



# Fisheries Technical Working Group (F-TWG) Spring Meeting

April 2, 2025



NYSERDA



# Ground Rules

- **Contribute – your perspectives are important**
- **Share time – lots to cover and many people around the table**
- **Integrate ideas and pose questions**
- **Stay focused on the agenda**
- **Avoid multitasking and other distractions**
- **We all have our unique challenges in a hybrid environment – it will take all of us being mindful to make this work**





# State of Surfclam Stock Enhancement

Daphne Munroe & Sarah Borsetti  
Andrew M. Scheld & Caela Gilsinan

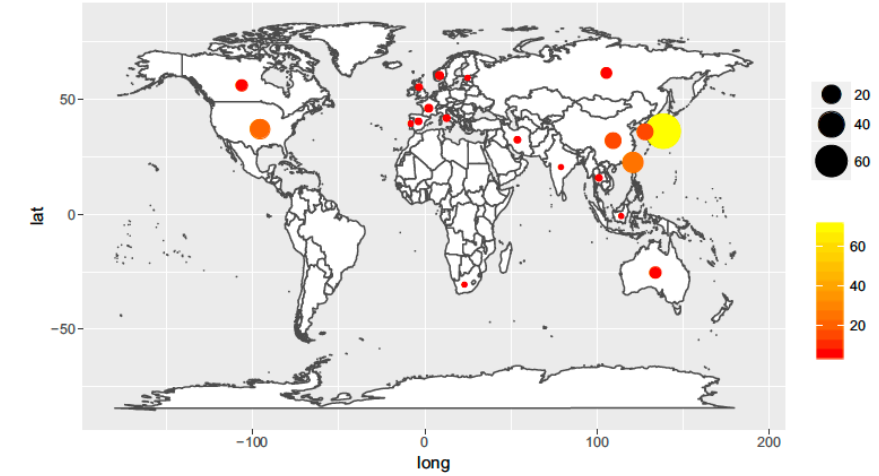
NYSERDA FTWG  
April 2, 2025

# Stock Enhancement of Wild Fisheries

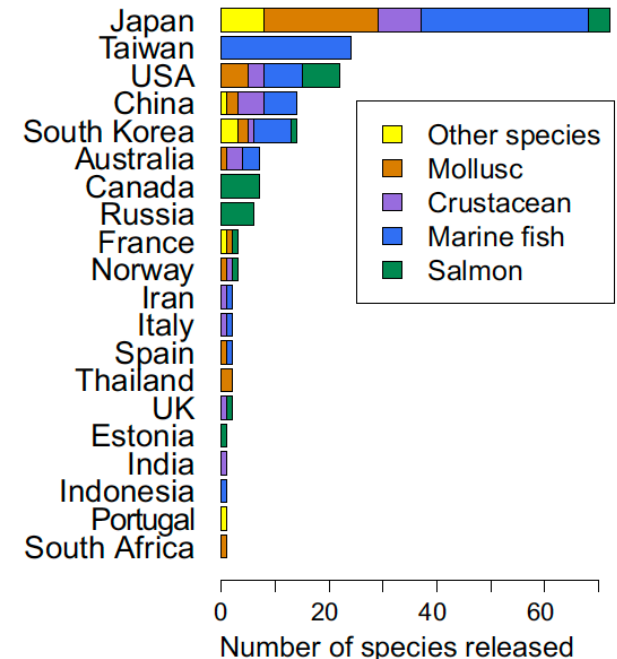
- Stock enhancement for >180 species globally
  - US released 22 marine species (e.g., 30-40% Alaskan salmon harvest hatchery produced)
  - Conservation & production motivations
- Common in finfish
  - Salmon hatcheries
  - Japanese scallop
- Is this farming or fishing?



(a) Number of marine species released



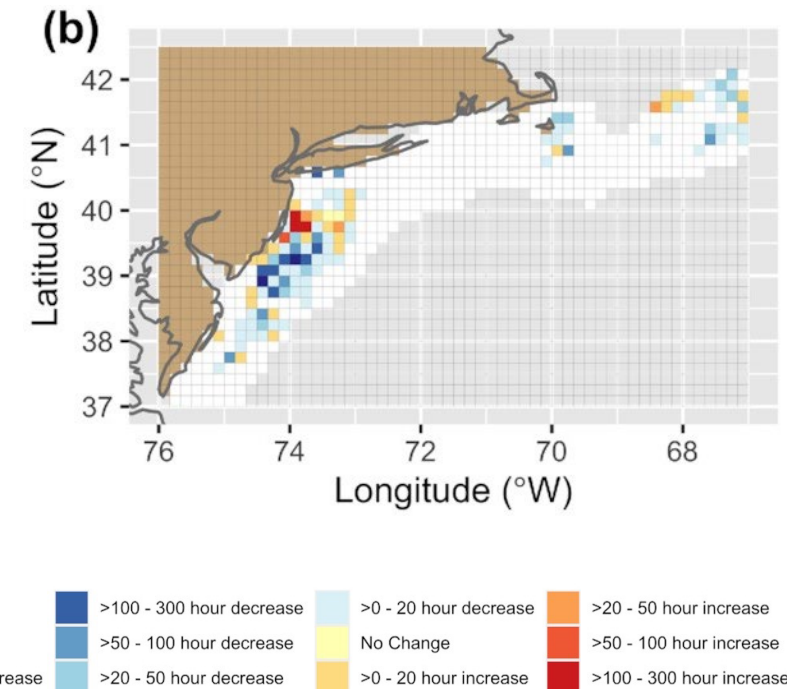
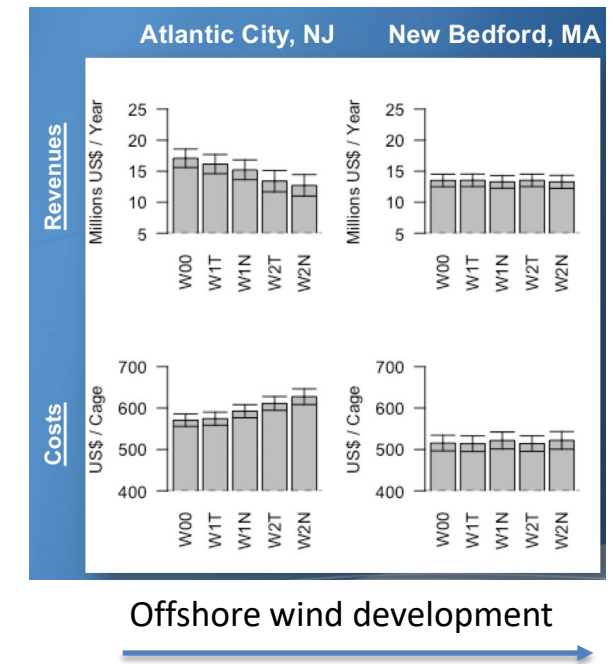
(c)





# Background

- 2.35M acres leased for offshore wind development in U.S. Mid-Atlantic and Northeast
  - Atlantic surfclam fishery revenue losses estimated at 3-15% (\$1M - \$5M annually), concentrated in NJ
  - Hatchery produced Atlantic surfclam (seed) could avoid or minimize impacts → provision of substitute resources (US Council of Environmental Quality, 40 CFR 1508.1(s))
    - BOEM guidance is to Avoid > Minimize > Mitigate



ICES Journal of Marine Science, 2022, 79, 1801–1814  
DOI: 10.1093/icesjms/fsac109  
Advance access publication date: 20 June 2022  
Original Article



## The Atlantic surfclam fishery and offshore wind energy development: 2. Assessing economic impacts

Andrew M. Scheld<sup>1,\*</sup>, Jennifer Beckensteiner<sup>1,2</sup>, Daphne M. Munroe<sup>3</sup>, Eric N. Powell<sup>4</sup>, Sarah Borsetti<sup>3</sup>, Eileen E. Hofmann<sup>5</sup> and John M. Klinck<sup>5</sup>

# How do we get there?

Community based approach

Science driven strategies

Cooperative research

**Funded By:**











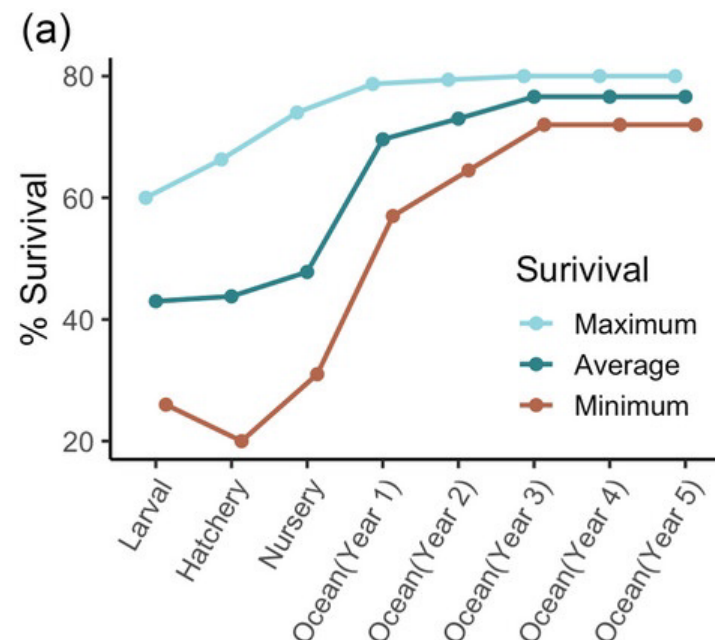


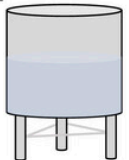






# Gilsinan et al. 2024



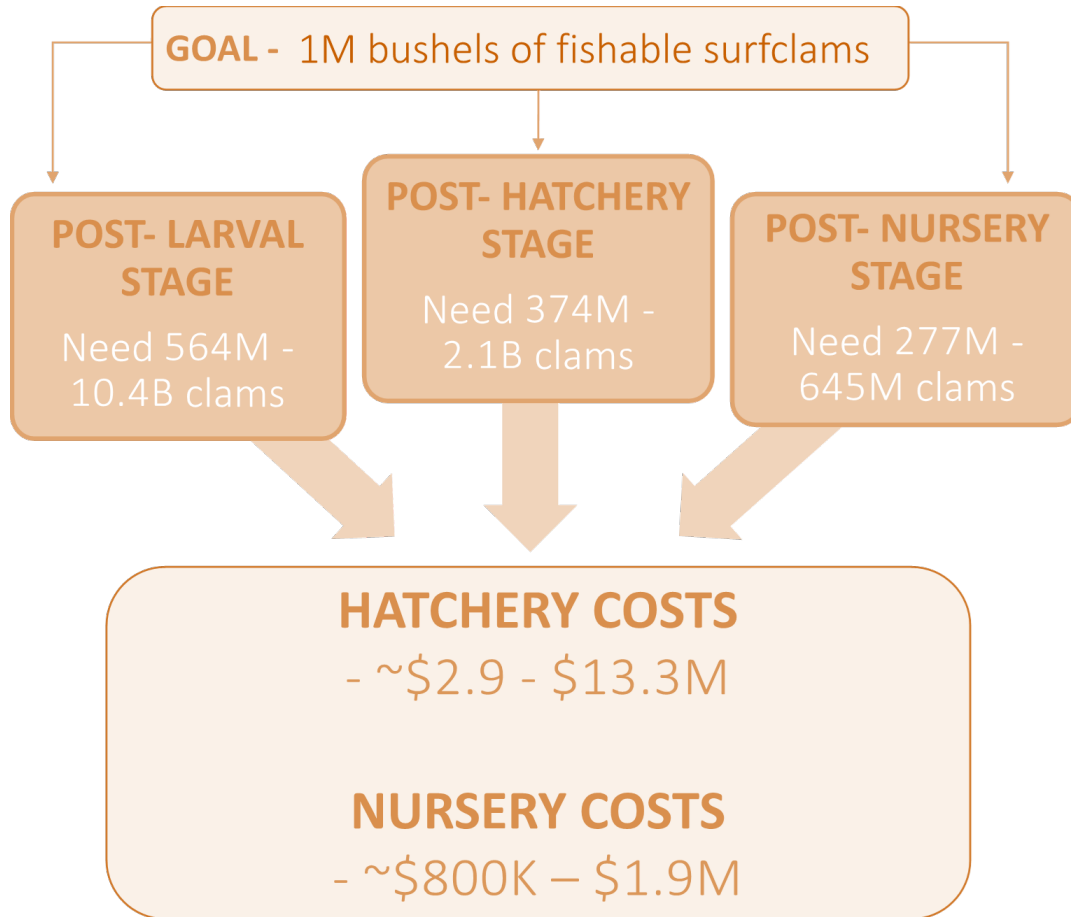
- Desktop analysis to evaluate scale needed to produce 1M bushels of market-size surfclam
  - (~50-60% recent landings)
- Considered:
  - Hatchery construction, operation, and maintenance costs
  - Surfclam growth, survival in hatchery & nursery
- Data gathered through literature review & interviews



