible growth over the next 20 years.

Compatible Seasons

Certain types of mariculture are compatible with Alaska's existing seafood industry in many ways including multi-purpose equipment and technologies. Another example of compatibility is that cultivation and growing seasons for kelp species often fit within the offseason of some Alaska fisheries.

You can get involved in mariculture in many ways; farming, processing, hatcheries, market and product development, and sales!

Want to learn more? Visit us:
The Alaska Mariculture Alliance at alaskamariculture.org

Photo Courtesy of Alaska Seafood

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alaskamariculture.org

Alaska Fisheries Development Foundation
afdf.org/projects/current-projects/alaska-mariculture-initiative/

Alaska Department of Natural Resources
dnr.alaska.gov/mlw/aquatic/

NOAA Fisheries
fisheries.noaa.gov/alaska/aquaculture/alaska-region-aquaculture

Want training on kelp or oyster farming? Or information on the application process for an aquatic farm lease?

Alaska Sea Grant
https://alaskaseagrant.org/our-work/aquaculture/

Alaska Aquaculture Permitting Portal
http://akaquaculturepermitting.org/

Alaska Mariculture Training & Research Center

ALASKA MARICULTURE RESEARCH & TRAINING CENTER

amrtc.org

Alaska Fisheries Development Foundation, Inc.

ALASKA MARICULTURE ALLIANCE

Photo Courtesy of Alaska Seafood

Benthic Impacts of Kelp Farms

How might kelp farms affect life on the sea floor?

Although research on kelp farms in the United States is as young as the industry, it is reasonable to believe that kelp farming provides many positive benefits to the local ecosystem and the environment.

A multi-year project is just taking off in Alaska to study these impacts and provide more clear guidance for regulators.

What kind of impacts might mariculture have on benthic environments?

Reducing Greenhouse Gas Emissions

Kelp farming may contribute to efforts to capture and sequester carbon in our atmosphere, mitigating the effects of global warming. For example, as it grows, kelp removes CO_2 from the ocean. It may then be used for fertilizers which have a lower carbon footprint than synthetic fossil-fuel derived fertilizers. Red and brown seaweeds can also be fed to animals, which research suggests may reduce the animals' greenhouse gas emissions. As mariculture continues to develop, we will continue to learn more about these climate impacts!

Shading the sea floor

The degree that a kelp farm shades the floor depends on water depth and clarity, wave action, current, and kelp density. One study of a Swedish farm at 5m (15 feet) depth found that during peak growth, the kelp significantly shaded the floor but it did not change the oxygen, nutrients or number of mobile animals on the floor. Generally, most Alaska kelp farms are located at depths of between 50-100 feet, which may result in less shading.

Slowing ocean acidification

A consequence of increased levels of carbon dioxide in our atmosphere is that ocean acidity increases as the ocean absorbs CO_2. Ocean acidity poses unique challenges to shell forming organisms (e.g., crabs, oysters, clams and mussels). For example, crabs have less energy to grow and stave off disease. Research on potential impacts to Alaska bivalves is ongoing but research elsewhere has shown that, in some ocean conditions, kelp can significantly decrease acidity in the water column as it uses CO_2 to grow.

Genetic Diversity of Wild Kelp

Research into the genetic diversity of Alaska's wild populations is ongoing, with the purpose of assessing the risk posed by farming. In the meantime, ADF&G has taken a conservative approach to protect against alterations to native genetic diversity, requiring that broodstock (parent plants) consist of 50 individuals and be collected within 50 km by water of the farm.

Creating Habitat

Studies in other parts of the U.S. and the world have found that an aquatic farm may provide important habitat for fish and invertebrate species, including as nursery habitat for early life stages. Research on Alaska farms is ongoing.

Want to learn more? Visit us:

The Alaska Mariculture Alliance at alaskamariculture.org

Photo Courtesy of Alaska Sea Grant

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Alaska Department of Natural Resources
dnr.alaska.gov/mlw/aquatic/

NOAA Fisheries
fisheries.noaa.gov/alaska/aquaculture/alaska-region-aquaculture

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Photo Courtesy of Alaska Sea Grant

Help Keep Mariculture in Alaska Marine Mammal Free!

What is marine mammal entanglement?

Entanglement is when a marine mammal becomes wrapped in either marine debris or gear associated with a marine activity, such as fishing line.

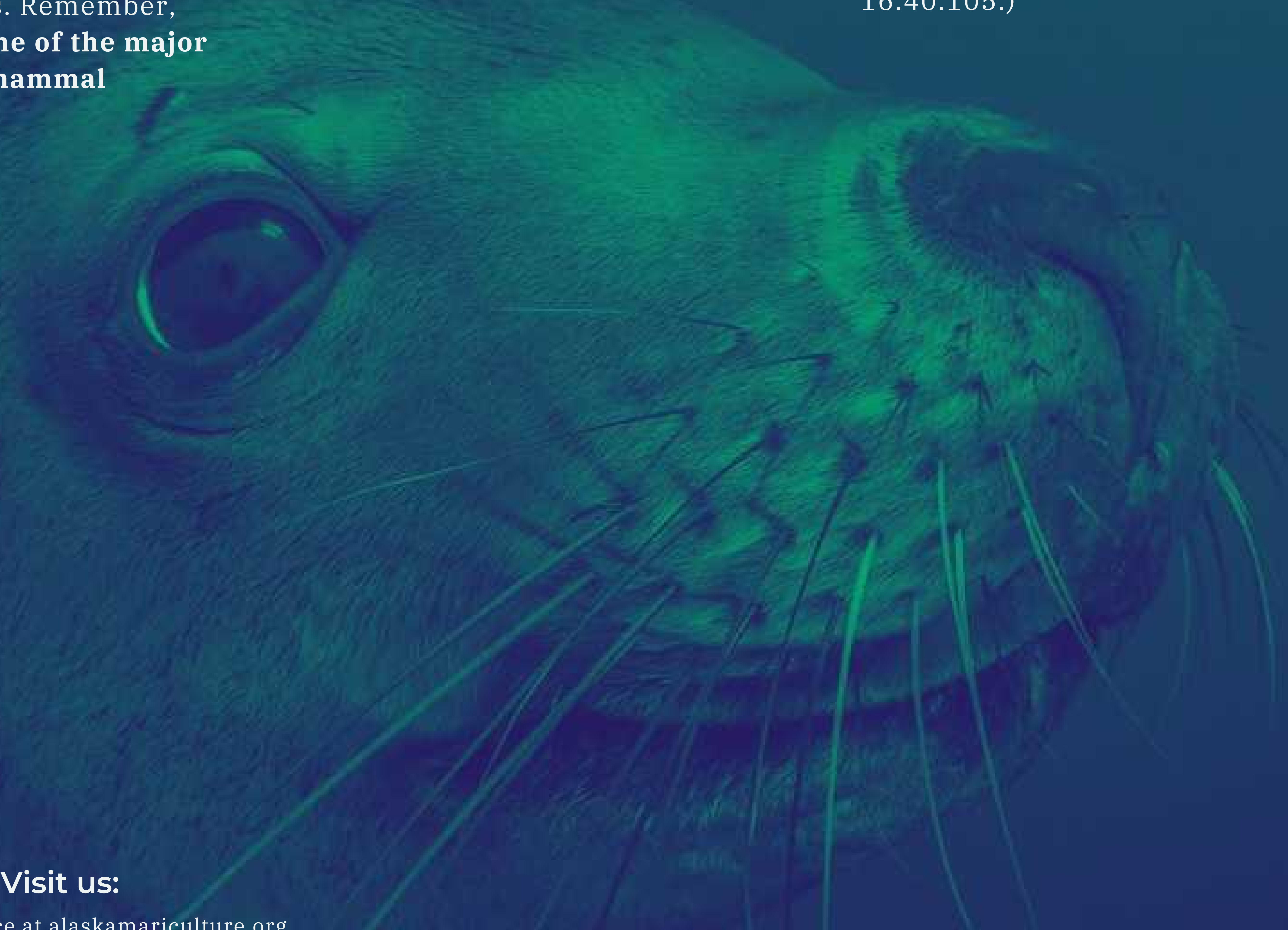
This will limit an animal's movement, weigh it down, and can result in serious injury or mortality.

It is possible for a marine mammal to become entangled in mariculture gear in Alaska. While currently there are no documented reports of marine mammal interactions with mariculture farms in Alaska, mariculture gear poses an inherent entanglement risk to marine mammals.

The level of entanglement will depend on where and how much mariculture gear exists in sensitive areas, the type of gear in the water, and the dynamics and behavior of the marine mammal populations in the area.

There are a number of ways we can all keep marine mammals free from mariculture gear!

- **Consciously and consistently maintain your aquatic farm.** Most mariculture gear needs to be under tension to maintain location and prevent snarling of equipment, which also helps prevent entanglement. Proper tension will depend on consistent maintenance and could be impacted by storms. Remember, **marine debris is one of the major causes of marine mammal entanglement!**
- **Carefully consider site suitability for an aquatic farm.** The permitting process for a farm site requires that overlap between potential mariculture sites and marine mammal habitat is examined for impact before a lease is issued.
- **Get familiar with the statutes, regulations, policies, and guidelines that are in place** to protect wildlife or their habitats "from being significantly impacted" by mariculture farms. (Sec. 16.40.105.)



Always report entangled, injured, or stranded marine mammals to the right source!

NOAA Fisheries Stranding Hotline:
(877) 925-7773

Alaska SeaLife Center:
(888) 774-7325

Want to learn more? Visit us:

The Alaska Mariculture Alliance at alaskamariculture.org

See also NOAA Fisheries' recommended best management practices to minimize impacts to marine mammals and mariculture farms.

Photo Courtesy of Dmitry Kokh

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Photo Courtesy of Dmitry Kokh

Partners make this project possible:

University of Alaska
Principal Investigator: Dr. Michael Stekoll, UAF

Woods Hole Oceanographic Institute

Blue Evolution

Kodiak Island Sustainable Seaweed

Kodiak Kelp Company

TendOcean

C.A. Goudey and Associates

GreenWave

Alaska Fisheries Development Foundation

F/V Savage

Kelson Marine

University of Connecticut

Marine Biological Laboratory, Woods Hole Oceanographic Institute

Thank you to all of the partners that make this work possible!

Learn more about research on seaweed production at-scale:

Hauke L. Kite-Powell, Erick Ask, Simona Augyte, David Bailey, Julie Decker, Clifford A. Goudey, Gretchen Grebe, Yaoguang Li, Scott Lindell, Domenic Manganelli, Michael Marty-Rivera, Crystal Ng, Loretta Roberson, Michael Stekoll, Schery Umanzor & Charles Yarish (2022) Estimating production cost for large-scale seaweed farms, Applied Phycology, 3:1, 435-445, DOI: 10.1080/26388081.2022.2111271

Lean more about ARPA-E and the Kodiak project:

Kelp Cultivation: Lessons from Kodiak

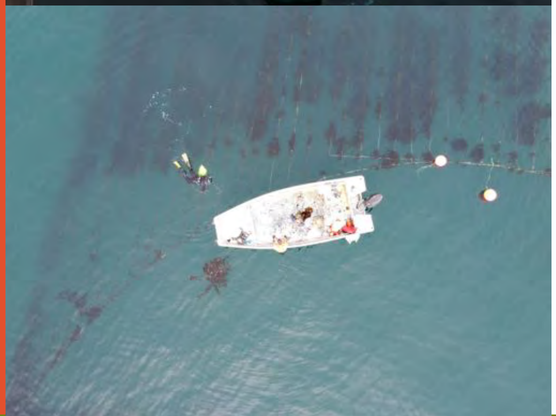
U.S. Department of Energy
Advanced Research Projects Agency-Energy (ARPA-E)
Macroalgae Research Inspiring Novel Energy Resources (MARINER)

Project Background

Led by the University of Alaska Fairbanks, this 4-year project focused on the integrated cultivation and harvest system design of kelp farms with the goal to increase efficiency and/or reduce costs. This project was funded by the U.S. Dept. of Energy (DOE), Advanced Research Projects Agency-Energy (ARPA-E) which is interested in the scalable production of macroalgae for potential future use as a biofuel.

The intent of this project was to design replicable farms that are cost-effective systems for growing sugar kelp. Through innovative technology and practical solutions, the project team's objective was to reduce costs associated with kelp farming. Test sites for this project were identified in New England and Kodiak, Alaska.

The first outplanting at the Kodiak farm site took place in the fall of 2019. Since then, the project team has learned a lot about growing kelp! The goal of the project is to integrate all aspects of kelp farming into the test site. From seed production to harvest and reseeding, these efforts look at the many ways we can best grow sugar kelp in Alaska's productive waters. There is still more to come with this project! This is a fist look at some of the techniques and gear used at the Kodiak farm site.



Farm system: Catenary Array

Designed by Cliff Goudey at TendOcean, the catenary array is designed to maintain tension across a farm structure. This design has been used at the demonstration site in Kodiak. Although the diagram below, provided by project partner GreenWave, is not an exact rendition of the array in Kodiak, it generally depicts the catenary array design.

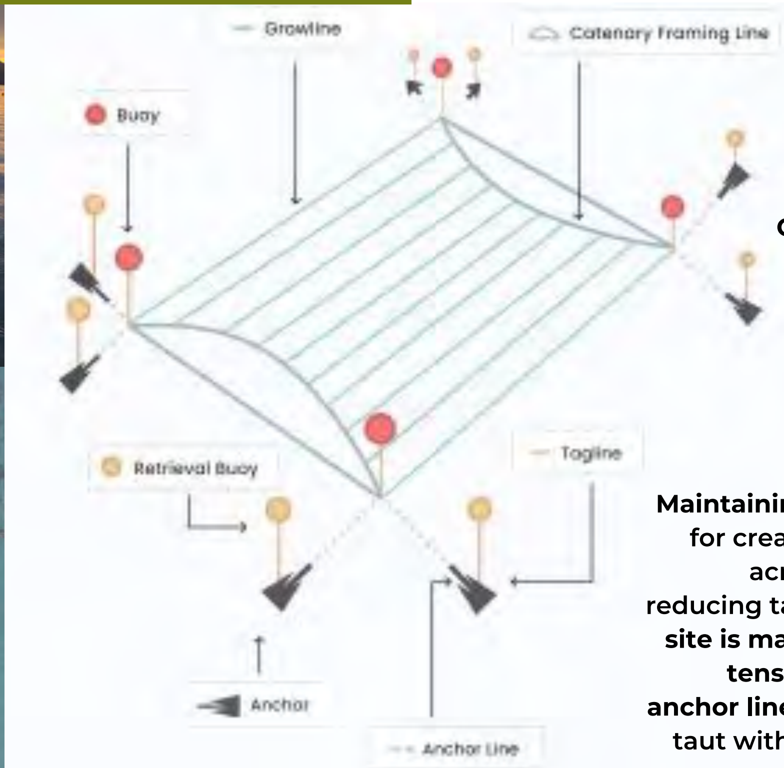
The Kodiak site includes three different buoy types (not all depicted in the diagram):

Polyform A-5: 10 x $252 = $2,520

Polyform A-2: 15 x $72 = $1,080

Spar Buoys: 4 x $2000 = $8,000

Where the polyforms act as retrieval buoys, the more dynamic spar buoys frame the farm array. Distance between buoyancy is approximately 100 ft.



C-links: 220 x $4 = $880
These c-links (not pictured) provide connections between the lines on the array where needed.

Maintaining tension is important for creating consistent growth across the array as well as reducing tangling. **Tension at this site is maintained with deadeye tensioners on each of the 8 anchor lines.** The system is pulled taut with the help of hydraulics.

Site Overview

Location: Kodiak, Alaska

Area: 17 acres

Current speed: ~0.5 knots

Bottom type: soft

Depth: 55-80 feet

High nutrient levels: >5 umol nitrate (most of the season)

Not exposed to ocean swell (fetch is ~10 miles)

Seed

The cost of seed depends on the hatchery and the transportation costs. For this project, seed was $1/ft which totaled around $44,000 for the entire array.

Generally, outplanting occurs between end of October and middle of November.

Yield

Max: 19 lbs/ft, from subsampling

Average: 4.8 lbs/ft, average across the entire farm

Typically, the kelp is harvested in early May.

Total annual harvest: from 100,000 to 170,000 lbs

Mariculture and Fishing: Complementary Industries

Will mariculture activity interfere with fisheries?

By state law, aquatic farm locations cannot conflict with established fishing activity.

- Established uses, including fishing, have priority over proposed farm sites. (5 AAC 41.240).
- Before approving a lease and operation permit application, agencies seek input on the proposed farm site from local fishery managers, local organizations, and the general public.
- In some cases, conflicts can be mitigated, for example farms can remove most buoys and other structures prior to the fishing season if there is an expected hindrance to the fishery.

Aquatic farms may even benefit fishing areas...

Acting as cover from prey species, kelp farms may attract forage fish and invertebrates eaten by the fishery's target species. Find out more by checking out the *Benefits of Alaska's Growing Mariculture Industry* fact sheet!

In fact, the seasonality of aquatic farming presents an opportunity to both farm and fish:

- Commercial fishing boats adapt well to kelp farming or working with oyster gear.
- Most work on kelp farms takes place during the shoulder season of commercial salmon fisheries (kelp is outplanted in the fall and harvested in the spring) while most work on oyster farms is during the summer, making it compatible with winter fisheries.
- Mariculture is a unique opportunity for tourism. For example, in Maine, many oyster farmers give tours of their farms and share their products with visitors. Integrating mariculture and tourism can benefit both industries by increasing sales and creating connections between the mariculture industry and Alaska's visitors!

Mariculture also presents new market opportunities

- The market is growing. Buyers of kelp are incorporating it into food ingredients (e.g., salsa and spices) and beauty products. Products in development include animal feed, biostimulants, and compostable plastics.

Want to learn more? Visit us:

The Alaska Mariculture Alliance at alaskamariculture.org

Photo Courtesy of Alaska Sea Grant

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fisheries.noaa.gov/alaska/aquaculture/alaska-region-aquaculture

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Alaska Aquaculture Permitting Portal
http://akaquaculturepermitting.org/

Alaska Mariculture Training & Research Center

ALASKA MARICULTURE RESEARCH & TRAINING CENTER

amrtc.org

AFDF
Alaska Fisheries Development Foundation, Inc.

ALASKA MARICULTURE ALLIANCE

Photo Courtesy of Alaska Sea Grant

Shellfish Farming on Alaska's Coast: Exploring Scale

What do we mean when we say 'scaling up'?

As scale relates to shellfish farming and cultivation in Alaska, it is a question of appropriate number or density of shellfish for a given farm within a local ecosystem.

We want to know the largest amount of shellfish a farm can produce in a given lease area without causing significant harm to the surrounding environment.

Thinking about scale brings up questions like...

1. What is an appropriate size for a shellfish farm in Alaska?
2. Farmed shellfish like oysters eat phytoplankton just like native shellfish... will farmed shellfish out-compete the locally present species?
3. Is there an ecological or social threshold, or carrying capacity, for successful operations?
4. How do we minimize risk of Pacific oysters entering or integrating with the nearshore environment in Alaska?

The answers to these questions are specific to location...

The point at which cultivated shellfish in an area would drastically change the balance of an ecosystem is very site specific. Characteristics like farm size and ecosystem area size really matter.

Here in Alaska, most shellfish mariculture sites are relatively small (on average around 13 acres) compared to the bays, inlets, straits, and waterbodies they are located in so **there is not an immediate concern of resource depletion or outcompeting other organisms that eat phytoplankton.**

In addition, state regulations minimize the amount of surface area within a bay that may be leased to aquatic farms to 1/3 or less of a bay, bight, or cove (11 AAC 63.050).

What about shellfish farms in other parts of the ocean?

There are some studied locations, such as Tracadie Bay, Prince Edward Island, Canada and the Ría de Arousa in Spain, where the size and prevalence of shellfish farming has altered the surrounding ecosystems.

However, the relative scale at which shellfish farming takes place in Alaska is small. **Potential impacts can be identified and prevented under the current permitting process requirements**, which provide for public comment and agency scrutiny for proposed sites.

Alaska has over 30,000 square miles of shoreline.

Currently, authorized aquatic farms (shellfish and aquatic plant farms) only make up around 1,200 acres of Alaska's waters, which is roughly 2 square miles.

While not all of the state's shoreline area will be suitable for aquatic farms, Alaska has a large ocean space relative to other places for marine activities, such as mariculture, to take place.

Want to learn more? Visit us:
The Alaska Mariculture Alliance at alaskamariculture.org

Photo Courtesy of Alaska Seafood

Want to learn more or get involved in mariculture? Visit us:

Alaska Mariculture Alliance
alaskamariculture.org

Alaska Fisheries Development Foundation
afdf.org/projects/current-projects/alaska-mariculture-initiative/

Alaska Department of Natural Resources
dnr.alaska.gov/mlw/aquatic/

NOAA Fisheries
fisheries.noaa.gov/alaska/aquaculture/alaska-region-aquaculture

Want training on kelp or oyster farming? Or information on the application process for an aquatic farm lease?

Alaska Sea Grant
https://alaskaseagrant.org/our-work/aquaculture/

Alaska Aquaculture Permitting Portal
http://akaquaculturepermitting.org/

Alaska Mariculture Training & Research Center

ALASKA MARICULTURE RESEARCH & TRAINING CENTER

amrtc.org

AFDF
Alaska Fisheries Development Foundation, Inc.

ALASKA MARICULTURE ALLIANCE

Photo Courtesy of Alaska Seafood

Program Transfer Agreement

This is a Program Transfer Agreement ("Agreement") entered into this 1st day of January 1 2023, between Bering Sea Fishermen's Association ("BSFA"), an Alaska nonprofit corporation with its principal place of business at 821 N Street, Anchorage, AK 99501, and Alaska Fisheries Development Foundation ("AFDF"), an Alaska nonprofit corporation with its principal place of business at 120 Third Street, Wrangell, AK 99929. BSFA and AFDF are collectively referred to herein as "the Parties."

Background

A. BSFA is a nonprofit corporation that works to support 128 healthy and vibrant fishing communities by fostering greater social, financial, and political capacity to access, sustainably develop, and protect fisheries in the Arctic, Yukon, Kuskokwim, and Bristol Bay regions of Alaska. In line with that mission, it supports component programs that further its charitable goals.

B. The Alaska Ocean Cluster ("Program") is a component program of BSFA. Founded in 2017, AOC has been supported by BSFA with the financial assistance of the Economic Development Administration's Build to Scale Program. AOC operates in accordance with the policies and procedures of BSFA.

C. AFDF is a nonprofit corporation that represents harvesters, processors, and support sector businesses in the Alaska seafood industry. Its mission is to identify common opportunities in the Alaska seafood industry and to develop efficient, sustainable outcomes that provide benefits to the economy, environment and communities. AFDF is exempt from federal income tax under Section 501(c)(3) of the Internal Revenue Code ("Code").

D. In furtherance of their tax-exempt purposes, BSFA wishes to transfer to AFDF, and AFDF wishes to accept from BSFA the Program the terms set out in this Agreement.

BSFA and AFDF agree as follows:

1. Transfer of Program

1.1 Program Assets

On the Effective Date (as defined in Section 2.1), BSFA will transfer to AFDF all of BSFA's right, title, and interest in and to the assets listed on **Exhibit A** ("Program Assets").

2. Effective Date of Transfer

2.1 Effective Date

The transfer of the Program Assets and assumption of Program Liabilities will take place on January 1, 2023.

3. Representations and Warranties of BSFA

BSFA represents and warrants to AFDF as follows:

3.1 Authority; Binding Nature of Agreement
BSFA has the requisite corporate power and authority to enter into this Agreement and to carry out the transactions contemplated by this Agreement. The execution and delivery of this Agreement has been duly authorized by all requisite corporate action on the part of BSFA. This Agreement, assuming it constitutes the valid and binding obligation of AFDF, constitutes the valid and binding obligation of BSFA, enforceable against BSFA in accordance with its terms, subject to laws: (a) relating to bankruptcy, insolvency and the relief of debtors; and (b) governing specific performance, injunctive relief, and other equitable remedies.

3.2 No Conflict
Neither the execution and delivery of this Agreement by BSFA nor the consummation by BSFA of the transactions contemplated by this Agreement will: (a) result in a violation by BSFA of any provision of the articles of incorporation or bylaws of BSFA; (b) result in a violation by BSFA or entitle the other party to terminate any contract included in Program Assets, [except as described in Schedule 4.3]; or (c) result in a violation by BSFA of any law or governmental regulation applicable to BSFA, except, in each of (a), (b), and (c), where such violation or termination would not have a material adverse effect on the Program.

