MAXIMUM SEED YIELD AND SEED VIABILITY: TWO NECESSARY CONSIDERATIONS FOR A SUCCESSFUL EELGRASS SEEDING PROGRAM

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Figure 1. Collection location
4th of July Beach, San Juan Island (48.469456 N, -123.005024)

1. Introduction

- Zostera marina, eelgrass, is a keystone species that increases biodiversity and productivity in the nearshore as this meadow forming, flowering plant engineers and provides valuable habitat (1,2).
- Restoration using seeds is a promising way to yield a genetically diverse population while also minimising impact on the donor population.(3)
- *Zostera marina* can reproduce sexually via seeds or asexually via rhizome growth. Seeding allows for crossing over of genetic information for a more genetically diverse population
- Each year eelgrass naturally disperses seeds, these can be collected and used to restore eelgrass where damage or disappearance is observed (4,5,6).
- Seeding is more efficient and less intensive than the process of adult transplants.
- Seeding must start somewhere, adult flowering shoots must be collected in order to efficiently collect seeds.
- Considerations of multiple factors contribute to an understanding of what must be done to collect seeds at the most optimal time for both high yield and viability.
- Optimizations of both of these factors as well as considerations of both spontaneous abortion and gene diversity can help inform future restoration projects.

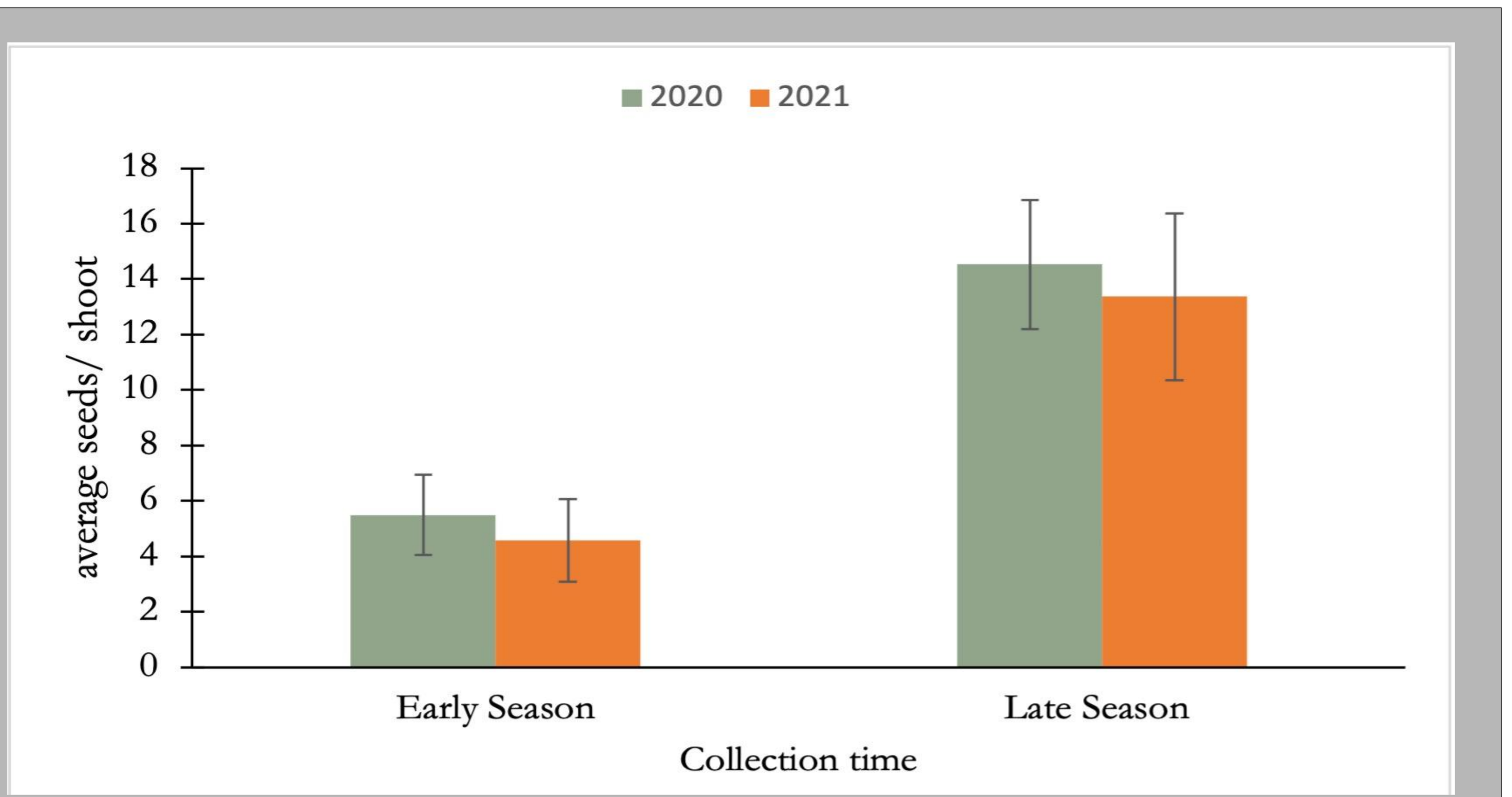

Figure 3. Seed yield per shoot
Error bars represent the standard error of the mean, sample size for 2020 is 5 treatments, sample size for 2021 is 7 treatments.

2. Methods

- Collected eelgrass flowering shoots at 4th of July Beach, San Juan Island (48.469456 N, -123.005024) during maximum low tides (-2.2 ft MLLW) during time period 1: 22-23 June 2020 & 7-8 July 2021, and time period 2: 6-7 July 2020 & 21-23 July 2021 (Figure 1).Collect shoots with attached rhizomes from 2 different collection tides in peak of wild population flowering season
- Place in Eelgrass Culture System (Figure 2), measure salinity, temperature, and monitor on a semiweekly basis (water temp 11 degrees C; salinity 29 PSU).