Production stages			
Larval	Hatchery	Nursery	Ocean
 <p>Metamorphosis: 27 days Final size: 242µm Survival: 43%</p>	 <p>Duration: 62 day Initial size: 1.5mm Final size: 12.3mm Growth rate: 0.2 mm/day Survival: 44%</p>	 <p>Duration: 266 days Initial size: 17mm Final size: 41mm Growth rate: 0.12mm/day Survival: 48%</p>	 <p>Duration: 5 years Size required: 120 mm Clams/bushel: 88 Bushels: 1,000,000 Total clams: 88,000,000 Survival: 57-80%</p>



# Gilsinan et al. 2024



- To support 1M market-size bushels:
  - 374M – 2.1B surfclam at hatchery stage
  - 4 – 18 hatcheries, \$4M - \$15M
  - Average costs of ~\$0.01/clam
- Labor was the largest cost
- Analysis did not consider: land acquisition, permitting, hatchery failure, planting & harvest





# Hatchery and nursery siting to support surfclam stock enhancement

- Assess existing hatchery capacity
- Evaluate potential sites for new hatchery development
- Estimate additional costs & production risks
- Interviews and Gilsinan model updates



# Findings

- Existing hatchery capacity varied across states
  - 10 (VA) to 0-1 (NH, DE)
  - NY: 3 private, 5 public; NJ: 5 private, 2 public/research
  - Oysters, hard clams, bay scallops most common
  - Interest in new species generally (diversification)
    - Needs to be worth while and fit within existing production schedules
- New hatchery challenges:
  - 2 sites investigated (Point Pleasant Beach, NJ; Far Rockaway, Queens, NY)
  - permitting (water quality), availability of space, public acceptance, workforce
- Cost Model:
  - Hatchery failure is potentially high (~33%), increasing cost estimates
  - Ocean planting and harvest increase program costs by 15-44%
  - Costs under average survival scenario: \$0.26 per harvestable clam





# Seed Survival & Growth

Experiments recently completed evaluating response of seed clams to ocean environmental stressors, seed growth and survival under various planting densities and sizes, and vulnerability to predators.

## More information

Video:  
Seed Clams

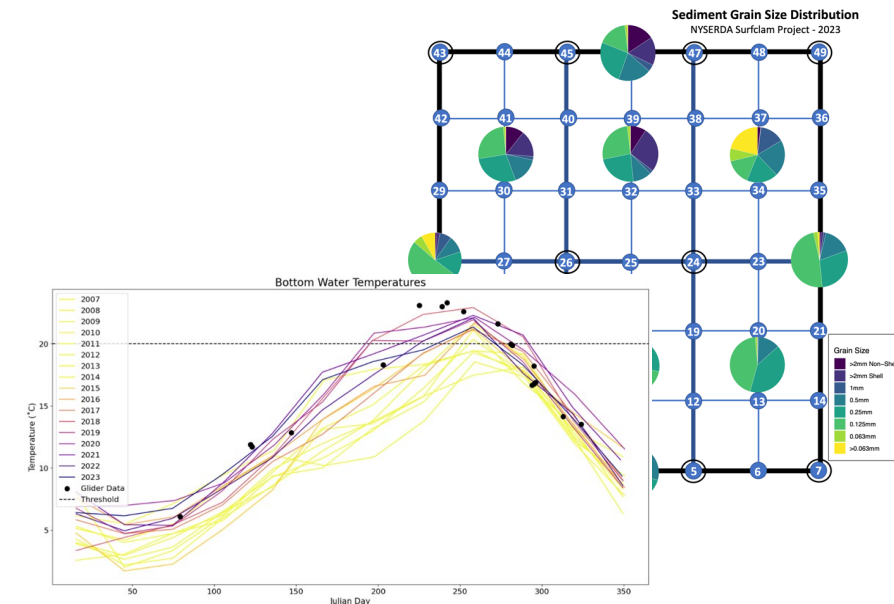
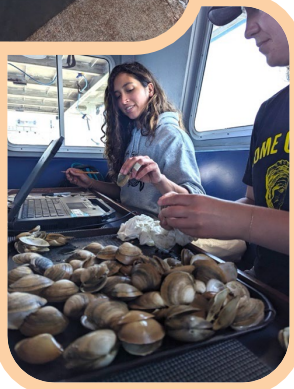


Initial results show

17 – 41 % Shell Length

78 – 187 % Biomass

over 8 months.



# 2025 Experiments:

- Field experiments (ocean) to test how survival and growth of seed surfclams varies with density
- Lab experiments to test the predation rates and size preferences of key predators on juvenile surfclams

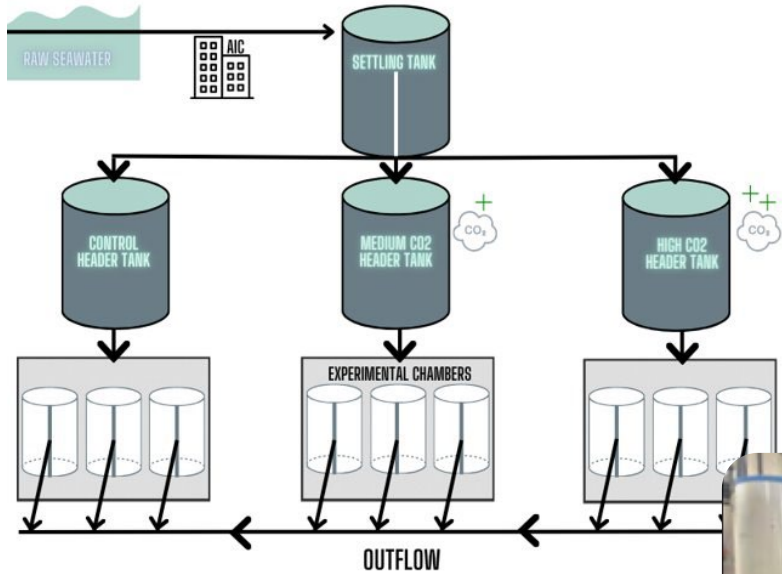


New Jersey Offshore Wind  
Research & Monitoring Initiative



# Offshore aquaculture potential for the Atlantic surfclam

## *in situ* observations and multi-stressor laboratory experiments



- 3 pH conditions (ambient (control):  $7.8 \pm 0.07$ , medium:  $7.51 \pm 0.10$ , or low:  $7.20 \pm 0.10$ )
- flow-through conditions for six weeks
- feeding and digestive physiology was measured
- thermal stress (24–26 °C) dominated any changes from low pH



Dr. Laura Steeves





# Offshore aquaculture potential for the Atlantic surfclam

Two deployments:

Winter: 4 cages (2023)

Spring: 2 cages (2024)

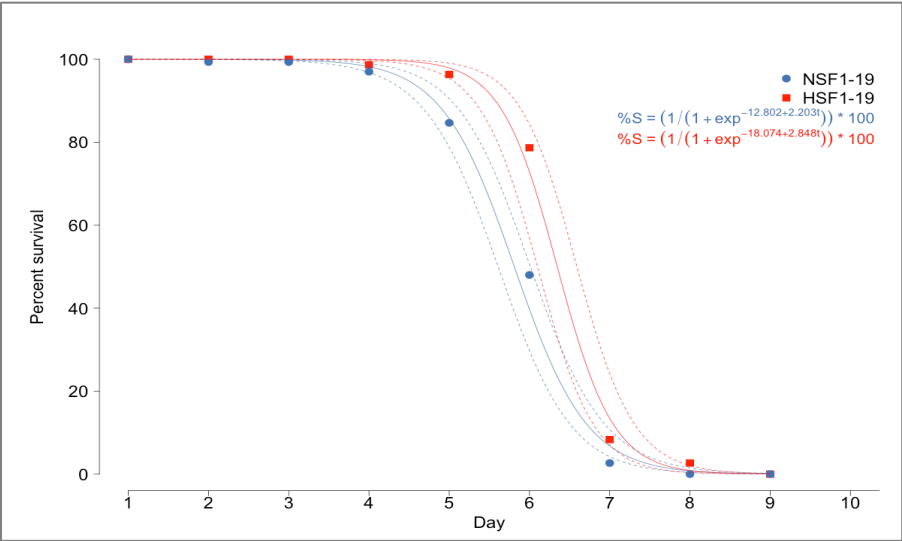
Retrieved: Summer 2024



Worked well under summer conditions.  
Not a replacement for fishery.  
Provided important biological information.



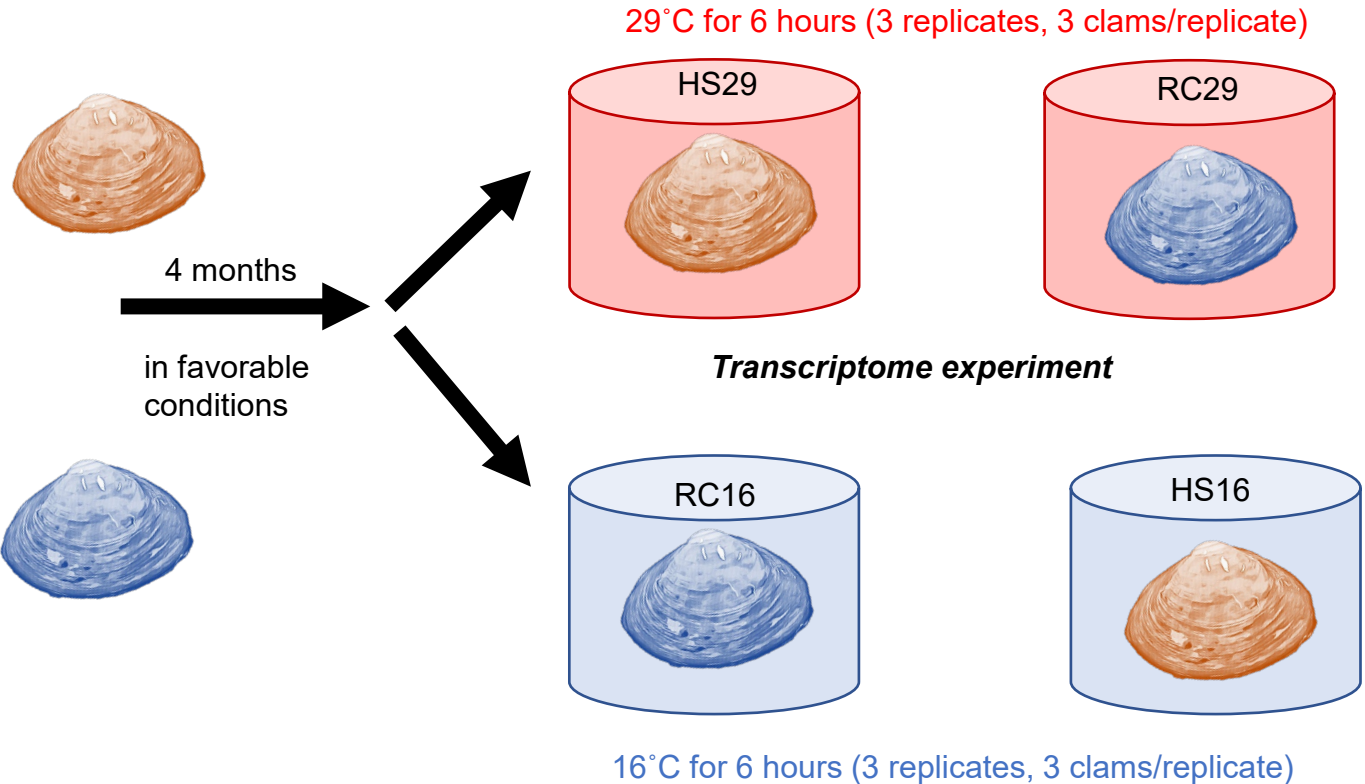
# Can we Selectively Breed Atlantic surfclams (*Spisula solidissima*) for heat tolerance?



