

# **PIFSC-PIRO Ecosystem-Based Fisheries Management Workshop April 6–7, 2021 Final Report**

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## List of Acronyms

CWA	Clean Water Act
EBFM	Ecosystem-based Fisheries Management
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESD	Ecosystem Sciences Division
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
FWCA	Fish and Wildlife Coordination Act
HCD	Habitat Conservation Division
IEA	Integrated Ecosystem Assessment
IFD	International Fisheries Division
LMR	Living Marine Resource
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PI	Pacific Islands
PIFSC	Pacific Islands Fisheries Science Center
PIRO	Pacific Islands Regional Office
PRD	Protected Resources Division
PRIMNM	Pacific Remote Islands Marine National Monument
SFD	Sustainable Fisheries Division
SOP	Science Operations Division

## Executive Summary

NOAA Fisheries strives to maintain and build productive and sustainable fisheries and healthy marine and aquatic ecosystems, as well as to protect threatened and endangered species, through use of an ecosystem-based approach to science and management. To further our goal of implementing ecosystem-based fisheries management (EBFM) in the Pacific Islands region, NOAA Fisheries Pacific Islands Fisheries Science Center (PIFSC) and Pacific Islands Regional Office (PIRO) held an EBFM Workshop on April 6 & 7, 2021. The workshop was designed to:

1. Foster EBFM understanding and establish communication channels between PIRO and PIFSC personnel.
2. Identify ways to better align management (PIRO) and research (PIFSC) activities.
3. Identify priority activities needed to fully implement EBFM in the Pacific Islands region.

The workshop included sessions on mandates used by PIRO to guide their missions and PIFSC science priorities and objectives that determine research activities. Researchers and managers introduced participants to multiple EBFM-focused projects, highlighting current research/management efforts that have begun to facilitate better alignment between the ongoing science and management activities.

The introductory sessions led into breakout sessions focused on four separate but often overlapping themes: Coral Reefs and Insular Fisheries, Fishing (Indigenous) Communities, Pelagic Fisheries, and Protected Species. The sessions brought interested employees and theme experts together to discuss issues associated with implementing EBFM in the region, with staff self-selecting their participation. Each group discussed three similar questions:

Question 1: EBFM requires the consideration of all ecosystem components (multiple fisheries, protected species, habitat, human communities) instead of the single-species approach. How does the consideration of these additional components change the approach to research/management of your respective subject area?

Question 2: How will EBFM help to identify and address the unique pressures on your respective theme in the region?

Question 3: Does EBFM create demands for more/different data collection, management, and analyses? How can we best address data gaps and analytical challenges to enhance effective research/management of your respective theme at appropriate spatial and temporal scales in the region?

The workshop presentations and discussions successfully enabled PIFSC and PIRO staff to identify priorities for EBFM implementation in the Pacific Islands region. The breakout sessions made it clear that this workshop was only a first step, and that continued progress of EBFM in the Pacific Islands region will require active support from NMFS Pacific Islands leadership and sustained progress in three main areas:

*Communications:* Every breakout group agreed that better communications, both internally and with external partners, is a top priority to not only facilitate the work of

scientists and managers, but to effectively engage our partners. This entails not only meeting with the various communities to inform them of our plans, but also listening to them and incorporating their concerns and expertise into both our science and management endeavors. Indeed, the ultimate success of EBFM relies on the active participation of all our constituencies.

*Data:* New data collection efforts are needed to fully implement EBFM, especially in the socio-economic and pelagic areas. With limited resources available for expanded new surveys, existing research efforts should strive to generate data that can be used for multiple analyses. Existing and new data need to be collected, managed, and delivered to partners in a collaborative, transparent and accessible manner.

*Resource limitations:* The PI region needs sustained fiscal and personnel support to fully implement EBFM. EBFM cannot be successful without fundamental changes to our normal operating procedures, including the way we allocate funds and prioritize projects.

