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Francesco Ungaro, Pexels

NEW RESEARCH TO INFORM A FISHERY ECOSYSTEM PLAN IN THE U.S. CARIBBEAN

The Caribbean Fishery Management Council (CFMC) recognizes the need to move toward ecosystem-based fisheries management (EBFM) by taking into account interactions among marine species, human activities, and the environment. Drawing from guidance provided by the Lenfest Fishery Ecosystem Task Force, the CFMC is planning to develop a Fishery Ecosystem Plan (FEP) to evaluate how best to integrate ecosystem approaches into existing management for U.S. Caribbean waters. However, stakeholders and managers in the region suggest that a key precursor to an FEP is characterizing the Caribbean's diverse marine ecosystems. This process may include defining relationships among marine species, evaluating the social and economic significance of ecosystem components, and identifying the stressors that threaten each system.

To meet this need, the Lenfest Ocean Program is funding Drs. J.J. Cruz-Motta, University of Puerto Rico-Mayaguez; Stacey Williams, Institute for Socio-Ecological Research; and Tarsila Seara, University of New Haven, to:

1. Build conceptual and quantitative models based on stakeholder perceptions and existing data to describe the structure and dynamics of U.S. Caribbean ecosystems within a fisheries context;

2. Work with stakeholders to compare and integrate the results of the conceptual and quantitative models to understand the biological, environmental, and socioeconomic factors affecting fisheries systems; and

3. Select and estimate indicators of ecosystem health under different conditions (e.g., threats, impacts, and human activities).

A SCIENTIFIC FOUNDATION FOR A FISHERY ECOSYSTEM PLAN

Managing a fishery as a dynamic system that includes interacting ecological, environmental, and socioeconomic components requires a different knowledge base and planning process than does traditional single-species management. In 1999, a NOAA Fisheries Ecosystem Principles Advisory Panel recommended the development of Fishery Ecosystem Plans, or FEPs, to support decision-making and thus operationalize EBFM.

RESEARCH TEAM

- Dr. Juan J. Cruz-Motta, University of Puerto Rico-Mayaguez

- Dr. Stacey Williams, Institute for Socio-Ecological Research

- Dr. Tarsila Seara, University of New Haven

COLLABORATORS

- Dr. Graciela Garcia-Moliner, Caribbean Fishery Management Council

- Dr. Bill Arnold, NOAA Fisheries Southeast Regional Office (retired)

- Dr. Tauna Rankin, NOAA Fisheries Office of Habitat Conservation

- Sarah Stephenson, NOAA Fisheries Southeast Regional Office

- Dr. Alida Ortiz, Caribbean Fishery Management Council

- Dr. Nicolle Angeli, U.S. Virgin Islands Department of Planning and Natural Resources

- Ernesto Diaz, Department of Natural Resources and Environment of Puerto Rico

In 2014, the Lenfest Ocean Program convened a 14-member task force to develop a practical blueprint for building FEPs. The Fishery Ecosystem Task Force found that a critical first step in fishery ecosystem planning is developing an overall conceptual model of how a fishery system works. Conceptual models enable managers to assess how the relationships among the ecological and socioeconomic components of an ecosystem can influence fisheries. This information can then serve as a baseline from which to generate an EBFM vision and strategy.

A conceptual model for the U.S. Caribbean will need to characterize highly diverse systems, from coastal coral reef assemblages to offshore blue-water habitats. Stakeholder input based on personal experience, along with quantitative data collected from the marine systems and the communities they support, will serve as key information for constructing such a model.

DEVELOPING MODELS OF U.S. CARIBBEAN ECOSYSTEMS

Dr. Cruz-Motta and his team will partner with managers, scientists, and stakeholders to build conceptual and quantitative models for each of the three management areas within the U.S. Caribbean: 1) Puerto Rico; 2) St. John/St. Thomas; and 3) St. Croix.

Using Stakeholder Perceptions to Build Conceptual Models

The researchers will hold multiple rounds of workshops with stakeholders, including fishermen, managers, and members of the conservation community, to gather information on their understanding of the structure and connectedness of the U.S. Caribbean's three management regions. During the first round of workshops, the researchers will inform stakeholders of the project's objectives. Then, the team will use a cognitive mapping approach, in which stakeholders create visual representations of what they perceive to be primary ecosystem components (e.g., fish species, habitat types), the relationships among them, and the factors (human-caused or otherwise) that could impact those components. This method will provide a tool to help readily analyze and communicate stakeholder perceptions.

Gathering Existing Data to Generate Quantitative Models

For its quantitative approach, the research team will compile all available information related to the U.S. Caribbean's marine ecosystems, including fishery-dependent and fishery-independent data, environmental variables, socioeconomic indicators, and human-induced stressors. They will then analyze the trends across space and time for each data source to address information gaps identified during the stakeholder workshops. These analyses will enable the researchers to determine whether the structure and composition of marine communities have varied over time, whether those changes have been similar across regions, and what variables may have caused such shifts. The team will also examine the significance of the specific relationships among the components of an ecosystem.

Combining Model Outputs to Characterize U.S. Fishery Ecosystems

Finally, the researchers will compare stakeholder perspectives as represented by the conceptual maps with the quantitative analyses. To do this, they will integrate the two approaches to refine overall conceptual models, validate elements that stakeholders disagree on or are unsure of, and prioritize future research efforts. The research team will also work with stakeholders to select and estimate key indicators of ecosystem health and identify the main threats to fisheries systems.

The three-year project is scheduled to conclude in June 2022.

"BY COMBINING STAKEHOLDER PERCEPTIONS WITH QUANTITATIVE DATA, WE WILL HELP TO DEVELOP AN UNDERSTANDING OF U.S. CARIBBEAN ECOSYSTEM STRUCTURE, FUNCTION, AND THREATS."
- Juan J. Cruz-Motta

CONTACT

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