Heat-Selected-17 (HS)



Non-Selected-17 =  
Random Control (RC)



Dr. Mike Acquafredda







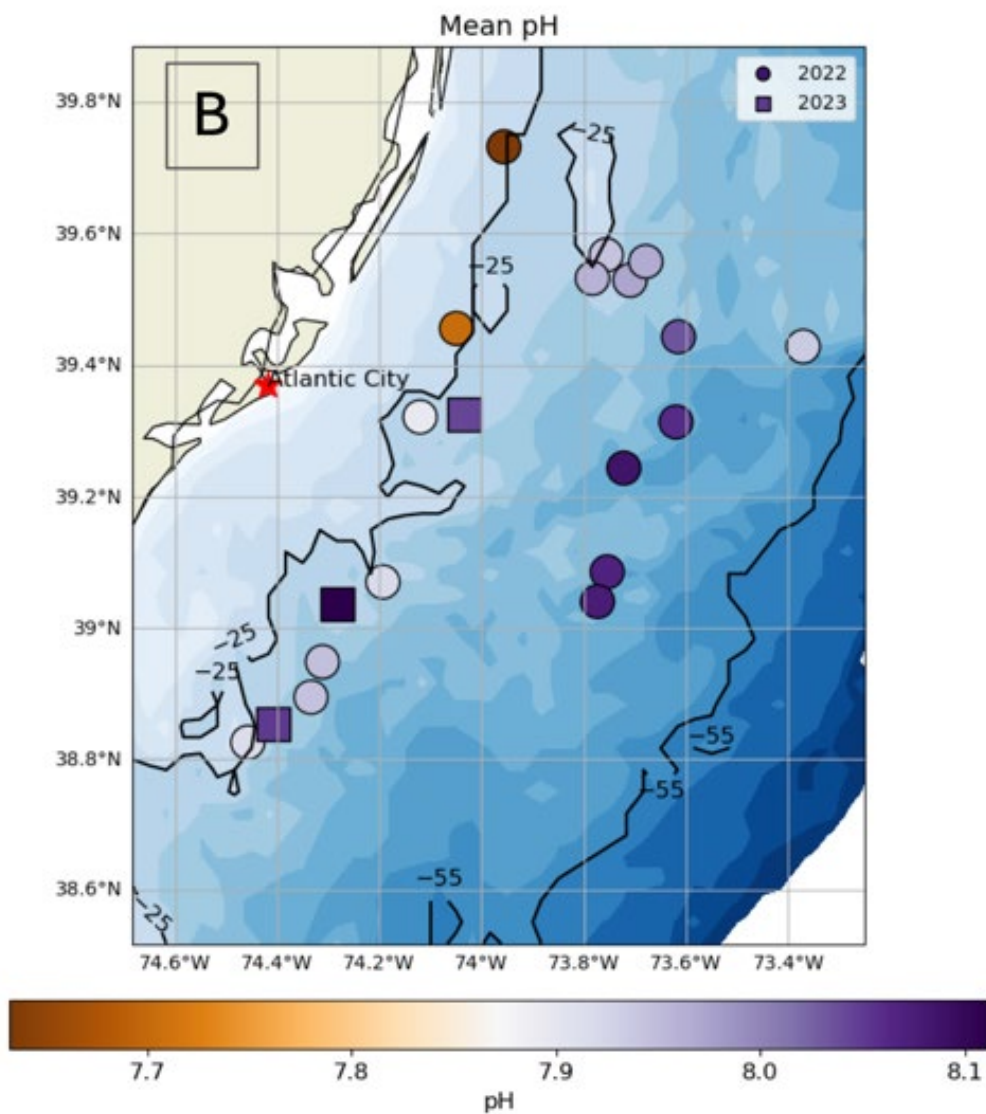
Calibration Experiments for a  
Novel Clam Survey Dredge  
&  
Monitoring Carbonate Chemistry  
of Surfclam Habitat



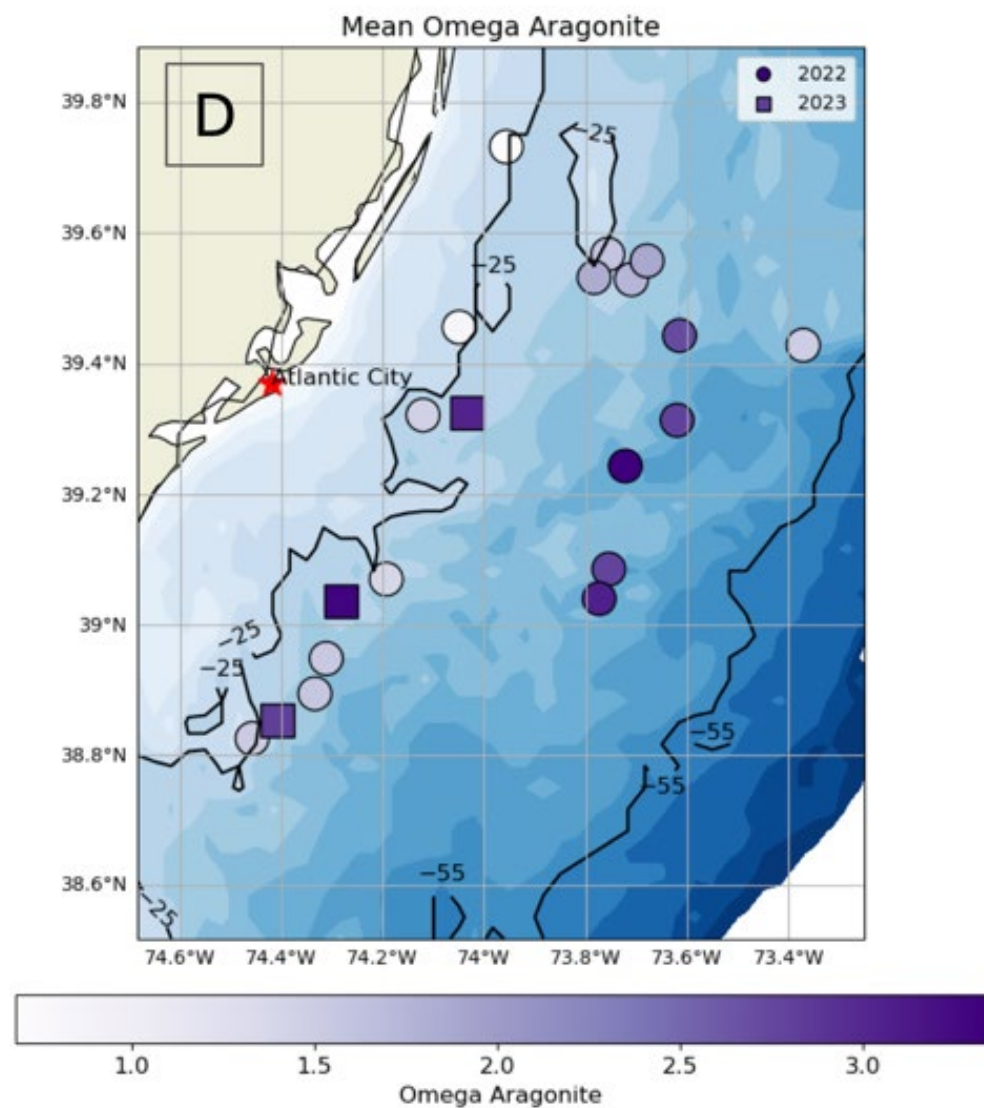
New Jersey Offshore Wind  
Research & Monitoring Initiative



