



Caribbean Fishery Management Council's EBFM Efforts Ecosystem Conceptual Models (ECMs) and Fishery Ecosystem Plan (FEP)

The recognition of the importance of preserving the ecosystem of the coral-based fisheries was well established since the 1980s in the original FMPs and Amendments, established by the Caribbean Fishery Management Council (CFMC) for managing fisheries in the EEZ.

The U.S. Caribbean-wide FMPs, in place until 2022, included management of spiny lobster, queen conch, reef fish (shallow and deep-water species) and corals. Each FMP had ecosystem considerations; the protection of habitat by the total prohibition on the take of corals with compatible regulations with the Governments of Puerto Rico and the Territory of the U.S. Virgin Islands. This prohibition dates to the 1990s.

The DAPs, fishers, fishing community representatives, and the governments of Puerto Rico and the USVI had requested that the Council consider the differences among the islands when addressing fisheries management in the U.S. Caribbean. These entities highlighted the unique characteristics of the fishery resources within each island or island group, and the communities that are dependent on those resources. To this end, the CFMC and NOAA Fisheries developed Island Based Fishery Management Plans (IBFMPs), changing from U.S. Caribbean-wide fishery management plans to a comprehensive FMP for each Puerto Rico, St. Thomas/St. John and St. Croix. These IBFMPs were finally implemented on October 13 2022. These FMPs can be found at: [Caribbean Fishery Management Council - Island Based FMPs \(caribbeanfmc.com\)](http://caribbeanfmc.com)

In 2016, the Caribbean Fishery Management Council (CFMC) initiated their process of evaluating the EBFM approach and implementing it in the region. This approach to EBFM is hierarchical, considering the ecosystem at the local island, U.S. Caribbean region, Caribbean basin, and global scales. This hierarchical approach allows a more intensive focus on fine-scale management needs while still allowing consideration of the larger-scale effects of management decisions. The Council process is open and inclusive. To that end, the Council has conducted frequent public meetings, provided educational opportunities via brochures and web-based information (social-media network), directly involved the DAPs representing each of the three island management areas (Puerto Rico, St. Thomas/St. John, St. Croix), and presented progress reports to the public at every Council meeting. The first step in moving to an EBFM approach was the shift from U.S. Caribbean-wide FMPs to Island-based FMPs.

The overarching goal of the Island-based FMPs is to ensure the continued health of fishery resources occurring in the EEZ surrounding each Island within the context of the unique biological, ecological, economic, and cultural characteristics of those resources and the communities dependent upon them. To achieve this fundamental goal, these FMPs established a place-based framework designed to provide the foundation for conserving and managing the fisheries within

an integrative, ecosystem-based approach. Essential to this ecosystem-based fishery management (EBFM) approach is enhanced stewardship among fishers, residents and others who value the fishery resources and marine and coastal environment of Puerto Rico, ST. Thomas/St. John, St. Croix and the U.S.

The development of the regional Road Map was initiated in 2017 by the EBFM working group, followed by the creation, review, approval, and release of the EBFM RoadMap Implementation Plan for the Caribbean in 2019.

The basic tool for the implementation of the EBFM is the Fishery Ecosystem Plan (FEP). An informal group began working on the U.S. Caribbean FEP in 2017. Then came Hurricanes Irma and Maria in September 2017. In the U.S. Caribbean region one major climate induced ecosystem concern is threats to coral reef ecosystems - coral bleaching, disease, ocean acidification and the increase in storms and hurricanes with the potential to demolish coral-reef ecosystems.

The FEP guides the EBFM procedures and processes and is dependent upon stakeholder input via Public Scoping. In this context, the Fishery Ecosystem Plan (FEP) represents the foundation and guide on how Ecosystem-Based Fishery Management is executed in the U.S. Caribbean region.

To accomplish the steps set forth in the Implementation Plan, the Caribbean Fishery Management Council (CFMC) has since requested and received from its SSC and District Advisory Panels (DAPs) the Ecosystem Conceptual Models developed by each. The DAPs are comprised by commercial and recreational fishers, aquarium traders, restauraners, charters, divers and non-government organizations that provide advice to the Council for each area or island and act as a liaison between fishers, other users of marine resources and the local governments. The CFMC has three DAPs, one each for Puerto Rico, St. Thomas/St. John and St. Croix.

