

Evaluating Social-Ecological Vulnerability and Climate Adaptation Strategies for Northeast U.S. Fishing Communities

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Abstract

Climate change is affecting marine ecosystems, fish populations, and fisheries that depend on them. Marine waters of the Northeast Shelf have warmed rapidly over the past decade, and as a result, the impacts of climate variability and change are being felt acutely in this region. In the Northeast United States, the conversation around climate and fisheries is moving from a discussion of impacts on fish populations to a discussion of impacts on fisheries and fishing communities. Fishermen and fishing communities are already recognizing the need for new scientific information to understand vulnerabilities to climate variability and climate change and to identify adaptation options at local scales and within time frames relevant to decision-making.

This project will advance the science needed to assess climate vulnerabilities for Northeast fishing communities and evaluate strategies to support adaptation to both climate variability and climate change. Our goal is to develop a social-ecological vulnerability assessment framework, one that will integrate knowledge of expected ecosystem change with knowledge of the economics and adaptive capacity of fishing communities. Central to operationalizing this framework are economic models that quantify the social and economic impacts of climate-related changes in fish productivity and evaluate how these impacts can be altered by employing different adaptation strategies. The models provide an objective approach to compare adaptation strategies within the context of an idealized system. We recognize that scientific, behavioral, social, economic, regulatory, and governance factors will facilitate or constrain their use, and examining these factors is necessary to fully assess adaptation options. Ultimately, this project will provide objective tools for evaluating vulnerability of fishing communities and assessing the on-the-ground benefits and feasibility of different adaptation strategies.

A key feature of this project is that it will integrate data and approaches from the fields of climate science, fisheries ecology, marine resource economics, fishing technology, and change management to evaluate climate-related impacts and adaptation options for marine fisheries and fishing communities. Accomplishing this integration of information across the complex system in which fisheries operate—from physics and ecosystems to economics and communities—requires fundamental research that will produce new knowledge of how fisheries ecosystems and fisheries interact. It is also a foundational step towards supporting NOAA's vision of ecosystems, communities, and economies that are resilient in the face of change. NOAA's strategic plan recognizes that achieving this vision requires (1) understanding current and projecting future changes in earth system conditions, (2) evaluating the vulnerability of communities and ecological systems to these conditions, and (3) providing information that will enable people and communities to adapt to the changing conditions. This project will directly address all three of these prerequisites for supporting resilience in the context of climate variability and change. It will also contribute to NOAA's strategic goals for healthy oceans and climate adaptation as well as its integrated modeling objective for its science and technology enterprise. Further, the project specifically addresses the RFP's objectives of (1) understanding climate-related impacts on fish that support economically important fisheries and the communities that depend on them and (2) identifying adaptation options that will enhance community resilience in the context of climate variability and change. While meeting NOAA's immediate needs, our work will (1) provide tangible information that Northeast U. S. fishing communities are seeking as they prepare for the impacts of climate variability and change and (2) establish the foundation of a scalable framework that can be used to guide climate adaptation planning for fisheries and fishing communities within and beyond the Northeast.