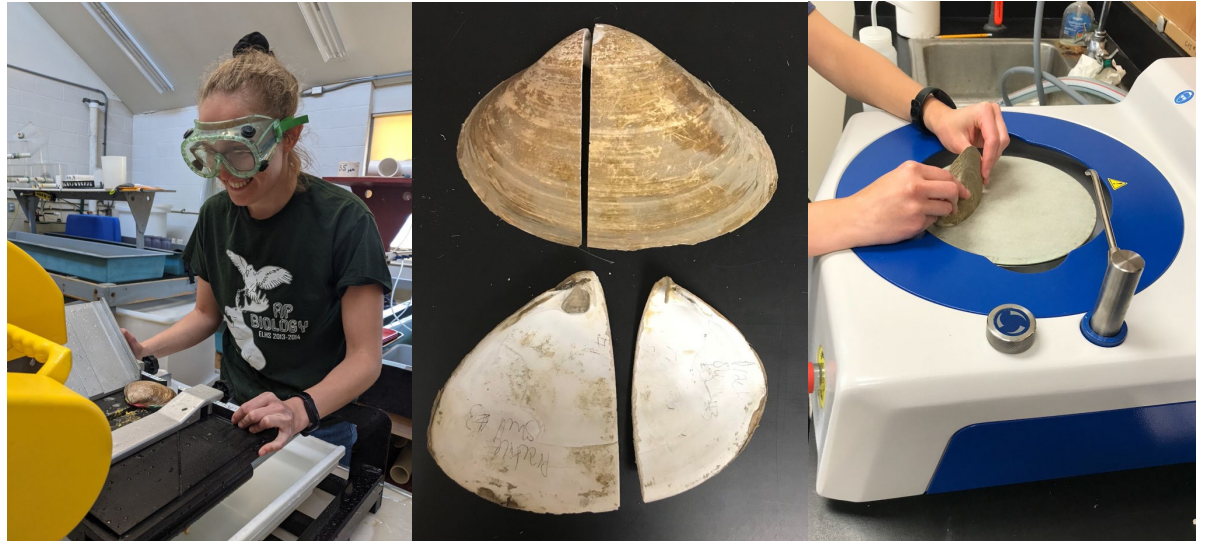
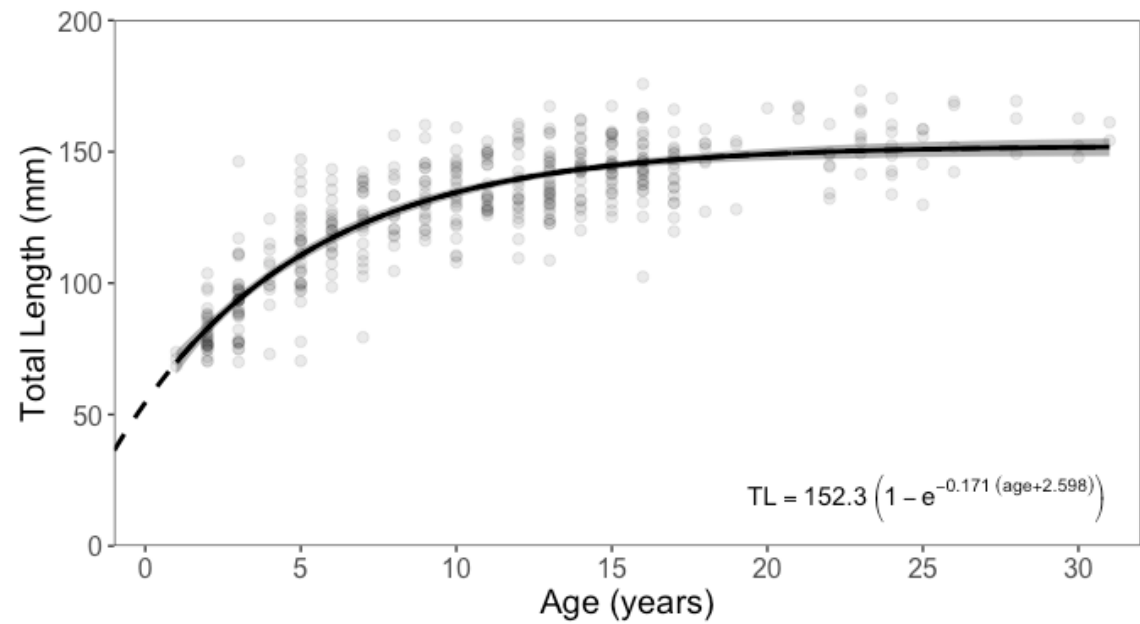
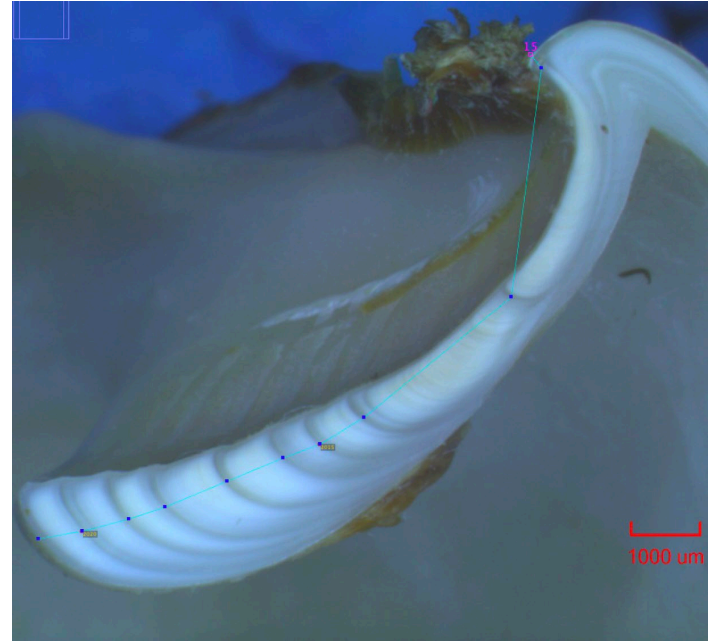
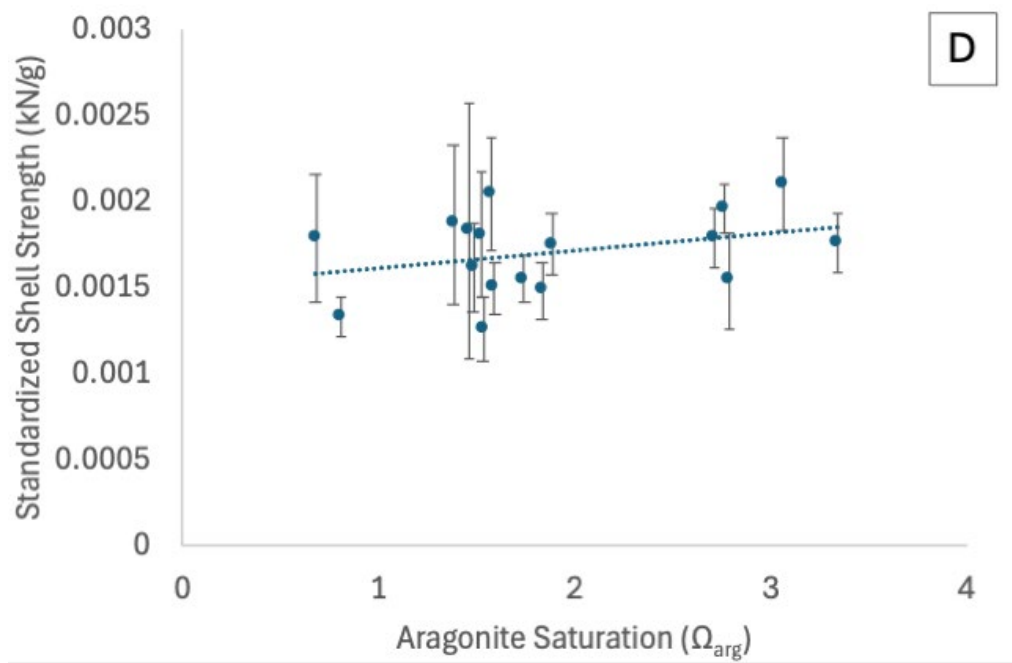
Bottom pH: 2022 Survey Stations



Bottom  $\Omega_{\text{Aragonite}}$ : 2022 Survey Stations



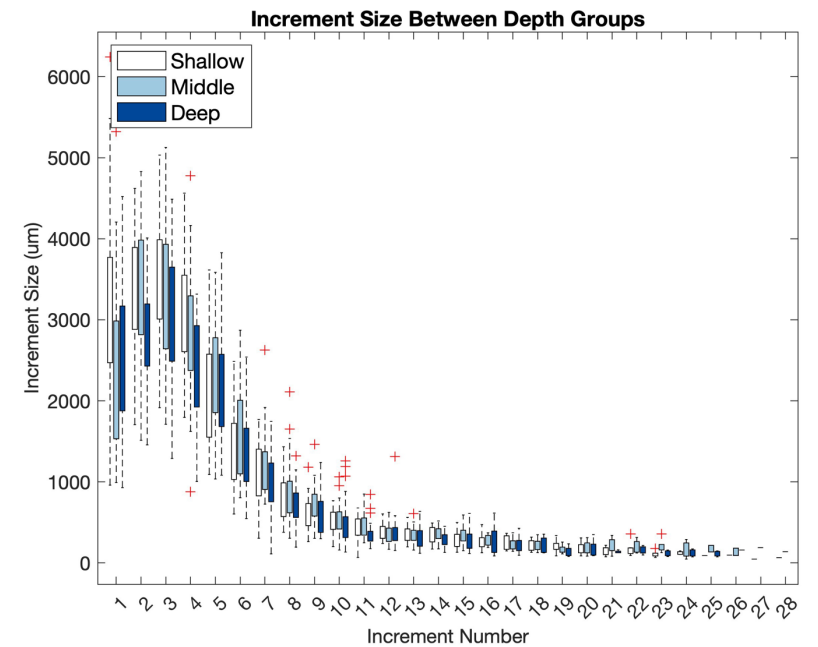
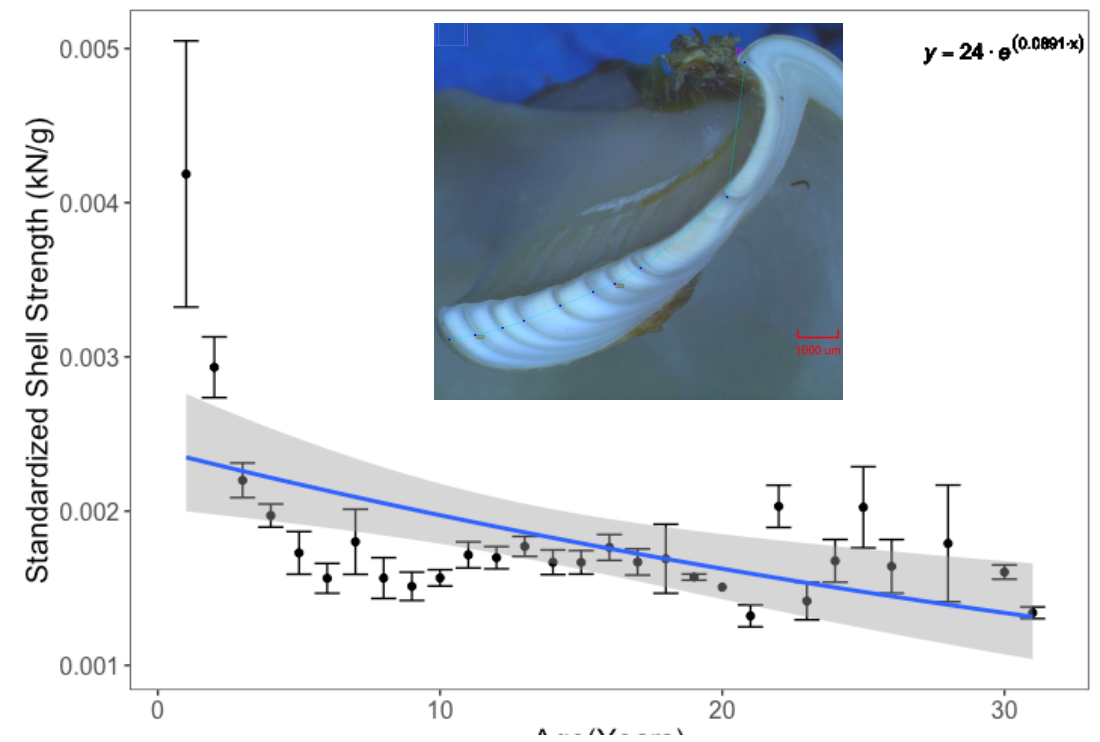
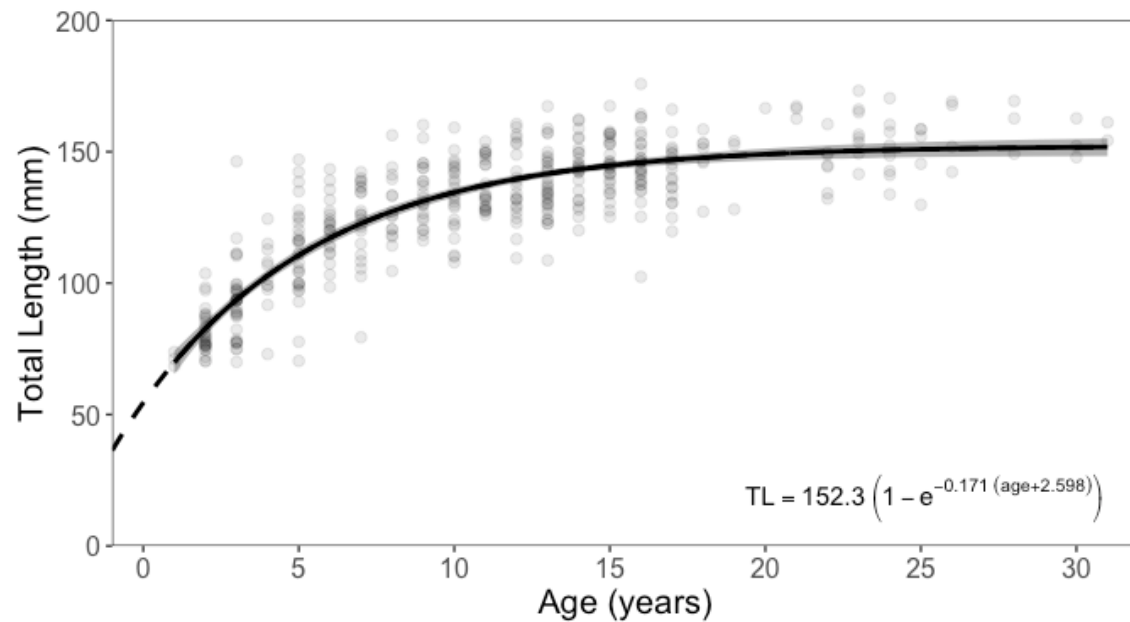
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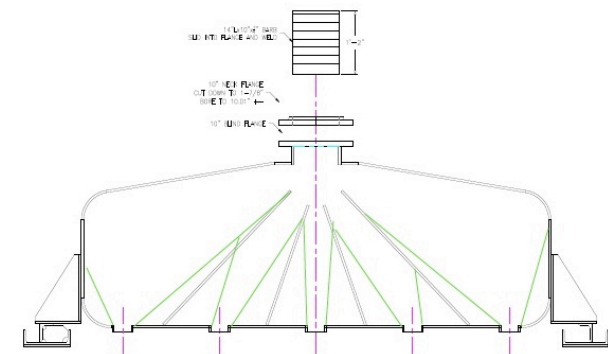
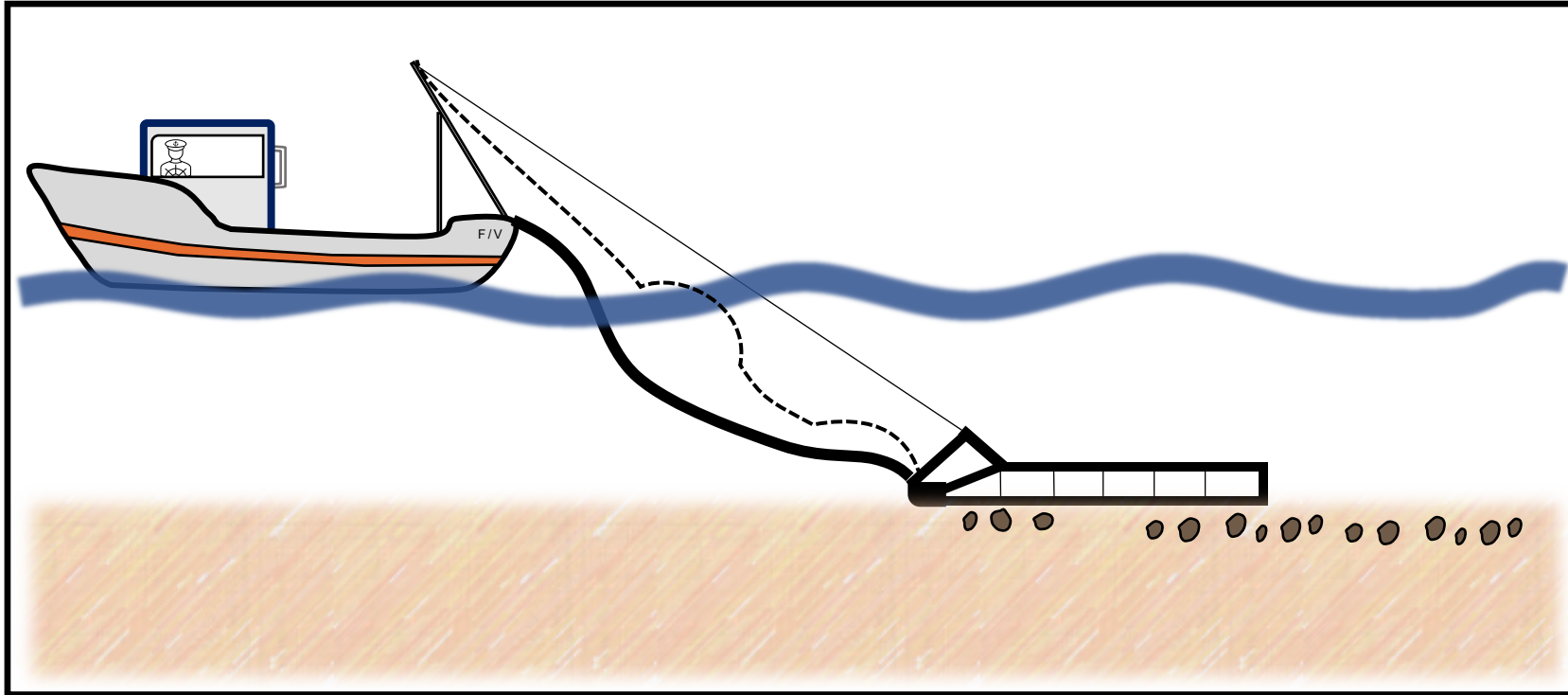


