

Surfclam Stock Enhancement: Who, What, When, and Where next?

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BACKGROUND

The Atlantic surfclam industry generates ~\$30 million in annual revenue and is a prime source of employment for many individuals along the Atlantic Coast. Development of offshore wind offers unique opportunities for sustainable energy production, though it may result in loss of fishing grounds. Ensuring that these two industries can exist in tandem is essential, leading to proposals for mitigation options. One approach being explored involves the production of surfclam seed in aquaculture settings to be planted on fishing grounds outside wind lease areas for the purpose of stock enhancement to offset lost fishing opportunities.

At the request of its members, the Responsible Offshore Science Alliance (ROSA) hosted a workshop as a side meeting during [NYSERDA's 2024 State of the Science Workshop](#) on Offshore Wind, Wildlife, and Fisheries to discuss preliminary research into the potential option of surfclam stock enhancement as a mitigation measure for the loss of access to fishable biomass. The side meeting convened federal and state agency representatives, research experts, fisheries management representatives, fishing industry members, and offshore wind developer fisheries liaisons and was facilitated by Consensus Building Institute (CBI) with support from the [M-OCEAN Project](#). Organizers of the workshop included: Sarah Borsetti (Rutgers University, Haskin Shellfish Research Laboratory), Colleen Brust (New Jersey Department of Environmental Protection), Tom Dameron (Surfside Foods), Daphne Munroe (Rutgers University, Haskin Shellfish Research Laboratory), Mike Pol (ROSA), René Reilly (ROSA), and Andrew Scheld (Virginia Institute of Marine Science).

The workshop focused on the progress that has been made through stock enhancement studies and the scientific and logistic requirements that need to be addressed to inform a surfclam stock enhancement strategy. Presentations highlighted compensatory mitigation options currently in discussion as well as biological, logistical, economic, and policy considerations for surfclam seeding. These presentations were followed by breakout groups where rich discussion brought forth questions regarding environmental factors, costs, permitting, and administrative management, among others, that must be addressed moving forward.

A summary of the presentations and emerging themes and questions from breakout sessions is outlined below. Presentations from the meeting are available [here](#).

PRESENTATION: Overview of Fisheries Mitigation Options

Kris Ohleth, Special Initiative on Offshore Wind (SLOW)

The Special Initiative on Offshore Wind (SLOW) is a third party supporting the convening and facilitation of eleven states on the East Coast: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina. The states' objective is to establish a credible regional administrator for managing and distributing fisheries compensatory mitigation funds for offshore wind on the Atlantic Seaboard, notably including the entirety of the seaboard, and not just the eleven states. Mitigation is to be used only when avoidance and minimizing options are exhausted. The goal of the regional administrator approach is to ensure consistency across projects and developers and fairness for fisheries across ports. Additionally, the regional administrator will provide administrative consistency that will enable the development of expertise and efficiencies of scale. The presentation emphasized that compensation has been mandated because impacts have been identified both at the federal level, by the Bureau of Ocean Energy Management (BOEM), and at the state level, through their permitting authority. This compensation can be distributed on an individual basis or on a collective basis.

Surfclam stock enhancement would be used consistent with the States' objectives that stock enhancement mitigation would be used as a minimizing option, not as compensatory mitigation option. The surfclam stock enhancement program would be funded in lieu of individual compensation for the loss of access to wind energy areas, but the funds would not come from those already required by BOEM for direct financial compensation. Surfclam stock enhancement mitigation calculations will be separate and distinct from the compensation calculations paid by offshore wind developers.

A surfclam enhancement workshop is being planned for November 20th in Philadelphia by Captain Tom Dameron, SLOW and CBI. The workshop will include: 1) sharing state of the research on aquaculture practices for Atlantic surfclam; 2) identifying additional data needs and gaps; 3) reviewing the BOEM NEPA process to date and how it can accommodate such mitigation measures in future submittals; 4) evaluating opportunities and risks for offshore wind developers to invest in such mitigation and what it may need to reduce risk to do so (financial, regulatory, etc.); 5) identifying other permitting challenges that may exist (primarily any potential NOAA rules and regulations); and 6) collectively identifying concrete, specific next steps and actions to move from research to action.