Ecosystem Conceptual Models

The first step of the FEP consists of the development of an Ecosystem Conceptual Model (ECM) that will help to identify the important components of the fishery system and how they interact. The ECM will serve as well in the planification of future fishery management by identifying ecological, economic-social factors of concern, key threats and inform on how management decisions may affect those factors. The ECM allows the brainstorming discussion to be visually carried on between scientists, shareholders, managers and policymakers with diverse backgrounds, allowing an increase of a common understanding of complex system dynamics.

In 2019, the SSC convened with the DAPs to begin working on the development of the ECMs. The first attempt was a bit chaotic but provided the opportunity to seek guidance from the SEFSC and SERO to refine the process for creating the conceptual models. The EBFM working group review the CMs created by the DAPs and develop guidance for next steps for both the DAPs and the SSC. The Risk Assessment was postponed and will be re-formulated into a more relevant assessment of the U.S. Caribbean, after initial steps are taken to model the system.

Numerous meetings were held with the DAPs and the SSC to work through the conceptual models. These took place in person in 2019, but were held virtually in 2020 and 2021. The DAPs and the SSC completed the ECMs in 2021. Meetings with the St. Thomas/St. John and St. Croix DAPs are

conducted in English while the meetings with the DAP-PR are conducted in Spanish. All input from the DAP-PR is translated to English. However, all joint meetings of the DAPs and the DAPs and the SSC are conducted in English with simultaneous translation in Spanish and English.

Also in 2019, there were discussions regarding the formality and legality of the team tasked with FEP development. After researching the roles and structure of other regional councils' FEP development teams (GMFMC, 2018; PFMC 2022), it was recognized as appropriate the establishment of a development team as an Advisory Panel and the existing EBFM Planning Team would fit the role of the technical committee, comprised of scientists, Council staff, and federal agencies who will collect the information and draft the plan. This team would draft the plan based on the information provided by the DAPs, SSC, and other stakeholder groups.

The Council formally established a Technical Advisory Panel (TAP) for the EBFM, composed of 8 members, including staff from NMFS Southeast Regional Office (SERO) and Southeast Fisheries Science Center (SEFSC), the Council and its SSC, the Coral Reef Conservation Program, Pew Charitable Trusts, the University of Puerto Rico, and the Institute for Socio-Ecological Research, Inc., all providing expertise in socioeconomic, cultural, educational, scientific and regulatory fields in the Caribbean region. Since February 2020, the EBFM TAP has held virtual and hybrid meetings to continue the development of the Caribbean FEP by providing a wide range of topics including the concept and aim of the FEP, the data challenges encountered, and integrating parallel projects that will contribute to the data gathering for the FEP development.

At this stage the CFMC has approved the Vision of the FEP, the Goals and Objectives and the basic outline and time line for the development of the FEP. However, as the FEP is being developed these could also be re-defined, specially now with the implementation of the IBFMP and their consideration of an ecosystem approach under a most certain changing climate scenario.

Concurrent efforts to move forward the EBFM approach include the SEFSC's development of the Ecosystem Status Report for the U.S. Caribbean under the direction of Mandy Karnauskas. The process, as with that of the Council, has been to consult with local stakeholders, and use the ECMs developed by the DAPs, SSC and other groups in the determination of appropriate indicators to understand the behavior of the U.S. Caribbean ecosystems. Among the indicators selected are for example: sea surface temperature, coral bleaching stress, hurricane activity, land-based pollution, coastal development, Sargassum inundation. The ESR has been presented to the SSC and upon completion will be discussed with the SSC, DAPs, and CFMC.

The Lenfest funded project "Building a Fishery Ecosystem Plan for the U.S. Caribbean Region as a Guide for Implementing Ecosystem-based Fishery Management" is providing for additional ECMs developed by other stakeholders-groups throughout the U.S. Caribbean. These other groups included small fishermen communities, academics, coastal businesses, regulatory agencies, and NGOs. The outcomes from these efforts will also be discussed with the SSC, DAPs and the CFMC.

The Council, in partnership with NMFS and other regional constituencies, is in the process of moving towards full implementation of EBFM in the region. EBFM enables a more holistic approach to decision-making by considering trade-offs among fisheries, aquaculture, protected species, biodiversity, habitats, and the human community, within the context of climate, habitat, ecological, and other environmental change, described below.