3.3 Title to and Condition of Assets
BSFA has good title in all Program Assets, free and clear of liens.

3.4 Litigation
As of the date of this Agreement, there is no lawsuit or other legal proceeding relating to Program pending (or, to the knowledge of BSFA, being overtly threatened in writing) against BSFA before any court of competent jurisdiction or arbitrator.

3.5 No Additional Representations or Warranties
BSFA provides Program Assets to AFDF on an "as is" basis and makes no further representation or warranty of any kind, express or implied, relating to Program Assets, including without limitation, implied warranties of the condition, quality, merchantability, fitness for any particular purpose, collectability, non-infringement, or enforceability of any Program Assets.

4. Representations and Warranties of AFDF

AFDF represents and warrants to BSFA as follows:

4.1 Authority; Binding Nature of Agreement
AFDF has the requisite corporate power and authority to enter into this Agreement and to carry out the transactions contemplated by this Agreement. The execution and delivery of this Agreement has been duly authorized by all requisite corporate action on the part of AFDF. This Agreement, assuming it constitutes the valid and binding obligation of BSFA, constitutes the valid and binding obligation of AFDF, enforceable against AFDF in accordance with its terms, subject to laws: (a) relating to bankruptcy, insolvency and the relief of debtors; and (b) governing specific performance, injunctive relief, and other equitable remedies.

4.2 No Conflict

Neither the execution and delivery of this Agreement by AFDF nor the consummation by AFDF of the transactions contemplated by this Agreement will: (a) result in a violation by AFDF of any provision of the articles of incorporation or bylaws of AFDF; (b) result in a violation by AFDF or entitle the other party to terminate any contract to which AFDF is a party; or (c) result in a violation by AFDF of any law or governmental regulation applicable to AFDF, except in each case where such violation or termination would not have a material adverse effect on AFDF or Program.

4.3 Litigation

As of the date of this Agreement, there is no lawsuit or other legal proceeding relating to AFDF or Program pending (or, to the knowledge of AFDF, being overtly threatened in writing) against AFDF before any court of competent jurisdiction or arbitrator.

5. Covenants

5.1 Program Branding and Materials

After the Effective Date, AFDF will ensure that all Program materials and external communications, including without limitation any website, letterhead, logo, registration forms, grant proposals, fundraising solicitations, donation acknowledgments, and contracts, do not indicate that Program is a sponsored Program of BSFA. BSFA may, in its public materials, describe Program as a former Program of BSFA. For clarity, AFDF may use and disclose Program's historical financial information and donor lists in furtherance of its mission and operations.

5.2 Administrative Responsibilities

After the Effective Date, AFDF will be solely responsible for all reporting and for performing all accounting, payroll, and credit card processing functions for the Program.

5.3 Confidentiality

Except as may be required by law, neither AFDF nor BSFA will use or disclose to any third party any confidential or proprietary information provided by the other, including without limitation information about Program Employees, trade secrets and proprietary information, budget and other financial data, Program plans and strategies, technical data and research, and know-how ("Confidential Information"), for any purpose other than carrying out its obligations under this Agreement, without first having obtained the prior written consent of the disclosing party. Confidential Information does not include information that is generally available to the public, information already known by the receiving party before entering into this Agreement, or information the receiving party independently develops.

5.4 Public Disclosures

BSFA and AFDF will consult and agree on a joint press release announcing the transfer of the program which will occur in the first half of 2023. Following this press release, neither party is required to consult, coordinate, or agree on any public disclosure mentioning the Program beyond the confidentiality covenants in Section 5.

6. Indemnification

6.1 Survival of Representations and Warranties

All representations and warranties of BSFA and AFDF contained in this Agreement will terminate and expire on, and will cease to have any further force or effect following, the 18-month anniversary of the Effective Date.

7. General Provisions

7.1 Entire Agreement

This Agreement, together with its exhibits, expresses BSFA's and AFDF's final, complete, and exclusive agreement, and supersedes any and all prior or contemporaneous written and oral agreements, arrangements, negotiations, communications, course of dealing, or understanding between BSFA and AFDF relating to its subject matter.

7.2 Amendment

This Agreement may be amended only as stated and by a writing signed by both BSFA and AFDF which recites that it is an amendment to this Agreement.

7.3 Severability

If any provision of this Agreement is held illegal, invalid, or unenforceable, all other provisions of this Agreement will nevertheless be effective, and the illegal, invalid, or unenforceable provision will be considered modified such that it is valid to the maximum extent permitted by law.

7.4 Notices

Notices, approvals, and consents under this Agreement must be in writing and delivered to BSFA and AFDF by mail, courier, fax, or email to the contact persons identified on the signature page.

7.5 Governing Law; Jurisdiction

This Agreement is governed by Alaska law. AFDF and BSFA consent to the exclusive jurisdiction of the state and federal courts for the Municipality of Anchorage, Alaska.

7.6 Counterparts

This Agreement may be executed in one or more counterparts, each of which will be deemed an original and all of which will be taken together and deemed to be one instrument. Transmission by fax or PDF of executed counterparts constitutes effective delivery.

* * * * * * * * * *

This Agreement was signed by the parties as of the date stated in its first paragraph:

Bering Sea Fishermen's Association

Signature

Name: Karen Gillis

Title: Executive Director

Date: January 1, 2023

Alaska Fisheries Development Foundation

Signature

Name: Julie Decker

Title: Executive Director

Date: January 1, 2023

Exhibits

Exhibit A: Project Assets

Exhibit B: *Memorandum of Understanding between Bering Sea Fishermen's Association and Alaska Fisheries Development Foundation* (Signed September 26th, 2022)

Exhibit A

Project Assets

Tangible property
1. Any equipment, servers, computers, software installed on such computers (including the related licensing and support agreements for the use of such software), materials, supplies, furniture, or furnishings purchased with Project funds and used exclusively for the Project.

Intellectual property

1. Project's trademarks, and logos
2. Project's website domain name, content, and URL: https://www.alaskaoceancluster.com/
3. Goodwill exclusive to the Project
4. Project's digital and social media accounts, including the following:
   - Facebook: https://www.facebook.com/AlaskaOceanCluster/
   - Twitter: https://twitter.com/akoceancluster
   - LinkedIn: https://www.linkedin.com/company/alaskaoceancluster/
   - Instagram: https://www.instagram.com/alaskaoceancluster/?hl=en
   - Others: YouTube, Mailchimp, WordPress, Zoom, Canva, EventBrite, Salesforce, Asana, Box, Monday, Affinity
   - Subscriptions: IntraFish, SeafoodSource, UnderCurrent News

Contracts
1. Website hosting agreement with SunDog Media

Books and records
1. Program and financial records, donor list and contribution history, contact database, correspondence, and other documents relating exclusively to the Project
2. Newsletters, brochures, mailing lists, marketing materials, fundraising materials, handbooks, and other written materials used exclusively for Project

Exhibit B

Memorandum of Understanding between Bering Sea Fishermen's Association and Alaska Fisheries Development Foundation (Signed September 26th, 2022)

(Begins on the following page.)

MEMORANDUM OF UNDERSTANDING

BETWEEN

BERING SEA FISHERMEN'S ASSOCIATION

AND

ALASKA FISHERIES DEVELOPMENT FOUNDATION

1. **Parties.** This Memorandum of Understanding ("MOU") is made and entered into this 26th day of September, 2022 (the "Effective Date") between Bering Sea Fishermen's Association (BSFA), an Alaska nonprofit corporation with its principal place of business at 821 N Street, Anchorage, AK 99501, and Alaska Fisheries Development Foundation, Inc. (AFDF), an Alaska nonprofit corporation with its principal place of business at 120 Third Street, Wrangell, AK 99929. BSFA and AFDF are hereinafter referred to individually by name or collectively as "the Parties."

2. **Purpose.** The purpose of this MOU is to provide the cornerstone and structure for a future binding agreement by which the Alaska Ocean Cluster (AOC) program will be transferred from BSFA to AFDF, including all program assets and liabilities.

3. **Key Terms.** The following are the key terms BSFA and AFDF agree to:

    - ***Program transfer.*** BSFA will transfer to AFDF the Alaska Ocean Cluster, a component program of BSFA dedicated to accelerating technological innovations that benefit Alaska's Blue Economy, including all assets and liabilities.

    - ***Award transfer.*** Pending EDA approval, BSFA will transfer to AFDF its 2020 EDA Build to Scale Industry Challenge Award, which currently supports the Alaska Ocean Cluster. AFDF will sponsor the program until December 31, 2023, when the award expires. At the end of the award period, AFDF retains the right to continue/discontinue the program.

    - ***Intellectual property transfer.*** BSFA will transfer to AFDF all intellectual property, including domains, websites, logos, social media accounts, electronic and physical documents, and all other materials necessary to continue program operations. BSFA will renounce any and all future claims to "Alaska Ocean Cluster," "Blue Pipeline Venture Studio," "Blue Pipeline," "Blue Storm," and "Ocean Tuesdays." AFDF is not bound to use "Alaska Ocean Cluster," "Blue Pipeline Venture Studio," or "Blue Pipeline" in marketing the program.

    - ***Member companies.*** AFDF will continue to support the program's existing member companies, including: Blue Ocean Gear Inc, SafetyNet Technologies Ltd, PolArctic LLC, OpenTug LLC, Saildrone Inc, AlaSkins LLC, Noble Ocean Farms LLC, Foraged & Found LLC, Blue Dot

Kitchen SPC., Net Your Problem LLC, Jig Jug Tackle Organization LLC, Ivaldi Group Inc., Beadedstream Inc., and Alaska Salmon Fertilizer LLC.

- ***Special projects.*** AFDF will continue to support AOC's Special Projects including formal and informal partnerships with Seafood Harvesters of America, University of Alaska Fairbanks Department of Mechanical Engineering, and Sandia National Laboratories, among others.

- ***Key persons.*** AFDF will continue to employ key program personnel and contractors.

- ***Advisory Committee***. AFDF and AOC staff will form an advisory committee to align program activities with AFDF priorities. By identifying industry priorities, the committee will empower program staff and contractors to more effectively recruit and work with member companies to meet industry needs.

4. **Confidential Information.** Neither party is obligated to share Confidential Information under this MOU. If either Party does share Confidential Information, the receiving party agrees to hold such Confidential Information in trust and confidence, and will not use the Confidential Information without the disclosing party's prior consent. "Confidential Information" means any information learned by the receiving party from the disclosing party that is not available to the public concerning any matters relating to the business of the disclosing party, and any information a reasonable person would understand, based on the nature of the information and the circumstances of disclosure, to be confidential.

5. **Term and Termination.** This MOU will be effective from the Effective Date and will continue until terminated as set forth in this Section (the "Term"). Either party may terminate this MOU at any time, for any reason or no reason, upon notice to the other party. Obligations of confidentiality survive for five (5) years from the date of termination.

6. **Non-Binding Agreement.** Except for Section 4 (Confidential Information) which is binding, this MOU is intended to facilitate discussion and collaboration and does not create a legally binding or financial obligation on either party.

(Signatures on the following page.)

The parties have read and accepted all terms of the Memorandum of Understanding.

AGREED TO:

Bering Sea Fishermen's Association

Signature

Name: Karen Gillis

Title: Director

Date: 9/26/22

Signature

Name: Karen M Hadley

Title: Secretary/Treasurer

Date: 9/26/22

Alaska Fisheries Development Foundation

Signature

Name: Markos Scheer

Title: President

Date: 9/26/2022

Signature

Name: Julie Decker

Title: Executive Director

Date: 9/27/22

Submitted abstract for film showing at American Fisheries Society Alaska Chapter Meeting

March 27th 2023, at 7pm, Morris Thompson Center, Fairbanks, Alaska

Film Contact First and Last Name: Benjamin Americus

Film Contact Organization: Alaska Fisheries Development Foundation

Film Contact Email: bamericus@afdf.org

Film Name: Five Years Before the Mast: Sights, sounds, and smells from Alaska hatchery research fieldwork

Film Description: Every spring, hundreds of millions of juvenile Pink Salmon migrate from estuaries in Prince William Sound to marine waters. Some of these fish come from wild streams and others from hatcheries. A year and a half later, millions of fish return to estuaries in Prince William Sound as adults, however not all of these fish return to their site of origin. Some, whether by mistake or intention, travel up unknown streams to spawn in a phenomenon known as straying. In 2013, the Prince William Sound Science Center, contracted by the Alaska Department of Fish and Game, began collecting salmon carcasses for a decade-long study into the extent and effects of straying hatchery salmon. This film takes us to spawning grounds in Prince William Sound for the first five years of this work. You will experience the sights, sounds, and smells of Alaska's pink salmon runs and meet some of the rugged individuals who collected tissue samples from over 250,000 salmon carcasses in the remote, perilous corners of Prince William Sound.

Film Length: 5 minutes.

Submitted abstract for presentation at the American Fisheries Society Alaska Chapter Meeting

March 26–31, 2023, Westmark Conference Center, Fairbanks, Alaska

Title: Sustainability certification of Alaskan fisheries

Benjamin E. Americus bamericus@afdf.org Alaska Sea Grant Fellowship*
Hannah M. Wilson wilsonh@afdf.org Alaska Fisheries Development Foundation
Thomas M. Sheridan tmsheridan@alaska.edu Alaska Blue Economy Center
Julie K. Decker jdecker@afdf.org Alaska Fisheries Development Foundation

Seafood sustainability certifications are used to inform consumers of environmentally friendly options. The most widely recognized certification comes from the Marine Stewardship Council (MSC) and appears as a blue check mark on packaging. MSC has certified over 400 fisheries globally, including Alaskan salmon, the second fishery in the world to be certified. In Alaska, Responsible Fisheries Management (RFM) is an alternative sustainability auditor that certifies Alaskan salmon as well as flatfish, pollock, crab and cod. Since 2010, major retailers in the United States and Europe including Costco, Walmart, and Whole Foods have transitioned to purchasing certified sustainable seafood, making MSC/RFM certification is increasingly important to Alaskan fisheries.

MSC and RFM recertification occurs on a five-year cycle. During recertification, the “client group” representing the fishery, facilitates meetings between MCS and RFM assessment teams and management biologists. Since 2019, the Alaskan Fisheries Development Foundation (AFDF) has served as the client group for Alaska salmon. In past years, MSC has certified Alaskan salmon with conditions to be addressed on the sustainability of pink and chum hatchery programs and the possibility for murrelet bycatch in gillnets. To address these conditions for the 2024 reassessment, AFDF collaborated with state and federal biologists to 1.) prepare a synthesis of results from the Alaska Hatchery Research Project, and 2.) perform an Ecological Risk Assessment on seabird bycatch risk in gillnet fisheries.

AFDF also serve as the client group for MSC and RFM certification of Pacific cod, and RFM certification of halibut and sablefish. Sustainability certification, whether by MSC, RFM, or other agencies, incentivizes fisheries research and adds value to Alaskan seafood. AFDF fills a necessary role in this process.

Alaska Hatchery Research Program Synthesis, 2022

for MSC/RFM Sustainability Certification, December 12–14, 2022

Prepared by the Alaska Fisheries Development Foundation

Benjamin Americus, Tommy Sheridan, Julie Decker

With Review by the Alaska Department of Fish and Game

Cover photo: Pink Salmon in Vanishing Creek in Northern Prince William Sound, Alaska. September 2015. Photo By Benjamin Americus

Glossary of Terms

- ADF&G: Alaska Department of Fish and Game
- AHRP: Alaska Hatchery Research Program

- PWS: Prince William Sound
- PWSAC: Prince William Sound Aquaculture Corporation
    - AFK: Armin F. Koernig Hatchery
    - CCH: Cannery Creek Hatchery
    - WNH: Wally Noerenberg Hatchery
- VFDA: Valdez Fisheries Development Association
    - SGH: Solomon Gulch Hatchery
- NSRAA: Northern Southeast Regional Aquaculture Association
- SSRAA: Southern Southeast Regional Aquaculture Association
- DIPAC: Douglas Island Pink and Chum Incorporated
- AKI: Armstrong-Keta Incorporated

- pHOS: Proportion of hatchery-origin strays
- RS: Reproductive success
- RRS: Relative reproductive success
- F_{ST}: Fixation index. A metric of genetic differentiation between populations
- SNP: Single nucleotide polymorphism.
- Stray: A fish that returns as an adult to a different location from where it was born. In this document we use "strays" to describe recipient strays that add to the population of a stream rather than donor strays that are lost to other populations.
- Wild origin fish: A fish that is born in a wild/natural stream, not a hatchery. We use this term irrespective of the hatchery/wild status of preceding generations.

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Abstract

In Alaska, most hatchery salmon production occurs with Pink Salmon in Prince William Sound and Chum Salmon in Southeast Alaska. These hatcheries are operated by private non-profit organizations and follow state regulations to minimize impact to wild populations. State law requires use of local broodstock and selection of release sites away from significant wild populations, among other measures. In both Prince William Sound (PWS) and Southeast Alaska (SEAK), hatchery-origin strays have been observed in wild populations. Straying is a natural component of salmon biology but straying of hatchery-origin fish raises concerns of potential introgression of maladapted traits into wild populations. To address these concerns, the Alaska Department of Fish and Game and hatchery operators began the Alaska Hatchery Research Program (AHRP) in 2011. The AHRP seeks to understand the impact of straying hatchery fish on wild populations by assessing (1) the baseline genetic stock structures and evidence of introgression, (2) the extent of and variability of straying, and (3) the effect of straying on salmon fitness. This document synthesizes and contextualizes the findings of the AHRP and is organized by these three research questions.

The AHRP found significant, but shallow genetic differences among wild populations of Pink Salmon in PWS and Pink and Chum Salmon in SEAK, consistent with patterns found for these species in other areas of similar geographic size. Hatchery-origin strays were found at variable proportions among streams (with highest proportions near release sites) in both regions, with regional averages ranging from 0.05 to 0.15 for Pink Salmon and 0.03 to 0.09 for Chum Salmon in PWS and 0.03 to 0.06 for Chum Salmon in SEAK. Finally, hatchery-origin Pink Salmon strays produced, on average, about half as many offspring that returned to the stream as wild-origin fish did, with high variability among streams, sexes, and years. We discuss potential mechanisms that may explain this fitness discrepancy and potential management strategies to reduce the extent and negative impacts of straying hatchery-origin fish. The AHRP is an ongoing work, thus the conclusions made here are preliminary.

Introduction

History of Hatcheries in Alaska

The first salmon hatchery in Alaska was constructed for Sockeye Salmon enhancement at Kutlakoo Creek on Kuiu Island in 1892 (Hunt, 1976). This site, independently run and short-lived, was followed by a dozen federally and territorially operated hatcheries in the early 1900s. Poor hatchery practices and infrastructure failure kept returns low, and all Alaskan hatchery work was discontinued by the late 1930s (Roppel, 1982). Between the late 1940s and 1960s, there were small hatchery releases by territorial/state hatcheries and federal research hatcheries (Roppel, 1982). Following historically low commercial salmon harvests in the 1950s and 1960s, the Alaska Legislature established the Division of Fisheries Rehabilitation, Enhance and Development (FRED) within Alaska Department of Fish and Game (ADF&G) in 1971 to revisit fish culture practices. The overarching goal of the program was to enhance salmon fisheries while minimizing adverse impacts on wild stock production. In the 1974 Private Non-Profit Hatchery Act, the Alaska legislature stated that “the program shall be operated without adversely affecting natural stocks of fish in the state and under a policy of management which allows reasonable segregation of returning hatchery-reared salmon from naturally occurring stocks” (Snow, 1991).

Along with ADF&G biologists, a broad consortium of experts from other regulatory agencies, the University of Alaska, and fishermen's associations collaborated to formulate guidelines and policies for the development of Alaska’s modern hatchery program throughout the 1970s and 1980s. Above all else, this consortium was charged with the development of a program that intended to supplement and not replace wild salmon fisheries (McGee, 2004). Policies and regulations were enacted to specifically protect wild stocks from potential negative effects of hatchery activities. According to McGee (2004), the protection of wild salmon stocks in Alaska is accomplished through (1) a rigorous hatchery permitting process that includes review by experts in the fields of genetics, fish pathology, and fishery management; (2) policies that require the placement of hatcheries away from significant wild stocks; (3) use of local brood stocks; (4) legal mandates requiring wild stock prioritization in fishery management; (5) requirements for the tagging and marking of hatchery-produced fish; and (6) requirements for special studies on interactions between hatchery and wild fish, as necessary.

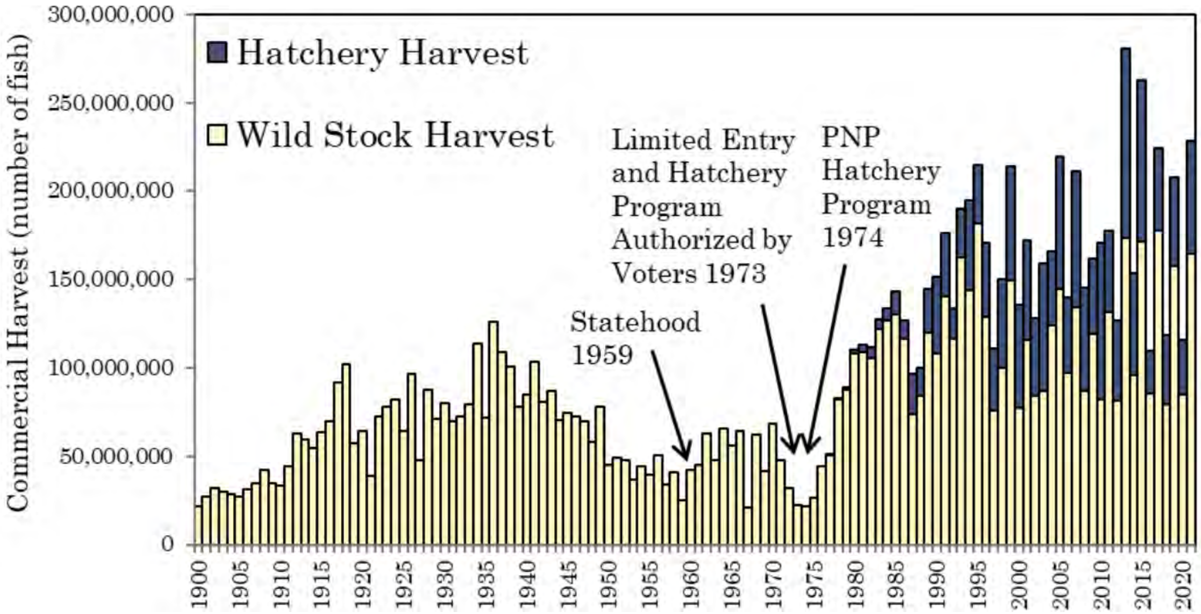

Figure 1. Commercial salmon harvest in Alaska, 1900–2021. From Wilson, 2022.

The State of Alaska funded and oversaw the construction of 18 hatcheries between 1969 and 1983. Starting in 1974, the legislature allowed hatcheries to be operated by private, non-profit (PNP) corporations with State permitting and oversight (Fig. 1). As of 2021, there were 30 production hatcheries operating in Alaska, 26 of which were operated by PNPs. Non-PNP hatcheries include two sport fish hatcheries operated by ADF&G, one research hatchery at Little Port Walter operated by the National Marine Fisheries Service, and one production hatchery operated by the Metlakatla Indian Community. Statewide annual hatchery releases from 1995 to 2021 range from 1.3–1.8 billion fish, mostly consisting of Pink Salmon (*Oncorhynchus gorbuscha)* from Prince William Sound (0.5–0.8 billion) and Chum Salmon (*Oncorhynchus keta*) from Southeast Alaska (0.3–0.6 billion) (NPAFC, 2022; Fig. 2; Table 1; Table 2). Canada, Japan, Korea, and Russia also operate production salmon hatcheries, with the largest contributions coming from Japanese and Russian Chum Salmon (1.4–2.0 billion fish) and (0.2–1.0 billion), respectively, since 1995 (NPAFC, 2022).

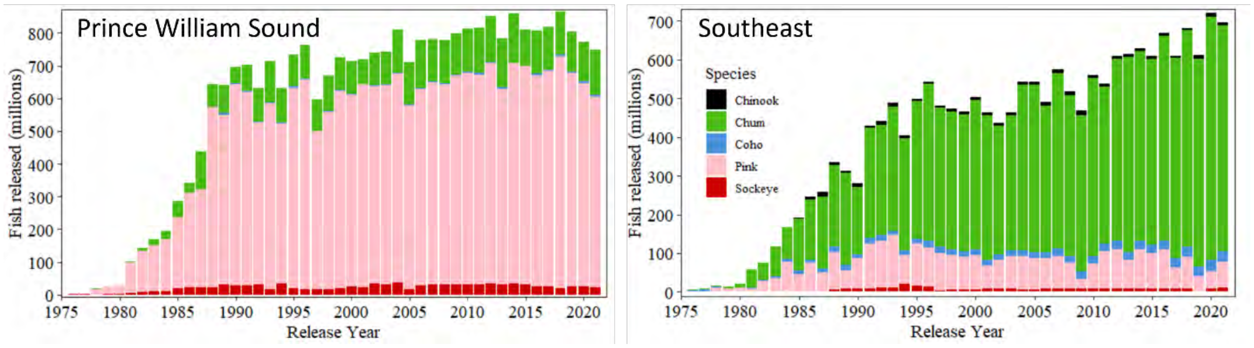

Figure 2. Hatchery salmon releases from Prince William Sound and Southeast Alaska from 1975 to 2021. From Wilson, 2022.

