Quantifying Atlantic Sea Scallop (Placopecten magellanicus) Larval Abundance throughout Cape Elizabeth, Maine

Hannah Haskell
Britney Evangelista
Alex Loftis

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Introduction

The Atlantic Sea scallop (*Placopecten magellanicus*) is an economically important species for the state of Maine. In 2010, the industry brought in just under $1.5 million USD to the state. Recent studies have revealed an increasing trend in Atlantic Sea scallop abundance which appears to be heavily influenced by larval supply. Increasing the production of scallops in Maine would not only allow for an increase in revenue from the existing meat market, but also potentially allow for the expansion of that market to include items such as roe and whole scallops.

Currently, the primary method of harvesting scallops is dredging along the bottom of the ocean, a practice which can wreak havoc on benthic communities. A newer method of scallop production is through the use of aquaculture. Scallop aquaculture is still a relatively new method and therefore is in the early stages of development.

A successful way of obtaining scallops for aquaculture purposes is by collecting larvae from the wild through the use of spat collectors (Figure 5). These collectors contain plastic mesh material which the scallop larvae can attach to and settle. Being able to predict when the larvae are most abundant in the water column is crucial to this collection process as it could lead to an increase in yield of scallop larvae and potentially lead to the collectors not having to be in the water for as long. Reduced time in the water means less maintenance and a decreased chance of the collectors becoming tangled or run over by nearby boat traffic.

Questions

- When are scallop larvae most abundant in the water column?
- Do environmental factors have an effect on larval abundance?

Methods

- Water samples were collected off the coast of Cape Elizabeth, Maine (43°29’25.4”N, 70°11’59.5”W) over the course of four weeks.
- A sonde was deployed during sampling to collect environmental data such as temperature, salinity, and chlorophyll concentration.
- Two-five aliquots of 10 mL or 20 mL from each sample (depending on sample density) were analyzed using a dissecting microscope. The number of bivalve larvae in each aliquot was determined using a hand tally counter.
- The average salinity, temperature, and chlorophyll for each of the four sampling dates were used to compare to the average larval density.
- Analysis of variance was run to determine whether there was a significant difference in scallop densities between sample dates.
- A generalized linear model was used to determine if environmental factors had a significant effect on larval density.

![Figure 1. Ambient temperature (°C) and average ± standard deviation of *Placopecten magellanicus* larvae from Cape Elizabeth, Maine. Averages are based on replicate subsamples.](image)

![Figure 2. Chlorophyll (μg/L) and average ± standard deviation density of *Placopecten magellanicus* larvae from Cape Elizabeth, Maine. Averages are based on replicate subsamples.](image)

![Figure 3. Biodiversity of zooplankton sample collected from Cape Elizabeth, Maine.](image)

Results

- Scallop larval density was characterized by a significant increase on 10/1/18 (Figures 1 & 2).
- Date had a significant effect on scallop larval density, F(4,12) = 67.59, p < 0.001.
- As the season progressed, water temperature decreased (Figure 1).
- Chlorophyll concentration increased as season progressed (Figure 2).
- Neither temperature (t = 0.047, p = 0.970) nor chlorophyll (t = 0.087, p = 0.945) had a significant effect on scallop larval density.
- Zooplankton samples primarily contained copepods (84.81%), while scallop larvae only made up 2.77% of samples (Figure 3).

Discussion

- Our findings suggest a relationship between scallop larval density and date yet there is no clear correlation between environmental factors such as temperature and chlorophyll.
- We have confirmed that sea scallop larvae can be collected and identified via plankton tows, but the relative abundance compared to other organisms is low.
- More data should be collected in the future in order to draw stronger conclusions, as results from only four sampling dates is limited.
- Additionally, studies looking into other variables that may affect scallop spawning should be conducted (such as moon cycles and tides) in order to help us better understand the factors that impact sea scallop larval abundance and therefore improve the current sea scallop aquaculture industry.

Acknowledgements

Thanks to Nate Perry and Drew Shane for collecting samples and environmental data. Additional thanks to Dr. Lasley Rasher for all of the guidance and support throughout the project.

References