LENFEST OCEAN PROGRAM

A research project

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NEW RESEARCH TO IDENTIFY CLIMATE-VULNERABLE STOCK ASSESSMENTS

INTRODUCTION

In the United States, Regional Fisheries Management Councils (RFMCs) rely on scientific assessments of fish stock abundances in their jurisdictions to guide management decisions. These assessments- or stock assessments- integrate multiple data sources within mathematical models to predict the abundance of fish populations. The stock assessment report helps inform fisheries management advice and set sustainable catch limits. As climate change alters ocean conditions and shifts fish distributions, data from the past becomes a poorer guide to the future, potentially leading to unreliable management advice.

To prevent such failures of scientific advice, fisheries scientists and managers need a framework for predicting which stock assessments may be undermined by climate change. The Lenfest Ocean Program is funding Dr. Olaf Jensen, University of Wisconsin, to lead a team of researchers to identify and prioritize fish and invertebrate populations that are at greatest risk of stock assessment failures due to climate change.

THE NEED TO UNDERSTAND CLIMATE CHANGE IMPACTS ON STOCK ASSESSMENT ACCURACY

Stock assessment models account for many factors, including the life history of a fish species, environmental conditions, previous fishing pressure, and other factors that may be specific to the fishing jurisdiction's region. Unknown changes to any of these factors can result in uncertainty and lead to a stock assessment failure, or a mismatch between the predicted sustainable fishing levels and the actual ability of the stock to withstand harvest.

Climate change can impact the ability to accurately assess a fish stock. For example, it can change a fish stock's recruitment and natural mortality rates, a species' range and distribution, and overall stock productivity. If these factors are not accounted for appropriately, stock assessments may provide unreliable management advice that leads to over- or under-fishing.

RESEARCH TEAM

- Olaf Jensen, University of Wisconsin-Madison
- John Weidenmann, Rutgers University
- Chip Collier, South Atlantic Fisheries Management Council
- Roger Mann, Virginia Institute of Marine Science
- Kathy Mills, Gulf of Maine Research Institute
- Vince Saba, NOAA Fisheries (NMFS)

This project is an outcome of the Lenfest Ocean Program Ideas Lab, a workshop held in October 2019 to identify research priorities for shifting marine species.

Learn more at lenfestocean.org.

In order to flag fisheries at risk of inaccurate data due to climate change, assessments can be conducted to assign a climate vulnerability score to the final stock assessment. Climate vulnerability scores are based largely on ecological theory however, and their reliability for predicting stock assessment failures is not yet fully understood. Climate risk policies (e.g., the South Atlantic FMC has proposed including climate impacts in their proposed changes to the Acceptable Biological Catch (ABC) Control Rule) could also be used to protect climate-vulnerable stocks from over- or under-fishing, but this is considered a temporary fix to addressing increasing risk of widespread stock assessment failures. As such, a critical knowledge barrier exists for understanding what climate change factors have the greatest influence on stock assessment performance.

RESEARCH APPROACH

In this project, the research team will analyze past stock assessments and evaluate stocks' vulnerability to climate change to generate a list of predictors that have the greatest impact on stock assessment performance. By identifying the most impactful predictors this research can help inform the RFMCs and their Scientific and Statistical Committees (SSCs) about:

- stock assessments at risk of future failures;
- stocks that should be prioritized for climate risk policies; and
- methods to be incorporated in their stock assessment processes.

The research will be conducted in three phases:

Phase 1: Understand Past Stock Assessment Performance

The research team will compare outputs of the two most recent stock assessments for all federally managed fish and invertebrate stocks in the U.S. This will help elucidate the performance and accuracy of advice from previous stock assessments.

Phase 2: Determine Performance Indicators

Researchers will use information from the first phase to identify predictor variables that indicate a stock assessment's performance. Predictors come from four broad categories: 1) a species' sensitivity to changing environments, 2) environmental characteristics of the fish stock range, 3) characteristics of the model and underlying data, and 4) regional environmental and ecological differences. Results from this step will inform which stocks should be prioritized for potential climate risk policies.

Phase 3: Identify Effective Approaches to Optimize Fisheries Management

Using previous results from phases 1 and 2, researchers will work directly with RFMCs and SSCs to integrate findings within the current management framework and stock assessment processes. Differing approaches will likely be needed to reflect the unique needs of each RFMC and SSC, and the stocks they manage.

It is imperative to include managers and policymakers throughout this project. The research team has convened an advisory group with expertise in climate, stock assessments, and fisheries management and the research will be conducted in collaboration with an advisory board, as well as fisheries managers and others involved in discussions about use of stock assessments.

ADVISORY BOARD MEMBERS

- Roger Griffis, Climate Coordinator for NOAA Fisheries
- Rick Methot, Senior Scientist for Stock Assessments, NOAA Fisheries
- Eva Plaganyi, Principal Research Scientist and fisheries modeling expert, CSIRO, Australia
- Paul Rago, NOAA Fisheries, retired; Chair of Mid-Atlantic Fisheries Management Council's Science and Statistical Committee

CONTACT

For any questions, please contact Emily Knight, Manager, Lenfest Ocean Program, at eknight@lenfestocean.org.To learn more about this research and stay up to date on our latest projects, follow us on Twitter @lenfestocean or sign up for our newsletter at lenfestocean.org.