LENFEST OCEAN PROGRAM

A research project
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NEW PROJECT TO ESTIMATE FISH AND INVERTEBRATE PRODUCTION ASSOCIATED WITH KEY COASTAL HABITATS IN THE UNITED STATES

Coastal habitats like oyster reefs, seagrass beds, and salt marshes serve as critical nurseries for economically and ecologically valuable fish and invertebrate species, providing access to food and shelter from predators. Scientists and managers have generally assumed that if these habitats were to be degraded or lost, the abundance of marine species would decline. However, researchers have long struggled to quantify how habitat affects species abundance, making it difficult to integrate habitat considerations into management decisions. The Lenfest Ocean Program is supporting Bryan DeAngelis of The Nature Conservancy, Dr. Philine zu Ermgassen of the University of Edinburgh, and Dr. Jonathan Grabowski of Northeastern University to develop estimates of fish and invertebrate production (weight per area per year) associated with oyster reefs, seagrass beds, and salt marshes in the United States.

THE NEED TO CONSIDER HABITAT

Sustainable healthy fisheries and coastal ecosystems requires fundamental understanding of how organisms are connected to their environment. For example, if one acre of seagrass habitat is removed, how will its loss affect the total number of blue crabs available to commercial and recreational fisheries? Alternatively, how many more blue crabs would become available if one acre of seagrass were to be restored?

In the United States, fisheries management has gradually been shifting toward an ecosystem-based approach that considers a species' interactions with other species, with its habitat, and with humans. The Magnuson-Stevens Act, the primary U.S. fisheries legislation, requires that regional fishery management councils use the best available science to describe, identify, and protect critical habitats. Information quantifying fish and invertebrate production from specific habitats could improve managers' ability to target restoration, conservation, and fisheries management measures to rebuild and maintain healthy stocks while maximizing economic benefits.

> **"QUANTIFYING HOW COASTAL HABITATS IMPACT FISH AND INVERTEBRATE PRODUCTION CAN HELP MANAGERS PRIORITIZE HABITAT PROTECTION AND RESTORATION EFFORTS."**
>
> - Bryan DeAngelis

QUANTIFYING HABITAT PRODUCTION TO PROVIDE ACTIONABLE RESULTS

In this project, the research team will explore two critical questions:

1. To what degree do oyster reef, seagrass bed, and salt marsh habitats enhance fish and invertebrate production in the U.S. Northeast?
2. What biological and environmental factors have the greatest influence on this production for each habitat?

These questions emerged from a 2017 workshop the researchers held with federal and state fishery and habitat managers to discuss the types of information that would be most useful for addressing management priorities. The research team is assembling an advisory panel consisting of members of the fisheries, habitat restoration, and conservation communities in order to ensure that the project provides the most useful information.

To develop estimates of habitat-specific fish and invertebrate production for the Northeast, the researchers will aggregate existing data on species abundance from a wide variety of sources, including peer-reviewed papers, gray literature, and unpublished data from state resource agencies, academic institutions, and programs such as the National Estuarine Research Reserve System. They will then leverage previously developed methods to compare habitat-specific fish and invertebrate abundance with those of adjacent, unstructured areas.

To estimate how biological factors such as habitat area and oyster density, along with environmental factors like water depth and temperature, affect production, the team will expand previous work to include all available data sources that include species abundance information and one of the habitat variables of interest. They will then model the relationship between the abundance of fish and invertebrate species and each variable.

The researchers will develop online decision-making platforms that managers can access to estimate fish and invertebrate production for specific seagrass and salt marsh habitats, analogous to a tool they have already developed for oysters. The platforms can be updated as new results emerge, ensuring that managers are always considering the best available scientific information.

RESEARCH TEAM

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COLLABORATORS

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