PRESENTATION: Surfclam Stock Enhancement – Biological and Logistical Considerations

Daphne Munroe, Rutgers School of Environmental and Biological Sciences

Daphne Munroe presented data with a focus on biological and logistical considerations. She highlighted the difference between aquaculture, where a farmer *owns* the animals and the focus is placed on domestication, and hatcheries to enhance wild fisheries, where the focus is on

protection of the species and hatchery-raised species become a part of the wild fishery. She also noted that fisheries enhancement has occurred in several other stocks worldwide, with examples presented for Pacific salmon and Japanese scallops. Typically, stock enhancement is undertaken for stocks that are depleted for some reason; the enhancement case we are discussing for surfclams is not motivated by stock depletion, rather is motivated by lost fishery access to key beds.

Munroe provided an overview of a NYSEERDA-funded project to model surfclam stock enhancement by putting two size classes of surfclams, 40mm and 50mm (both of which are larger than would be anticipated for use in a large-scale program) into the ocean with no protection. The results found 40% of seeded surfclams were able to bury an hour after deployment. Numerous naturally-recruited surfclams were observed at the experiment location, indicating that it is a site that would support juvenile surfclam survival. While there is not currently an accurate estimate of survival, high survival of the seeded surfclams were observed even at high planting densities.

Additional experiments, to be conducted in 2025 funded by the [New Jersey Research and Monitoring Initiative](#), aim to test how survival and growth varies with density, as well as the predation rates and size preferences of key predators on juvenile surfclams. Other pending initiatives include the development of a seeding tool, the design of which was funded by the [Science Center for Marine Fisheries](#) (SCMFIS), and the identification of enhancement locations using artificial intelligence (AI) and machine learning. Finally, a M-OCEAN initiative that is developing a next engine for a nature inclusive design of offshore wind was highlighted. If funded, the project would have a 10-year lifespan.

PRESENTATION: Surfclam Stock Enhancement – Economic and Policy Considerations

Andrew Scheld, Virginia Institute of Marine Science at William and Mary

Andrew Scheld presented economic and policy considerations, beginning by describing stock enhancement globally, including prevalent species, regions, and concerns noted by [Kitada \(2020\)](#). He indicated that 2.35M acres have been leased for offshore wind development in the US Mid-Atlantic and Northeast, which modeling suggests will lead to 3 to 15% revenue losses annually for the Atlantic surfclam fishery, concentrated in New Jersey (Scheld et al., 2022). Research of [Gilsinan et al. \(2024\)](#), funded through SCMFIS, was then presented, where it was calculated that 374M to 2.1B surfclams at the hatchery stage using 4 to 18 hatcheries would be required to produce one million bushels of market-size surfclams (120mm). Costs for this production could range from \$4M to \$15M, with an average cost of approximately \$0.01 per surfclam. Land acquisition, permitting, hatchery failure, planting and harvest were not considered in this analysis and remain key uncertainties.

Scheld also noted a current project to assess the existing hatchery capacity, potential sites for new hatchery development, additional costs and production risks, as well as implications for fishery management. Twelve interviews have been conducted with aquaculture extension

agents and specialists from Virginia to Maine, with results demonstrating variation across states but a general interest in diversification of species. Permitting, space availability, and workforce were common concerns, as well as acceptance by the public..

DISCUSSION

The following questions were raised by participants:

- *How was the estimation of 1M bushels of market-size surfclam determined?*
 - Answer: We essentially wanted a big round number that we could work with and extrapolate from.
- *How far out was the test site? Was it conducted in state or federal waters?*
 - Answer: Federal waters. We tried to work with the state to get it permitted, but it was almost impossible. The test site was roughly three miles offshore.
- *Were the observed growth rates similar to a natural set?*
 - Answer: There were not many measurements from that size, but there appeared to be really good growth, and at higher than normal densities.
- *How would you determine locations for large-scale seeding? Would it be helpful to do it close to a wind farm?*
 - Answer: A big consideration would be proximity to current landings. Bottom-water temperature and sediment type are going to be important, but other environmental concerns may also be considerations. It is possible that seeding would be done next to an offshore wind project, though this may be more of a question for industry folks.
- *What is the ideal range for seed size within the seeding device?*
 - Answer: It will depend on survivability. We're planning to spread the seed through a 10-inch hose then splitting that into five 4-inch hoses, so a pretty large amount of seed can be spread across the width of the seeder.
- *Once we reach the target of 1M and 60% survivability, how long would it take for this stock to reach a useful level of stock enhancement?*
 - Answer: We're not necessarily talking about carrying capacity, which is part of the challenge for this assessment. Presumably, you would have local patches that are up and above carrying capacity. The idea is to establish higher-density patches that make up for losing optimal grounds. By seeding clams, hopefully we'd be creating equivalent grounds elsewhere to make up for the loss.
- *Are you familiar with any habitat suitability analysis? Could they be used to inform the siting?*
 - Answer: There have definitely been some efforts in that direction. In our forecast work we made a habitat model. It is not a full suitability model, but absolutely habitat suitability must be considered.
- *Given there may be a limited area for a bed, who determines who gets to fish on that?*
 - Answer: Anyone with a federal fishing permit would be allowed to fish on it. The bed would probably exist within a rotational management scheme.
- *Does the \$2.1B number change if it's at the end of the nursery stage?*