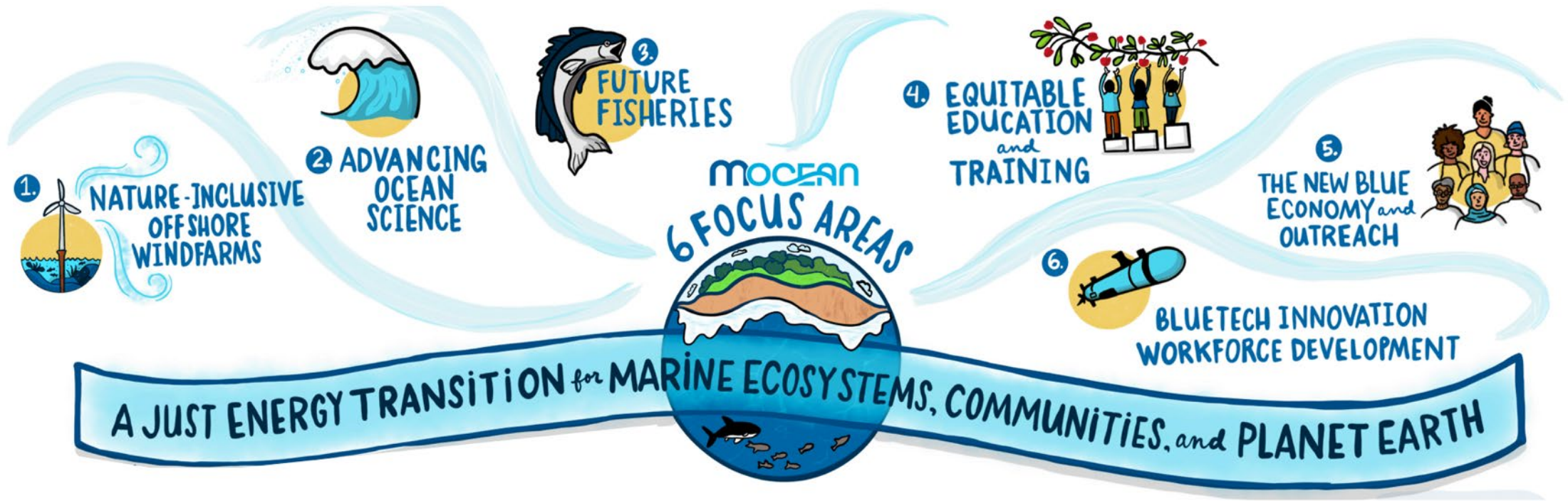
# New Jersey Offshore Wind Research & Monitoring Initiative



# Design of a Seeding Tool

- Architectural design complete





**mocean** (Mission is the OCEAN) is committed to advancing the design, operation, and valuing of Nature-Inclusive & multipurpose U.S. offshore wind farms through science, engineering, policy, and engagement with communities.

**Tufts**



**New England  
Aquarium**

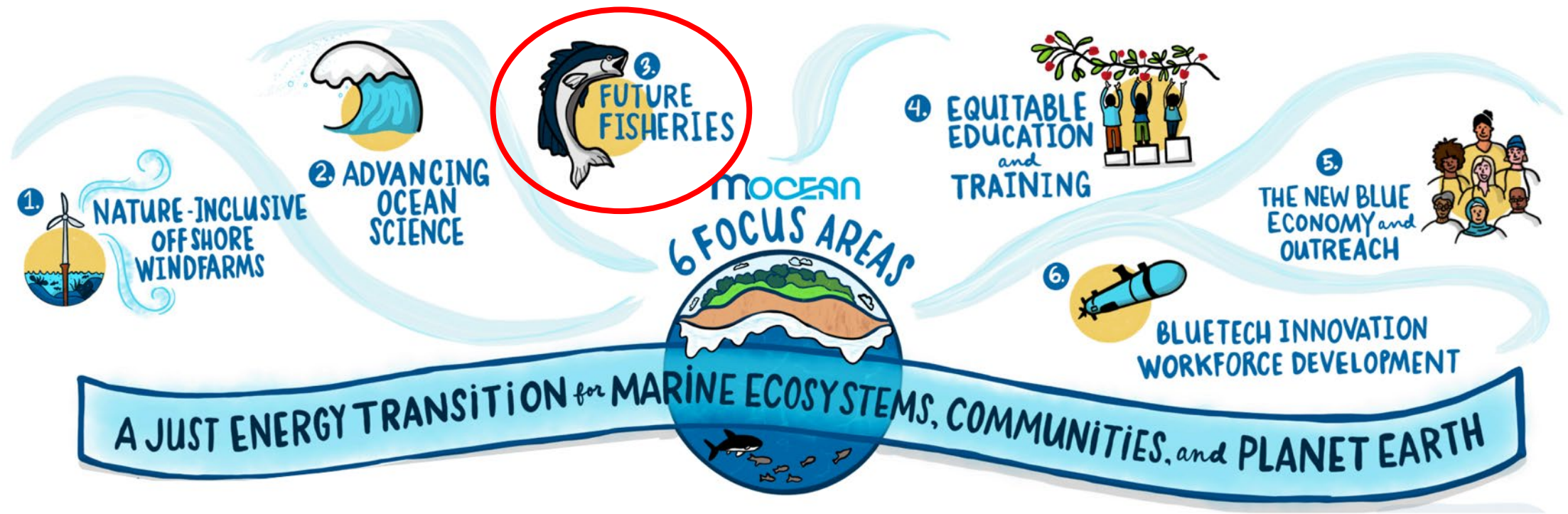


**RUTGERS**



**SeaAhead**





**Future fisheries** encompasses **coastal economies/communities, biodiversity objectives**, specific interventions to **support blue food production** (wild harvest fisheries and restorative aquaculture)

- **Advancing the science:** OSW interactions relative to fisheries; and the impact of climate change on fisheries.
- **Considering operational innovation** to support co-existence; Support continued food production.
- **Exploration of fisheries management measures** that can more readily adapt to changes in the fisheries related to climate.

# ATLANTIC SURFCLAM FISHERIES

## MITIGATION WORKSHOP STOCK ENHANCEMENT AS A MITIGATION STRATEGY

November 20, 2024  
Philadelphia, PA

**SUMMARY  
REPORT**  
JANUARY 2025

**Workshop Convener:**  
Tom Dameron, Surfside Foods, LLC

### Brought Together

- Surfclam Industry
- Federal Sector
- State Sector
- OSW Developers
- Research Sector

### Workshop Goals

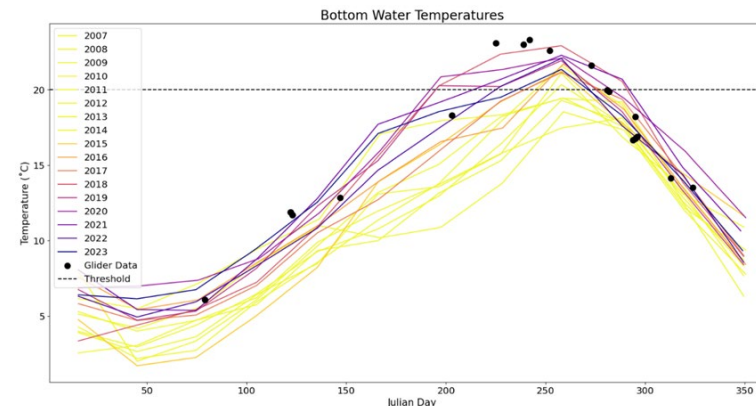
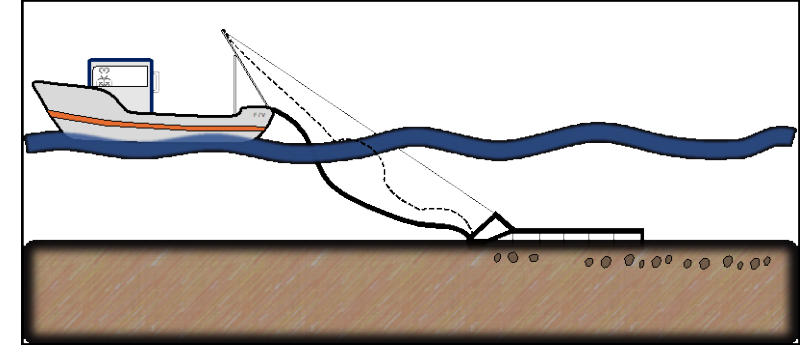
- Review Research and evidence for seeding viability
- Review standards & key elements
- Build a shared understanding of roles, authorities, and jurisdiction
- Explore stock enhancement mitigation and regional scaling
- Determine immediate, short term and long term actions