Prince William Sound Pink and Chum Salmon Hatcheries

In response to poor salmon returns to PWS during the late 1960s and early 1970s, which can be tied in part to losses in productivity stemming from the 1964 Great Alaskan Earthquake, the Prince William Sound Aquaculture Corporation (PWSAC) was founded in 1974. The goal of PWSAC was to develop hatcheries in the area, and to stabilize Pink and Chum Salmon runs at levels similar to those which occurred from 1920–1950 (Stopha, 2013). According to Stopha (2013), PWSAC's founders also viewed salmon hatcheries as safeguards against potential impacts from oil development in the region, including the construction of the Trans-Alaska Pipeline System (TAPS) terminus in Port Valdez. The State of Alaska commenced PWS hatchery construction in the mid-1970s at Cannery Creek Hatchery, with PWSAC building its first hatchery simultaneously at a former cannery site in Port San Juan in southwestern PWS, a facility that is now known as the Armin F. Koernig Hatchery.

In 2021, Prince William Sound Pink Salmon accounted for 34% of all statewide hatchery releases, totaling 583 million fish (Wilson, 2022). Presently, four Pink Salmon hatcheries operate in Prince William Sound: (1) Armin F. Koernig (AFK), (2) Cannery Creek (CCH) and (3) Wally Noerenberg (WNH) hatcheries operated by PWSAC, and (4) Solomon Gulch Hatchery (SGH) operated by the Valdez Fisheries Development Association (VFDA). Original broodstock for these hatcheries came from multiple sources in Eastern and Western Prince William Sound in the 1970s and 1980s (Fig. 3; Habicht et al., Seeb, 2000). Annual broodstock is collected during historical peak run timing by voluntary entry into brood holding ponds. This timing varies between hatcheries, with SGH broodstock collection beginning in late July and ending mid-August (VFDA, 2022) and PWSAC hatchery collection beginning in late August/early September and running until mid-September (PWSAC, 2022a; 2022b; 2022c). PWSAC hatcheries have periodically employed barrier seines with closable openings to restrict the escape of hatchery returns. In the late 1980s through the mid-1990s at AFK and WNH, fish outside the barrier nets were collected via purse seine and moved inside for broodstock (Habicht et al., 2000). This may have inadvertently introduced wild origin broodstock from mixed populations (Sharr et al., 1996; Seeb et al., 1999). Since the late 1990s, fish have voluntarily entered brood holding areas to be harvested irrespective of hatchery or wild origin. Under the modern sampling program (volitional entry) >99% of all fish are likely of hatchery-origin (Smoker, 2009).

While 78% of hatchery releases in Prince William Sound are Pink Salmon, PWSAC does operate large Chum and Sockeye Salmon programs. In 2021, Main Bay and Gulkana hatcheries collectively released 23 million Sockeye Salmon fry, and AFK and WNH collectively released 137 million Chum Salmon (Wilson, 2022). In 2021, 41 million of these Chum Salmon were raised at WNH and transported to net pens at Port Chalmers near Montague Island for imprinting and remote release.

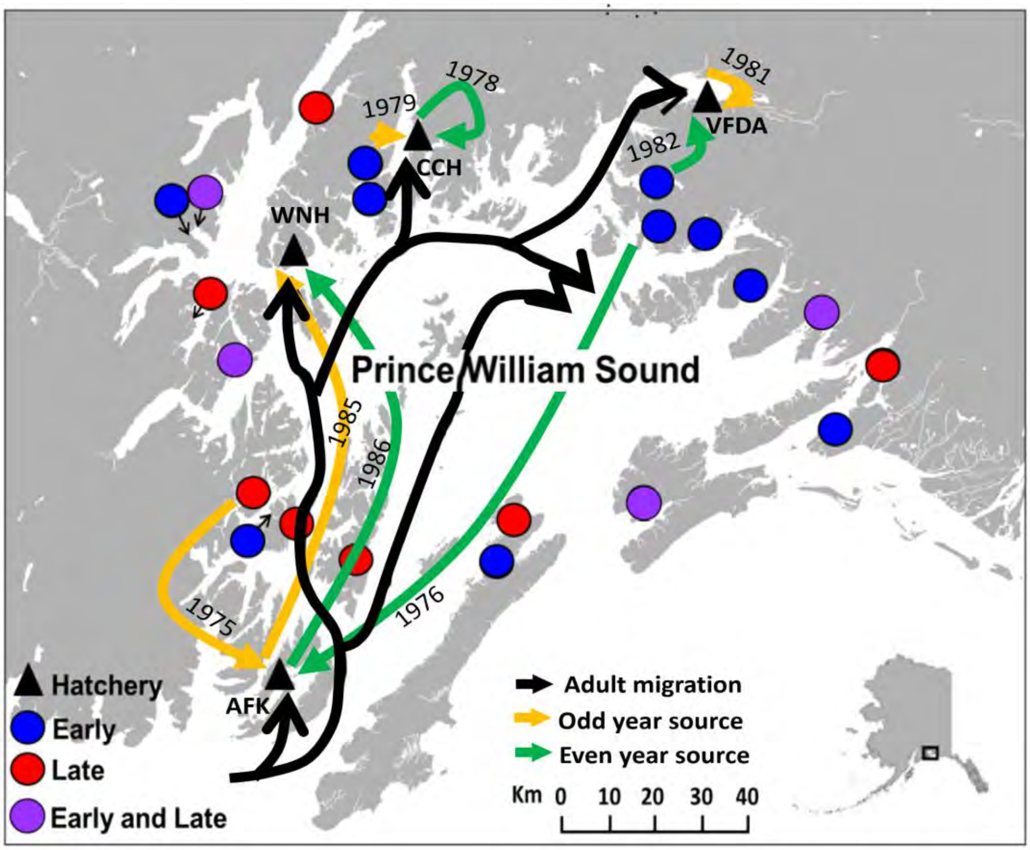

Figure 3. Adult migration routes (black arrow) and movement of ancestral sources of Pink Salmon broodstock for Prince William Sound Hatcheries (colored arrows). Only the largest contributors are included here. For a more detailed review see Habicht et al., (2000).

During broodstock harvest, for both Pink and Chum Salmon, eggs and milt are collected in a common trough that feeds into buckets. Water is added to the buckets to induce fertilization, and eggs are gently poured into incubation trays (PWSAC, 2022d). In dark rooms, eggs are incubated in artificial plastic substrate with constant upwelling of fresh water. Fish are thermally marked in October, as eyed eggs (Volk et al., 1994). By March, fry emerge from incubation substrate and are moved to saltwater rearing net pens in front of the hatchery. In the net pens, fish are fed commercially manufactured feed and then released as smolts to feed on April zooplankton blooms (PWSAC, 2022d).

Table 1. 2021 Prince William Sound Pink and Chum Salmon releases as reported by operators. From Wilson, 2022.

Operator	**District**	**Hatchery**	**Release Site**	**Pink (millions)**	**Chum (millions)**
PWSAC	Southwestern	A F Koernig	Sawmill Bay	131.1	18.8
	Northern	Cannery Creek	Unakwik Inlet	114.6	0
	Coghill	Wally Noerenberg	Lake Bay	88.3	77.3
			Port Chalmers	0	41.1
VFDA	Eastern	Solomon Gulch	Solomon Gulch	249.1	0
Total				**583.2**	**127.2**

Southeast Chum Salmon Hatcheries

In 1976, two years after the formation of the PNP Hatchery Program, Douglas Island Pink and Chum Incorporated (DIPAC) and Southern Southeast Regional Aquaculture Association (SSRAA) were founded. These regional organizations were modeled after PWSAC (DIPAC, 2022; Roppel, 1986), however, unlike PWSAC, SSRAA propagated mostly Chum Salmon from the start, DIPAC propagated Pink and Chum Salmon initially but focused on propagating Chum Salmon in 1991, and both operators developed strategies of a central incubation facility with remote release sites. Release sites were selected near anadromous water sources to imprint juveniles but away from large wild populations (Heard, 2012). In the early part of the following decade, more PNPs were founded using this model including the Northern Southeast Regional Aquaculture Association (NSRAA) in 1978 (NSRAA, 2020), and Armstrong-Keta Incorporated (AKI) in 1980 (AKI, 2022).

In 2021, Southeast Alaska hatchery Chum Salmon accounted for 34% of all statewide hatchery releases, totaling 583 million fish (SSRAA, 2022; Wilson, 2022). In Southeast Alaska, 10 Chum Salmon-producing hatcheries presently operate, with 16 separate remote release sites. SSRAA operates Burnett Inlet, Neets Bay, and Whitman Lake hatcheries. NSRAA operates Hidden Falls, Medvejie, and Sawmill Creek hatcheries. DIPAC operates the Macaulay Hatchery, and the Sitka Sound Science Center operates the Sheldon Jackson Hatchery. The Metlakatla Indian Community operates the Tamgas Creek Hatchery, and AKI operates Port Armstrong Hatchery. Original broodstock for the three largest Southeast Alaska Chum Salmon producers, SSRAA, NSRAA, and DIPAC, came from local stocks (within 40 miles) in the 1970 and 1980s (Roppel, 1986; Josephson et al., 2021). Approximately half the parr reared in Southeast Alaska are released at remote sites (Table 2; Wilson, 2022). Annual broodstock is primarily collected at the hatcheries, however in cases of shortage, remote egg-take and transfers from remote release sites occur (SRAA, 2022; Wilson, 2022).

Table 2. Southeast Chum Salmon as reported by Operators. From Wilson, 2022.

Operator	**Region**	**Hatchery**	**Release Site**	**Chum (millions)**
SSRAA	Southern Southeast	Burnett Inlet	Burnett Inlet	32.4
			Anita Bay	22.8
			Nakat Inlet	14.7
			Port Asumcion	18.2
	Southern Southeast	Neets Bay	Neets Bay	67.2
			Nakat Inlet	1.2
	Southern Southeast	Whitman Lake	Kendrick Bay	22.2
			McLean Arm	11.0
Metlakatla Indian Community	Southern Southeast	Tamgas Creek	Tamgas	20.0
			Port Chester	10.0
NSRAA	Northern Southeast Inside	Hidden Falls	Thomas Bay	11.7

			Kasnyku Bay	48.9
			Southeast Cove	35.4
	Northern Southeast Inside	Gunnuk Creek	Gunnuk Creek	17.6
	Northern Southeast Outside	Medvejie	Bear Cove	37.4
			Deep Inlet	34.1
	Northern Southeast Outside	Sawmill Creek	Deep Inlet	16.0
			Crawfish Inlet	25.9
AKI	Northern Southeast Outside	Port Armstrong	Port Armstrong	13.2
DIPAC	Northern Southeast Inside	Macaulay	Gastineau Channel	11.7
			Amalga Harbor	46.3
			Boat Harbor	23.5
			Limestone Inlet	11.8
			Sheep Creek	21.3
SSSC	Northern Southeast Outside	Sheldon Jackson	Crescent Bay	3.0
			Deep Inlet	6.1
Total				**583.3**

Introduction to Straying

Straying is a necessary component of salmon biology, supporting genetic resilience, population stability, and range expansion (Keefer & Caudill, 2014). In western Prince William Sound, straying may have allowed population recovery after major habitat disturbance events like the 1964 Earthquake and the 1989 Exxon Valdez Oil Spill. Many factors are suspected to drive straying including interrupted juvenile imprinting, adult homing failure, and attraction to non-natal streams (Keefer & Caudill, 2014). Pink and Chum Salmon may have higher stray rates than other Pacific Salmon due to their limited reliance on fresh water for early growth and imprinting, lack of variation in intertidal spawning habitats, and for Pink Salmon, the lack of overlapping age cohorts (Beacham et al., 2012; Bett et al., 2016; Quinn, 2018). Pink Salmon in particular have lower olfactory selectivity during upstream migration, contributing to their lower stream fidelity (Ueda 2011; Ueda 2012). Higher stray rates of Pink Salmon may be adaptive, allowing for their wide and abundant distribution in the North Pacific and elsewhere (Ueda 2012). Additionally, within species, there may be population-specific dispersal (i.e., straying) plasticity, as found for Chinook Salmon (Westley et al., 2015).

While staying between wild populations is useful for long term survival, straying of hatchery-origin fish into wild systems may have negative consequences. Several mechanisms are discussed below and reviewed in detail in Naish et al., (2007): (1) Hatchery-origin strays may interbreed with wild fish, thereby introducing maladapted traits, (2) hatchery fish may transmit or amplify disease, (3) hatchery fish may displace wild fish on the spawning grounds, and (4) harvests of mixed wild and hatchery populations may overfish small wild populations. The focus for most of this synthesis is on the first mechanism.

In fisheries management, it has been proposed that a 2% incidence of pre-spawning hatchery strays in a neighboring wild stock population could serve as a trigger point for action, and for consideration of hatchery reform to reduce straying. This “2% rule” is based on the theoretical rate of loss of alleles in a wild salmon population as described by Withler (1997). According to Withler’s (1997) research, at a 1.5% influx of hatchery genes in each generation, a 2.5% effective stray rate, and alleles with an intermediate difference in fitness between the wild genotype with the highest level of survival and the hatchery genotype (selection coefficient= 0.025), the replacement of 50% of alleles in a wild population could occur in 25 generations. It is proposed by some that replacement of dissimilar alleles would accompany a decrease in population fitness and a resulting decrease in productivity of the wild population (Hilborn & Eggers, 2000).

To address these concerns, the extent of hatchery straying has been widely studied. In Alaska, hatchery straying was first assessed in Prince William Sound in 1991 using coded wire tags applied to Pink Salmon fry from the 1989 brood year (Sharp et al., 1994). Strays from all four PWS Pink Salmon hatcheries were identified in wild systems, with the most strays coming from WNH and AFK. Thermal marking was employed to replace coded wire tags in 1995 (Joyce et al., 1996), and all PWS hatchery Pink Salmon were marked in 1996 (Joyce & Evans, 2000). Thermally marked strays were found in wild systems in 1997 (Joyce & Evans, 2000). The largest contributors to straying were WNH and AFK, confirming the earlier studies with coded wire tags. In Southeast Alaska, thermal marking was implemented in 1991 and thermally marked strays were first identified in wild streams in 1995 (Josephson, 2010).

Whereas the extent of hatchery straying has been widely studied in Alaska, the physiology of hatchery-origin fish relative to their wild-origin counterparts is less known. We can draw inference from hatchery programs with other species. In a study of Skagit River, both male and female hatchery-origin Chinook Salmon had earlier spawn timing than wild-origin fish, an important fitness trait (Austin et al., 2022). In the Yakima River, after one generation of hatchery rearing, male and female Chinook Salmon were significantly shorter and lighter than their wild-origin counterparts (Knudsen et al., 2006). When accounting for size differences, hatchery-origin females were 8% less fecund than wild-origin females (Knudsen et al., 2008). Some, but not all studies found reduced egg-fry survival in offspring of hatchery-origin fish (Schroder et al., 2008; Knudsen et al., 2008).

Reduced fitness (reproductive success) of hatchery-origin fish in wild systems has been observed in three of six species of anadromous Pacific Salmon: *C*oho (*Oncorhynchus kisutch*), steelhead

(*O. mykiss*), and Chinook (*O. tshawytscha*), although results can be mixed (Araki et al., 2008; Williamson et al., 2010). Male but not female hatchery-origin Chinook Salmon had consistently lower reproductive success than wild-origin Chinook colonizing new habitat (Anderson et al., 2013). Hatchery-origin Chinook Salmon returns can have slightly less offspring than wild-origin females (Fast et al., 2015). The fitness of hatchery-origin strays relative to natural-origin fish they spawn alongside has been rarely studied prior to the project synthesized here.

Goals of Alaska Hatchery Research Program

In order to address concerns over straying, the Alaska Department of Fish and Game (ADF&G) began the Alaska Hatchery Research Program (AHRP) in 2011. Funding for the program was provided by the State of Alaska, hatchery operators, fish processors, and external grants. The goals of the program are detailed in Box 1. Field sampling was contracted to the Prince William Sound Science Center and Sitka Sound Science Center. Hatchery or wild origin and pedigree reconstructions were determined by the Alaska Department of Fish and Game. In this report we summarize the findings of the ongoing work by ADF&G and contextualize their findings.

Box 1. Priority Questions of the Alaska Hatchery Research Project

- What is the genetic stock structure of pink and chum salmon in each region?
- What is the extent and annual variability in straying of hatchery pink salmon in Prince William Sound (PWS) and chum salmon in PWS and Southeast Alaska (SEAK)?
- What is the impact on fitness (productivity) of wild pink and chum salmon stocks due to straying of hatchery pink and chum salmon?

Genetic Stock Structure

Prince William Sound Pink Salmon

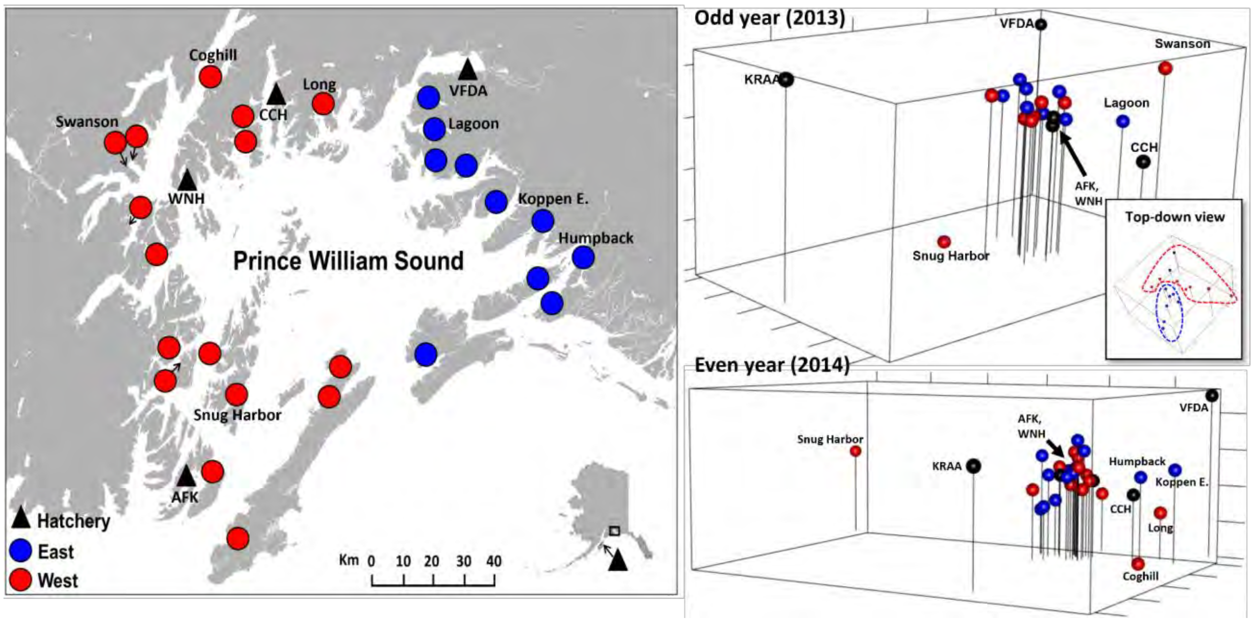

Figure 4. Non-metric Multidimensional Scaling plot of Prince William Sound Pink Salmon collected as adults 2013 and 2014 and genotyped with 16 microsatellite loci. From Cheng et al., 2022a.

The most recent genetic stock assessment of Prince William Sound Pink Salmon in Alaska was carried out in 2013 and 2014. There were 3,000 adult Pink Salmon samples collected from 23 sites in 2013 and 6,554 samples collected from 26 sites in 2014 (Fig 4; Cheng et al., 2015). In both years, samples from Kitoi Bay Hatchery on Kodiak Island were included as an outgroup. For Prince William Sound, Cheng et al (2015) genotyped 16 microsatellite loci and calculated a fixation index (F_{ST}, a metric of genetic differentiation among populations) of 0.002 among spawning groups in 2013, and 0.001 in 2014. These F_{ST} values align with prior work on Pink Salmon populations from other regions in Northern America that lack large scale hatchery programs (Churikov & Gharrett, 2002; Beacham et al., 2012).

The relatively low genetic diversity in Pink Salmon may be due to their intertidal spawning, the proximity of potential spawning areas within and between streams, and low diversity of habitat that they depend on for their life history (Quinn, 2018; Waples et al., 2001). Despite the relatively low natural genetic diversity of Pink Salmon and potential homogenization from straying, statistically significant differences were detected among natural and hatchery collections. WNH and AFK were genetically similar to each other and some wild populations. WNH was originally sourced from AFK broodstock. There are two potential explanations for the similarity between AFK and wild populations: (1) wild broodstock were introduced during the late 1980s to mid 1990s era of purse seining to collect broodstock and (2) AFK fish are more commonly found among wild populations than Pink Salmon from other hatcheries (Brenner et al., 2012).

In an ongoing study, Cheng et al., compared the 2013 and 2014 genotypes of samples from AFK, CCH, and SGH to historical samples from the same sites collected in the 1990s (Cheng, 2022). No significant differences were detected across time within hatcheries. To ascertain whether wild systems had become more similar to their hatchery donors over time, Cheng compared historical (1990s) and contemporary (2013 and 2014) hatchery broodstock samples to contemporary wild-origin samples from Prince William Sound streams (Fig. 5).

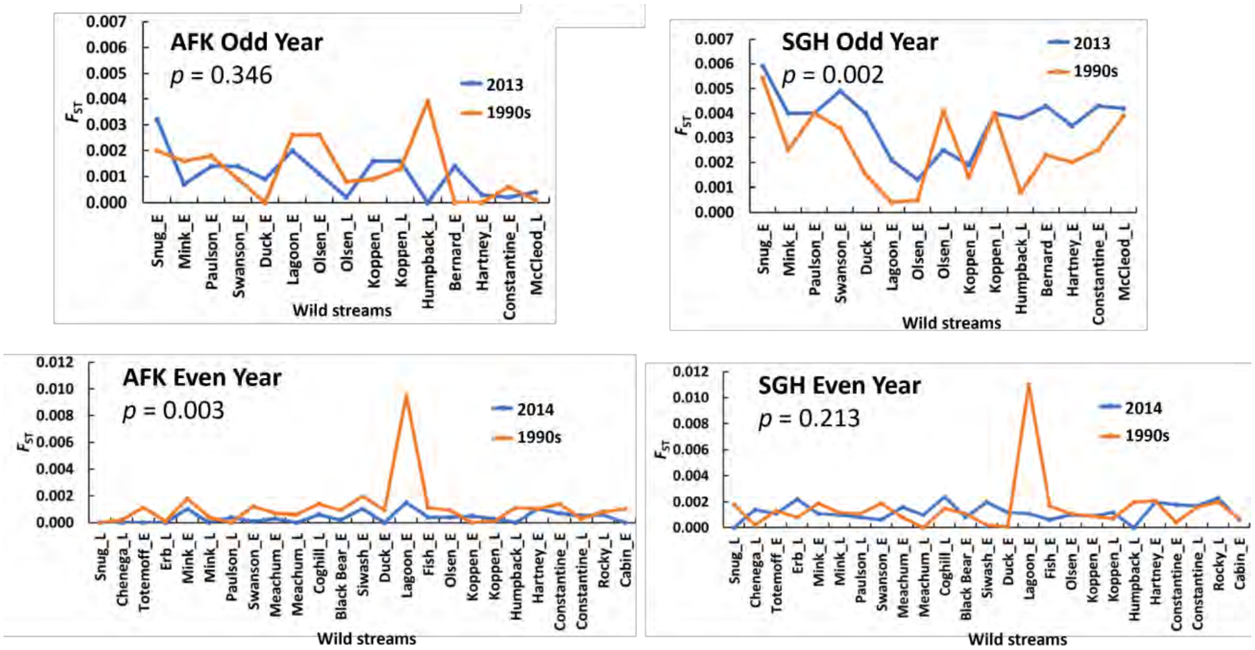

Figure 5. F_{ST} values of genetic differentiation for Pink Salmon at Armin F. Koernig and Solomon Gulch hatcheries when comparing contemporary samples (2013 and 2014) to historical samples from the 1990s. From Cheng et al., 2022b.