- Answer: Yes, 277–645M clams would be needed at the end of the nursery stage to produce 1M bushels of fishable (120 mm) surfclams (see Gilsinan et al. 2024, Table 1).
- *Has discussion of seasonality in hatchery production come up?*
 - Answer: Yes, there's vastly more success with surfclams in the fall than in the spring so there definitely seems to be some opportunity to take advantage of offseasons with oysters.

BREAKOUT GROUP DISCUSSIONS

Following the presentations, participants split into four breakout groups to discuss various topics regarding the potential implementation of surfclam stock enhancement. Breakout groups consisted of mixed representation, to encourage sharing of ideas and information across sectors.

Hatchery and Nursery:

Participants discussed potential locations for hatchery production, how permitting processes may be considered and streamlined, and factors impacting hatchery capacity. The following themes and questions emerged from the discussion:

- **Environmental quality and location:** Participants noted that good water quality and fishery access are important factors. Brood stock can be moved around so there was less concern about the geographical location of a hatchery. However, cost concerns regarding the expense of waterfront property and social resistance were raised. Balancing quality and cost efficiency will be an important consideration when deciding hatchery locations.
- **Utilizing existing hatcheries:** Capacity considerations including the possibility of utilizing hatcheries offseason, particularly given the opposing seasons of surfclams and oysters/hard clams, were discussed. It was noted that spare capacity may exist, but that communication within the industry will be particularly important on this front. Federal funding may provide a higher level of hatchery capacity.
- **Permitting:** Participants noted the difficulties that may arise with state permitting for expanding existing hatcheries and building new ones. This could limit production. Permitting requirements will vary by state.
- **Seed timing and transportation:** The question of aligning seed timing with natural surfclam spawning cycles was raised as was the question of how seed may be transported. These questions both held a lot of variability, particularly based on seed size.
- **End goals must be clear:** Participants emphasized the importance of understanding the endpoint and end goals to guide clear and focused planning and implementation (e.g. Aiming for a specific level of production? Of return on investment?)

Ocean Survival and Planting:

Participants discussed external factors that may impact planting as well as how planting management may function. The following themes and questions emerged from the discussion:

- **Planting location:** Participants noted that the RODA Knowledge Trust is available and this proprietary surfclam fishery dependent data should be used for records of surfclam fishing. Modeling is important for identifying suitable habitat, temperature modeling would be a good start. Potential conflicts must also be considered and spatial planning is a tool that can be used. In particular, commingling with ocean quahog is a conflict.
- **Rotational management programs:** Participants noted the importance of coordination among seeding areas. They also discussed the need for a rotational management program, suggesting that more informal management systems could be sufficient.
- **Seeding device ownership:** Defining who owns the seeding device remains an important question to be answered, particularly whether seeding will fall to industry members, external contractors, or a mix of both.
- **Planting concerns:** Concerns were raised about the possibility of disturbing a habitat that hasn't already been disturbed, especially if seed is planted in areas that have not traditionally been fishing grounds.
- **Standardization of necessary permits:** The level and type of federal permitting required remained unclear to participants, leading to the suggestion of standardization to increase efficiency in permitting. It was also suggested that the US Army Corp of Engineers should be consulted for permitting.

Program Costs and Tradeoffs:

Participants discussed how cost acceptability should be determined and programmatic tradeoffs. The following themes and questions emerged from the discussion. Many of these issues regarding policy and regulatory requirements will be addressed in future meetings.