- After 4 weeks in culture and following a seed maturation schedule (7), we recorded ripening characteristics of seeds in haphazardly selected spathes in the separate treatments and extracted a volumetric sample from the bottom water to estimate seed presence
- Treatments were determined ready to extract seeds when all of the haphazardly selected spathes were in stage 5 (7), the flowering shoots were wilted and brown, and the number of seeds found at the bottom of the treatment was ≥10.
- Collect floating intact shoots, send for spontaneous abortion evaluation
- Sieve sediment, save vegatative material for hessian bag seeding project
- Collect seeds for seeding and testing.
- Count seeds and evaluate seed yield
- Test a subsample of seeds for viability using a 1% tetrazolium chloride solution
- Collect data and evaluate for best yield/ viability data
- Collect shoots from 100m transect and evaluate genetic diversity

Figure 2. Culture System

3. Results/discussion

- Seed yield varied significantly between the two collection dates. Seed yield was 2.9 fold higher (independent two-tailed $t8 = -2.63$, $p=0.030178$) in flowering shoots collected on July 6 & 7 when compared to those collected on June 22 & 23 in 2020 (Figure 3).
- While in 2021 Seed yield varied significantly between the two collection dates as well. seed yield was 2.59 fold higher (independent two-tailed $t5 = 3.8133$, $p=0.0125$) in flowering shoots collected on July 21-23 when compared to those collected on July 7-8 (Figure 3).
- Seed viability varied between collection times. 80% of the seeds from the field collection of flowering shoots on June 22 & 23 tested viable while 50% of the seeds from field collections of flowering shoots on 6 & 7 July tested viable from 2020.
- In 2021, Seed viability varied between collection times. 60% of the seeds from the field collection of flowering shoots on July 7-8 tested viable while 65% of the seeds from field collections of flowering shoots on 21-23 July tested viable.
- Discerning peak collection time based on optimal seed yield and viability is essential for the efficiency of future restoration efforts.
- We are currently waiting on data from genetic diversity and spontanous abortion of seeds, this could aid in understanding this information more.

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