SCIPP RESEARCH BRIEF - PREDICTING RESTORATION AND AQUACULTURE POTENTIAL OF EASTERN OYSTERS THROUGH AN ECO-PHYSIOLOGICAL MECHANISTIC MODEL

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OVERVIEW

Oyster aquaculture is a growing industry, with the Louisiana and Texas coasts containing important regions for oyster cultivation. Eastern oysters are crucial to various U.S. fisheries, not only along the Texas and Louisiana coasts, but in other regions as well. They also support the broader ecosystem and its functions. With the oysters playing such an important role in economic and ecosystem health, it becomes vital that improved understanding on how future changes in temperature, salinity, and pH impact oyster production is developed.

METHODS AND RESULTS

To assess current conditions, six estuary study zones along the Louisiana and Texas coasts were defined and assessed according to a variety of data sources. Future conditions were assessed using a global climate model for the region defined by black dots in Figure 1. Using these datasets and a previously developed oyster dynamic energy budget model, the potential for oyster growth and development was determined.

After completing the model simulations under current conditions, the researchers found that oysters in Louisiana had faster growth and greater reproduction than Texas oysters, although more zones along the Louisiana coast had no oyster survival. Lastly, the Texas coast ecology was found to be more receptive to restoration efforts than Louisiana's.

Offshore regions had higher aquaculture and restoration scores under projected future climate conditions. Limitations to model resolution inhibited forecasting ability, but the results were consistent with those of other studies.

QUICK INFO

STUDY LOCATIONS

- Texas Coast
- Louisiana Coast

OBJECTIVES

- Understand the growth and survival potential of eastern oysters
- Determine how eastern oysters will respond to changing conditions

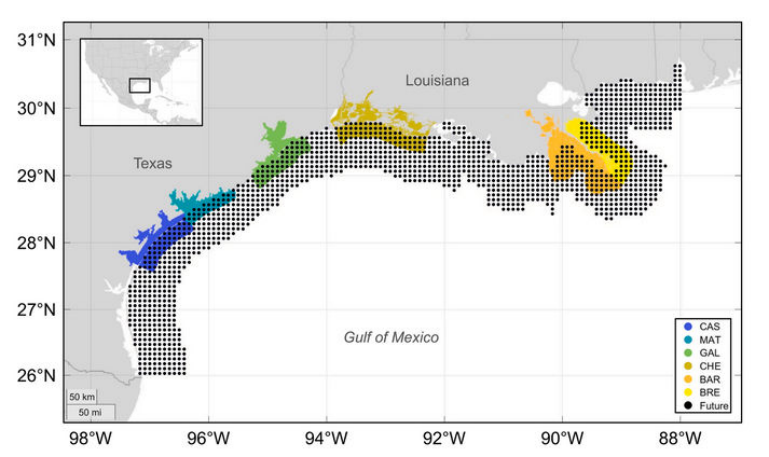

Figure 1. Map of the study location. Colored regions represent the selected estuary study zones, while dots represent the coastal area used to model future conditions.

IMPLICATIONS

1. The Future of Oyster Aquaculture and Restoration

Changing environmental conditions within the Gulf of Mexico will continue to impact the success of oyster aquaculture and restoration efforts. The research conducted in this study provides insight into current and future trends amongst eastern oyster populations along the Texas and Louisiana coasts. Information about about survivability, time to market size, etc. can be leveraged by planners and oyster farmers to produce more efficient and successful oyster cultivation and restoration efforts. Eastern oysters fill an important niche in the coastal ecosystem and support the livelihoods of oyster farmers throughout the region, which why successful aquaculture and restoration activities are imperative.

2. Future Research

Forecasting at the desired spatial resolutions and time scales was challenging due to current global climate model capabilities. As a result, future research into model improvements was suggested. Furthermore, the dynamic energy budget framework and methods from this study may be used for future research on other species and processes.

Access the full report: Lavaud, R., M.K. La Peyre, B. Couvillion, J.B. Pollack, V. Brown, T.A. Palmer, and B. Keim, 2024: Predicting restoration and aquaculture potential of eastern oysters through an eco-physiological mechanistic model. Ecological Modelling, 489, 110603, https://doi.org/10.1016/j.ecolmodel.2023.110603.

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