# On the Horizon

- Optimize the seeding tool
  - Several experiments, at scale, over 3 years
- Use AI and Machine Learning to identify enhancement locations
  - habitat suitability identified from
    - ecological and fisheries datasets,
    - co-existent oceanographic/atmospheric data and models,
    - proprietary commercial fishery spatio-temporal biological data



**Ahmed Aziz Ezzat**  
Rutgers Engineering



# How do we get there?

## Community based approach

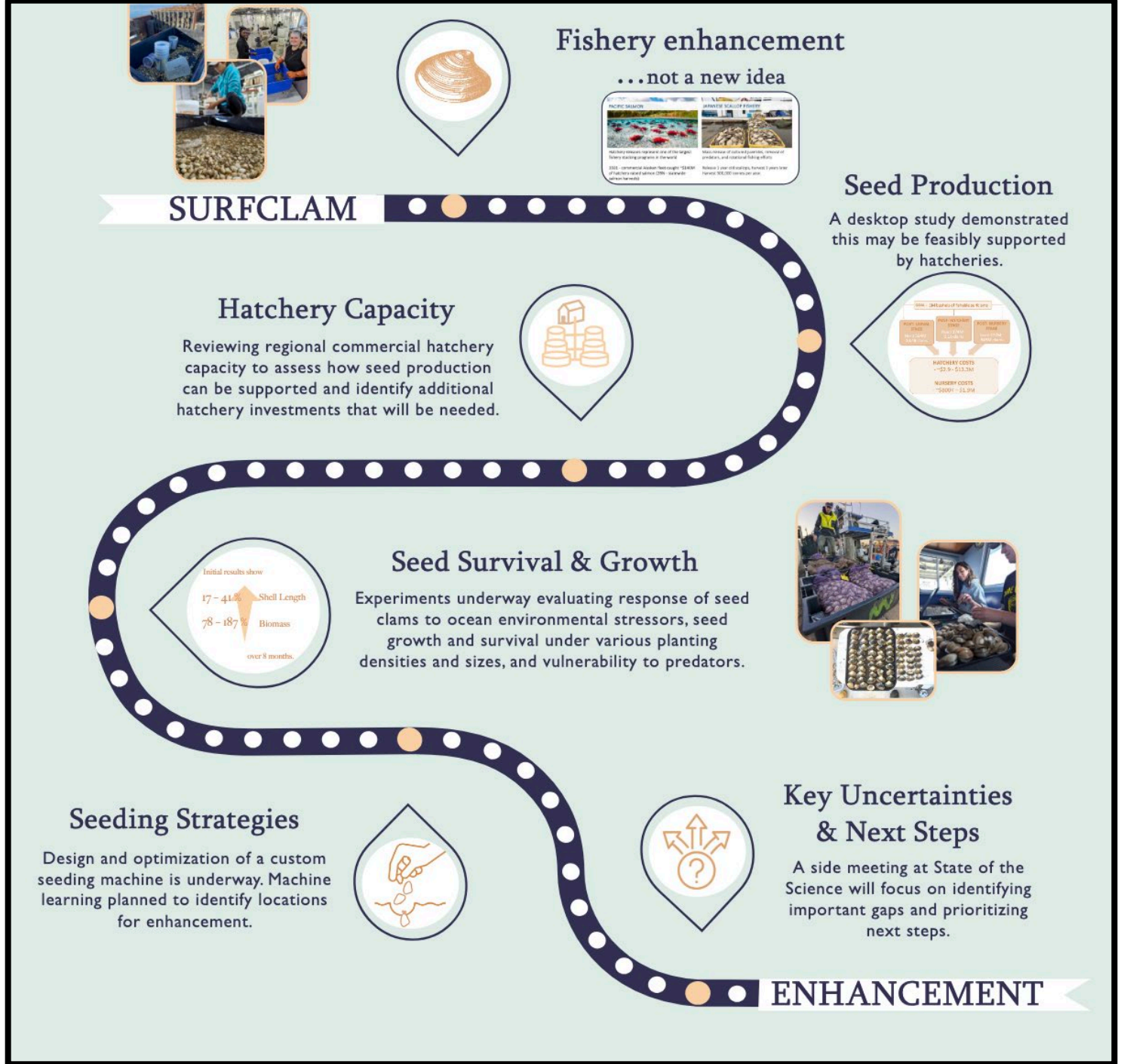
LaMonica, Surfside Foods, Atlantic Capes Fisheries, Inc., SEAWATCH INTERNATIONAL

## Science driven strategies

## Cooperative research

### Funded By:

rmi, NEW YORK STATE NYSERDA, NOAA, ATLANTIC SHORES offshore wind, BOEM, NSF, SCMFIS, Sea Grant, COMMUNITY offshore wind



# Sea Scallop Resource Enhancement



**David B. Rudders**

**Virginia Institute of Marine Science**

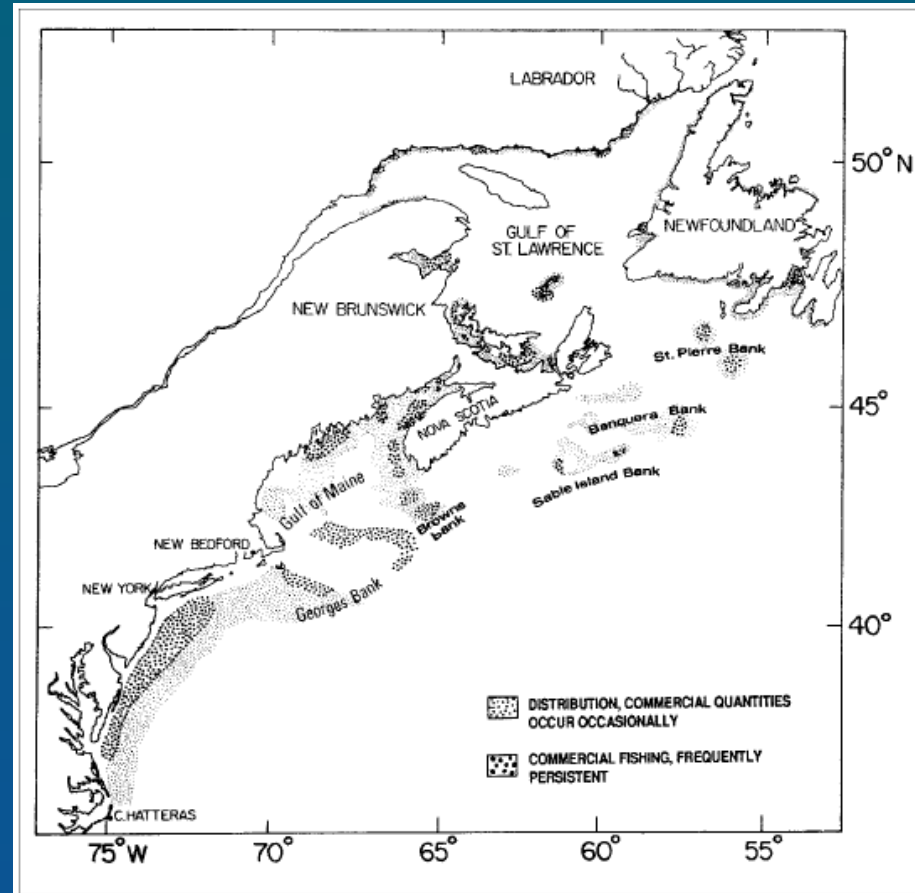
**New York State Fisheries Technical Working Group**

**April 2, 2025**



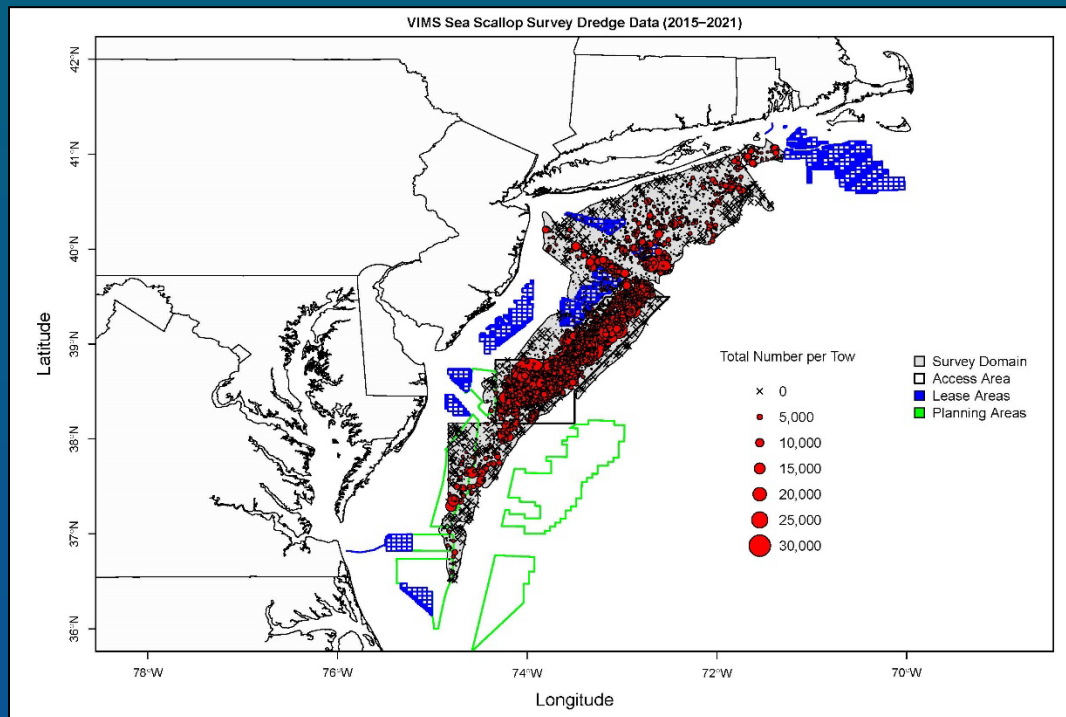
## The sea scallop, *Placopecten magellanicus*

- Spatial distribution is mediated by temperature. As a result, scallops are found farther offshore as a function of decreasing latitude
- Supports commercial fisheries throughout its range from Canadian Maritimes to Virginia Capes.
- Environmental and anthropogenic factors may serve to radically alter the footprint of the fishery.



Geographic distribution of *Placopecten magellanicus*. (from Shumway et.al., 2006)

# The sea scallop resource: A changing footprint



- The footprint of the resource is changing.
  - Warming ocean
  - Changing oceanography
  - Disease/parasites
  - OSW development
- In aggregate, the outlook appears to point to lower resource levels and potentially less access to remaining areas.
- What to do? Can we do more with less?



# Can we do more with less?

## Lessons from across the globe



- Many countries have had experience with approaches that represent spectrum of approaches grow their scallop resources
  - Japan, France, Canada, China, Chile, New Zealand.
- Japan is a huge producer of scallops (*Patinopecten yessoensis*) that range from 400-600,000 mt annually.
- The fishery started as a wild capture fishery but moved to a ranching type approach in the 1960's
  - Wild spat collection, intermediate culture and bottom sowing
  - Based on the cooperative organizational structure.
- Can any of these approaches be used in the U.S. to stabilize and enhance our resource?

# Workshop on the State of Knowledge Related to Scallop Enhancement



## Objective

A workshop was convened during October 2024 with sea scallop stakeholders, scallop enhancement experts and decision makers to synthesize the state of knowledge as it relates to scallop enhancement and explore how scallop enhancement relates to the U.S. East Coast sea scallop resource.