- **Communication and knowledge sharing:** Across developers, industry members, and government agencies, communication is essential. Two suggestions emerged: the importance of collaboration between federal and state agencies to streamline processes and collaboration between developers and the surfclam industry to inform mitigation requirements.
- **Financial responsibility:** Several questions were raised regarding the source of funding for research and fishery enhancement, including the ability and mechanism to require developers to contribute.
- **Community benefits:** Shoreside impacts were also discussed and the potential need to reevaluate the multiplier. Surfclams are landed in Atlantic City, Point Pleasant, and Cape May, NJ. Participants suggested that surfclam enhancement could be considered a community benefit and distributional effects should be considered. Do we want to be sure that all areas receive benefits so that communities that support the fishery are

supported? A third party mediator may be useful. States were also seeking guidance on what role they can play to help move ideas forward.

- **Funding as mitigation:** Participants encouraged utilizing a data driven approach to determine the funds individual projects will be responsible for, including prior catch data, survey data and projections. Proprietary surfclam fishery dependent data should be utilized. Funds should be proportional to biomass lost to the fishery due to the access lost from offshore wind energy development. The entire lease area may not be highly productive and should be taken into account.
- **Administrative support:** Participants discussed the role of a regional fund administrator, noting that a managing fund would require a different skill set than compensatory mitigation, as well as the options of having a federal or state administrative lead, or a third party administrator. Across all of these options it remained clear that administrative support is essential.
- **Markets will determine costs:** Participants emphasized social acceptance and the market as being primary determinants for surfclam pricing. The importance of developers and industry members in determining costs was noted as well.
- **Many costs remain unknown:** The costs of seeding devices and planting remain unknown. These will be key research questions that still need to be addressed.
- **End goals must be agreed upon:** Participants again emphasized the need to clearly articulate the endpoint. From the surfclam industry perspective, the goal of the seeding program is to replace biomass lost to the fishery due to offshore wind energy generation, by planting seed outside WEAs. Others asked if the goal is a specific level of production? Time? Spatial area? Profit? How long will it take for industry to begin seeing a return?

Harvesting and Fishery Management:

Participants discussed permitting details as well as the role of stock enhancement within the existing assessment process. The following themes and questions emerged from the discussion:

- **Defining access:** What exactly access means remains an important question to answer. Participants wanted to understand whether access was defined by fisheries or by the fishing grounds. Who is included in “access” is also important, specifically whether access would be based on individual claims and if involvement or direct impact was necessary for access. This is a federal fishery and the perspective of surfclam industry members is that anyone with a permit should be able to access areas that have been seeded.
- **Distinguishing between planted and native clams:** Participants were inclined to not distinguish between planted and native surfclams, raising concerns about social acceptance and the labor required to survey clams. However, this is still an open question for discussion. It is unclear if hatchery-reared surfclams will be distinguished in

federal surveys and if they will eventually become a part of the wild fishery assessment. How will planted clams affect catch limits?

- **Increasing harvest efficiency:** Participants noted that harvest quotas are not currently being met and that expanding the market may be less important than increasing harvest efficiency and the profitability of vessels. How long will ocean grow-out take?
- **Informal rotational management:** When considering rotational management programs, participants highlighted the success of current informal practices. However, suggestions were made that the overall goals of enhancement may require a higher level of management and necessitate restricting access. It will be important that a rotational scheme is developed so that the seeded clams reach market size before permitted vessels are allowed to harvest them.

CLOSING REFLECTIONS

A handful of participants representing fishing industry, government agencies, researchers and offshore wind developers shared their key takeaways from the meeting and things to consider to continue moving forward from research to practice.

- November 20 policy workshop will be an important discussion.
 - What metrics will the funding be based on?
 - How can BOEM's NEPA process accommodate enhancement as a direct mitigation option?
 - What other permitting challenges may exist?
 - What are the opportunities and risks for offshore wind developers to invest and how can those risks be reduced?
- Continually integrate research findings to facilitate next steps.
 - Learning from research projects currently underway could be extremely helpful in informing how this program could scale up.
- Explore ways to better understand and reduce hatchery costs
 - New technologies being used in oyster industry may be able to be applied to surfclam
 - Reduce time, increase efficiency.
 - Reduce labor costs, work in the hatchery.
 - Better understand production.
- Look further into access to seafloor and potential habitat disturbance
 - If new (versus existing) harvest grounds are utilized, participants will need to gain access to the that seafloor
 - May need to consider an impact analysis if disturbing the new areas of the seafloor when harvesting and planting.
 - Council process needs to be considered and determined, and it is lengthy.
- Defining the end goal is important to charting a path forward.

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