The EBFM workshop not only created a shared understanding of the challenges facing PIFSC and PIRO in the implementation of EBFM, but also generated priority action items for near-term implementation across the two agencies. These included:

- Develop a communication system for sustained coordination between PIRO and PIFSC with an EBFM focus and then expand coordination out to primary partners in the region (e.g., Western Pacific Fisheries Management Council, U.S. Fish and Wildlife Service). Multiple communication initiatives will increase awareness of EBFM (workshops with partners and communities) and foster collaboration to enable complex research initiatives and to achieve specific management goals. Improved communications will be a routine tool that we can apply in all EBFM endeavors.
- PIFSC and PIRO leadership should immediately develop a shared process to identify staff and resources to facilitate the implementation of EBFM for the region. PIFSC/PIRO need to recognize the importance of habitat science and management as a critical component of EBFM research and implementation. Habitat loss/degradation was highlighted as a key issue for three of the four breakout groups. Part of the transition to an EBFM focus could be the incorporation of management strategy evaluations that assess the extent to which science and management goals are achieved. Depending on the success of these evaluations and other research/management prioritization efforts, this should evolve into a future component of the annual activity planning process such that EBFM is a primary resource allocation criteria.
- The overlap of EBFM with PIFSC and PIRO climate efforts is obvious and the two programs should be complementary. One approach could be to make EBFM part of the annual Climate Workshop where staff would benefit from regular updates and create synergy between these separate efforts.

In addition to these overarching recommendations, the four breakout groups identified certain priorities for each thematic area.

### *Coral Reef and Insular Fisheries*

- Increase regional collaboration (within and external to NMFS), including input from jurisdictions on their community, management, and science needs.
- Improve internal and external communication and coordination.
- Improve data readiness, standards, and access, address gaps and scale mismatches.
- Make EBFM a leadership priority.
- Make EBFM a research and management priority.
- Build cross-division and cross-agency EBFM projects into the budget process.

### *Fishing (Indigenous) Communities*

- Design and adopt communication and collaboration processes that prioritize community needs and perspectives.
- Increase and improve efforts to collect socio-economic data and develop relational understanding.
- Carefully examine agency practices to better reflect community priorities while adhering to NOAA EBFM guidance.

### *Pelagic Fisheries*

- Recognize the need for habitat, life history, basic ecological, oceanographic, and biogeochemical research for target, non-target, prey, and forage species, along with bycatch and other drivers of fisher behavior. Commit the resources necessary to study dynamic pelagic habitat, larval stages, distribution, movement, and diet. Utilize more fishery-independent data and analyses.
- Conduct management strategy evaluation of management scenarios. Pull all the scientific components together to evaluate management decisions. Develop scenarios from the perspective of the fisheries responses. Re-assess current and previous management regimes to see if they are working.
- Use climate change scenarios to project impacts of environmental change on the ecosystems, habitats, and fisheries.

### *Protected Species*

- Develop a clear understanding of the objectives and risk tolerance of managers and stakeholders towards various management measures and the science that will be required to identify and evaluate them.
- Understand how climate change and ecosystem perturbations will impact protected species and fish stocks distribution, and how those changes might affect protected species interactions (i.e., bycatch) with the fisheries.
- Determine how fishers (and other stakeholders) will influence and respond to policy and management changes, and how potential trade-offs will affect the status of protected species using the EBFM approach.



The 2-day EBFM Workshop was well received by PIRO and PIFSC staff, and 120 staff members were successfully introduced to EBFM basic concepts. Both PIRO and PIFSC provided information that helped clarify the mandates and typical research deliberations that influence the way they conduct NMFS business. This exchange created greater awareness among participants and helped to identify potential areas for collaboration. The presentation of ongoing EBFM projects made it clear to Pacific Islands' region staff that EBFM is a more comprehensive approach to fisheries management with many possible benefits, especially in the face of accelerating climate change. The impediments to fully realize EBFM in the region are substantial. Adoption of EBFM will necessitate major changes to the way that PIFSC/PIRO have historically operated. Overcoming institutional inertia is never an easy or simple proposition. The region must also deal with the lack of available, appropriate, and contemporary data needed to answer the more complex questions that an EBFM approach will generate, the need for additional resources to successfully implement this approach, and the challenges of improved communication, cooperation, and collaboration from our internal and external partners in the region. Focused and sustained efforts by leadership and staff are essential to move EBFM forward in the PI region.

## Background

NOAA Fisheries strives to maintain and build productive and sustainable fisheries and healthy marine and aquatic ecosystems, as well as to protect threatened and endangered species through use of an ecosystem-based approach to science and management.