## **Workshop on the State of Knowledge Related to Scallop Enhancement**

### **Workshop Structure**

- **Agenda**
  - **Centered around 4 focal areas**
    - **Seed Production**
    - **Planting and Transplanting**
    - **Ecological Considerations**
    - **Regulatory and Management Regimes**
  - **Topic experts from across the globe provided context, perspective and their experience on the varied aspects of scallop resource enhancement.**
  - **This information will formed the basis for discussions around each theme.**



## **Workshop on the State of Knowledge Related to Scallop Enhancement- Focal Areas**

- 1. Potential needs for sea scallop enhancement on the U.S. East Coast;**
- 2. Understanding and developing tools to increase and/or improve spat collection, grow out of juvenile scallops, survival of juvenile scallops, and predation impacts;**
- 3. Enhancement site location, selection, and monitoring for both inshore and offshore seeding and aquaculture efforts;**
- 4. Transportation methods for enhancement studies and efforts;**
- 5. Developing advice for standards and best practices for scallop enhancement and aquaculture efforts;**
- 6. Discussion of the economic feasibility of enhancement efforts;**
- 7. Impacts/implications for the wild caught sea scallop fishery; and**
- 8. Policy implications.**



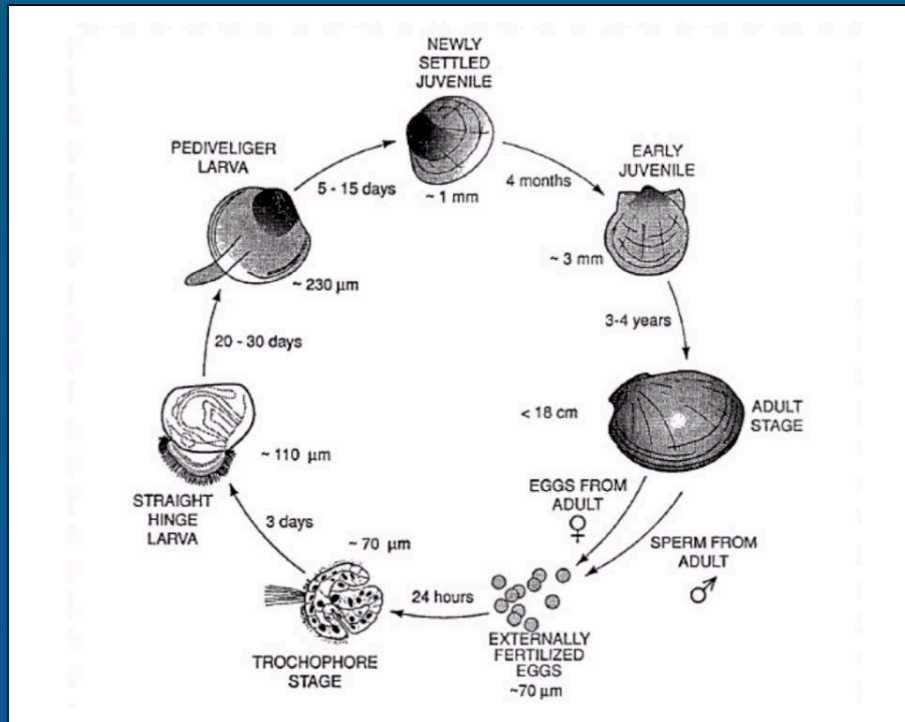
# Workshop on the State of Knowledge Related to Scallop Enhancement-Deliverables

## Deliverables

1. A conference proceedings document summarizing the workshop.
  1. This would be a synthesis of information from the workshop for policy makers and NOAA
2. A whitepaper articulating the strengths, weaknesses, opportunities, and threats of scallop enhancement for the U.S. federal fishery for *Placopecten magellanicus*.
  1. Identification of priority research needs to support the concept moving forward

# Scallop Enhancement

## Technical efforts to date



- How to control the scallop life cycle to increase the population.
  - Intervention at the early life history stage.
    - Seed Production
      - Hatchery production and nursery rearing
    - Wild spat collection
  - Intervention at the juvenile stage
    - Transplanting
      - Site selection, predation, disease...



# Scallop Enhancement

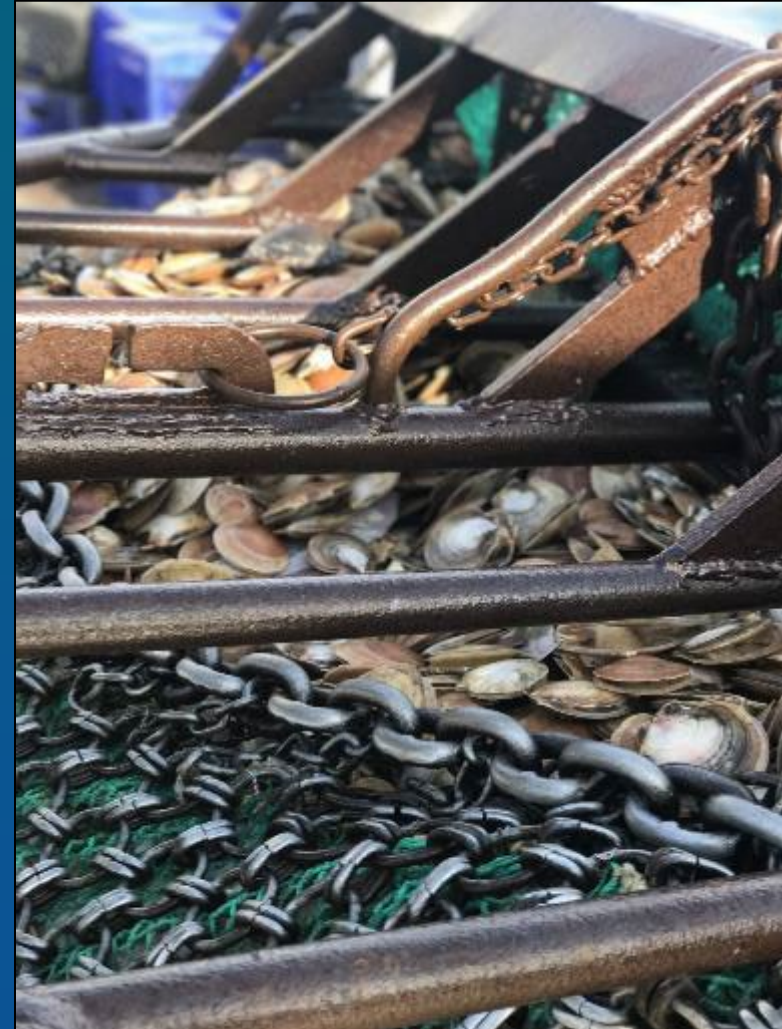
## Ongoing Challenges

- **Biological**
  - Scallops are a boreal species that struggle at temps  $>17^{\circ}$ - $18^{\circ}$  C
  - Implications for efforts to develop scalable shoreside capacity.
  - 3-5 year growout cycle.
- **Environmental**
  - NES is warming and the effective footprint of the species appears to be shrinking.
- **Socio-economic**
  - Enhancement could represent a major shift in resource management strategy.
    - Legal, regulatory and policy implications
  - Do the economics work?



# Concluding thoughts

- Sea scallops are facing a myriad of environmental and anthropogenic stressors that may reduce the footprint of the resource in U.S. waters.
- Acknowledging the existing expertise and long-running efforts with sea scallop culture and enhancement in the U.S., we sought to leverage that experience and engage with domestic and international colleagues to build out our understanding of the state of knowledge of enhancement.
- Ultimately, efforts are still in the early stages, however the current work happening in clams and scallops is promising. For scallops, there are technical and policy hurdles to address and overcome.





The background of the slide is a close-up photograph of numerous surfclams submerged in water. The clams are densely packed, with their light-colored, ribbed shells visible. The water is slightly rippled, and the overall lighting is soft, creating a naturalistic and textured backdrop for the text.

# Regulatory Framework for Surfclam Stock Enhancement

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New York State Fisheries Technical Working Group (F-TWG)

- April 2, 2025 -

Janine Barr

# Overview

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- Setting the Stage
  - General scope of surfclam stock enhancement (SSE) protocols
  - SSE as “aquaculture”
- Applicable Regulations and Permits
- Framework for SSE Approval
- Case Studies of other SSEs



# Key Takeaways

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- There are existing stock enhancement programs, but the **SSE would be the first of its kind** and will have a unique regulatory and permitting to anything before it.
- Individuals involved in the SSE planning process will need to discuss and identify the location, timing, and physical disturbance SSE planting may have on the physical environment *before* the specific steps to achieve regulatory approval can be taken.
- The individuals responsible for submitting paperwork for SSE approval will be influenced by *when and how* individuals involved in SSE planning coordinate with offshore wind's Construction and Operation Plan (COP) approval process.

A close-up photograph of numerous clams in a pot of water. The clams are densely packed, with their shells showing various patterns of ridges and colors ranging from light tan to dark brown. The water is slightly rippled, and the overall lighting is soft, creating a warm, textured appearance. The text "Setting the Stage" is overlaid in the center in a white, serif font.

# Setting the Stage



# General Scope of Surfclam Stock Enhancement Protocols

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- Method/Scale:
  - Hatchery, to nursery, to transport offshore and planted at the bottom of ocean at a density to cover a large surface area sufficient to support multiple commercial fishermen
- Location:
  - Offshore in Federal waters
  - Surfclams could be planted in areas that currently have or do not have wild surfclam populations
- Number of Planting Locations:
  - At least one location, but experts are open to planting in multiple locations pending funding availability

# Surfclam Stock Enhancement is Aquaculture

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- 2024 National Aquaculture Development Plan's (NADP) definition of conservation aquaculture
  - “The conservation, restoration, ***and enhancement uses*** of aquaculture typically pursued or implemented by public agencies. Products of conservation aquaculture include commercial or private sector activities, such as commercial and recreational ***fishing of species produced in a hatchery and released into the wild.***” ([NADP](#))

# Surfclam Stock Enhancement is Aquaculture

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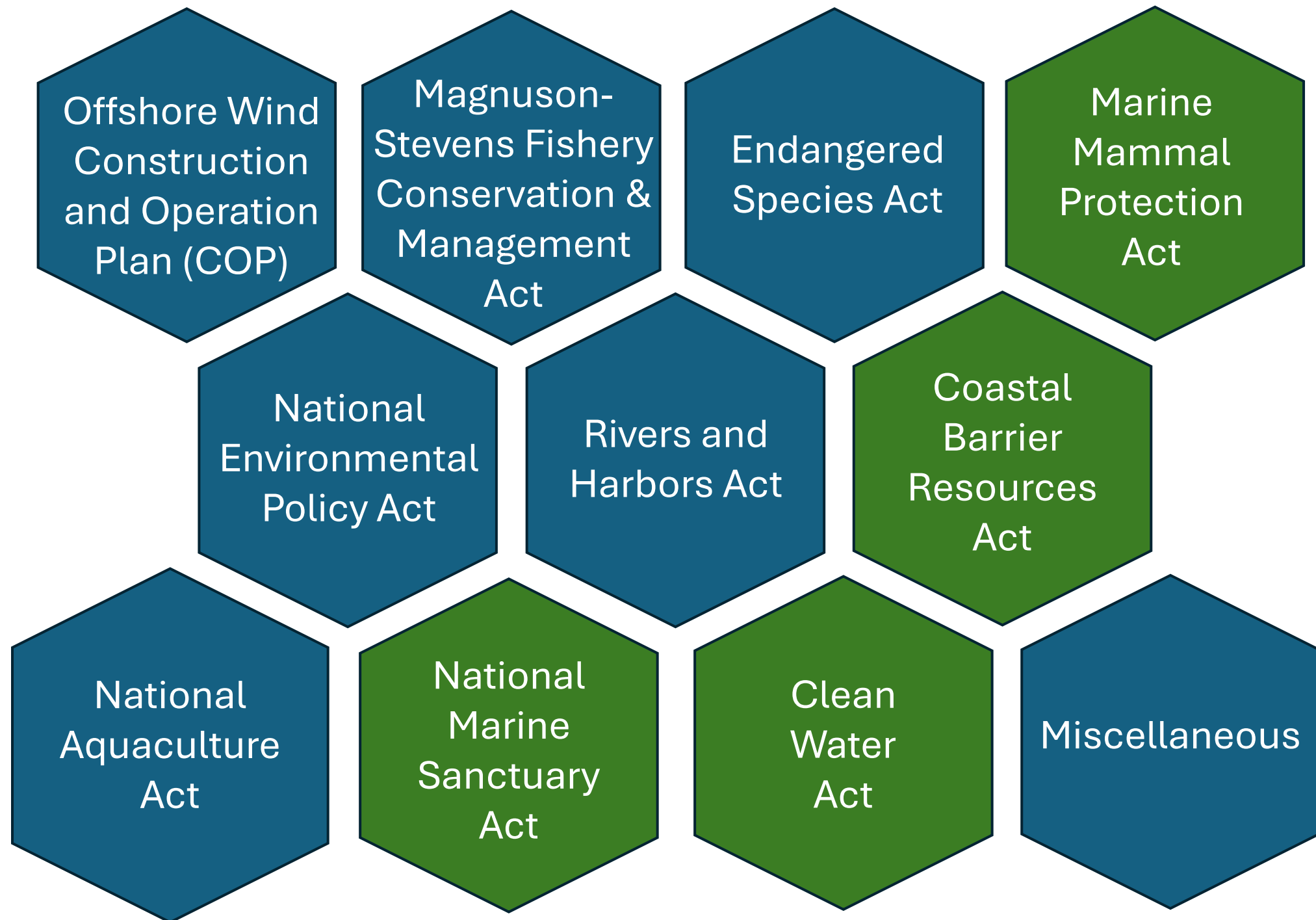
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A SSE program would not have the same physical footprint as traditional marine aquaculture, so some of the regulations would not be as restrictive to SSEs.





