Freshwater Mussel Propagation: Propelling Restoration into the Future

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Introduction

Freshwater mussels are bivalve mollusks that live in our streams, rivers, and ponds. There are over 700 species worldwide and they inhabit every continent except for Antarctica. Nearly 500 of these species live in North America making it the biodiversity hotspot for freshwater mussels. Unfortunately, over 70% are at risk of extinction, making freshwater mussels one of the most imperiled groups of organisms in North America. In the Delaware River Basin, mussels have experienced major declines in their range, abundance, and species richness.

In 2007, the Partnership for the Delaware Estuary (PDE) developed the Freshwater Mussel Recovery Program (Fig. 1) and has since engaged diverse partners on numerous research projects to recover freshwater mussels in the region.

There is growing interest in restoring mussel beds for their ecosystem services such as improving water quality and enhancing benthic habitats. One major obstacle for mussel recovery is the lack of widespread natural reproduction, due in part to disconnection between mussels and their essential fish hosts (Fig. 2).

Recent advances in hatchery propagation provide new opportunities for producing viable mussel seed to bolster diminished populations and reestablish extirpated populations. Working with Cheyney University and other partners, the Partnership for the Delaware Estuary tested and refined mussel propagation protocols, successfully producing viable offspring during 2009-2011. Building on these lessons and insights from a VA-based hatchery, two hatchery facilities are being planned to meet the growing demand for mussel seed in the Delaware River basin and vicinity.

Demonstration Hatchery

Located within the Fairmount Water Works in Philadelphia, PA, this demonstration hatchery will offer a glimpse into the inner workings of a freshwater mussel hatchery. Visitors will be immersed in the sights and sounds of a mussel hatchery, from mussels and their fish hosts in tanks to their microcosmic workings (Figs. 3 & 4). The exhibit will showcase ecological and biological information through a blend of scientific rigor and artistic interpretations of freshwater mussels and their environment (Fig. 5). This is the first hatchery of its kind where scientific principles are explained through interactive exhibits and demonstrated by knowledgeable educators.

Goals & Objectives

- Provide engaging outreach for the public to learn the importance and fascinating life of a freshwater mussel
- Demonstrate the process of propagating freshwater mussels and expose the public to a “living laboratory”
- Build awareness of impacts on our aquatic environments and the associated flora and fauna

Status

Currently under construction. Grand Opening: February 16th, 2017!

Production Hatchery

A production hatchery is envisioned that will be capable of producing over 500,000 juvenile mussels yearly and growing them to an appropriate size for future grow-out and release (Figs. 6-8). This facility would support propagation of multiple species and include biosecurity protection to preserve basin-specific genotypes. This facility would require close collaboration among many partners and would expand the reach of current propagation efforts elsewhere in the country.

Goals & Objectives

- Propagate native freshwater mussel species to reseed streams in need of restoration
- Serve as critical laboratory space for freshwater mussel research
- Provide capacity to propagate freshwater mussels from other watersheds by implementing strict quarantine procedures
- Furnish a working hatchery space for research opportunities
- Secure funding for production hatchery and its full operation

Status

- Business plan has been developed
- Memorandum of Understanding has been drafted
- Currently fundraising for hatchery construction

Conceptual Propagation Flowchart

- Delaware River Broodstock
- Susquehanna River Broodstock
- Production Hatchery
- Conceptual Propagation Flowchart

Next Steps

- Secure funding for production hatchery and its full operation
- Organize freshwater mussel workgroup
- Partner engagement to bolster mussel recovery capacity
- Continued outreach through the Fairmount Water Works

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Discussion

In addition to promoting mussel restoration and outreach, these new facilities will provide diverse research opportunities for scientists and students and offer an opportunity to engage other organizations, agencies, and states throughout the region. A combination of indoor and outdoor satellite grow-out sites and restoration sites will need to be identified to ultimately re-establish our regions freshwater mussel populations for future generations.