NOAA Fisheries defines EBFM “as a systematic approach to fisheries management in a geographically specified area that contributes to the resilience and sustainability of the ecosystem; recognizes the physical, biological, economic, and social interactions among the affected fishery-related components of the ecosystem, including humans; and seeks to optimize benefits among a diverse set of societal goals.” (NOAA 2016a)

To provide a framework for this shift to EBFM, NOAA Fisheries has developed an EBFM Policy that identifies and outlines six Guiding Principles:

1. Implement ecosystem-level planning.
2. Advance our understanding of ecosystem processes.
3. Prioritize vulnerabilities and risks of ecosystems.
4. Explore and address trade-offs within an ecosystem.
5. Incorporate ecosystem considerations into management advice.
6. Maintain resilient ecosystems.

NOAA Fisheries maintains that a “coordinated implementation of EBFM across mandates will lead to greater efficiency and will enable” our agency “to explicitly consider trade-offs between fisheries, fishery species, and other ecosystem components (e.g., other species, habitats, and humans) and processes that affect, or are affected by, fisheries.” (NOAA 2016a)

Although the purpose of the Policy was to define, describe the benefits, and provide a framework for the implementation of EBFM, the actual implementation strategy was set forth in the EBFM Road Map. Designed to guide EBFM implementation for the next 5 years, the Road Map describes strategies for the implementation of the Policy’s six Guiding Principles.

The “Road Map is intended to ensure that: no major pressures affecting” Living Marine Resources (LMRs) “and their habits are omitted;” that our agency “executes the correct analytical level of assessment, addresses relevant ecosystem linkages, accounts for ecosystem-level features and cumulative impacts; and the frequency and scope of LMR assessments align with the broader ecosystem and fishing community dynamics.” (NOAA 2016b)

Another major objective of the Road Map is to identify complementary efforts that are taking place across the agency and to assist in efforts to coordinate them. To address the directive within NOAA Fisheries EBFM Policy for the implementation of EBFM, and to address the objective of identifying and coordinating efforts as set forth in the EBFM Road Map, the Pacific Islands Fisheries Science Center (PIFSC) and Pacific Islands Regional Office (PIRO) held the first EBFM Workshop on April 6–7, 2021.

## **Workshop Objectives**

The first PIFSC-PIRO EBFM Workshop consisted of two 4-hour sessions held on consecutive days. The workshop objectives were as follows:

1. Foster EBFM understanding and establish communication channels between PIRO and PIFSC personnel.
2. Identify ways to better align management (PIRO) and research (PIFSC) activities.
3. Identify priority activities needed to fully implement EBFM in the Pacific Islands region.

## **EBFM Workshop Day 1**

The morning of the first day focused on establishing communications and mutual understanding with staff from various programs within PIFSC and PIRO (protected species, fisheries, habitat, science operations, etc.) giving collaborative presentations. PIRO staff presented on the mandates used to guide their missions and PIFSC staff gave presentations on the priorities and objectives that determine research activities. The second half of the first day targeted the second objective by introducing participants to multiple EBFM-focused projects in the region. During this session, staff from the science center and regional office introduced current research/management efforts and presented opportunities for better alignment between the ongoing science and management activities.

## **EBFM Welcome and NOAA Priority Perspective**

The PIFSC-PIRO EBFM Workshop began with a welcome and opening remarks by Michael Tosatto, the Regional Administrator for the Pacific Islands Regional Office, and Michael Seki, the Director for the Pacific Islands Fisheries Science Center. A summary of their comments are below.

### Michael Tosatto

EBFM in the Pacific Islands region relies on Science Center information to implement ecosystem management initiatives. To this point, PIFSC's efforts have been a deliberate and strategic effort, and PIRO is looking to make progress guided by PIFSC. Looking to the future, PIFSC and PIRO will need to continue our alignment, while supporting our partners. It starts with us being able to guide them to meet our mandates

### Michael Seki

The workshop was a long time coming. While we all hope to implement EBFM, the plan was not clear since everyone has a different definition of EBFM. The six Guiding Principles define where we want to go and will guide us as we move forward with this effort. Ours is a unique region, and the challenge we face is how we clarify our priorities. The first step is for us to move forward together. This workshop should consider how we approach our change from single species to multiple species assessment.

## **EBFM Overview**

After the opening remarks, Gerry Davis, the Assistant Regional Administrator for the Habitat Conservation Division, provided a workshop overview.