For AFK, in the even lineage, wild fish had become significantly more similar to AFK broodstock over time ($p = 0.003$) suggesting introgression of hatchery fish to wild populations. This relationship had not significantly changed in the odd year lineage. For SGH, the even year lineage had not changed in its relationship to wild fish, but the odd year lineage had become significantly less similar to SGH broodstock ($p = 0.002$), suggesting genetic isolation and drift. These results align with straying studies that found AFK to contribute the largest proportion of strays to wild streams, and SGH to contribute relatively few strays (Brenner et al., 2012; Knudsen et al., 2021).

Prince William Sound Chum Salmon

To look for genetic introgression between hatchery and wild Prince William Sound Chum Salmon, ADF&G compared SNP allele panels in samples from four wild streams collected in the years 1964–1982 and 2008–2010 and broodstock from WNH collected 2008–2010 (Jasper et al., 2013). The degree of differentiation in 2008–2010 samples was slightly less than that of the historical samples (F_{ST}=0.0161 vs F_{ST}=0.0158). The authors used a source-sink model to quantify changes in allele frequencies due to introgression from straying WNH fish. In all four study streams, there was a convergence of wild allele frequencies towards hatchery frequencies, suggesting introgression from hatchery strays. In some cases, the rate of introgression was more closely tied to the degree of temporal overlap between hatchery and wild fish than proximity to WNH or the intensity to straying.

Southeast Chum Salmon

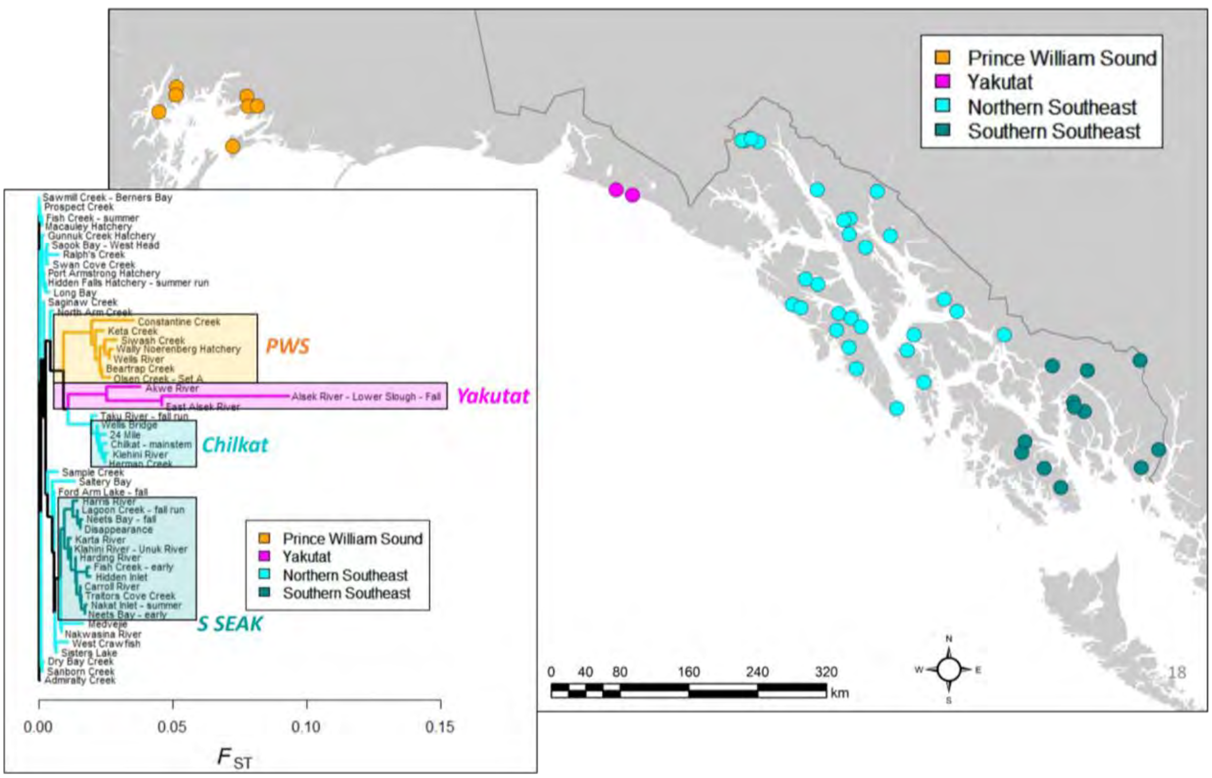

Figure 6. Stock structure of Southeast and Southcentral Alaska Chum Salmon from a 2014 survey. From Habicht et al., 2022.

ADF&G is currently performing a genetic stock assessment of Chum Salmon in Southeast Alaska, and some preliminary results are available (Habicht et al., 2022). Results from 52 stream sites using 93 microsatellite loci suggest that stocks partition by geography and run timing (Fig. 6). Southern Southeast Chum Salmon are genetically distinct from Northern Southeast Chum Salmon, and fish from Yakutat and Prince William Sound. Fall-run Chum Salmon are also genetically distinct from spring and summer-run fish from the same region. This is the case in both Northern and Southern Southeast Alaska. These trends align with a previous study on Chum Salmon in Southeast Alaska (Kondzela et al., 1994).

Straying extent and interannual variability

Prince William Sound Pink Salmon

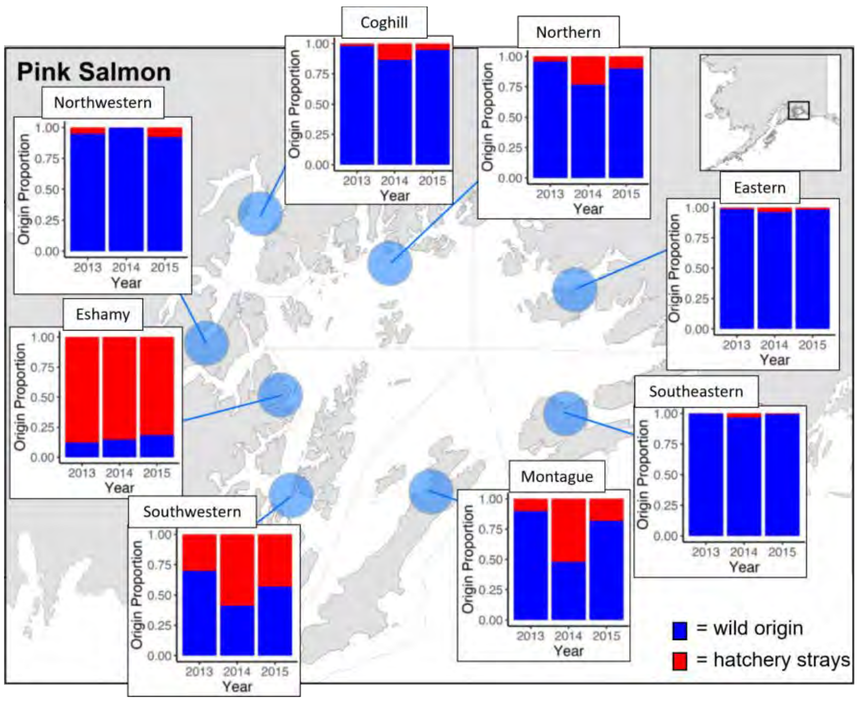

Figure 7. Pink Salmon proportion of hatchery-origin spawners (red; pHOS) in Prince William Sound fishing districts in 2013–2015. From Knudsen et al., 2021.

The most recent and comprehensive survey of Prince William Sound Pink Salmon straying was performed from 2013–2015. Across all regions, the estimated proportion of hatchery-origin spawners (pHOS) in streams was 0.05 in 2013, 0.15 in 2014, and 0.11 in 2015. pHOS was highly variable across streams among the eight fishing districts (Fig. 7), with the higher proportions near hatcheries, as noted in a 2008–2010 survey (Brenner et al., 2012). The Eshamy district had the highest proportion of hatchery strays across all years (average of 0.86), though only one stream (Comstock Creek) was sampled. Eshamy District contributed less than 1% of estimated Prince William Sound Pink escapement across the three years surveyed (Knudsen et al., 2016).

The Southwestern district had the second highest pHOS (0.37) and accounted for 9% of PWS escapement. The Eastern and Southeastern districts, the two largest contributors to total PWS Pink escapement (27% each), consistently had the lowest hatchery pHOS in the survey years (0.026 and 0.016 respectively). When comparing streams surveyed in both studies, 2008–2010 (Brenner et al., 2012) and 2013–2015 (Knudsen et al., 2021), Pink Salmon pHOS increased in all districts surveyed, though not in all streams within districts. During this time hatchery releases remained consistent. pHOS is highly dependent on interannual survival rates, run size, and harvest patterns. These factors caveat interannual comparisons (Knudsen et al., 2021).

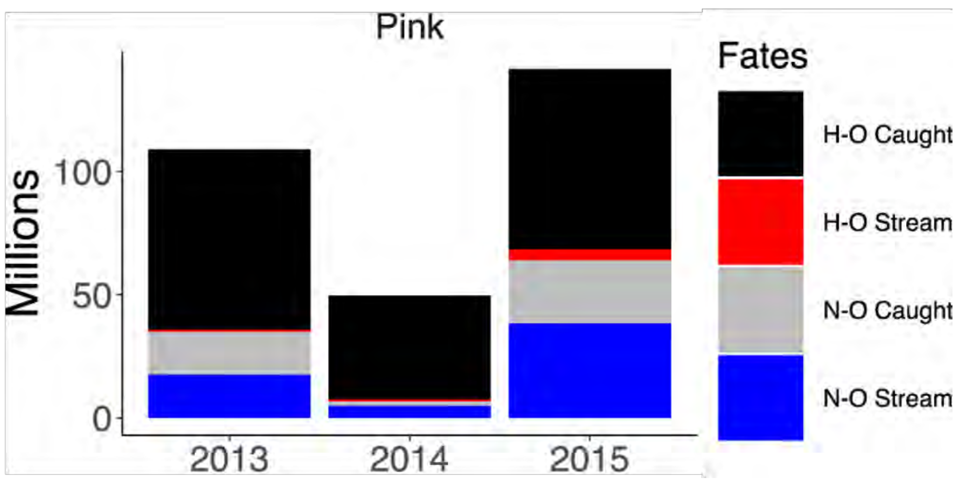

Figure 8. Estimations of escapement to streams and catch for hatchery-origin (H–O) and natural-origin (N–O) Pink Salmon in Prince William Sound during 2013–2015. From Knudsen et al., 2021.

In 2013–2015, counts from aerial and ground surveys and hatchery-wild proportions from stream and ocean sampling were combined to estimate the hatchery, natural, and total run size of Pink Salmon in Prince William Sound (Fig 8; Knudsen et al., 2021). The total run size ranged from 49.6–141.8 million fish, with hatcheries contributing 55–86%. Across PWS, fisheries harvested 70–88% of the total run. This included 94–99% of all hatchery fish returning to PWS, and 27–50% of returning natural-origin fish.

Prince William Sound Chum Salmon

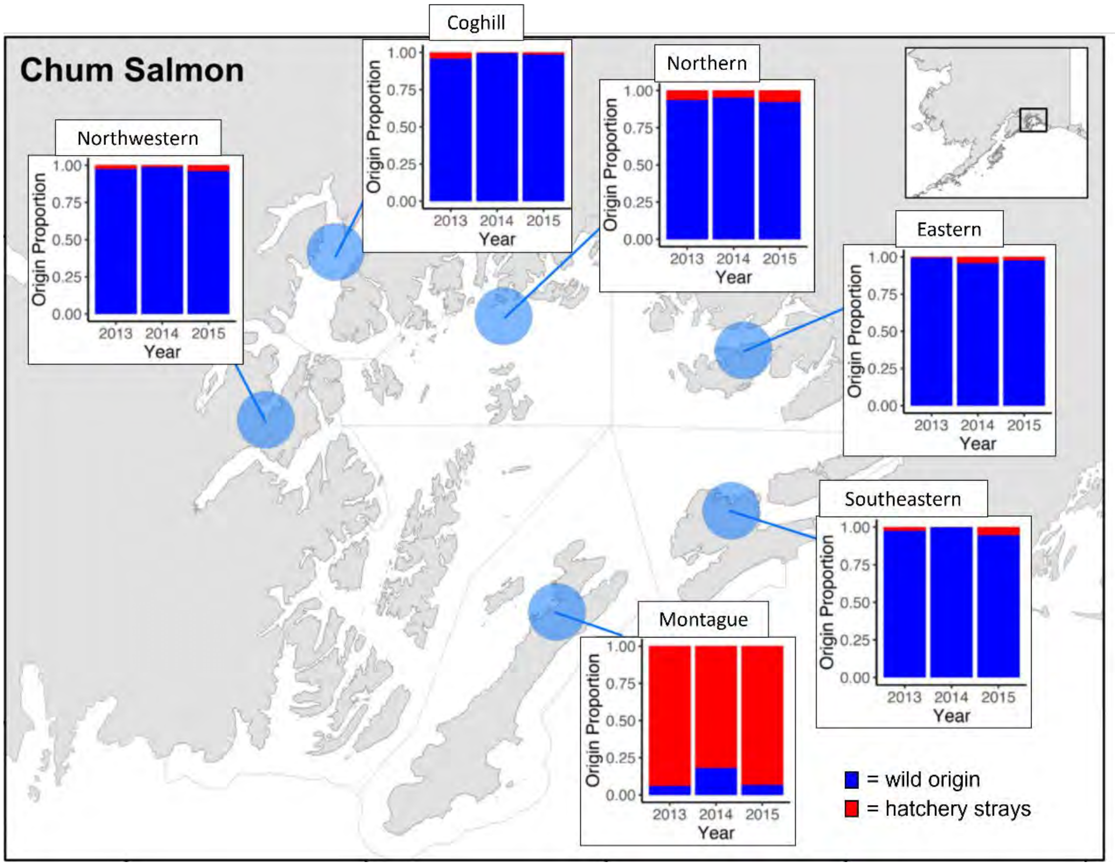

Figure 9. Chum Salmon proportion of hatchery-origin spawners (red; pHOS) in Prince William Sound fishing districts in 2013–2015. From Knudsen et al., 2021.

Across all Prince William Sound wild Chum Salmon populations, the estimated proportion of hatchery-origin spawners (pHOS) in streams was 0.03 in 2013, 0.03 in 2014, and 0.09 in 2015 (Knudsen et al., 2021). Of the six fishing districts surveyed, Montague District had the highest pHOS (0.78–0.85). For contrast, the Northern District had the next highest pHOS with 0.05–0.10. These findings align with results from surveys in 2008–2010 (Brenner et al., 2012), which found the Chalmers River in Montague District to have a pHOS greater than 0.90. Strays sampled in the 2013–2015 surveys in Montague District mostly came from the WNH remote release site in Port Chalmers (Knudsen et al., 2021). Port Chalmers was originally selected as a remote release site due to the limited wild Chum Salmon production in nearby streams, possibly due to uplift from the 1964 earthquake (Roys, 1965) and separation from the main migratory path (Knudsen et al., 2021). In Coho Salmon (Labelle 1992) and Chinook Salmon (Candy & Beacham, 2000), remote rearing and release increases straying by disrupting imprinting.

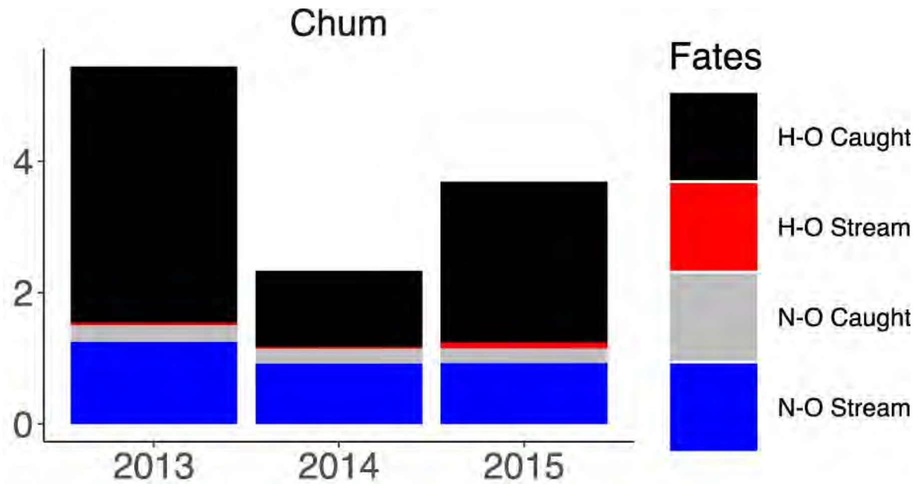

Figure 10. Estimations of escapement to streams and catch for hatchery-origin (H–O) and natural-origin (N–O) Chum Salmon in Prince William Sound during 2013–2015. From Knudsen et al., 2021.

The sampling and survey techniques used to estimate the total Pink Salmon run in 2013–2015 were simultaneously applied to Chum Salmon. The total run size ranged from 2.3–5.4 million, with hatchery fish contributing 51–72%. Across PWS, fisheries harvested 59–76% of the total run. This consisted of 96–99% of all hatchery fish returning to PWS, and 17–20% of all natural-origin fish.

Southeast Chum Salmon

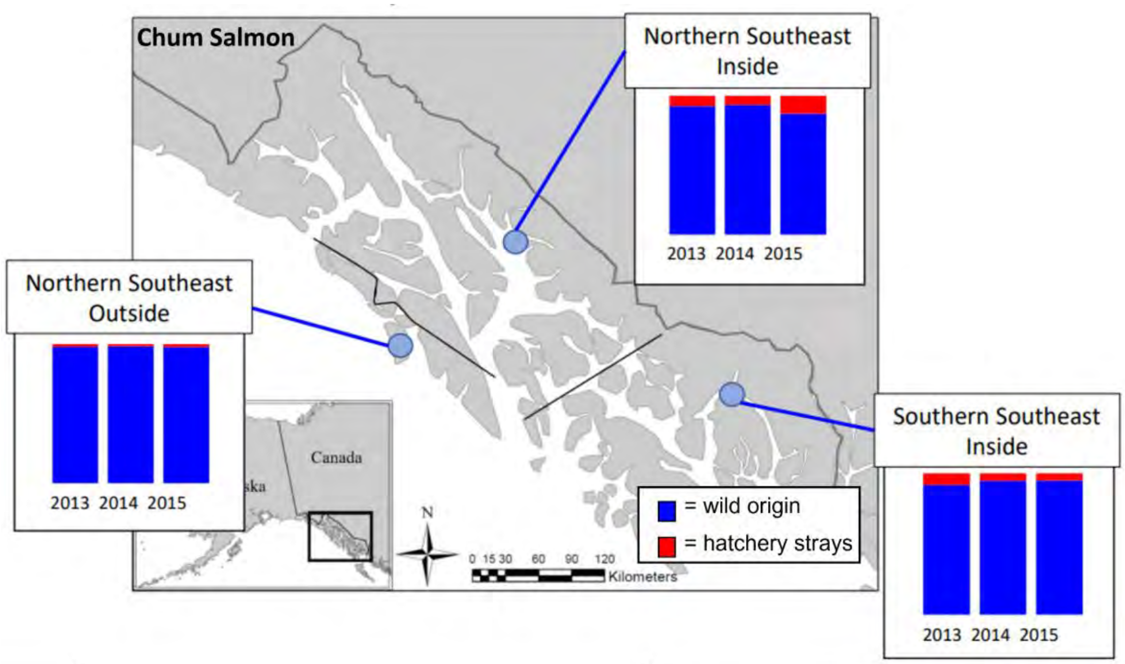

Figure 11. Chum Salmon proportion of hatchery-origin spawners (red; pHOS) in Southeast Alaska regions in 2013–2015. From Josephson et al., 2021.

A comprehensive survey of Chum Salmon in Southeast Alaska spawning streams (Josephson et al., 2021) was completed during the same years as the Pink and Chum Salmon surveys in Prince William Sound (2013–2015). Across Southeast Alaska regions, the pHOS was 0.03 in 2013, 0.03 in 2014, and 0.06 in 2015. Of the three management areas, Southern Southeast had the highest 2013–2015 average pHOS at 0.05 and accounted for 30% of estimated total Southeast Chum escapement during these years (Fig. 11.). The Northern Southeast Inside (NSI) region had an average pHOS of 0.04 and accounted for the majority of total Southeast escapement at 59%, and the Northern Southeast Outside (NSO) had the lowest pHOS of 0.02 and accounted for the remaining 11% of escapement. As with PWS Chum Salmon, pHOS was highly variable between streams and regions, with the highest pHOS in streams near hatcheries and remote release sites. The pHOS estimates from NSO align with results from 2008–2011 surveys (Piston & Heinl 2012a, 2012b. NSI previously had higher pHOS values (0.13 in 2010), though this may be reflective of high variability between years and sampling differences between studies.

In 2018 and 2019, hatchery Chum Salmon returned in unprecedented numbers to a new (2015) remote release site in Crawfish Inlet (Piston & Heinl, 2020). In both years, many fish were observed straying into West Crawfish Inlet rather than returning directly to the release site. This caused an increase in pHOS in several nearby streams, including West Crawfish NE Arm, an AHRP index stream. In 2013–2015 surveys, this stream had a pHOS of 0.01–0.02 (Josephson et al., 2021). In 2018 and 2019, the stream was surveyed after the peak of wild returns, typically mid-August (Piston & Heinl, 2020). In 2018, the pHOS of West Crawfish NE Arm Head was 0.62 on August 27th, then 0.99 on September 28th. In 2019, the pHOS was 0.08 on August 27, 2019, and then 0.94 on September 4th, (Piston & Heinl, 2020). These findings suggest that the unprecedented hatchery Chum returns to Crawfish Inlet did result in increased pHOS in nearby streams. In the case of West Crawfish NE, this occurred after the peak of wild spawning, so hatchery and wild-origin spawners were temporally segregated, possibly limiting introgression.

Impact on Fitness

Prince William Sound Pink Salmon

Since the implementation of wide scale hatchery Pink Salmon releases in 1989 (15+ Pink Salmon generations), extensive hatchery straying has occurred, yet wild productivity in Prince William Sound has remained strong, with three of the four highest wild returns on record occurring in the last 10 years. The environmental factors driving these returns are complex, and population-level changes in reproductive success are overshadowed by broader environmental changes (Ohlberger et al., 2022).

Stream	2013	2014	2015	2016	2017	2018	2019	2020
Erb	P	P	P,O	P,O	O,G	P,O,G		O,G
Paddy	P	P	P,O	P,O	O,G	P,O,G		O,G
Hogan	P	P	P,O	P,O	P,O,G	O,G	O,G	
Gilmour		P	P	P,O	P,O	O,G	O,G	
Stockdale	P	P	P,O	P,O	P,O,G	O,G	O,G	

Figure 12. Sampling of Prince William Sound Pink Salmon for pedigree analysis. P=parent, O=offspring, G=grand offspring. Green boxes=published results (Shedd et al., 2022a). Yellow boxes=preliminary results. Modified from Shedd et al., 2022b.

To understand the effects of straying on population fitness, the AHRP investigated five streams in western Prince William Sound. A genetic-based parentage analysis was used to estimate relative reproductive success (RSS) across multiple generations of even and odd year lineages. ADF&G used thermally marked otoliths and genetic parentage analyses to identify hatchery strays and natural-origin donor fish in 2013–2018, and then quantified their adult returning progeny in 2015–2020 (Fig. 12). Presently, results from two generations (2013–2016) of even and odd year fish from two streams (Hogan and Stockdale) have been published (Shedd et al., 2022a). Hogan Creek on Knight Island and Stockdale Creek on Montague Island both have high pHOS (0.59 and 0.31 respectively, across the study period), with potentially 16 generations of introgression prior to the study. In all years, most hatchery strays in both streams came from the nearby AFK hatchery (Knudsen et al., 2016).

