Kelp Ark QUARTERLY REPORT 4

Seed Quality Improvement Project, Q4 2026

Title: Population genetics and gametophyte seed banking of Alaska kelps

Date Submitted: 5/12/2026

Report Narrative:

NEW: We collected 67 kelps on the Kodiak Region on February 8th, this was the only collection done during this quarter, this due to inclement weather conditions during times where both field collectors and laboratory personnel were available to work on them; furthermore, our laboratory incubator at UAF were nearing a full load.

To alleviate the UAF incubator, personnel from Kelp Ark visited the Stekoll lab to help with isolations and turnover rate on created plates, this was done as an extra layover after attending the Mariculture Conference of Alaska.

During this intense 3-day work window, both teams worked to clear up most of accumulated plates and isolations.

For this quarter, we have added 66 new isolations to our collection. 59 *Alaria marginata*, and 7 *Nereocystis luetkeana* from the Kodiak Region.

We continue to increase our collection of "mixed" gametophyte tubes as a backup to ensure we have our gametophyte strains from these individuals and locations.

Task summary:

Task 1: Establish a collection of commercially relevant Alaska kelp

1.1(Q1) Kelp Ark will work with a group of Alaska farmers to gather sugar, bull, and ribbon kelp sori. Sori will be collected from each Alaska kelp-growing region (Prince William Sound, Kenai Peninsula, Southeast, and Kodiak)

Due to weather conditions and incubator capacity, we have slowed down field collections during this quarter. We were only able to do a field collection from Kodiak region, and it has been processed in the UAF lab.

However, with assistance from visiting Kelp Ark personnel, the latter has been addressed, as now the incubator will be able to hold material from several more field collections.

Percentage completion for collections and isolations of gametophytes from 4 project regions, and 3 species.

Field Collected	Alaria marginata	Saccharina latissima	Nereocystis luetkeana
Prince William Sound	100%	100%	0%
Kenai Peninsula	100%	0%	0%
Southeast	82%	58%	96%
Kodiak	100%	0%	100%

Gametophytes isolated	Alaria marginata	Saccharina latissima	Nereocystis luetkeana
Prince William Sound	100%	100%	0%
Kenai Peninsula	99%	0%	0%
Southeast	77%	53%	14%
Kodiak	100%	0%	20%

1.2 (Q1-2) 100% Kelp Ark will communicate with the Gene Conservation Lab at the Alaska Department of Fish and Game before sori collection in order to communicate their sampling plan and ask for feedback. Kelp Ark will consider adapting protocols, when possible, to increase the project's ability to inform the Alaska kelp farm permitting process.

Communications with the ADF&G Gene lab has resulted in working with us by funding part of our genomics work that we will be doing as part of our Task #2. The ADF&G team gave us a template for us to describe our scope of work and budget, so we may form an agreement between institutions.

1.3 (Q1-4) UAF will culture at least 50 individual kelp gametophyte strains per species per region. In total, this will be at least 600 strains, with cultures for sugar, bull, and ribbon kelp from each of the 4 regions. This collection will be housed in Juneau, AK at the UAF's Lena Point facility.

Our team at the UAF Laboratory has continued to isolate gametophytes and improved growth conditions to enable us to continue on Task 2. Our current count is up to 638

individuals. Additionally, as a redundancy, we are also keeping a tube with a mixture of several gametophytes; to be accessed in case something goes wrong with our isolations, we have 378 tubes for this case.

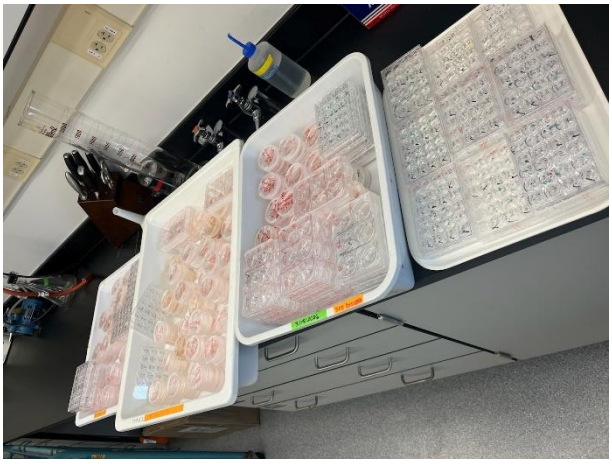

Figure 1. Plates and dishes cleared for discarding the 3-day work window where Kelp Ark helped UAF team to move isolations along as well as clear space for new materials.

1.4 (Q4) Kelp Ark will replicate the Alaska kelp seedbank in California.

Task 2: Assemble and annotate genomic and transcriptomic biodiversity resources

2.1 (Q3-4) Kelp Ark will use available genomes from S. latissima, N. luetkeana, and Undaria pinnatifida to align resequenced genomes of Alaskan kelps.

Biomass is now growing for all isolated gametophytes to be used for sequencing.

2.2 (Q3-4) Kelp Ark will use Illumina sequencing technology, utilizing a minimum of 5x coverage per genotype and a median read length of approximately 200 bp. Data will be filtered for sequencing adapters and quality via Illumina prior to starting the snp calling. They will filter out potential bacterial contamination using PathoScope 2.0.

2.3 (Q4-5) Kelp Ark will use principal component analysis to understand the geographical boundaries of population clusters to delineate population structure.

2.4 (Q4-5) Kelp Ark will communicate with the Gene Conservation Lab at ADF&G to share findings and maximize the utility of their research to ADF&G as they work to better understand population structure, local adaptation, and regulatory strategies for Alaska kelps.

