Monitoring Fitness of Caged Mussels to Prioritize Streams for the Freshwater Mussel Restoration Project

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Abstract

The Freshwater Mussel Recovery Program (FMMP) seeks to replenish both species and abundance of native mussels throughout their natural range with a suite of conservation, propagation, and reintroduction methods. For reintroduction into streams where mussels once lived but have been reduced or extirpated, it is helpful to first determine whether candidate streams are capable of sustaining viable freshwater mussel populations.

Introduction

The Freshwater Mussel Recovery Program seeks to restore native populations of mussels to streams where they historically thrived but currently are absent. To increase the chance that restoration is successful, caged mussels of a representative species, Elliptio complanata, were deployed in five southeastern Pennsylvania streams that are candidates for mussel restoration (White Clay Middle Branch, White Clay East Branch, Red Clay, Brandywine West Branch, Chester Creek.) We then monitored their fitness over the course of one year, compared to caged mussels held in source streams (Brandywine Creek, Ridley Creek.) Streams that held mussel condition similar to source streams will be targeted for restoration efforts in 2009.

Methods and Procedures

Mussels were collected from Brandywine and Ridley Creek, tagged and measured for shell height. 15 mussels were assigned to a cage with at least 4 cages being deployed at each restoration candidate stream, which consisted of Middle Branch White Clay Creek, East Branch White Clay Creek, Red Clay Creek, West Branch Brandywine Creek, and Chester Creek. Mussels from these source streams (Brandywine and Ridley Creeks) were also deployed in cages back into the source streams as experimental controls. After a year of caging, mussels were removed from each cage during December 2007, April, May, June, and October 2008. Sampled mussels were shucked, freeze dried, homogenized, and then divided into subsamples for weight-on-ignition, protein, lipid, and carbohydrate analyses. Weight data were used to calculate condition index, a measure of meat fitness per shell volume. Survivorship and condition data for mussels from different streams were contrasted against one another as well as controls. Comparisons between source streams, and between caged and uncaged controls, were examined. Data were statistically analyzed using Statgraphics version 5.0.

Results

Condition index varied significantly among streams (mean range, 35-51). No caging effects were observed, and so data from source streams were combined between caged and uncaged animals.

Discussion

These preliminary results suggest that 4 out of the 5 candidate streams can sustain Elliptio complanata if chosen for restoration. Besides East Branch Brandywine, all of the candidate streams do not presently contain native mussels. However, if these streams were to be ranked for fitness, the top 3 streams within the study group are MB White Clay (mean condition 51.6), Ridley (51.3), and Red Clay Creek (50.3), based on the average condition index over the final six months of the caging period.

In the future, these results will be combined with additional physiological data (proximate biochemical composition of mussel tissues) and water quality analyses (in the source streams) to finalize restoration recommendations for the FMMP.

Conclusion:

Caging mussels works:
- No caging effects
- Better indicator of habitat quality than survivorship

Streams Varied

Effective method of prioritizing streams for mussel habitats and streams for future restoration effort.