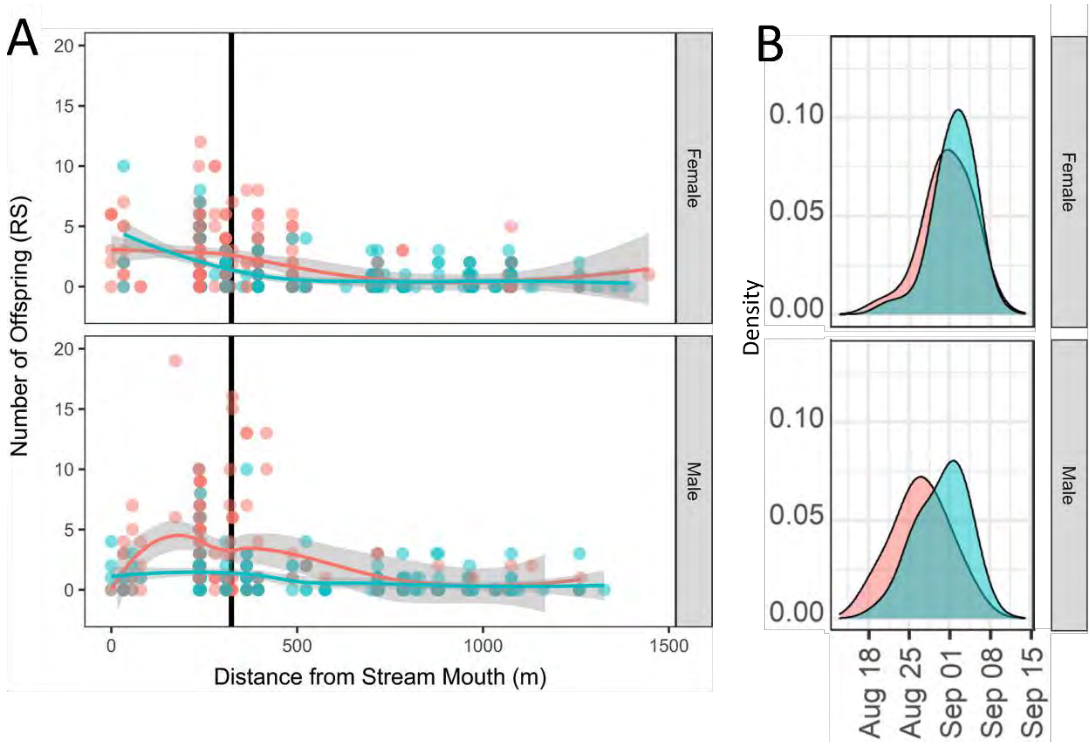

Figure 13. Phenotypic difference between 2014 brood year hatchery and wild fish at Stockdale Creek. A: The association between spawning location and reproductive success, B: relative density of hatchery and wild fish at Stockdale creek across time in 2014. From Shedd et al., 2022a and 2022b.

Reproductive success (RS) was highly variable between years and streams. In both Hogan Creek and Stockdale River, body size, spawning date, and spawning location were significantly associated with RS (Shedd et al., 2022a). Hatchery-origin spawners were generally bigger than wild origin fish, spawned later in the season and further upstream (Figs. 13 & 14). When not correcting for these morphological and behavioral differences, RRS ranged from 0.05–0.86 for males, and 0.03 to 0.47 for females (Table 3). When accounting for these factors, the RRS of the even year lineage was 0.42–0.60 (excluding Hogan males with ah RRS that was not different by origin). However, these models explained < 10% of the variation in RS of Hogan Bay (6% for females and 4% for males) and < 40% of variation in RS in Stockdale (25% for females and 36% of males). This suggests some other fitness-determining factors are at play besides body size, spawning time, spawning location.

The effect of origin on reproductive success was also observed among different types of matings. Two hatchery-origin parents produced fewer returning spawners than two wild origin parents (origin was significant for Stockdale but not Hogan). The number of returning spawners from one hatchery and one wild origin parent was intermediate between two hatchery and two wild spawners.

Table 3. Proportion of hatchery-origin strays and relative reproductive success (RRS) of hatchery-origin Pink Salmon in five streams in Prince William Sound. From Shedd et al., 2022a, 2022b.

Stream	**Lineage**	**Brood year pHOS**	**Male parent RRS (95% CI)**	**Female parent RRS (95% CI)**
Hogan	2013/2015	0.64	0.05 (0.01–0.17)	0.03 (0.01–0.08)
	2014/2016	0.92	0.80 (0.68–0.94)	0.62 (0.52–0.74)
Stockdale	2013/2015	0.16	0.69 (0.31–1.35)	0.17 (0.03–0.55)
	2014/2016	0.74	0.29 (0.25–0.34)	0.43 (0.37–0.50)
Gilmore	2013/2015	NA	NA	NA
	2014/2016	0.56	0.82 (0.69–0.96)	0.88 (0.76–1.01)
Paddy	2013/2015	0.15	NA	NA
	2014/2016	0.60	0.96 (0.78–1.19)	0.63 (0.53–0.76)
Erb	2013/2015	0.11	NA	NA
	2014/2016	0.23	0.33 (0.28–0.39)	0.34 (0.30–0.39)

Preliminary results from the 2014–2016 lineage for three additional streams in Prince William Sound are available (Shedd, 2022b; Table 3). These streams vary in brood year pHOS: Erb Creek 0.23, Gilmour Creek 0.56, Paddy Creek 0.60 (Gorman et al., 2017). At all three sites, hatchery-origin fish were found later in the season and further upstream than natural-origin fish, as was observed at Hogan and Stockdale. Similarly, body length was generally greater in hatchery-origin fish than wild origin fish (Fig. 14). Hatchery-origin RRS was lowest at Erb Creek, which had the lowest brood year pHOS. RRS was similar between Gilmour and Paddy, which had similar brood year pHOS.

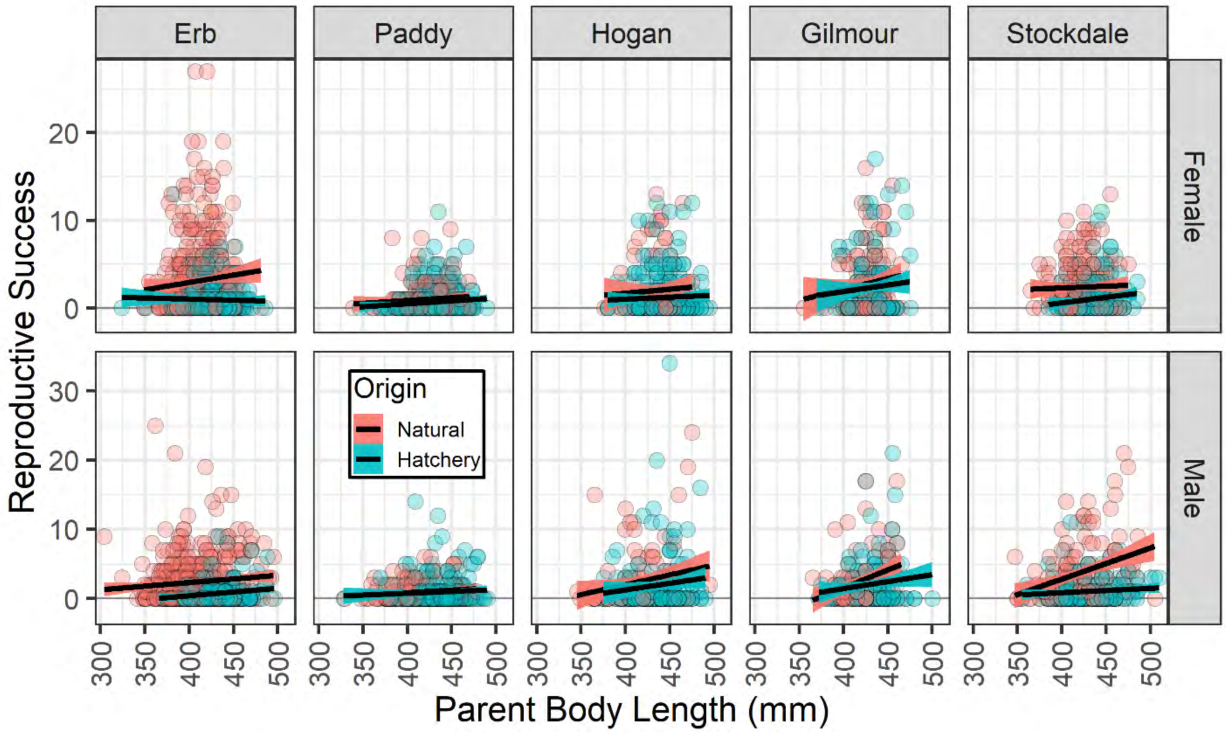

Figure 14. Relationship between parent body length and reproductive success in five Prince William Sound Pink Salmon streams in 2014. From Shedd, 2022b.

Southeast Chum Salmon

Mirroring the work in Prince William Sound, Chum Salmon from four streams in Southeast Alaska were sampled for pedigree reconstruction beginning in 2013 (Fig. 15). Due to low sampling proportion and variable age at spawning, Chum Salmon fitness information could not be ascertained from samples collected in Southeast Alaska streams from brood years 2013–2016. ADF&G sampled three of the four streams more intensively in 2017–2022, and there are tentative plans to continue sampling in 2023. RRS data from these years are expected to be available in 2024.

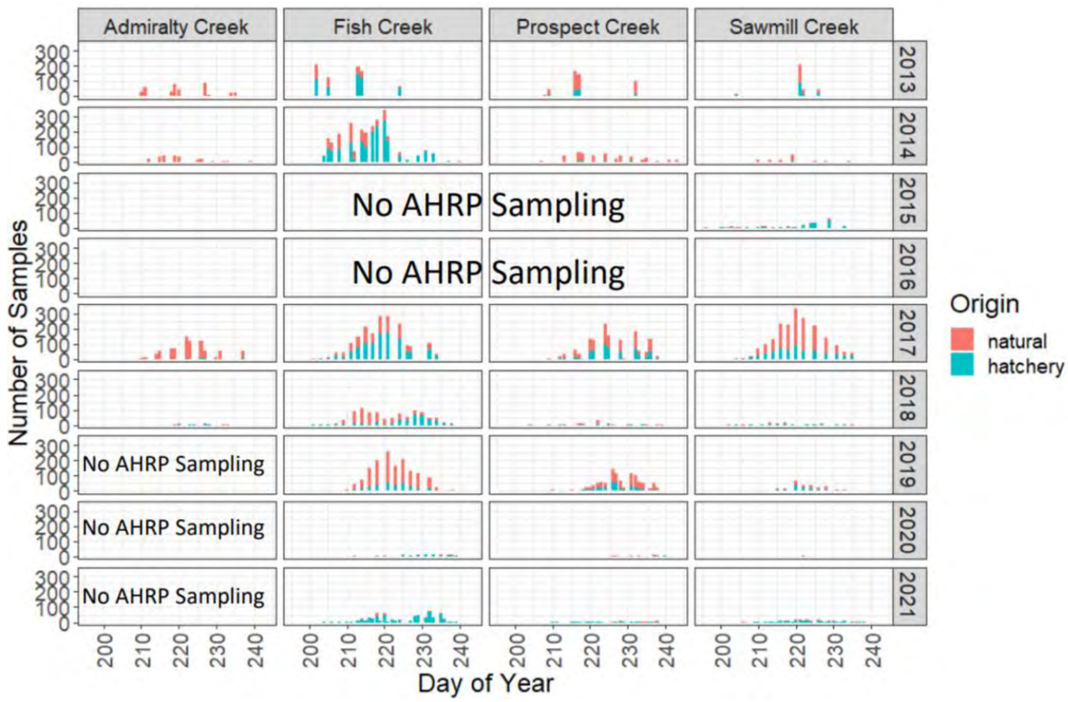

Figure 15. Sampling of Southeast Chum Salmon for pedigree analysis. 2022 samples are currently being processed to determine origin. From Shedd 2022.

In an AHRP-associated study on Sawmill Creek in 2015, differences in fitness-associated traits were observed between hatchery and wild Chum Salmon (McConnell et al., 2018). As of 2015, hatchery releases had occurred in nearby waters for 28 years (5 to 8 generations) using mixed broodstock originally sourced from Sawmill Creek and four other locations. Sawmill Creek has evidence of long-term immigration of hatchery fish, with strays recorded as early as 1995, and a pHOS of 0.152–0.512 from 2013–2015. In 2015, hatchery strays entered the creek later, were younger, and smaller than their wild counterparts. Hatchery-origin females lived shorter duration in-stream than wild origin females, and retained 28% more eggs, though this was linked to arrival timing and not necessarily origin (Fig. 16).

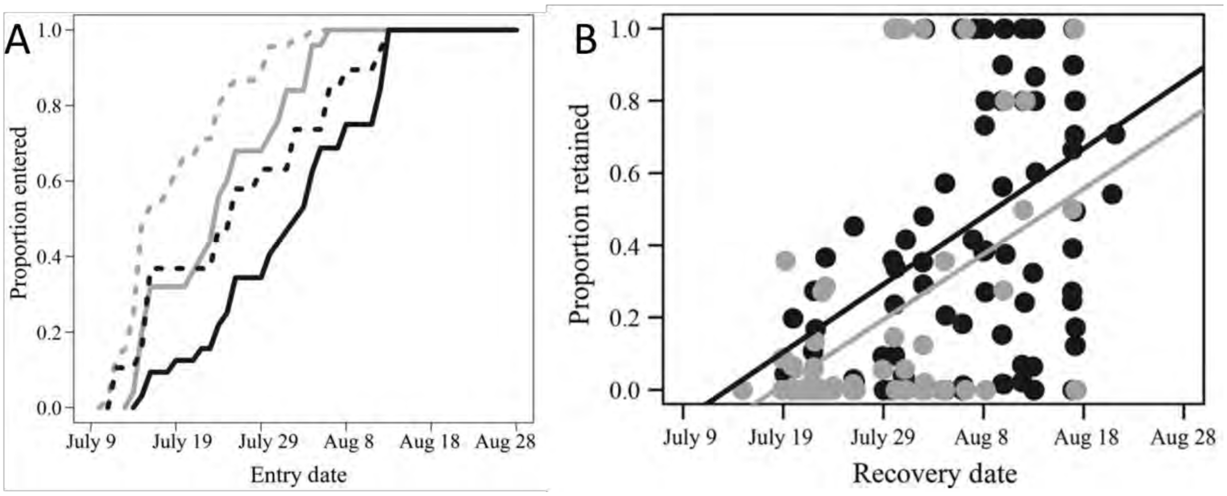

Figure 16. 2015 brood year characteristics for Chum Salmon in Sawmill Creek, Southeast Alaska. A: Cumulative proportion of Chum Salmon entering Sawmill Creek. B: Proportion of eggs retained by natural and hatchery-origin female Chum Salmon. Dashed lines: male, solid lines: female. Grey: natural-origin, black: hatchery-origin. From McConnell et al., 2018.

Given the extent of hatchery straying that has occurred, the phenotypic differences between hatchery and wild Chum Salmon in Sawmill Creek are surprising. One explanation is that hatchery and wild spawners are segregated, thereby unable to interbreed. McConnell et al., (2018) observed hatchery-wild temporal overlap in 92% of visits to Sawmill Creek, and all spawning occurred within a 300m reach, suggesting extensive spatial and temporal overlap. Both male and female hatchery fish arrived to the stream 10 days later than wild-origin fish and had to displace natural fish to spawn. This, alongside smaller body sizes for competition and redd building, put hatchery fish at a competitive disadvantage that may be reflected in greater egg retention. In Sawmill Creek, hatchery Chum Salmon spawning also coincides with high Pink Salmon abundance and periodic hypoxic conditions (Sergeant et al., 2017), which may further contribute to reduced reproductive success and limited gene flow to wild populations.

Potential mechanisms for reduced reproductive success in hatchery fish

Domestication selection/relaxation of natural selection

Domestication selection is the process by which a wild-origin population genetically adapts to captivity. This occurs simultaneously with the relaxation of selective pressures imposed in natural systems. These pressures are applied to hatchery fish due to differences in their life histories to wild fish. In hatcheries, unfertilized egg to fry survival is approximately 90% for Pink and Chum Salmon, (PWSAC, 2022a; NSRAA 2022), whereas in wild systems this value is 7–9% (Bradford, 1995). Environmental factors contributing to this difference include regulation of temperature, oxygenation, substrate quality, egg density, and egg disinfection in hatcheries. Hatchery-origin Pink and Chum Salmon are held in saltwater net-pens for 6 and 12 weeks respectively (PWSAC, 2022a) and fed fishmeal. Net pen rearing alters their early marine experience relative to wild-origin fish, that experience high size-specific mortality (Beamish & Mahnken 2001). Once released, hatchery and wild-origin fish share a common marine-phase life history, although annual growth patterns sometimes differ by stock, suggesting different environments or feeding behavior (Beauchamp et al., 2007; Cross et al., 2009). As returning adults, hatchery fish that school at, and most commonly swim up fish ladders at hatchery sites are selected for broodstock, regardless of success in selecting suitable mates, or spawning sites. In Table 4, we summarize potential sources of domestication selection and relaxation of natural selection on hatchery fish.

Table 4. Potential sources of domestication selection and relaxation of natural selection and potential impacts on fitness.

Domestication selection	**Relaxation of natural selection**
Juvenile - Feeding on fishmeal - Volitional movement to net pens - Higher egg density Adult - Schooling outside of hatchery	Juvenile - Temperature and oxygen stress - Egg surface pathogens - Prey avoidance Adult - Mate selection - Spawning site selection

The effects of domestication selection and the relaxation of natural selection can be observed at several levels: germline, transcription, phenotype, and reproductive success. The AHRP identified differences between hatchery-origin strays and wild fish in terms of phenotype (body size, run timing, spawning location) and reproductive success, but the germline and/or transcriptional drivers of these processes remain poorly understood. To explore possible drivers for RRS and body size differences, we can make inferences from other Pacific Salmon species.

The reduction in fitness of hatchery-origin Prince William Sound Pink Salmon aligns with similar studies on other Pacific Salmon. Several studies compared the genetics (DNA sequences) and epigenetics (DNA-methylation) of wild-origin and hatchery-origin Steelhead and Coho. In hatchery-origin Coho, Le Luyer et al., (2017) identified differentially methylated regions in genes relating to osmoregulatory processes (smoltification), and swimming performance, corresponding with previously noted deficiencies in hatchery fish (Brauner et al., 1994; Shrimpton et al., 1994). In another study on Coho Salmon, hatchery rearing was associated with epigenetic modifications in the germline DNA of adult salmon that persisted in their offspring, even after 1.5 years in the ocean (Leitwein et al., 2021).

In Steelhead, changes in gene expression (Christie et al., 2016) and fitness (Christie et al., 2012) can be induced within a single generation of hatchery rearing. In a separate study on Steelhead, no hatchery or wild-origin specific differences were identified in DNA, however differentially methylated regions were identified in somatic cell DNA (non-heritable) and germ-cell DNA (heritable) (Gavery et al., 2018). Taken together with the Coho Salmon results, this suggests selective pressures from hatchery rearing induce changes at the epigenetic level, but not in terms of allele frequency. Epigenetic changes occur rapidly and are heritable for hatchery fish that return to the hatchery. The persistence of these modifications in the wild, in the case of staying fish, remains unknown. In zebrafish, epigenetic changes inherited from the mother undergo resetting during early development whereas epigenetic modifications from the father are stably inherited (Jiang et al., 2013). This may explain why the RRS was lower for hatchery-stray females than males in 3 of the 4 lineages examined (Shedd et al., 2022b). To quantitatively assess the persistence of epigenetic modifications brought about by hatchery rearing, it will be necessary to examine the survival of grand-offspring of hatchery strays.

Run Timing

In Pink Salmon, run timing is a heritable trait with much genetic variation (Smoker et al., 1998). Interannual variation in freshwater environments (temperature) allows genetic variation in run timing within populations to persist. Even and odd year Pink Salmon lineages from the same river systems consistently evolve the same run timing in the absence of interbreeding, suggesting environmental conditions can shape the run timing of populations (Oke et al., 2019). Parallel evolution between lineages is observed in streams with less than 40 years of data. In Chinook and Steelhead Salmon, run timing has been linked to a single locus containing two genes: GREB1L and ROCK1 (Hess et al., 2016; Waples et al., 2022). Fish with early run timing consistently display different GREB1L/ROCK1 genotypes than fish with late run timing (Narum et al., 2018; Willis et al., 2020; Thompson et al., 2020). It is unknown whether the heritability of run timing in Pink Salmon is also mediated by GREB1L/ROCK1. The placement of Pink Salmon in the Salmonid phylogeny suggests they inherited these genes, however Pink Salmon run timing varies little relative to Chinook and Steelhead Salmon (a few weeks versus between seasons).

Prince William Sound hatchery strays generally return later than wild-origin fish. Late run timing in a wild system may reduce reproductive success by a variety of mechanisms discussed below.

1. **Differential fishing pressure**: In Prince William Sound, commercial harvest is highly spatially and temporally variable during the months of Pink Salmon returns. Across PWS, 94–99% of hatchery fish are harvested, whereas only 27–50% of natural-origin fish are harvested (Knudsen et al., 2021). In a natural stream, the offspring of hatchery strays may inherit the late run-timing of its parents and be exposed to fishing pressures for hatchery fish, whereas the offspring of wild fish, born in the same river, may inherit the early run timing of their wild-origin parents and be exposed to less fishing pressure. In 2016, little fishing pressure was applied to western Prince William Sound, and Hogan and Stockdale hatchery stray RRS remained low, suggesting commercial harvest is not the sole driver of RRS.
2. **Straying fish delays**: It may be the case that hatchery strays take longer to find and utilize a suitable spawning location than wild fish. In a survey of hatchery and wild fish from 2017 and 2018 in Paddy and Erb Creek, hatchery strays spent on average 2 days longer in spawning streams than wild-origin fish, though few hatchery strays were collected and this difference was not statistically significant (McMahon 2021 Thesis).
3. **Spawning ground competition**: When hatchery fish do escape commercial harvests and stray into wild streams, they face more spawning ground competition than wild-origin fish that arrive on average, 5 days earlier for males and 2 days earlier for females (Shedd et al., 2022). This later spawning time may place the hatchery fish at a disadvantage for competing for prime spawning habitat.
4. **Egg incubation temperature:** Timing of spawning is correlated to temperature regimes experienced by juveniles, with earlier spawning in colder systems (Sheridan, 1962; Hogson & Quinn, 2002). In the Auke Lake System in Southeast Alaska, early spawning fish utilized cooler upstream waters and late spawning fish used warmer downstream waters (Fukushima & Smoker, 1997). The two groups were expected to have synchronous fry emergence. The late season, upstream spawning of strays observed in Shedd et al., 2022 may result in too low of incubation temperatures for their progeny and suboptimal emergence time.

5. **Temporal sampling bias**: Finally, sampling efforts in Prince William Sound were biased towards the beginning of the run, and the tail ends of the run were not always captured (Shedd et al., 2022a). Perhaps late-returning progeny of hatchery strays were excluded from sampling efforts.

Spawning ground familiarity

A final, non-heritable driver of RRS in hatchery strays may be a lack of familiarity for spawning grounds. Wild fish chemically imprint to highly specific areas within a stream as juveniles and return to the same location to spawn as adults (Bentzen et al., 2001; Neville et al., 2006; Barnett et al., 2019). Sockeye Salmon in particular, can return to spawn within 50 meters of their natal site (Quinn et al., 2006). Sockeye Salmon that spawn further from their natal site have lower reproductive success, even if spawning occurs within 500 meters of their natal site (May, 2022). A similar, though less fine-scale relationship between natal homing and fitness was identified in Atlantic Salmon (Mobley et al., 2019). Fitness associated with precise homing is an example of microgeographic adaptation (Richardson et al., 2014). These results in sockeye and Atlantic Salmon suggest that straying fish, regardless of hatchery or wild origin, are at an inherent fitness disadvantage due to maladaptation. In Prince William Sound Pink Salmon, it may be that the reduced RRS observed in hatchery strays is indicative of all fish that stray from their natal stream, regardless of hatchery or wild origin (Ueda 2012).

Strays, regardless of origin, may have maladapted immunological profiles for their spawning environment. Anadromous Pacific Salmon heavily express the stress hormone cortisol during the return to freshwater. Cortisol assists in freshwater adaptation but inhibits B cell development and proliferation, leaving spawners vulnerable to infections (Zwollo, 2018). In mammals, long-lived plasma cells (LLPCs) secrete pathogen specific-antibodies and survive years in bone marrow without the replenishment of new memory B cells (Slifka et al., 1998). In teleost fish, which lack bone marrow, LLPCs are stored in the interior kidney and perform a similar function (Schouten et al., 2013).

The “immunological imprinting hypothesis” (Zwollo, 2012) proposes that juvenile salmon develop immunological profiles specific to the pathogen fingerprint of their natal site. This early adaptive immunity is stored in the “immunological memory” of LLPCs, which later defend returning spawners from the pathogens of their natal streams. More broadly, this may explain some of the fitness advantage of returning to the natal site, and the disadvantage of straying.

In testing the hypothesis, Sockeye Salmon were found to secrete IgM from LLPCs constitutively though spawning in parallel with depletion of developing B cells (Schouten et al., 2013). Sockeye Salmon from geographically distant sites in Alaska expressed varying levels IgM, with unique compositions of Immunoglobin V_H gene families for each site. V_H gene expression was also correlated to the presence of fish pathogens in the natal streams (Chappell et al., 2017). Altogether, these results align with the “immunological imprinting hypothesis.” By this mechanism, straying fish arrive in wild systems immunologically ill-prepared, which may contribute to reduced fitness.

