

An Observational Retrospective on Ecosystem Change in Narragansett Bay **Commercial Fishermen as Ecological Integrators**

Purpose: The purpose of this project is to catalog fishermen's observations of a changing Narragansett Bay ecosystem in a systematic, standardized manner that produces data that can be easily interpreted and utilized by members of the science and management community.

Background: Narragansett Bay is changing. In the last decade nutrient loading to the bay has been reduced by 50% as the result of wastewater treatment upgrades. Stressors related to climate change are becoming more influential. Amid all of this, a vocal group of Narragansett Bay fishermen has begun to raise serious questions about changes they are observing. These changes include: a dramatic decline in barnacles and other fouling organisms; a decline in rockweed and kelp; an increase in various species of nuisance seaweed (*Desmarestia viridis*, *Dasysiphonia japonica*, and others); an increase in lobster shell disease; a decrease in sea stars; a dramatic increase in water clarity / decrease in plankton; instances of the bay smelling "like chlorine"; and appearance of "dead zones" in several parts of the bay. Fishermen who fish in both Narragansett Bay and Atlantic Ocean claim that these changes are not taking place in the ocean but exclusively in the bay.

According to fishermen's observations, a general ecosystem regime change appears to be taking place in the bay, likely associated with a cumulative suite of stressors. While this suite of stressors may include changing temperatures, fishermen are advocating for a research agenda that also explores other, more proximate causes, such as wastewater treatment chemicals, nitrogen reduction, emerging contaminants such as pharmaceuticals, and pesticides.

Objectives: This project attempts to bring value to many end users. It aims to serve fishermen by translating their knowledge into a format that is more usable by the scientific and regulatory community. It aims to serve the scientific community by gathering qualitative observational data that can help fill data gaps and shed light on emerging trends. It aims to serve a societal need by engaging fisheries stakeholders more fully and productively in the long-term collaborative effort to protect and restore Narragansett Bay's ecosystem.

How you can help: This project is currently in the design phase, and it is looking for your input. To make sure that this project and its end products are useful and usable by the scientific community, we would like to hear from you:

If you could tap into the collective minds of Narragansett Bay fishermen and ask them one question, what would it be?

What aspects of Narragansett Bay are not currently being thoroughly monitored? Can fishermen's knowledge help fill some gaps?

Moreover, we welcome advice about how to collect observational data in a format that can be aligned, compared, and integrated with information collected through scientific monitoring.

Methods: We will use a semi-structured interview combined with a structured survey and freehand mapping exercise to gather fine-scale information on the “what, where, and when” of the changes that fishermen are observing in Narragansett Bay:

- *What?* We will identify to the lowest possible taxonomic level those species or ecosystem components that have undergone notable change in recent years. We will catalog detailed observations about changes in the visual, olfactory, and tactile appearance of sediments and the water column.
- *Where?* We will obtain detailed information about where these changes have taken place. This will include historical and present-day distributions of notable ecosystem components/species as well as a spatial characterization of changes in sediments and water column characteristics.
- *When?* We will trace the evolution of these changes in time, trying to match the temporal extent of trends to specific years, decades, or co-occurring changes.
- *...And why does it matter?* Rather than viewing the subjectivity of fishermen's observations as a source of weakness in our research design, we will treat it as a value-added component. By eliciting details about the values context in which fishermen interpret changes in the bay, we will be able to assemble a “human values layer” that can then be “peeled off” of their observations. Ultimately, understanding the values that they place on ecosystem states will provide context for interpreting their observations and concerns. Adding the values layer back in will help frame the relevance on scientific monitoring of the bay to the human populations who use it.

We plan to interview 30+ Narragansett Bay fishermen and shellfishermen one-on-one in person. We will ask them to name and describe the most salient changes they have observed in the Narragansett Bay ecosystem during their careers. Using a laminated nautical chart and dry erase markers, we will ask them to illustrate the spatial extent of these changes, one species at a time. We will ask them to pinpoint dates as closely as they are able to recollect. We will use photographs that we are currently collecting aboard fishing boats to aid in species identification, since colloquial names for species can vary. Interviews will be recorded and transcribed and illustrations will be photographed.

Beyond research: To our knowledge, there is very little existing monitoring data for the key species that fishermen have named in their observations so far, such as invertebrates and seaweeds. Thus, this research will fill a critical gap in knowledge about the Narragansett Bay ecosystem. We hope that it will not only provide an observational retrospective on changes in the bay, but will also support efforts to develop collaborative monitoring programs for these components of the Narragansett Bay ecosystem, moving forward. Furthermore, we hope that this project is a first step to co-creating common language and goals between the commercial fishing community and the environmental monitoring community of Narragansett Bay. We will leverage this opportunity to build social capital among the fishing industry for greater coordination on environmental issues and to instill commitment and opportunities for civic engagement by this important user group in the work of studying, protecting, and restoring Narragansett Bay.

Learn more/advise/get involved: Contact Sarah Schumann (project coordinator) at schumannsarah@gmail.com or (401)297-6273.