Kelp Ark QUARTERLY REPORT 3
Seed Quality Improvement Project, Q3 2025
Title: Population genetics and gametophyte seed banking of Alaska kelps
Date Submitted: 1/22/2026

Report Narrative:

We have now increased our field collections by including all sites, our species-by-species collection includes 84 *Saccharina latissima*, 279 *Alaria marginata*, and 39 *Nereocystis luetkeana* individuals.

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.

With Holidays, and weather conditions affecting Alaska, our field work has been delayed, however we have been keeping up with the lab work aspects of the project goals. Having identified 572 successful isolated gametophytes.

Gametophyte growth has been slower than expected. The Kelp Ark team plans to visit the UAF Juneau team during the upcoming quarter to assist in optimization, as will be needed for the genetic work we proposed. We will also start working on the transfer of gametophytes into Kelp Ark's care.

Task summary:

Task 1: Establish a collection of commercially relevant Alaska kelp

1.1(Q1) 77% 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)

We have slowed down field collections during this quarter to allow the laboratory team to work on isolations and clearing up space in the laboratory conditions. Our overall collection is still advancing at an appropriate pace.

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

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%	0%

Gametophytes isolated	Alaria marginata	Saccharina latissima	Nereocystis luetkeana
Prince William Sound	100%	100%	0%
Kenai Peninsula	99%	0%	0%
Southeast	77%	53%	14%
Kodiak	93%	0%	0%

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. Details on how to go over re-budgeting and future subcontract are to be discussed at a later date.

1.3 (Q1-4) 45% 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 572 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 312 tubes for this case (fig. 2).

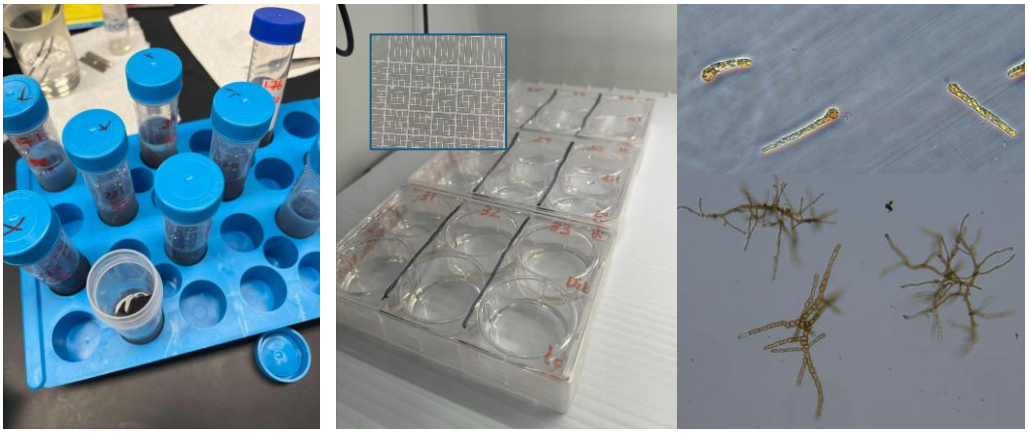

Figure 1. Gametophyte working stages. From left to right, spore releases in 50mL tubes, 6-welled dishes for serially diluted spore settling (inset of hemocytometer for cell counts), gametophytes culture at a size-class ready for isolation.

Isolated Gametophytes	F	M
A. marginata	198	197
Juneau	39	38
Prince William Sound	63	63
Kenai Peninsula	50	49
Kodiak	46	47
S. latissima	82	81

Juneau	27	26
Prince William Sound	55	55
N. luetkeana	7	7
Juneau	7	7

1.4 (Q4) 0% Kelp Ark will replicate the Alaska kelp seedbank in California.

Task 2: Assemble and annotate genomic and transcriptomic biodiversity resources

2.1 (Q3-4) 5% 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.*

We have established communications with other teams like Cameron Jardell from the Chugach Regional Resource Commission and his gametophyte hatchery work.

- *Kelp Ark will lead accounting and invoicing.*

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

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.
- 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.

Budget Overview

- Budget allocated: $199,396
- Amount spent this quarter: $29,549
- Remaining balance: $147,421

Next Steps

As weather permits, we will be restarting field collections efforts, focusing on increasing our Bull kelp 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.

Challenges

- Inclement weather conditions have slowed down our field collection efforts, and even laboratory work at the UAF location. However, we believe that our project is progressing well, as can be seen from task completion percentages.
- Import permit acquisition in California has been delaying the transfer of strains for optimized growth. There is not enough working space or personnel capacity in the UAF laboratory to undertake these tasks.