# Applicable Regulations and Permits







A close-up photograph of numerous clams, likely littleneck clams, in a pot of water. The clams are densely packed, with their shells showing various patterns of ridges and colors ranging from light tan to dark brown. The water is slightly rippled, and the overall lighting is somewhat dim, creating a moody atmosphere. The text "Framework for SSE Approval" is overlaid in the center in a white, sans-serif font.



# Framework for SSE Approval





# 10 SSE Decision Points that Trigger Specific Requirements

1. What entity is funding this project? 
  - Federal
  - Non-Federal
2. What boats will be used to plant and monitor the surfclams? 
  - Research Vessel
  - Fishing Vessel
3. Would an Exempted Fishing Permit (EFP) be needed for SSE “prep” work? 
  - Yes
4. Where will the surfclam hatchery be? 
  - In a CBRA area?
  - In New Jersey?

# **10 SSE Decision Points that Trigger Specific Requirements**

- 5. Do boats have a safe transit zone? → Yes
- 6. Do baseline data need to be collected to identify the best location(s) for surfclam bed(s)? → Yes
- 7. Will surfclams be transported among SSE beds as a form of rotational management? 
  - Yes
  - No
- 8. Has the project team obtained proper Federal approval for the ideal surfclam bed location(s)? 
  - Are restricted areas avoided?
  - Have environmentally sensitive areas been avoided?

# **10 SSE Decision Points that Trigger Specific Requirements**

9. Has the SSE been categorized as having no significant impact on the environment?
-  Yes  
No
10. Have fishermen applied for Exempted Fishing Permits?
-  Yes  
No



A close-up photograph of many clams in a pot of water. The clams are densely packed, with their shells showing various patterns of ridges and colors ranging from light tan to dark brown. The water is slightly rippled, and the overall lighting is soft, creating a warm, textured appearance. The text "Case Studies of Other SSEs" is overlaid in the center in a white, sans-serif font.

# Case Studies of Other SSEs

# Four Case Studies

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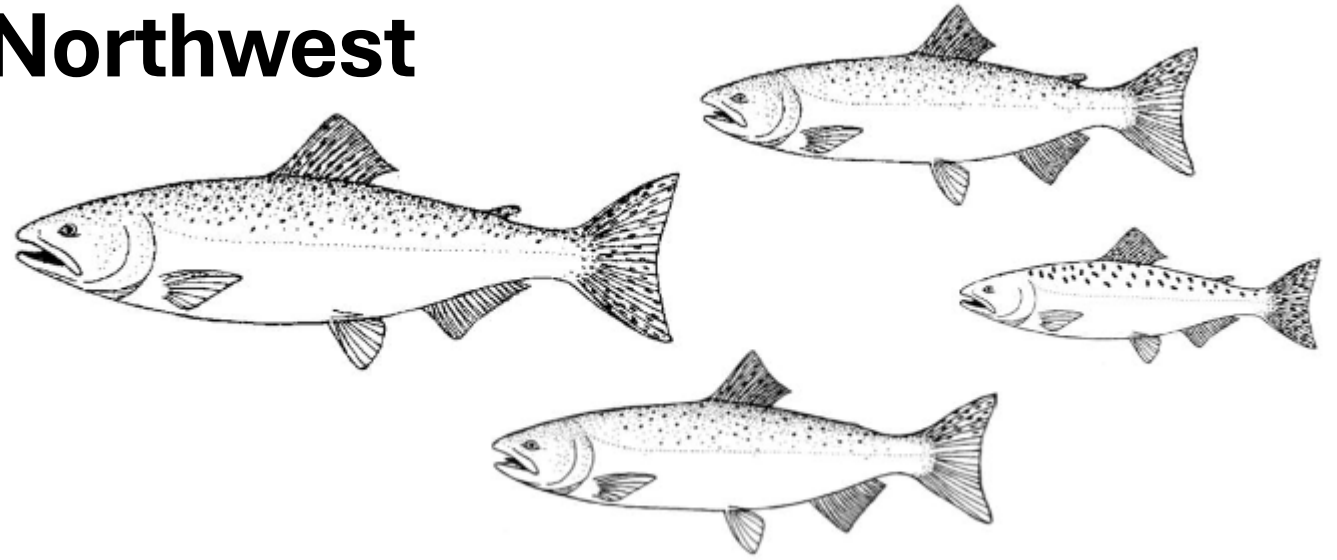
- Federal Waters
  - Salmon in the Pacific Northwest\*
  - Alaska Salmon\*
- State Waters
  - Shellfish Enhancement and Restoration in the Pacific Northwest\*\*
  - Shellfish Enhancement in the Northeast\*\*

\*Fishery consists of species listed under the Endangered Species Act.

\*\*Applicable state laws are not New Jersey laws.

# Salmon in the Pacific Northwest

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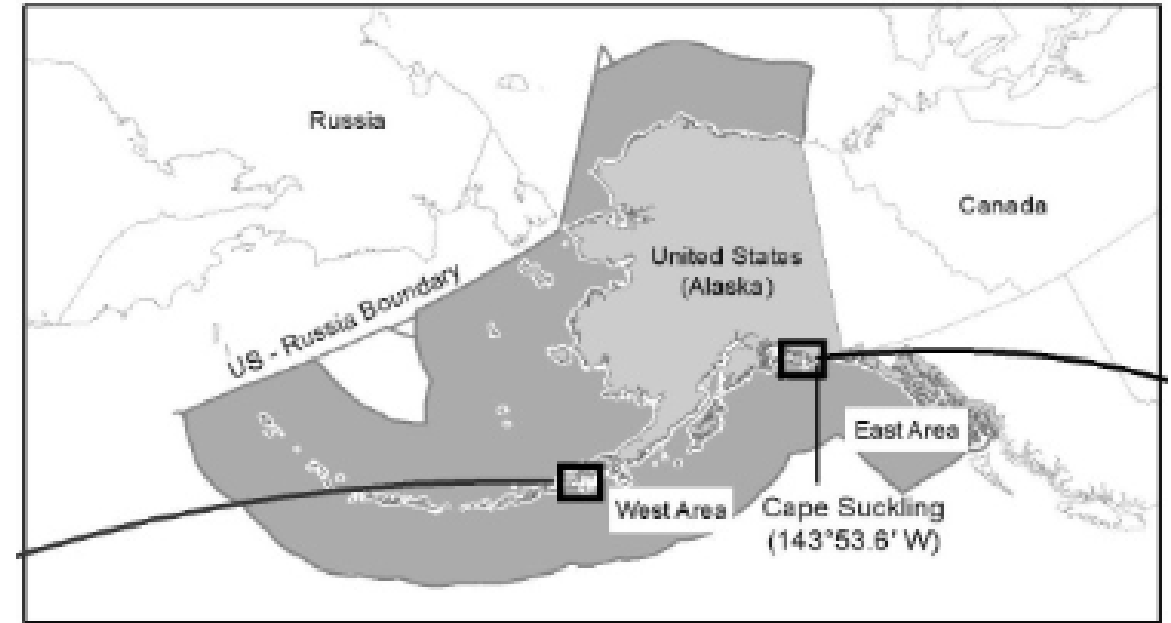


- Managed under the Pacific Fishery Management Council's Pacific Coast Salmon Fishery Management Plan (PCSFMP) in **federal waters**
- Conclusion: This case study serves as an example for how the surfclam FMP could be updated to include surfclam “natural and hatchery” surfclams in the EEZ. However, the PCSFMP contains additional language that would not be included in the surfclam FMP as the former fishery consists of salmon species listed under the ESA.



# Alaska Salmon

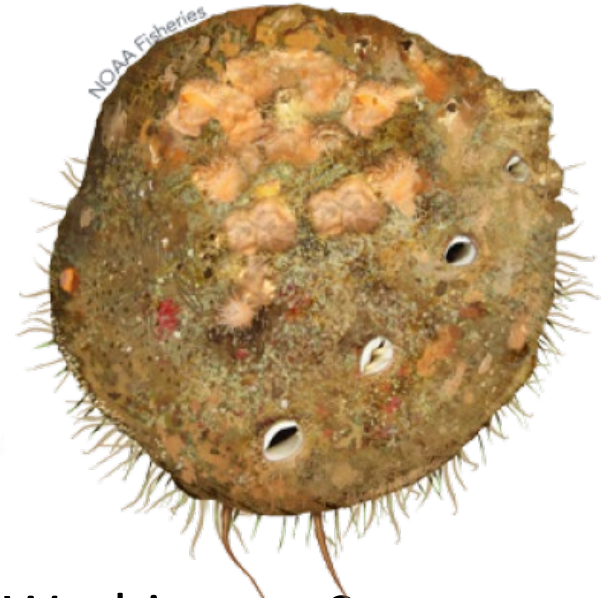
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- Managed under the Alaska Salmon Fisheries Management Plan (ASFMP) in **federal waters**.
- Conclusion: The ASFMP serves as an example for how the surfclam FMP could be updated to include proactive management measures for surfclams in the EEZ. However, the ASFMP contains additional language that would not be included in the surfclam FMP as the former fishery consists of salmon species listed under the ESA.

# Shellfish Enhancement and Restoration in the Pacific NW

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- Several efforts have been initiated in the Pacific Northwest in Washington State waters to introduce hatchery reared shellfish (*i.e.*, Olympia oysters, Pinto abalone, and White abalone) into the wild to restore native populations of oysters and abalone.
- Conclusion: It is possible to use shellfish in conservation aquaculture initiatives in state waters.

# Shellfish Enhancement in the Northeast

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- Massachusetts allows shellfish planting in **state waters** and has developed robust guidelines regarding the requirements and options available to individuals interested in planting shellfish.
- Conclusion: While Massachusetts shellfish planting practices are specific to State law, this guidance could serve as a template for the considerations and types of applicable State laws that may apply to surfclam SEPs in State waters.



A close-up, top-down view of a large number of clams in a pot of water. The clams are densely packed, with their shells showing various patterns of ridges and colors ranging from light tan to dark brown. The water is slightly rippled, and the overall lighting is somewhat dim, creating a moody atmosphere.

# Questions?

[barrjanine@gmail.com](mailto:barrjanine@gmail.com)