Shellfish Mariculture Seed Purchase Process

In South Carolina, the demand for locally sourced seafood coupled with advances in culture techniques has facilitated a steady increase in shellfish mariculture over the past decade. The shellfish mariculture industry is reliant on hatcheries to produce juvenile bivalves, or seed. Shellfish seed (measuring between 2-25mm) is purchased from hatcheries and stocked into gear to be grown for commercial purposes, often on an annual cycle. Placing shellfish into natural waters for mariculture purposes has advantages beyond economic value. Bivalves filter particulate matter from the water, and gear in which bivalves are stocked offer substrate for ecosystem assemblages, attracting predominant fishery species.

This resource outlines considerations for purchasing shellfish seed for mariculture operations in South Carolina with a focus on two economically and ecologically valuable bivalves, oysters and clams. This resource identifies requirements for out-of-state purchases and offers guidance for seed purchase and factors to take into account when preparing to stock an operation.

What Are the Options to Obtain Seed?

Bivalve seed may be purchased from hatcheries or nurseries to stock gear. South Carolina has limited availability of seed produced in-state. Local shellfish producers have upwelling systems and may be able to provide certain size seeds depending on availability. In comparing hatchery seed and nursery seed, hatchery seed is classified as any life stage produced in a facility on a closed water system. Parameters of the system include: filters seawater to 1 micron, ability to control culture conditions (filtration, temperature, disinfection), and feeds cultured or purchased microalgae. Whereas nursery seed is maintained in an untreated seawater system using naturally available food.

Purchasing Seed Out-of-State

To fulfill needs, mariculturists may rely on out-of-state hatchery and nursery operations for shellfish seed supply. Procedures to import seed are set in place by the South Carolina Department of Natural Resources (SCDNR) to ensure biosecurity of South Carolina's natural resources. Note that SCDNR will not approve importation of non-indigenous shellfish to be placed in water of the state. Before importing/shipping

bivalve seed from out of state and placing into South Carolina waters, all individuals must first obtain a valid *Indigenous Molluscan Importation Permit* from the SCDNR's Marine Permitting Office. The permit allows importation of indigenous species into state waters under S.C. Code of Laws Title 50. Chapter 5. Article 9. Section 50-5-1005. Steps toward receiving an importation permit include consulting with the SCDNR Shellfish Management Section (SMS) to obtain a permit application package, ensuring the hatchery you intend to import seed from meets appropriate standard operating procedures outlined by the SCDNR SMS (hatchery affirmation is completed on an annual basis), and seed to be imported must pass disease certification screenings. After the permit is received and seed imported, each seed shipment will need to be inspected by the SCDNR before being placed into state waters. Protocols for obtaining an *Indigenous Molluscan Importation Permit* are detailed in the application package which should be requested by contacting:

SCDNR Permitting Office
217 Fort Johnson Rd., Charleston, S.C. 29412
Tracy Ross: rosst@dnr.sc.gov

-or-

SCDNR Shellfish Management Section
217 Fort Johnson Rd., Charleston, S.C. 29412
Henry Davega: davegaw@dnr.sc.gov

Where to Buy Seed

Seed nurseries and hatcheries of the East Coast were compiled into the East Coast Shellfish Hatchery and Nursery Directory. This directory includes contact information for suppliers, type of operation, and species anticipated to be available. Hatcheries included in this directory are not guaranteed to be affirmed for Standard Operating Procedures (Appendix 2 of SCDNR seed importation protocol). Contact SCDNR for a list of affirmed hatcheries, or if seed is to be imported from an unlisted hatchery, request that SCDNR provide the specified hatchery with a Hatchery Affirmation Form (outlined in SCDNR seed importation protocol).

Importation of Polyploid Bivalve Seed

The importation of polyploid seed into the state follows the same importation process outlined for diploid seed. However, it is important to note that an additional permit is required to possess polyploid shellfish in the state of South Carolina following S.C. Code of Laws 50-5-1005. This is primarily due to uncertainties regarding polyploid ecological interactions. For information regarding polyploid possession contact:

SCDNR Permitting Office
217 Fort Johnson Rd., Charleston, S.C. 29412
Tracy Ross: rosst@dnr.sc.gov

When to Order Seed

The time in which seed should be ordered may vary depending on the species and ploidy of shellfish chosen to culture. Factors to consider include seed availability, cost, growth rate, season of harvest, and physical factors of the grow out location. Orders should be placed several months before the seed is needed. For instance, for spring/summer planting, order seed in the winter. It is beneficial to stagger seed orders so that harvests will be spread throughout the season. Market considerations are also important, so planning to order around holidays, tourism events, and summer (when wild harvests are prohibited in South Carolina) can be beneficial.

Comparing Diploid Versus Triploid

The ploidy of an organism refers to the number of sets of chromosomes contained within its cells. In nature, bivalves most often are diploids. This means the cells making up the bivalve contain 2 sets of chromosomes, one derived from the egg, one from the sperm. Polyploid organisms have multiple sets of chromosomes, and result from manipulating cellular division so that extra chromosomes are held within the same cell. For instance, a triploid organism has three sets of chromosomes. This type of manipulation is common in agriculture. Other examples of triploid crops are seedless watermelon and bananas.

In consideration, diploid seed cost less than triploid seed. Triploid bivalves are often sterile, which can offer production advantages like faster growth, and high meat quality in warmer months when diploids allocate energy to reproduction. Diploids may be more tolerant to environmental stressors whereas triploids have shown susceptibility in some instances. For oysters, planting a mix of diploid and triploid animals will enable a year-round market, and lessen the risk by having diversified stocks. While diploid harvests are normally harvested from late fall to early spring, triploids can be harvested throughout the summer months with a proper permit to do so.

Size of Seed to Purchase

When deciding what size seed to purchase, weigh risks and benefits of starting with seed measuring a few millimeters compared to seed closer to an inch. Smaller seed will be cheaper but will require more time, handling, and gear to reach market size. Larger seed will be more expensive upfront, but less risk is

present for juvenile mortality and will likely reach market size sooner.

If looking to purchase clam seed, be mindful that a permit is required to import or possess clams of the genera *Mercenaria* under 1 inch in width (measured as the distance from the exterior of one shell to the exterior of the opposite shell) following S.C. Code of Law Section 50-5-990.

For information on permits, contact:

SCDNR Permitting Office
217 Fort Johnson Rd., Charleston, S.C. 29412
(843) 953-9311
Tracy Ross: rosst@dnr.sc.gov

Record Keeping

It is advantageous to keep detailed records of the seed used to stock operations. Save information needed for the importation permit application which includes: species, size, ploidy, broodstock line, anticipated date of importation, and GPS location data depicting both stock origin and nursery culture sites. Track the crop as it grows and is harvested. These records will be beneficial for comparing seed, site performance, and will inform future decisions. They are also used for financial matters such as loans, insurance disaster relief, and grant applications.