Considerations for Management

In future years, hatcheries may adapt practices to mitigate potential negative consequences of hatchery-origin fish straying into wild systems. These changes should aim to increase hatchery salmon homing or reduce hatchery salmon straying. A third possible approach to “rewild” hatchery fish has been explored in conservation hatcheries with natural rearing (Tave et al., 2019; Sheller & Bruchs, 2020) or by integrating wild broodstock (Hayes et al., 2013). Integration of wild broodstock has been employed with success in Chinook Salmon conservation hatcheries outside of Alaska (Fast et al., 2015; Waters et al., 2020). However, the large broodstock requirements of production hatcheries and potential to deplete wild stocks makes this strategy problematic for Alaska. Given the scale of Alaskan production hatcheries, and difficulty in unraveling the source of fitness discrepancy between hatchery strays and wild fish, we only propose methods to address homing and straying.

Strategies to increase homing

Adult salmon use magnetic fields to navigate from the open ocean to their natal coastal range (Putman et al., 2013) and then olfactory cues to identify their natal river and spawning site (Hasler & Scholz, 2012; Keefer & Caudill, 2014b). Amino acids are a signal for olfactory homing of Pacific Salmon (Yamamoto et al., 2013) and are released in natural rivers by biofilms (Ishizawa et al., 2010) and sediment (Thomas & Eaton, 1996).

Artificial imprinting odors

Potential for artificial imprinting odors to boost homing has long been speculated (Hasler & Scholz, 2012), but has been explored little in recent years. Early efforts had mixed success in boosting homing (Cooper et al., 1976; Rehnberg et al., 1985; Hassler & Kucas, 1988). These experiments utilized an artificial compound, morpholine, rather than amino acids as a homing signal and only imprinted fish at the smolt life stage. More recent work suggests imprinting occurs while fish are embryonic and during parr-smolt transformation (Dittman et al., 2015). An experiment currently ongoing at the Oregon Hatchery Research Center (OHRC) imprinted embryonic and parr Chinook Salmon with a cocktail of amino acids, released the imprinted and tagged fish as smolt in 2020, 2021, and 2022. In 2024, adult fish will begin to return to a spawning ladder also releasing the amino acid cocktail (OHRC, 2022). In Alaska, potential applications of this research may include adding porous, solute-releasing sediment to rearing waters, adding biofilm-covered organic substrates like macroalgae to hatchery sites (Weigel et al., 2022), or the addition of unique chemical cocktails to rearing waters and hatchery discharge similar to the OHRC.

Strategies to reduce straying

Temporal segregation

In Prince William Sound, hatchery broodstock were selected to provide diverse fishing opportunities across the entire season, not necessarily for maximal temporal and spatial separation from wild fish (Fig. 3). Presently, broodstock is harvested during historical run peaks to preserve run timing. To enhance temporal separation, hatchery broodstock may be intentionally taken further from the peak of wild returns, e.g. earlier at SGH, and later at AFK. A consequence of this strategy is that hatchery strays will become more divergent in run timing from wild fish, spawning at a highly suboptimal time. This will decrease their overlap with wild fish and also decrease the relative survival of their offspring. This presents a "double-edged sword" that conflicts with Alaska's strategy of minimal stock manipulation. Limited temporal overlap would limit introgression, but in the case of hatchery-wild hybridization, reduced fitness could exacerbate the consequences of introgression.

New broodstock

As an alternative to manipulating current broodstock, the hatcheries that produce the most strays (AFK, WNH) could source more suitable broodstock from current wild PWS populations. Different Pink Salmon populations may stray more or less than others, as has been found with Chinook Salmon (Westley et al., 2015). Whereas SGH and CCH acquired ancestral broodstock from individual sources, the ancestral AFK broodstock, which was later propagated at WNH, came from multiple wild populations (Habicht et al., 2000). This may have inadvertently introduced fish with inherently higher stray rates. For new broodstock, a source population could be selected with a low natural stray rate and limited temporal overlap with wild fish.

Spatial segregation

Spatial overlap of hatchery and wild fish is dependent on run timing; however, management strategies may reduce spatial overlap without changing run timing. The fishery in the Eastern district of Prince William Sound may currently serve as a model of this. SGH in the Eastern district is the largest single producer of Pink Salmon fry in the state of Alaska, and its early run timing coincides with wild stocks in the region. Despite this overlap, the pHOS of the Eastern district is the second lowest in the Prince William Sound. This may be due to the relatively aggressive harvest of the fishery in the early season, with pressure on Jack Bay along the migratory path of incoming adults. Perhaps aggressive and early harvest of hatchery fish, at the expense of increased wild fish harvest, may reduce hatchery fish residence time in Prince William Sound and reduce straying. At AFK a barrier net was historically used to reduce hatchery fish residence time and potential to leave the bay, however private lodges in the area and fish crowding concerns prevent similar redeployment today.

Reduced hatchery production

The current management strategy in PWS is informed by in-season sampling (Russell et al., 2021) and successfully captures 94–99% of hatchery Pink Salmon that enter PWS (Knudsen et al., 2021). However, given the large abundance of hatchery returns (43.8–77.3 million Pink Salmon), this donor rate of 1–6% can represent a major source of introgression, particularly in small streams near hatcheries. It remains unknown whether hatchery strays are augmenting or replacing wild-origin fish, however reducing total hatchery releases may reduce pHOS. Reductions in production may be particularly effective at the AFK Hatchery in Southwest PWS where the wild runs are relatively small and where most hatchery and wild fish pass nearby on their migratory path into Prince William Sound.

Conclusions

Below, we revisit the priority questions of the Alaska Hatchery Research Program:

1. What is the genetic stock structure of Pink and Chum Salmon in each region?

Within Prince William Sound, Pink Salmon have similar genetic differentiation to Pink Salmon from other similarly sized regions (Cheng et al., 2015). Of the four contemporary hatchery Pink Salmon stocks in PWS, fish from AFK Hatchery were the most similar to wild fish in streams. Since the 1990s, even-year wild fish in streams had become more similar to AFK fish. A similar result was observed in PWS Chum Salmon, though rates of introgression were driven more by temporal overlap with wild fish than pHOS (Jasper et al., 2013). Odd-year wild fish had become less similar to SGH, potential due isolation and genetic drift of the hatchery broodstock. Like PWS Pink and Chum Salmon, Southeast Chum Salmon show genetic differentiation corresponding to geography and run timing (Habicht et al., 2022). Genetic introgression by hatchery strays into wild Southeast Chum Salmon populations remains to be tested.

2. What is the extent and annual variability in straying of hatchery Pink Salmon in Prince William Sound (PWS) and Chum Salmon in PWS and Southeast Alaska (SEAK)?

In PWS between 2013 and 2015, the total proportion of hatchery-origin straying Pink Salmon ranged from 0.05 to 0.15 (Knudsen et al., 2021). This proportion is highly variable between streams, with the highest pHOS found near hatcheries. Excluding Eshamy District, which contributes less than 1% of Pink Salmon escapement, the largest district-wide pHOS consistently occurred in the Southwestern district. Southwestern District contains the AFK Hatchery and the predominant migratory pathway for all Pink Salmon entering PWS. For PWS Chum Salmon, the total proportion of hatchery-origin strays in PWS ranged from 0.03 to 0.06 with the highest proportion of hatchery-origin strays in Montague District, which contains the Port Chalmers remote release site Knudsen et al., 2021). The pHOS of Southeast Chum Salmon ranged from 0.03 to 0.09 between 2013 and 2015 (Josephson et al., 2021). As was the case in PWS Pink and Chum Salmon, pHOS was highest near hatcheries and remote release sites.

3. What is the impact on fitness (productivity) of wild Pink and Chum Salmon stocks due to straying of hatchery Pink and Chum Salmon?

This component of the AHRP is still ongoing with additional results expected in 2023 and 2024. Presently, fitness data is available for Prince William Sound Pink Salmon from 2013 and 2014 brood years from two streams (Shedd et al., 2022a). Preliminary data is available from 2014 brood year fish from three other streams Shedd et al., 2022b. RS for hatchery-origin strays relative to their natural origin counterparts is highly variable between brood year, stream, and sex, with values ranging from 0.03–0.96. In all streams, hatchery-origin fish spawned later in the season and further upstream than their wild-origin counterparts. Body length was generally greater in hatchery-origin fish. When accounting for these differences, RRS for the 2014-year broodstock of hatchery strays was 0.42–0.60. This suggests additional factors besides spawning date, spawning location, and body size are contributing to reduced fitness. It remains unknown whether hatchery strays convey a heritable, lasting fitness disadvantage to wild populations, or the reduced RRS observed is ephemeral, and caused by other factors. We summarize possible mechanisms driving RRS in the section *Potential mechanisms for reduced RRS in hatchery fish*. Further, hatchery straying may impact wild populations in a manner irrespective of reproductive success, for example genetic homogenization might be detrimental to the resilience (e.g. portfolio effect (Schindler et al., 2010)). Future studies should seek to identify the most likely mechanism at play and recommend adjustments to management accordingly.

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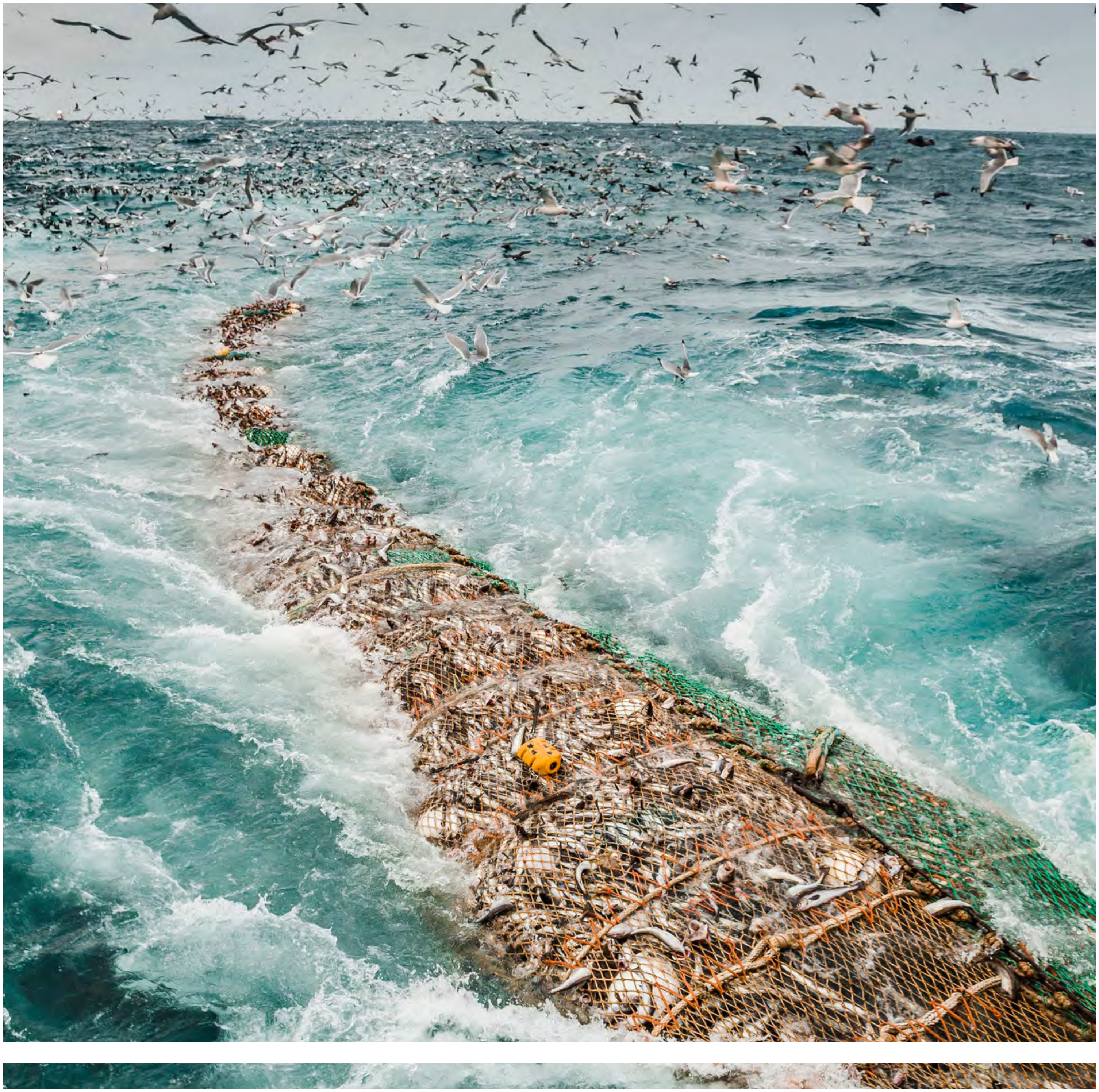


REDUCING SALMON BYCATCH IN THE ALASKA POLLOCK TRAWL FISHERY

A PILOT PROJECT USING LIGHTS

JANUARY 2023

INTRODUCTION

Minimizing bycatch is an important component of modern, profitable, and sustainable Alaska fisheries.

The purpose-built Pisces bycatch reduction light from SafetyNet Technologies was tested in the nets of three Alaska pollock trawl vessels in the summer of 2022.

The project took place between June and August 2022, where approximately 52 multi-day trips were completed with more than 35 million pounds of pollock harvested. Approximately 161 Chinook and 6,183 chum salmon were incidentally harvested.

Results indicate a slight correlation between use of the lights and bycatch reduction. Results are not statistically significant. Further research is needed and recommended to confirm light technology as a viable bycatch reduction tool.

Although the research team would have preferred stronger results, this project is considered a success.

The $100k project was relatively inexpensive and consistent with the model of rapid experimentation to develop solutions to industry challenges.

The technology survived difficult working conditions, was described as "easy to use," and gathered valuable information that can be used to support further deployments and engineering refinements.

The project is an example of the Denali Commission partnering with legacy industry and a technology start-up to test the viability of novel technology unlikely to be funded exclusively by industry.

In addition to lights, active excluders, trawl modifications, increased information sharing, ecosystem modeling, and new operating practices offer the potential to reduce bycatch.

PARTNERS & FUNDING

This project was developed and managed by the Alaska Ocean Cluster and the Bering Sea Fishermen's Association. The mission of Alaska Ocean Cluster is to support early-stage companies and the maritime industry to deploy new technologies that improve the profitability and sustainability of Alaska fisheries.

The Alaska Ocean Clustered partnered with Coastal Villages Regions Fund (CVRF), an Alaska Community Development Quota Group. CVRF is one of six non-profits dedicated to benefiting 65 Western Alaskan communities through ownership of Alaska seafood industry quota, vessels, and other maritime assets. The three pollock trawl vessels used in this project are partially owned by CVRF.

The project was funded by CVRF and the Denali Commission, an independent federal agency dedicated to economic development in Alaska.

Garrett Evridge was the Project Manager and primary author of this report. Taylor Holshouser, Kyle Belleque, Tom Rossiter, and Craig Syms contributed, among others.

METHODOLOGY

THE PLAN

- Illuminate the trawl excluder with a light
- Use lights every other trip
- Compare catch rates among the lit and unlit trips to see if there is a reduction in salmon bycatch

A simple on/off methodology was used to test the efficacy of the lights. Simplicity was prioritized to minimize disruption to fishing operations and match the modest budget.

Lights were oriented in a way to illuminate the trawl excluder. All three vessels used a double-hood design, which provides two escape routes.

We were guided by the hypothesis that salmon may swim out of the excluder when they see the difference in contrast between the trawl webbing and open ocean.

Relevant academic literature was reviewed and researchers in the field were interviewed.

Vessels were instructed to use the lights every other trip over the entire B season. We anticipated this approach would generate at least 32 lit trips and 32 unlit trips.

Having at least 30 comparable observations was expected to be sufficient to comment on the efficacy of the lights.

Captains followed a communication protocol that involved notifying the research team on Whatsapp at the start and end of every trip. These time stamps were later correlated with catch/bycatch data.

PROJECT REPORT

WHAT HAPPENED

- One vessel used lights all season
- Two vessels left for tendering due to the record-breaking Bristol Bay salmon harvest
- The technology was durable
- Pollock harvest efficacy appeared to be unaffected
- Results indicate some efficacy

Our methodology helped guide the project, but thing didn't go exactly as planned.

One of the three vessels elected to follow an always-on methodology instead of the alternating methodology. This reduced the amount of data to compare against other vessels.

Because of the record-breaking Bristol Bay salmon harvest, two of the three vessels in the project were called away to tender.

These unanticipated developments reduced the total number of trips to 52, down from the goal of at least 65. The total number of comparable on/off trips was also limited to 36.

The technology proved durable and reliable. Of the 30 total lights deployed, just one stopped working.

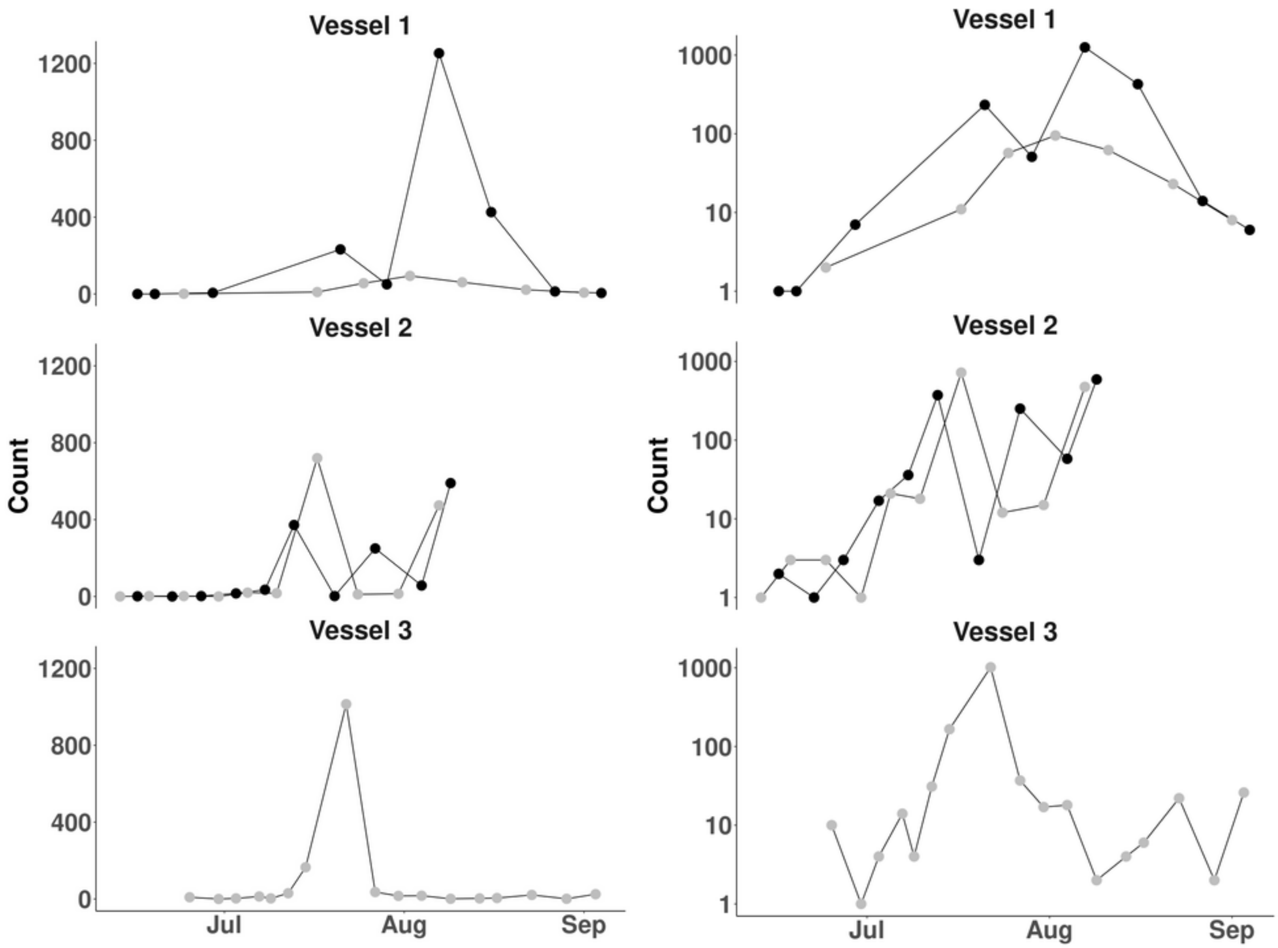
Our goal of conducting a simple, minimally disruptive project was generally met. This was achieved in large part thanks to the easy-to-use design on the Pisces light, which turned on and off when entering and leaving the water.

The remote used to change light settings was a point of feedback from the crew who asked for longer-range capability.

PROJECT REPORT

Figure 1. Chum catches per vessel, July - September 2022

Linear and logarithmic scale



Grey symbols are Light-On; black symbols are Light-Off.

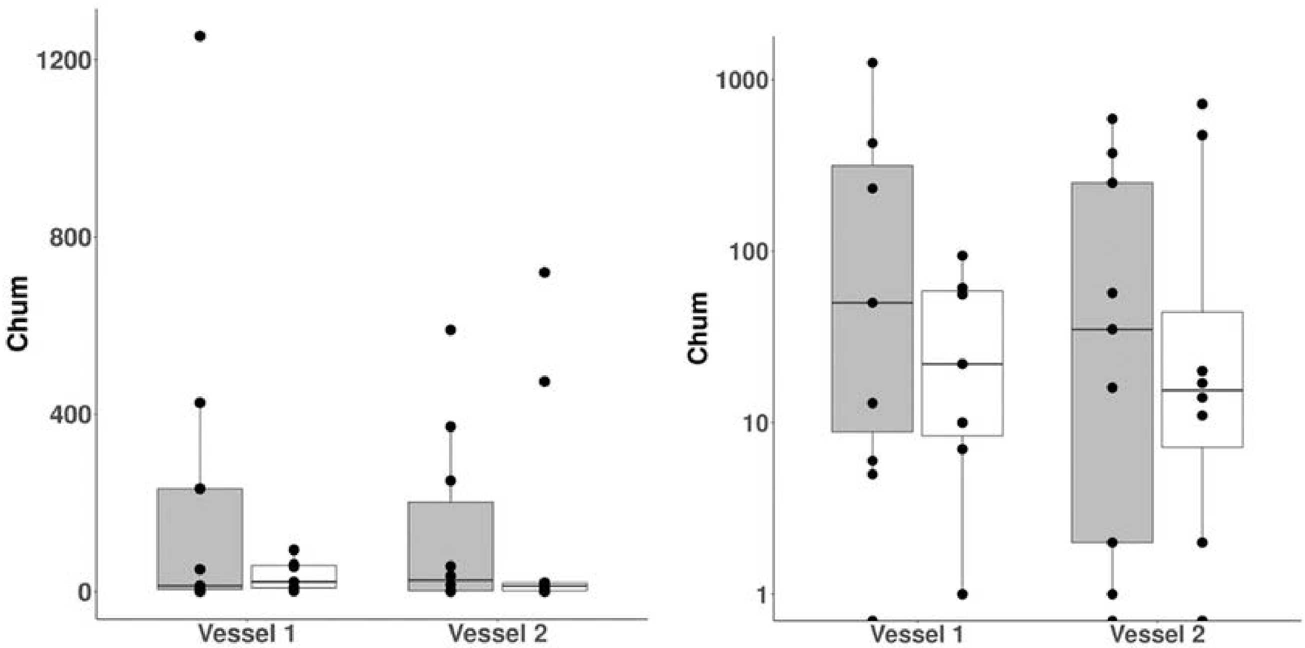
The first thing we notice is the significant variance in chum salmon catch, both across time and in magnitude. Use of a log scale helps us interact with the volatility in magnitude.

No definitive relationship between the use of lights and chum bycatch can be concluded from this data. We do see an interesting correlation in the Vessel 1 data where bycatch appears to be lower when the lights are in use. We also may be observing a seasonal effect in bycatch rates in Vessel 1 and Vessel 2.

PROJECT REPORT

Figure 2. Chum catch for Vessel 1 and Vessel 2, July - September 2022

Linear and logarithmic scale



The boxplots display the median (horizontal line) and quantiles (top and bottom of boxes). The points are the individual sample values. Grey boxes are Light-Off; white boxes are Light-On.