We are in conversations with ADF&G to acquire some additional funding for sequencing. We have asked for a quote from Novogene for sequencing samples. Gene lab has mentioned a funding pool of $45K that could be made available for our sequencing.

Task 3: Communication with stakeholders and AMC

- *Kelp Ark will engage with other AMC Kelp Seed Quality Improvement projects as appropriate, as well as the broader AMC coalition and scientific community, to share findings and participate in related efforts.*

Our team has established communications with all other SQI projects and have had good interactions to send material to our seedbank collection. We will be looking for outside funding sources to allow us to accommodate this desire, as our current project does not allow our team to carry on this task.

- *Kelp Ark will lead accounting and invoicing.*

Invoices have been submitted for the months of June, July, August, September, October, November, December, January, February, and March.

Task 4: Quarterly progress reports, final report, and project presentation

- Quarterly progress reports detailing updates will be submitted to AMC during the project period.
- Copy of all data generated during the project, in clean and usable formats.

  Created a format and started to populate a spreadsheet with all strain metadata for our collections. (See figure below for a preview of data being recorded)

GP ID	Location	Region	Genus	Species	Sex	Isolation Date	Isolated By	Collection Date	Collected By	Latitude	Longitude	Collection Site	Ocean	Nearest Continent
NL25-SE-001-FG1	South Shelter	Southeast	Nereocystis	luetkeana	Female	10/1/2025	Jessica Killeen	8/21/2025	Tamsen Peeples, J	58 21.9992	134 48.3082 W	Shelter Island (South)	North Pacific Ocean	North America
NL25-SE-003-FG1	South Shelter	Southeast	Nereocystis	luetkeana	Female	10/1/2025	Jessica Killeen	8/21/2025	Tamsen Peeples, J	58 21.9992	134 48.3082 W	Shelter Island (South)	North Pacific Ocean	North America
NL25-SE-005-FG1	South Shelter	Southeast	Nereocystis	luetkeana	Female	10/1/2025	Jessica Killeen	8/21/2025	Tamsen Peeples, J	58 21.9992	134 48.3082 W	Shelter Island (South)	North Pacific Ocean	North America
NL25-SE-008-FG1	South Shelter	Southeast	Nereocystis	luetkeana	Female	10/1/2025	Jessica Killeen	8/21/2025	Tamsen Peeples, J	58 21.9992	134 48.3082 W	Shelter Island (South)	North Pacific Ocean	North America
NL25-SE-009-FG1	South Shelter	Southeast	Nereocystis	luetkeana	Female	10/1/2025	Jessica Killeen	8/21/2025	Tamsen Peeples, J	58 21.9992	134 48.3082 W	Shelter Island (South)	North Pacific Ocean	North America
NL25-SE-011-FG1	South Shelter	Southeast	Nereocystis	luetkeana	Female	10/1/2025	Jessica Killeen	8/21/2025	Tamsen Peeples, J	58 21.9992	134 48.3082 W	Shelter Island (South)	North Pacific Ocean	North America
NL25-SE-014-FG1	South Shelter	Southeast	Nereocystis	luetkeana	Female	10/1/2025	Jessica Killeen	8/21/2025	Tamsen Peeples, J	58 21.9992	134 48.3082 W	Shelter Island (South)	North Pacific Ocean	North America

- Final report outlining key findings, successful techniques, and recommendations for future commercial production.
- Presentation at a virtual venue sponsored by SEC to share results of AMC projects. Presentation to include Power Point or similar slides.
  - Michael Marty-Rivera gave a talk on the “Kelp Genetics, Seed Quality, and Propagation” session panel at the Mariculture Conference of Alaska, in Anchorage.

Budget Overview

- Budget allocated: $199,396
- Amount spent this quarter: $29,671
- Remaining balance: $107,093

Next Steps

As weather permits, we will be restarting field collections efforts, focusing on increasing our remaining collections. We will continue isolating gametophytes at the UAF Lab to continue opening space in the laboratory. We will keep growing the biomass to be able to divide and use for genomics work.

During this Quarter, we also amended our contract with SEC to include additional tasks to our project. These tasks will be incorporated on our next quarterly report.

The tasks are as listed:

Task 5: Coordinate and facilitate a Korea–Alaska kelp industry knowledge exchange

• Kelp Ark will engage Korean collaborators and Alaska stakeholders, develop an agenda responsive to participant needs, and coordinate site visit and meeting logistics. SEC must review and approve the agenda prior to the meeting.

Deliverable: Summary report documenting activities, key discussion topics, identified challenges, proposed solutions, and unresolved issues.

Task 6: Support Sterile Kelp Breeding and Triploid Farming Regulatory Framework

• Kelp Ark will collaborate with SEC partners and relevant stakeholders, including ADF&G, to provide input supporting the development of a framework for sterile kelp breeding and triploid farming in Alaska.

• Develop a study plan outlining next steps for triploid kelp breeding activities.

Deliverable: A written plan describing recommended next phases of research and stakeholder engagement related to triploid kelp breeding activities.

Task 7: Develop and culture gametophytes to support triploid kelp production

• Isolate, culture, and maintain Saccharina latissima gametophytes and derived sporophytes under controlled laboratory conditions; induce and propagate doubled haploid lines; conduct complementary crosses to generate triploid sporophytes; and prepare resulting materials for sex determination and ploidy analysis.

Deliverable: Summary report documenting experimental methods, results, analysis, and the regulatory and industry implications of findings.

Challenges

- Inclement weather conditions have slowed down our field collection efforts, and even laboratory work at the UAF location. However, our project is progressing well, and will be done with field collections soon.
- Import permit acquisition in California has been delaying the transfer of strains for optimized growth.