South Atlantic Climate Variability and Fisheries: FEP II

Executive Summary

Climate change and variability are impacting the marine ecosystem in the southeast U.S., and understanding the impacts of these changes is essential to ensuring abundant fisheries and thriving coastal communities. Each year the oceans and coasts provide over $675 billion dollars worth of economic impact in the southeast U.S. alone (Kildow et al, 2009). Fisheries are major components of the economy, heritage, and ecological systems that support and sustain the unique culture of the region. However, over the coming decades, climate change is expected to profoundly affect the dynamics of the marine environment due to factors such as increased temperature, changes in wind patterns, decreased dissolved oxygen, acidification, and sea level rise. Over shorter time scales, climate variability influences marine ecosystems in manners that can exacerbate or ameliorate the effects of long-term climate change.

For the purposes of fisheries management, both climate variability (a result of natural variation in the ocean-climate system) and anthropogenic climate change should be considered. Both sources of variability impact the physical and biological conditions that affect the growth, distribution, and mortality of economically and ecologically important species. Marine organisms are sensitive to such changes in their environment, necessitating a greater understanding of current and predicted conditions in the South Atlantic region. Changing conditions are expected to impact everything from migration patterns to life histories to habitat to ecosystem structure. These changes highlight the need for the incorporation of climate considerations into a more comprehensive, big-picture approach to management of marine resources.

A key step to building more resilient, “climate ready” fisheries is to identify where best to incorporate climate-related information into the management process. Managers will need to assess risks and evaluate management strategies under various climate and ocean scenarios, and effectively evaluate and respond to changing conditions. This should be done through ecosystem-based fisheries management. This approach to management reflects the interconnectedness of ecosystem components. Moving forward, climate considerations coupled with a greater understanding of environmental drivers of ecosystem dynamics, will be important to fisheries management decisions.

In this chapter, the climate variability and fisheries technical working group provide a comprehensive and up-to-date review of five related sections: 1) historical and current oceanographic conditions and characterization of the South Atlantic marine environment; 2) predicted future oceanographic conditions; 3) climate impacts on fish, fish habitat and fisheries; 4) knowledge gaps and research priorities related to management needs, and 5) links to South Atlantic Fishery Mangement Council (SAFMC) management decisions and ecosystem-based fisheries management.

The technical working group concluded that there is an urgent need to better understand the impact of climate change and variability on the South Atlantic regional scale, and improve our ability to provide more accurate regional climate predictions. Based on which, a rigorous scientific understanding of the overall response of the South Atlantic marine community to climate change and variability should be developed in order to further quantify the vulnerability of fishery resources, human community response, and socio-economic impacts to future conditions in the region. These will require efforts and resources to i) improve the regional marine observing network to fill major data gaps, particularly in biological measurements (e.g., plankton, demersal fish, forage fish, catches) and ii) develop coupled marine environment-ecosystem climate downscaling models to determine relationships between the fishery resources and the changing environment, and iii) identify both climate indicators and ecological indicators suitable for the South Atlantic. The Integrated Ecosystem Assessment process and a process of indicator selection described by Fletcher et al. (2014) can be emulated by the SAFMC. Overall, adaptive ecosystem-based fisheries management processes in the South Atlantic that can respond to climate should evolve through increased dialogue between scientists and managers, and through studies focused on when and where climate information has the greatest capacity to improve management. Initiatives such as Ecosystem Status Reports (e.g., Karnauskas et al. 2013) can serve to motivate this dialogue and highlight the range of drivers and scenarios that are most important for scientists and managers to consider.