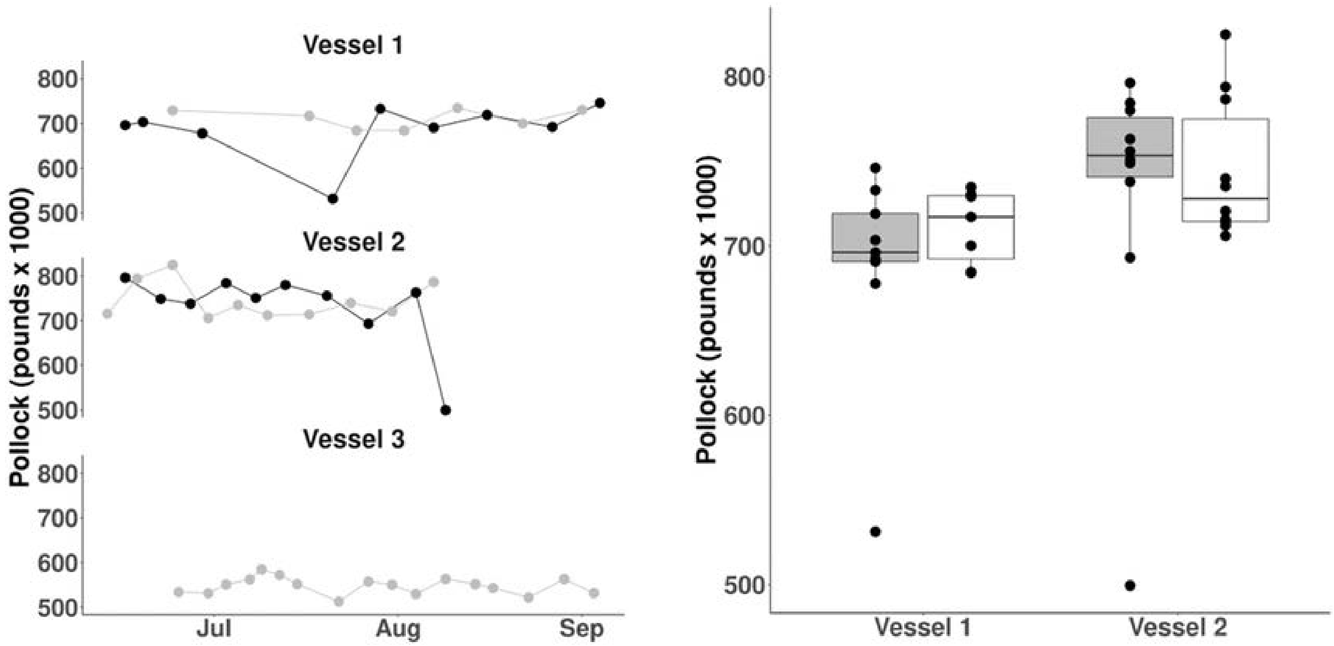
Across the season, there is some indication that chum catches were lower when the lights were on. We see this most clearly in the logarithmic scale where the median chum catch is lower on lighted trips. However, note that lights were being used when Vessel 2 saw its highest chum catch of the season.

It's possible that lights are reducing bycatch rates at times, with any effect in the data overpowered by periodic and magnitudes larger chum harvest.

PROJECT REPORT

Figure 3. Pollock Harvest

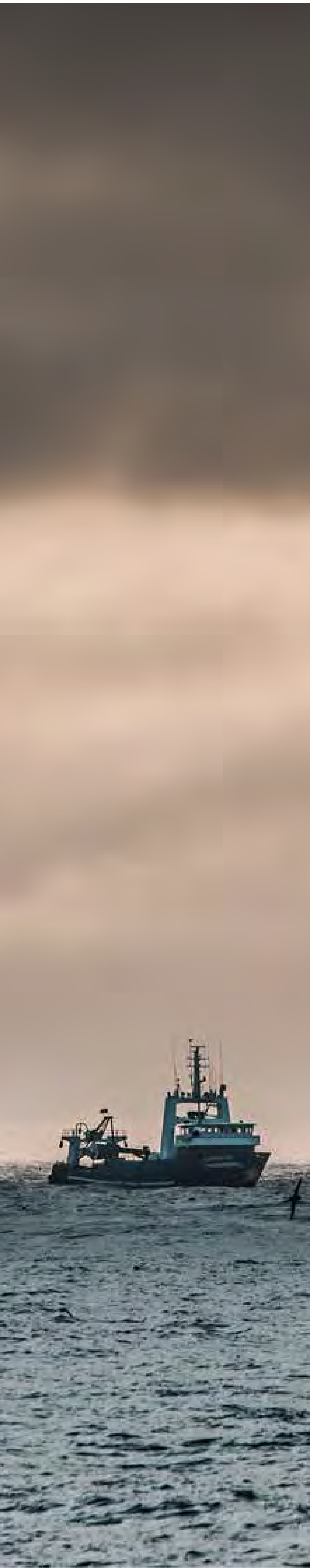
Linear Scale



Left: Time series of catches for each vessel. Right: Season-wide comparison between Light-On and Light-Off regimes. Colors as above.

There was no noticeable difference in pollock harvest when lights are used. This is seen most clearly in the box plot on the right where the median values move in opposite directions, indicating no relationship.

Future research should continue to consider the impact of any bycatch reduction device on target harvest.



FUTURE RESEARCH

Results show some promise, but additional research is needed to improve understanding of lights as a viable tool for reducing bycatch.

A key challenge when trying to prove causality for bycatch reduction tools is the relatively low frequency of incidental catch. For every Chinook harvested incidentally, more than 215,000 pounds of pollock were harvested. Another challenge is the "patchy" nature of chum salmon bycatch. Vessels were observed making trip after trip with less than 50 chum harvested, punctuated by rates that would rise to ten times that.

The best strategy to overcome these observed patterns is to increase the amount of data available for analysis.

Recommendations:

- Repeat the trial with more vessels following the prescribed on-off regime. There appears to be no detrimental effect on Pollock catch, and with more boats, the effect could be identified at a sufficient level of statistical significance.
- Video should be deployed alongside lights to identify whether the lights are placed correctly/optimally, and how placement can be improved. The bycatch reduction mechanism is an interaction between gear, light, visual environment, and fish behavior. These elements need to be considered and researched further.
- Video should also be used to provide visual evidence that bycatch species are indeed using the escape panel, and that this is due to the lights. An escapement net could be used as well.
- Expectations should be managed. It's unlikely that any one bycatch reduction solution will solve the problem of incidental harvest. Instead, we should be ready for a sustained focus on identifying and deploying multiple solutions that can meaningfully improve bycatch.

ADDITIONAL STRATEGIES

The use of lights aboard trawl vessels is only one of many strategies to reduce bycatch. Interviews with the fishing industry and other researchers were conducted to understand other strategies currently being used and which strategies might be viable in the future.

Trawl net designs. Changes to the structure of trawls and how they engage in harvesting are among the most common strategies to reduce bycatch. Conversations with industry participants indicate there are several possible changes to nets, doors, excluder panels, and foot ropes, among other elements, that should be considered.

Fishing practices. Changes in rates of haul, tow speed, and other parameters are an existing strategy to reduce bycatch. Bycatch rates can be higher in vessels that tow faster, reducing tow speed may be helpful. Once a net is full, captains describe different strategies to aid Chinook salmon release. Changing the rate of net retrieval — starting slow and ramping up to normal speed — is an example.

Shifting harvest time or location. Capitalize on the propensity for bycatch to occur follow seasonal and geographical patterns. Fishermen already regularly shift harvest activity among these patterns to minimize bycatch.

Active excluders. Potential exists to have a dynamic opening in a trawl net which opens to release bycatch species, before closing to maintain target species harvest. The optimal design would function automatically and have minimal pollock loss.

Information sharing & dynamic closures. Information sharing in the Alaska pollock fishery is among the best in the world, but there are likely opportunities to improve the ability to rapidly respond to and avoid bycatch concentrations.

Ecosystem modeling & surveying. We lack the ability to know the approximate location of target and bycatch species. Improved ecosystem modeling, supported by surveying, could support the development of tools which will improve understanding of where fish are likely to be located.

Please contact Garrett Evridge for more information: garrett@alaskaoceancluster.com

Photos courtesy of Alaska seafood (Alaska Seafood Marketing Institute) and Garrett Evridge

Version 1.0

Alaska Fisheries Development Foundation, Inc.
NSF 22-520 February 2023
Navigating the New Arctic (NNA)
Title NNA Research: Fishing for the Cold Pool.
Proposal #WS01031233

PROJECT DESCRIPTION

NNA Research: Fishing for the Cold Pool

Intellectual Merit

This project aims to improve our collective understanding of how climate change is impacting the cold pool in the Bering Sea. The Pacific cold pool is found in the region of the Bering Sea shelf where bottom water is < 2°C throughout the summer. When autumn and winter bring colder weather and the ocean begins to freeze, the salinization of the surface waters due to sea ice formation and subsequent brine rejection creates a heavy and dense water that leads to overturning and vertical mixing throughout the water column. The cold pool is important for the Arctic ecosystem structure and delineates the boundary between Arctic and subarctic fish species. Bottom water temperature has been found to be the dominant climate parameter for determining community composition of fish species and benthic crustaceans species in the Bering Sea.

By using commercial fishermen's deep knowledge of the ocean, and pairing that with scientific temperature loggers that collect over seasons, we will be able to create a comprehensive understanding of how and when the cold pool develops. Currently, there is one intense bottom temperature survey done annually in the summer. This survey is a critical snapshot of the temperature over the summer, but fails to show the development and other correlating factors and how climate change is impacting the structure of the cold pool. It is impossible to accurately forecast and to manage many of the Arctic commercial fisheries without clear knowledge of what is happening and how to improve our understanding.

This proposal will increase our knowledge and understanding across:
Indigenous Traditional Knowledge- Growing the value and blending knowledge systems in a way that can support subsistence activities and management decisions.
Local Experience and Knowledge- Developing new ways to capture critical observations on the ocean many commercial fishermen see, but don't have a way to incorporate into developing scientific discovery.
Physical Oceanography- Creating new data and knowledge on the cold pool development, ocean current, and stratification process and factors.
Marine Biology- Identifying the cold pool species, and changes across populations as fishing fleets data is correlated to location and temperatures.

Forecasting- Creating new modeling and forecasting capabilities using state-of-the-art artificial intelligence modeling to blend new and disparate data sources into a visual and educational product for all of the users.
Economics- Building the optimized fisheries management solution for sustainability and commercialization.

Broader Impacts

Understanding the Arctic cold pool will support the potential benefit to society by providing insights into regional and regional-to-global climate effects, informing regional adaptation and mitigation strategies, and improving environmental stewardship. This research can also contribute to the public's understanding of the processes and impacts of climate variability and changing climate conditions. It can help inform policy-makers and land managers about the potential susceptibility of local communities and ecosystems to changes in Arctic climate systems, ultimately contributing to more resilient, secure, and sustainable Arctic regions.

At a local level, a changing environment threatens the Alaska seafood industry, rural communities, Alaskan Native traditions, and food security of the United States. This project will partner with local fishermen to deploy, monitor, and retrieve instrumentation required for this effort. Early conversations indicate support and possible involvement from local fishing associations, such as the Bering Sea Crabbers Association, who are particularly exposed to climate risk. The project will support the understanding and adaptation for a whole region of fishing activities.

Improving our collective understanding of how climate change is impacting the cold pool will increase climate resilience, assist modern fisheries management decisions, support traditional subsistence and harvesting activities, and champion a transition to precision fishing methods to increase biomass and reduce carbon emissions. Snow crab stocks have been negatively impacted by the reduction of the cold pool in recent years, leading to the 2023 closure of the fisheries. There may be a direct relationship to temperature, where metabolic rates increase in warmer waters, and crabs can not find enough food to sustain themselves. Climate change may also indirectly affect snow crab survival through predation, as other species begin to move north. Historically, the crabs focused in the cold pool, which acted as a thermal barrier preventing predators from moving north. However, with extreme warming in 2018, the number of juvenile snow crabs dropped substantially.

Climate Resilience- By creating a holistic picture of the changes in the cold pool over the season, we can better forecast future change. This will provide communities, and organizations the ability to plan and adapt to scenarios before they happen. For example, if the crab fishing fleet was able to forecast their fisheries closure they could diversify into other fisheries or kelp farming while they had the ability to plan and build infrastructure.

Fisheries Management- The Bering Sea contains important stocks of commercial fish species hence understanding the changing physical environment in which they live is critical for proper management practices. These models will provide a higher resolution picture of how and where the cold pool is developing, and the correlating factors to understand and forecast the future development and impact on juvenile populations.

Introduction

A changing environment threatens the Alaska seafood industry, rural communities, and food security of the United States. In the Bering Sea there is a hidden but crucial habitat, a pool of cold bottom water, less than 2℃. It is formed by salinization of the surface waters due to sea ice formation and subsequent brine rejection in winter, which leads to overturning and vertical mixing throughout the water column. The cold pool is important for the Arctic ecosystem structure and delineates the boundary between Arctic and subarctic fish species. Improving our collective understanding of how climate change is impacting the cold pool will increase climate resilience, support modern fisheries management decisions, and support a transition to precision fishing methods.

In-situ observations in the Bering Sea are limited in large part due to the vastness of the area. The Bering Sea spans over two million square kilometers, making it incredibly difficult and costly to map out the area effectively. Additionally, the Bering Sea is considered to be one of the roughest and most unpredictable ocean ecosystems in the world. Its turbulent weather patterns, strong currents, and freezing temperatures put observers at a disadvantage and make gathering accurate in-situ data difficult and dangerous. Furthermore, the lack of infrastructure and lack of access to the area often make travel to and from the Bering Sea difficult, time-consuming, and costly. All of these factors have severely limited the number of in-situ observations that have been conducted in the Bering Sea and make it difficult to assess and monitor its ecosystem.

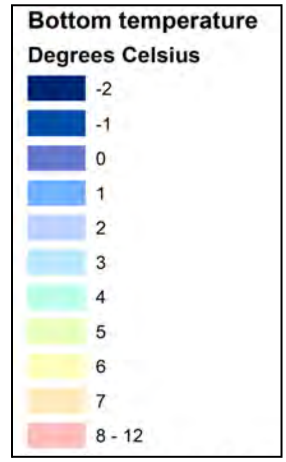
Our proposed project includes two primary components, and uses local knowledge to overcome the difficulties in gathering in-situ data. The first is working with commercial fishing operations and associations to deploy a network of ocean floor temperature loggers in the Bering Sea to gather year-round data. The network will follow a Northwest-Southeast transect which matches the seasonal extent of the cool pool. The second piece of the project is work with current and ongoing harvesters in the Bering Sea. Temperature loggers will be added to existing fishing gear, gathering data as harvest activity occurs.

The combination of datasets will produce a novel set of information which can be used to understand how the cool pool develops and recedes. It will support our ability to understand the relationship between sea surface temperatures, ice extent, and bycatch interactions, among other anticipated results. Data from the project will be publically available.

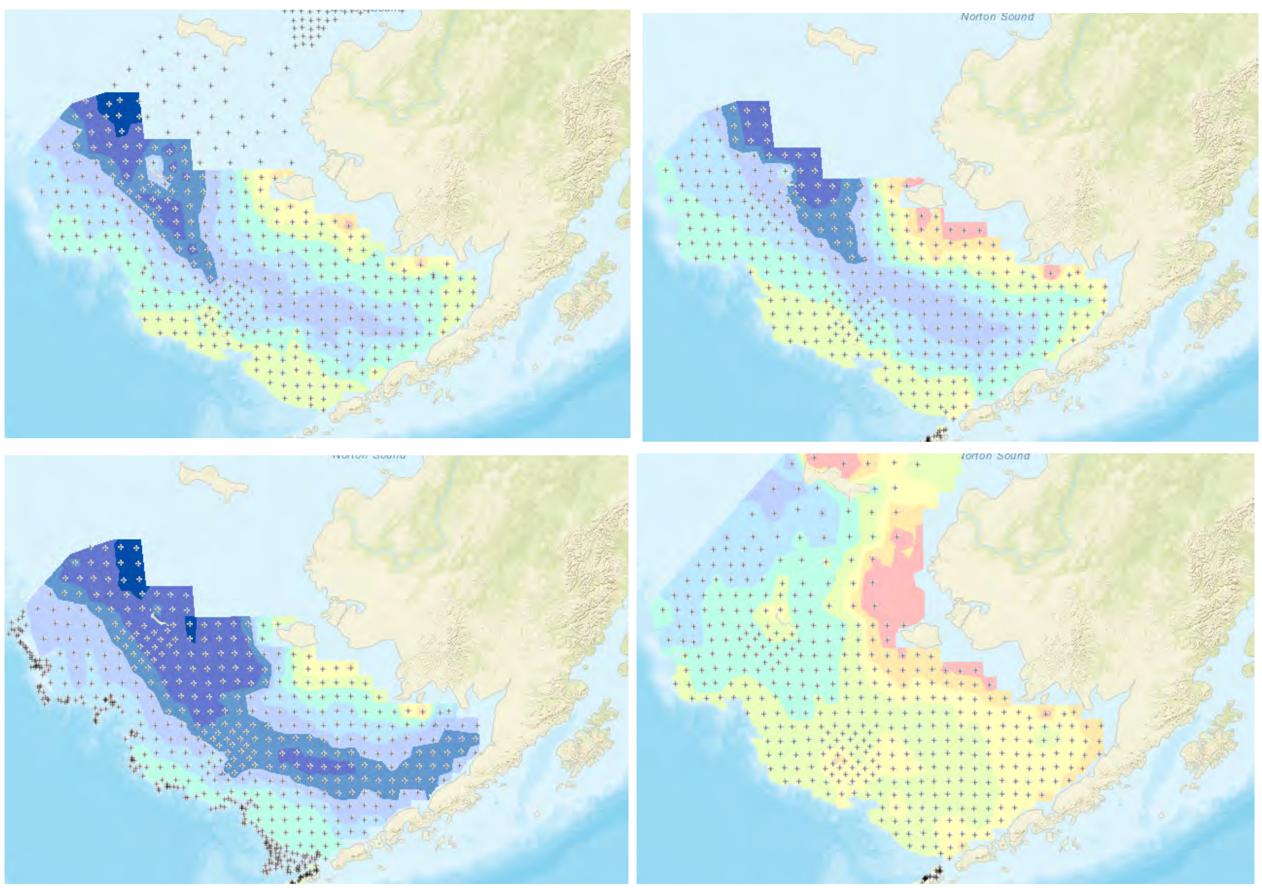
The Cold Pool

The Bering Sea is an ecosystem that experiences dramatic seasonal changes driven by sunlight and temperature. The Sea experiences winter sea ice coverage at the surface over its larger continental shelf. At depth a pool of cold salty bottom water, less than 2℃, forms as an artifact of the sea ice development. The cold pool is important for the Arctic ecosystem structure and delineates the boundary between Arctic and subarctic fish species.

The National Marine Fisheries Service (NMFS) Eastern Bering Sea summer bottom trawl survey collects environmental data, notably bottom water temperature, for much of the environmental time series database that provides our basic understanding of oceanographic conditions in the North Pacific, cold pool extent and more. The trawl covers the Bering Sea shelf in a grid of repeat stations that has been completed yearly since 1982 - 40 years. With insight from this series we have species ranges, species count variability like the crab stock assessments and abundance estimates, as well as surface temperatures and bottom temperatures.



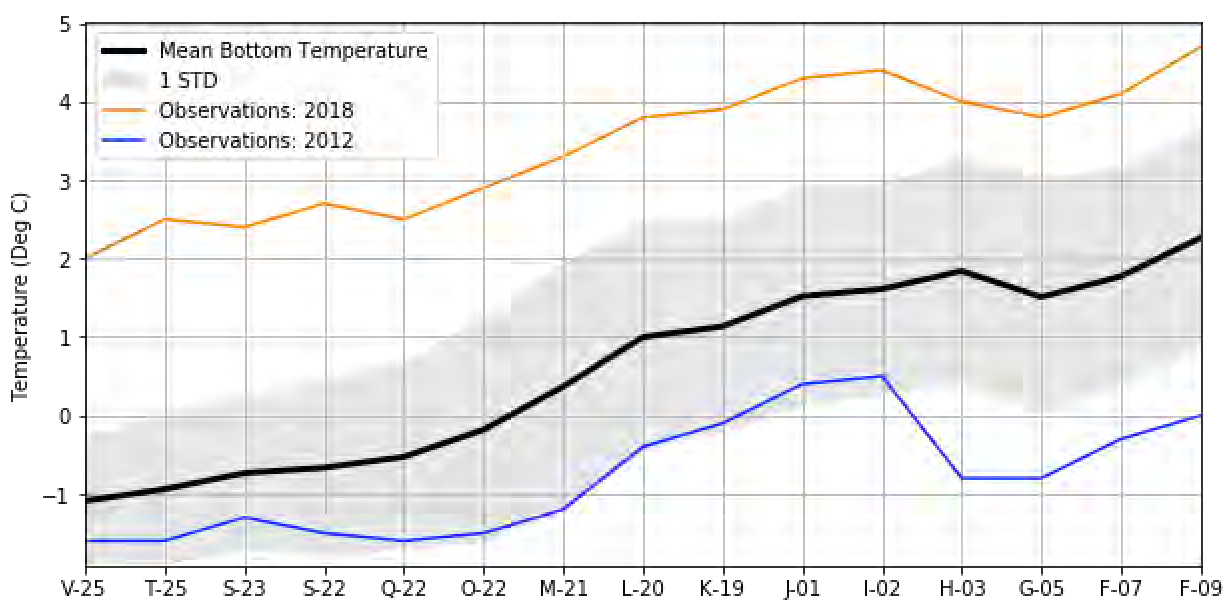
Cold pool variability during the summer has been recorded in this series as a snapshot during the spring and summer. On the NOAA groundfish survey interactive map, you can toggle between all the years of collected data through 2019. The set of figures below are screen shots from the map and show: 1988 top left; 1997 top right; 2012 bottom left; and 2018 bottom right. Temperature color contours are labeled in the legend to the right.



There is a visible persistent structure or tongue shape to the cold pool. While there is a consistent pattern to the expected growth of the cold pool, there is variability of how cold it becomes. The top two figures show a characteristic cold pool tongue, where temperatures are below 0℃ to the northwest, and temperatures below 2℃ extend all the way to the Alaska Peninsula. The bottom left shows a recent extreme year 2012, where 0℃ water extended all the way to the Alaska Peninsula. The bottom right shows another extreme year 2018, where there was no visible cold pool.

Modeling studies using the Regional Arctic System Model (RASM) estimate that the cold pool extends from the Russian side of the Bering Sea and St Lawrence island. These modeling studies, and the summer trawl surveys show that the general shape of the cold pool tongue extends south from the St Lawrence Island. It usually stays slightly north of St Matthew Island and the Pribilof Islands. The cold pool tongue has a long central axis moving around the central shelf at the 70 meter isobath.

The graph below illustrates the summer snapshot of the cold pool that we have from the trawl surveys along the center tongue axis. The data on the left starts at the north end of the survey (station V-25), and moves to the south (station F-09). The black line shows the mean bottom temperature from all years at the specific stations, and the gray patch around it shows the typical variability of 1 standard deviation around the mean. The two extreme years of 2018 (orange; very warm), and 2012 (blue; a recent cold year), are shown as a reference.



Historically, the cold pool started well below 0℃ at the first several stations, and slowly warmed up as it moved south-east.

However this is a single snapshot in the spring. There is a dearth of observations in the Bering Sea at depth in the winter as it is a difficult location for observations, but this is when the cold pool forms every year. Also, the directed crab fisheries occur in the fall for red king crab or Paralithodes camtschaticus (RKC), and winter/spring for snow crab/Chionoecetes opilio, and Tanner crab/Chionoecetes Bairdi, with no overlap with the summer trawl survey. Similarly, the crab fisheries are conducted using pot gear rather than a trawl net, which is used for the survey. Although the data collected on the summer survey is extensive and has a long-standing time series, there remains a disconnect between available environmental data and our understanding of what seafloor conditions are like during the execution of the directed fishery and how they may affect fishing performance.

This is the observational data gap that we are looking to fill: The growth and development of the cold pool during the winter.

The NMFS summer bottom trawl survey collects important oceanographic data across the Bering Sea shelf throughout the course of the annual survey, June-August. Directed crab fishing for Bristol Bay red king crab begins in mid-October while the snow crab fishery commences on January 1 and Tanner crab fishing lies within the temporal extent of these two directed fisheries. There is no temporal overlap with the summer bottom trawl survey. With environmental conditions changing over the seasons, and more uncertainty as we continue to see the effects of climate change, we will deploy two types of data loggers to collect fishery-specific environmental data for the duration of this project with the long-term goal of building a time-series database to compliment other data sources, like the summer bottom trawl survey.

