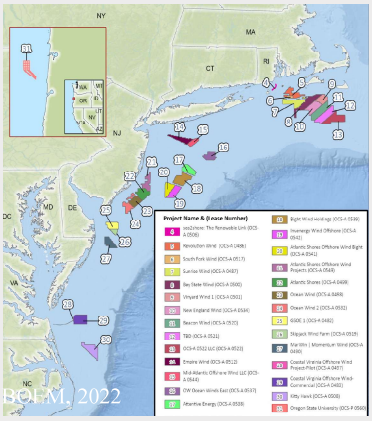
# Assessing the Viability of Large-Scale Hatchery Production for Atlantic Surf Clam

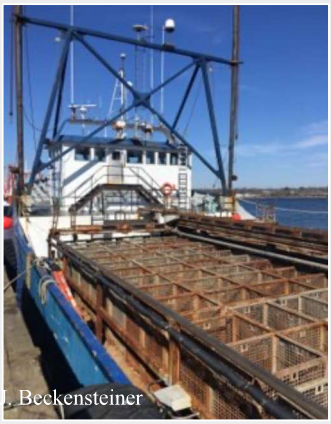
Caela Gilsinan[1], Andrew Scheld[1], Sarah Borsetti[1], Daphne Munroe[2]

[1]Virginia Institute of Marine Science, William & Mary
[2]Rutgers the State University of New Jersey, Haskin Shellfish Research Laboratory

## Background and Objective

The high demand for renewable energy has stimulated the development of offshore wind farms along the east coast of the United States. Over two million acres are currently leased for the development of offshore wind turbines in U.S. waters (BOEM, 2022). It is expected that the Atlantic surf clam (*Spisula solidissima*) industry will be negatively impacted due to overlap between commercial fishing grounds and wind lease areas. This project uses the best available knowledge about predatory losses, hatchery and nursery growth, and costs of production to explore the economic viability of several large-scale surf clam hatcheries to offset additional costs, reduced revenues, and potential job losses associated with the displacement of the fishing fleet.




## Methods

Reports and primary literature were utilized to understand growth and survival of Atlantic surf clams in hatchery and nursery settings. This information was then applied to back-calculate the scale of hatchery efforts needed to support one-million bushels of fishery-sized clams (shell length >120mm). Information on labor, energy, construction, and material inputs and costs for surf clam production were gathered from ~100 sources and by meeting with hatchery managers, researchers, and others knowledgeable about shellfish hatchery production. A techno-economic cost model and Monte Carlo analyses were employed to explore average production costs and their variability. Capital construction costs were assumed to be financed over a 10-year period.

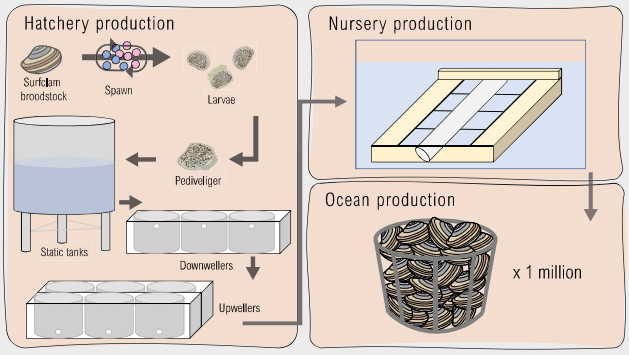



Figure 1: Atlantic surf clam hatchery and nursery production process to produce 1M bushels of surf clams.

## Results

To support an annual production of 1M bushels of surf clams, 88M fishery-sized clams (>120mm) would need to survive. This is approximately half of current fishery output. 374M – 2.1B clams are needed at the post-hatchery stage, and 277M – 645M clams are needed post-nursery. The calculated hatchery costs range from $2.8M - $13.3M and nursery costs range from $800K- $1.8M, with total costs ranging from $3.6M - $15.1M. As production levels increase, average costs decrease.

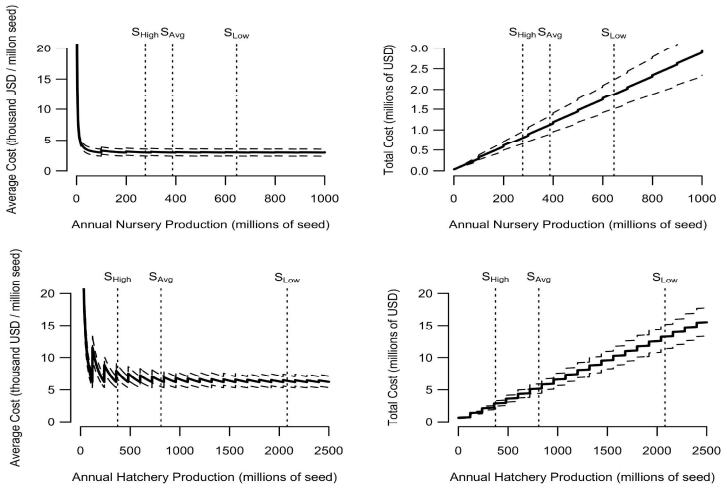



Figure 2: Average and total costs for annual hatchery and nursery production per millions of small surf clam. The dotted vertical lines correspond to high, low, and average surf clam survival.

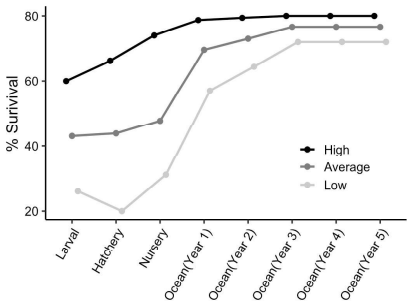



Figure 3: High, average, and low percent survival rates compiled from published literature and reports of surf clam over various life stages.

## Implications and Future Questions

Under current market conditions where surf clams regularly sell for $14-17 per bushel, our analysis suggests that several large-scale surf clam hatcheries could be a viable mitigation method to provide additional fishing opportunity for the commercial fishing fleet. However, costs that are associated with permitting, land acquisition, and ocean harvesting are not included. Future questions in this study include:

- Is large scale hatchery production a viable method for other marine species (scallops, quahogs, etc)?
- How does large scale hatchery production for Atlantic surf clam compare to alternative strategies to mitigate fishery impacts from development of offshore wind?
- What other methods and strategies can be used to reduce average costs of hatchery production?
- What is the optimal scale for hatchery production?

## Acknowledgements

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**Caela Gilsinan**
cbgilsinan@wm.edu
William & Mary