Observational Data Collection Methods

The proposed data collection is a two pronged approach, the first component is to repeat stations from selected summer trawl locations along a transect down the center of the cold pool. These stations would be left for several months to a year. This would provide a time series along the main axis of the cold pool tongue, showing the evolution of and development of the cold pool. This has never been completed, and would provide valuable information to inform model verification and development.

A variety of approaches have been considered to collect data over the course of an entire year. While the technology exists to operate at this time-scale and environment, the Bering Sea offers some unique challenges. These challenges are one reason why this type of time series does not exist.

Conditions that are relevant include:

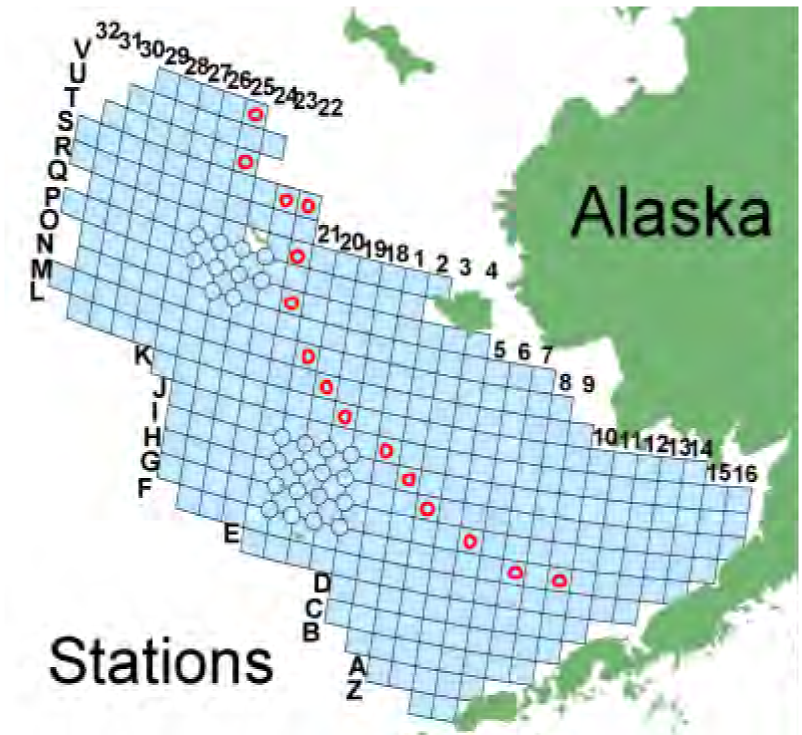
- Maintaining operations below 0-degree Celsius
- Coordination with trawl vessel fleets to minimize interaction with research equipment
- Preserving functionality in an environment where biofouling can occur
- Matching battery-life with a deployment/retrieval plan
- Sampling can be relatively infrequent to maximize battery life and minimize transmission time - on the order of once per day

Equip two crab pots connected with floating line. Each pot would be weighted to limit movement. Temperature loggers would be fastened to the pot, which will offer some protection. A vessel would be chartered to drop the pots off at the predetermined transect points and picked back up using a grappling technique. Conversations with crab fishermen to regularly grapple for pots indicate this retrieval strategy is viable and that the pots are unlikely to move very far over a year. Acoustic pingers would be used to assist locating and retrieving the pots. This approach requires charter of a vessel and crew equipped to handle crab pot deployment and retrieval.

Automatic pop ups are another possibility. These small sensors are commonly fixed to animals to track movement and other parameters. They function by releasing at a predetermined time, floating to the surface and transmitting data through satellite. A key downside is the elevated cost (typically more than $1,200 per sensor) and limited battery-life (less than six-months). However, the automatic transmission would prevent the need to charter a vessel to retrieve the device.

Use of a sensor buoy combined with an acoustically-actuated release device has been suggested. We are aware of several products on the market that meet this requirement. The positively buoyant buoy would gather temperature while connected to a release that can be actuated when the retrieval vessel is nearby. This is an attractive option because there is a possibility the system can be deployed by aircraft (cheaper than a vessel) and retrieval may be easier due to the GPS tracking capabilities offered by the buoy.

The figure below identifies the specific stations of interest from the summer trawl survey.



St	(Depth):	Lat(N),Lon(W)
V-25	(62.6m):	62.00, 173.73
T-25	(73.6m):	61.33, 173.59
S-23	(63.8m):	61.00, 172.15
S-22	(60.0m):	60.99, 171.48
Q-22	(65.9m):	60.33, 171.35
O-22	(72.3m):	59.66, 171.25
M-21	(71.2m):	59.00, 170.48
L-20	(66.7m):	58.66, 169.78
K-19	(67.8m):	58.33, 169.12
J-01	(67.1m):	58.00, 167.80
I-02	(67.9m):	57.66, 167.13
H-03	(69.2m):	57.33, 166.48
G-05	(70.8m):	57.00, 165.22
F-07	(75.2m):	56.66, 164.00
F-09	(72.1m):	56.66, 162.78

Total Stations: 15

In addition to the bottom long term station data, many water column profiles would be collected by fishers. This second method would be to let crab fishermen send out crab pots as they would during a regular fishing season. The crab fleet spreads across the fishing grounds of the Eastern Bering Sea from Bristol Bay to the Russian border, searching for males above the minimum allowable size. The addition of temperature sensors and environmental data loggers to the crab pots would provide environmental data at the scale of individual pots. These data, paired with fishing effort and pot-specific catch and bycatch data, would elucidate key factors in understanding the spatial and temporal framework of catch and bycatch of crab within each fishery. Moreover, these data could be used to understand how changes in climate could affect bycatch rates in these fisheries.

Specialized data loggers will be used that automatically upload data to a harddrive on a fishing vessel as it operates. A receiver on the vessel links to the sensor located on the fishing gear. As the gear goes through its deployment, harvesting, retrieval cycle, the sensor is collecting data. When the fishing gear is retrieved, the sensor automatically uploads the data. This approach matches the need to be minimally intrusive aboard fishing vessels.

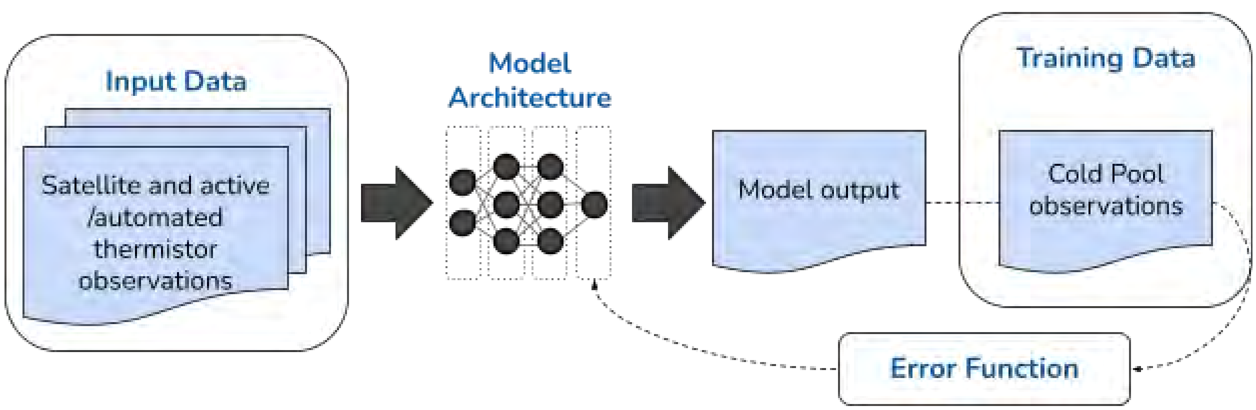
Forecasting

Artificial Intelligence and Machine Learning (AI/ML) is a revolutionary new way of building environmental models. Model development time is fast, and model architectures can be developed and used at different scales from local, to regional, to pan-arctic. Results can be on-demand with fast model runtime relative to their dynamic modeling counterparts. Finally, and most importantly, these models "learn" the relationships between variables of interest in a system, producing more accurate results. They are excellent at modeling complicated systems where not all variables and relationships are understood or specified and can highlight new findings and places for research.

Historically there have been two main classes of models: statistical and dynamical. Both have great value, and drawbacks. Statistical models leverage data, but are often too simple to identify relationships between variables beyond simple correlations. Classically, dynamic modeling is where the science has happened, but these models can have strong biases and fail when we don't fully understand the system, or when the nature of the system changes over time.

AI/ML models are built differently. These models extract knowledge from data by finding the hidden patterns that are exposed though examples and training data. AI/ML enables systems to learn and improve from experience without being explicitly programmed.

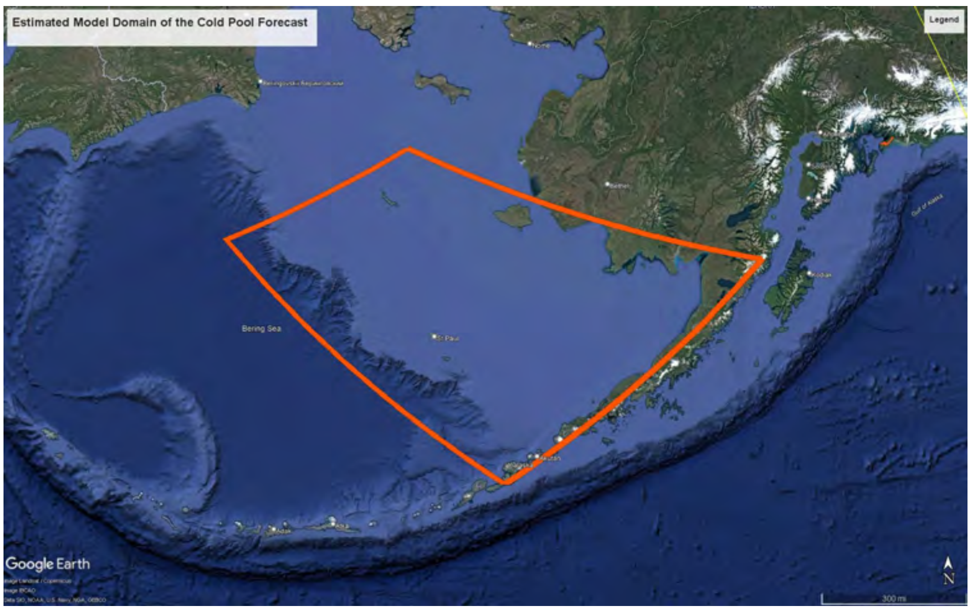
For this proposal, an Artificial Intelligence (AI) forecasting model will be developed integrating satellite observations of sea ice development, sea surface water temperatures and available near-real-time observations from automated thermistor data collection from active fishing activity. This will be used to generate a cold pool outlook.



There are three general components to understanding an AI/ML model: (1) the input data (2) the architecture, (3) the training data, and (4) the error function. The inputs to this model will be the near real time observations of in-situ temperature, and sea ice observations from satellites. The cold pool forecast training data will be based on the collected bottom water temperature time series data and interpolating to any available automated collection on active fishing vessels. Training data represents the ‘correct answer’. During the training of the model, the difference between the model output and the training data is found in the error function. The error is propagated backwards into the model, so the model can modify itself to get a better answer. This simplified AI/ML model workflow is briefly shown in the schematic above.

Inputs are ingested into the model, and an output is generated. During training the model output is compared to training data, what is the desired output. The error function finds the difference between the output and training data, and propagates that back into the model weights.

After training is complete, the model runs will produce seasonal outlook maps of bottom water temperatures. The model domain is estimated to cover 700,000 square kilometers, and is shown in the image below.



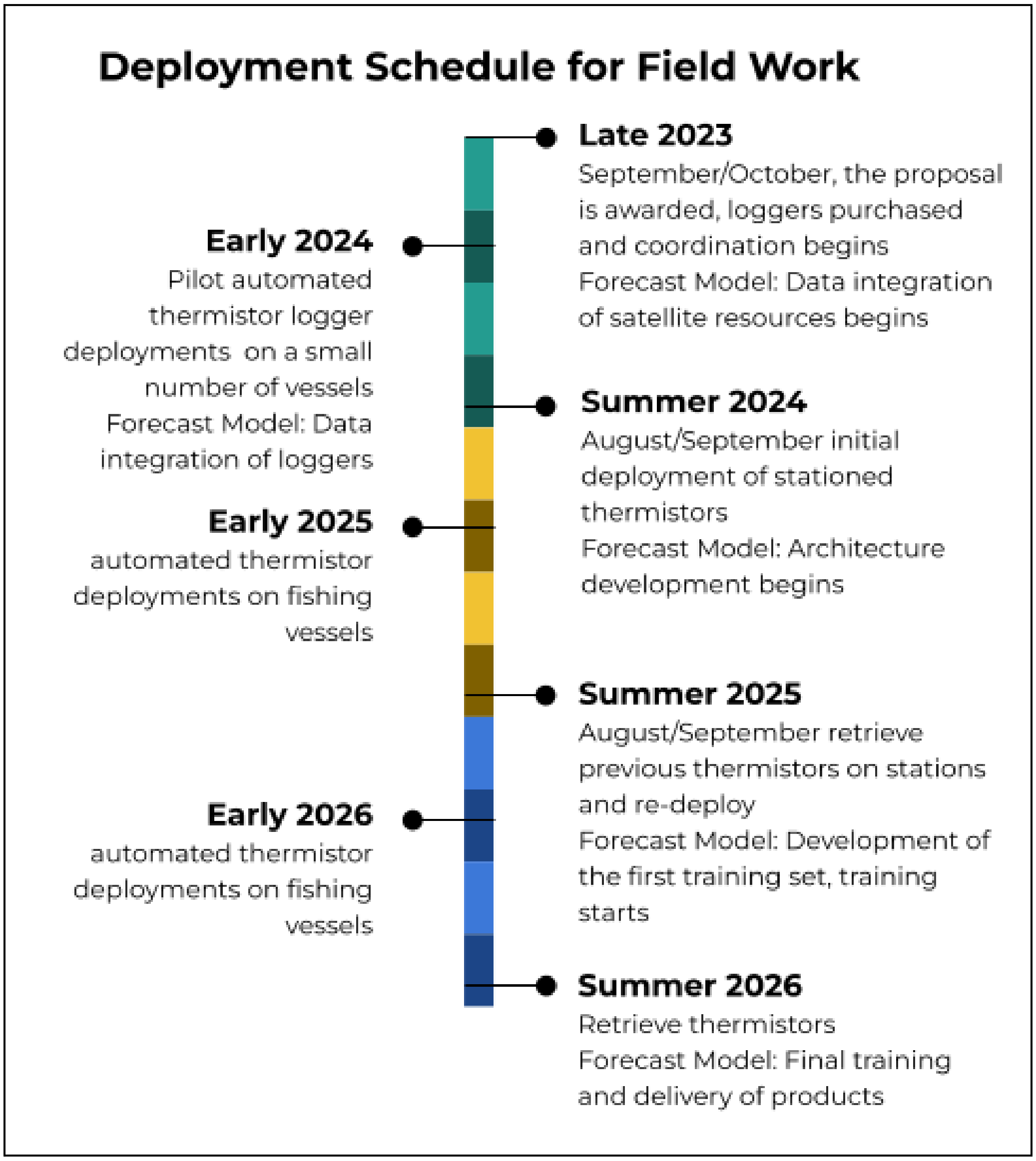
PolArctic will be completing the forecasting models. PolArctic is an Alaska Native Yup'ik, woman, and disabled veteran-owned small business working to solve critical environmental challenges impacting Alaska and the larger Arctic. Building custom artificial intelligence (AI) algorithms, PolArctic creates a range of data-driven products addressing developing market-demand for forecasting climate change, historical pattern analysis, and data consultation to support smart and resilient adaptation.

The team completed groundbreaking work incorporating traditional indigenous knowledge as a training set into an AI model to help the community adapt to climate change. The Commercial Inshore Fishery Potential pilot was funded by the World Wildlife Foundation (WWF) and the Nunavut Fishery Association, an Inuit native tribal organization. The pilot used traditional knowledge, scientifically collected trawl data, and satellite remote sensing to determine if conditions were present for a shellfish and kelp habitat in an area around the community of Sanikiluaq.

Additionally PolArctic has developed an AI sea ice forecasting architecture called ICE^3 training models for crab fishermen in the Bering Sea, fuel oil delivery in the northwest passage, and transport though Baffin Bay in Canada.

<u>Project Timeline</u>

Below is an approximation of the project timeline showing the critical deployments and retrievals of the gear. With anticipated award in late 2023, the project would kick off with an early pilot to demonstrate the capabilities of the gear and work through coordination with stakeholders. Throughout the project as measurements are obtained, the subcontractor PolArctic will be building a model of the cold pool to share with stakeholders and inform placement and measurements for future collection. The project will conclude after two years of measurements with a comprehensive model of the cold pool and how it forms seasonally.



Alaska Fisheries Development Foundation, Inc.

Industry Advisory Committee

Updated 2/20/2023

This DRAFT document provides an overview of AFDF's Industry Advisory Committee (IAC). Please contact Julie Decker or Garrett Evridge with any questions.

Purpose

AFDF is forming an Industry Advisory Committee (IAC) to identify, categorize, and rank the most prominent and pressing challenges and opportunities facing the Alaska seafood industry. This prioritization will allow the IAC and AFDF staff to focus its efforts on issues of the highest importance and craft collaborative solutions with the highest likelihood of success.

Need

The seafood industry moves from crisis to crisis, driven by the most critical real-time challenges. AFDF is offering assistance to industry to develop longer-term solutions to persistent priority areas. Industry engagement will be channeled through the IAC.

Process

Previous discussions about innovation in the Alaska seafood industry have offered limited tangible results. AFDF is proposing a more curated – but flexible – approach:

1. A three-member executive committee will work with AFDF staff to identify and rank five priority areas of focus.
2. Four additional committee members with relevant expertise in the priority areas will be selected.
3. The IAC will revise its focus every 24 months. We propose the inaugural cycle features the seafood processing sector with the next dedicated to seafood harvesting topics.

Outcomes

Desired outcomes will be discussed and determined by the IAC and may initially include:

- Develop briefing papers on IAC priorities (e.g., reshoring secondary processing to Alaska or the United States, feasibility of a cooperatively-owned marine collagen plant, strategies to reduce insurance costs, methods to reduce bycatch, and packaging alternatives, among others.)
- Recruitment of companies into the sector to provide specific services or products that are needed.
- Recruitment of entrepreneurs or firms to focus on solving a specific technical challenge.
- Identification of early-stage investment opportunities.

Existing Activity
Innovation and research is occurring across the industry. The IAC will be complementary and supportive of these proprietary efforts. AFDF and IAC will look for opportunities to partner and support existing efforts that do not jeopardize proprietary efforts. When findings from existing and prior efforts can be shared at the IAC, it will reduce duplication and accelerate results.

Membership
AFDF is recruiting members who can describe specific operational challenges, who have experience researching new technologies or processes, or have a strong understanding of industry operating expenses. The committee may also find it appropriate to invite qualified individuals to meetings periodically, without making these individuals members.

Commitments from IAC and AFDF
IAC members can expect to meet quarterly; meetings will last approximately 1-2 hours. A minimum of two AFDF staff will attend; one to lead to discussion and another to take notes.

Confidentiality & Intellectual Property
The IAC endeavors to be a forum for productive industry collaboration. AFDF recognizes the need to preserve confidentiality and intellectual property. AFDF will work with members to develop best practices to maximize participation while maintaining confidentiality. IAC meetings will be invite-only.

Antitrust
The IAC will not engage in any activity which may violate State of Alaska and Federal antitrust laws.

First meeting
The first meeting of the IAC will include a review of the key challenges and opportunities to begin organizing by category. Next, the IAC will prioritize categories. Then decide on priority projects and strategies within each category.

Priority Categories
A key feature of the IAC process is the prioritization of opportunities in the seafood industry which need further analysis, study, investment, technology or coordination.

AFDF suggests the IAC identify five priority areas. A draft list is found in Appendix I. This prioritization process should include justification as to why the category has been prioritized and ways to measure and track progress.

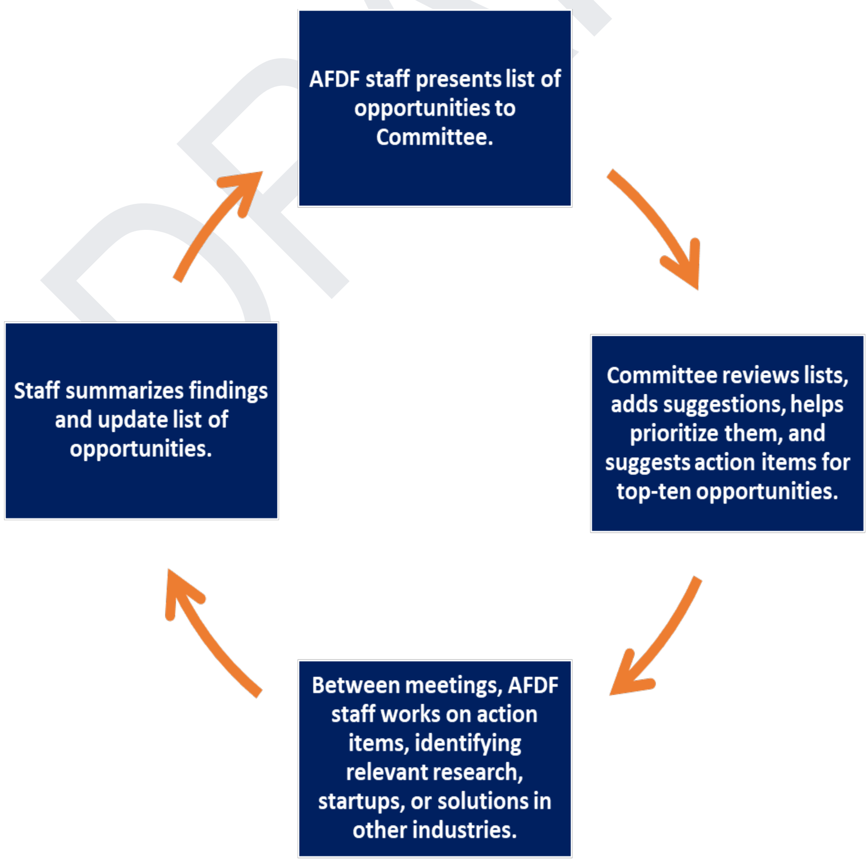
For example, early conversations indicate the topic of processing automation is a priority. A reduction in operating cost and reduced injuries may be reasons why this category has been selected. Specific goals associated with making progress in this category may include completion of a seafood automation technology review, attendance at a food manufacturing conference, and identification of the top five seafood processing transformations likely to be automated within the next five years.

Every priority area should be considered against the following objectives: 1) reducing operating expenses, 2) generating new revenue, and 3) reducing existential risk to the industry. Other considerations may include:

- State of technology
- Size of the market
- What are other sectors/industries doing?
- Is this the highest use of AFDF staff time?

Iterative Process

1. AFDF staff presents a list of opportunities to the IAC. These opportunities can range from broad ideas to specific, defined projects.
2. The IAC reviews this list at the meeting, adds/removes opportunities, prioritizes opportunities, and suggests action items.
3. Between meetings, AFDF staff work on the action items. This may mean developing a briefing paper on a topic, finding a relevant startup, or consulting experts.
4. AFDF staff summarizes findings and adds any opportunities to be presented to the IAC.



Example Matrix

AFDF staff will maintain a spreadsheet to track IAC priorities and action items, along with market size, possible outcomes, and other descriptors. The following is an example.

Category	Idea	Action Item	Is there a customer today?	Market size	Outcome	Tech. Status
Automation	Development of an auto-feeder for a Badder 190 and 212	Recruit a company to apply for PCCRC funding to conduct feasibility analysis	Yes	Estimated: $30 million	Estimated: $15 mil opex reduction	Developing
Decarbonization	Develop baseline AK fishing fleet decarbonization strategy	Support exiting BBB Green Energy Research	No	Large	Significant reduction in opex, carbon emissions; cleaner waters and atmospher e	Under-developed
Plastics	Identify opportunities for removing and/or replacing plastics throughout the seafood supply chain	Commission a feasibility report on opportunities for plastic reduction and/or replacement; work with startups to develop novel plastic replacements that work in the unique operating conditions of an Alaska seafood processing plant	Yes	Large	Reduction in plastic waste, improved sustainabil ity, potential decrease in opex over the long-term	Developing

Appendix I

Draft Industry Categories

- Processing automation & robotics
- Decarbonization & energy efficiency
- Catcher vessel quality improvements
- Bycatch reduction
- Product utilization & value-add processing
- Vessel construction & materials
- Marine coatings, deck gear & hardware
- Harvesting gear improvements
- Finance & insurance
- Ocean data & monitoring
- Safety
- Communications
- Bait
- Packaging
- Transportation
- Other