Gerry explained that the workshop was designed to provide PIFSC and PIRO staff a common understanding of what is EBFM, how we will move it forward, and how we can build on it through time. In this effort, collaboration will be critical. While the policy and implementation of EBFM may be a new initiative for NOAA Fisheries, a number of projects are already being undertaken that fit within EBFM; they're just not wearing that label.

For far too long, ecosystem services have been ignored. Interest in this area is occurring across NOAA Fisheries, and implementing EBFM Policy and Road Map will force us to pay attention to it. Implementing EBFM will require us to be innovative, and it will remind us that we will have to look at all aspects and all opportunities.

One of the biggest challenges of implementing EBFM is the temporal component, we have to consider what will management look like in the future? We have to start planning for those coming changes now. We need to understand the connectedness of the ecosystem components and begin to incorporate the changes that will be necessary into our management strategies. Fisheries is a huge driver of the EBFM process. Protected species are also a significant component, and EBFM affords us the opportunities to further explore these links and help us move forward.

Another challenge with implementing EBFM is we each have our own focus and the things we prioritize. We need to be cognizant of this, because how we see the problem affects how we gather and analyze data. One concept that should have our focus and has to be a priority for all of us is climate change. We will all need to understand how it will mold implementation of EBFM in the region.

Our region has several major issues that vie for our attention, but sometimes the simple things are the most important. We cannot let these things get lost in the details. Implementing EBFM will be a long road, and the workshop could allow us to identify some of the simple things that can be implemented to begin the process of moving EBFM forward. The resources we manage are under pressure, and time is short. We need to meet the challenge by developing effective strategies that allow us to maximize our alternatives.

### **EBFM 101—Successful EBFM Implementation and the Challenges**

While EBFM has been practiced in various forms for decades, EBFM as a NOAA Fisheries policy is a relatively recent development. At the workshop, Gerry Davis and Michael Parke jointly presented an EBFM introduction to attending PIFSC-PIRO staff and what EBFM implementation in the region may look like.

The continuum of fisheries management strategies is a stepwise progression from single-species fisheries management to ecosystem-based management. In the Pacific region, we are already implementing EBFM as we try to address issues related to commercial/recreational fisheries, indigenous fishing needs, and other extractive fisheries practices.

By its very nature, EBFM incorporates elements of physical, biological, and human socio-economic habitats (ecosystems). Those elements are addressed in the NOAA EBFM Guiding Principles, which require consideration of the various vulnerabilities and risks, and also allow for the development of trade-offs. NOAA resource managers regularly address vulnerabilities and risks to marine systems using science to identify the most important vulnerabilities and risks. These combined efforts of scientists and managers are directed to one overriding goal, maintaining resilient ecosystems for all stakeholders.

How does EBFM help us reach that goal? EBFM is an iterative approach and one that constantly requires evaluation of where you are, how you got there, and what you need to do to improve. EBFM is particularly suited to address the accelerating threat of climate change to our marine habitats and ecosystems.

Both the intensity and frequency of extreme climate events (e.g., coral bleaching, storms) in the Pacific Islands regions are creating a sense of urgency to respond with appropriate science and management plans and actions. These events, driven by rising sea temperatures and ocean chemistry changes, are causing shifts in species distributions, as the preferred habitats for the various life stages shift with the changing environmental conditions. The rapid environmental changes we are witnessing further complicates what was already an extremely complex system.

Several priorities that will need to be addressed for the successful implementation of EBFM in the region include:

- Communication—frequent discussions will be needed between PIFSC and PIRO, and with the stakeholders in the region to identify priorities and goals.
- Collaboration—discussions need to be open and consider not only knowledge based on western scientific principles, but on traditional methods from the stakeholders in the region, and other forms of knowledge across disciplines.
- Transparency—while it may be inconvenient or uncomfortable, it is critical that the process of implementing EBFM and our engagement with the Pacific Island communities be transparent as possible in order to build trust. We have to recognize and communicate that we do not have complete or perfect data, and we need to be explicit that we are using the best information and analyses available as we work toward equitable, inclusive, and effective solutions.
- Trade-offs—successful implantation of EBFM requires consideration of trade-offs. Ignoring them is not a solution and will not make them go away.
- Open Data—cataloging, documenting, and making our data available to our partners in an understandable and easily accessible format will allow us to work more efficiently, and will enhance each step in the process.

The road to the successful implementation of EBFM will be a long one, and many challenges will need to be addressed along the way. Some of the major challenges facing us going forward include the following:

- Temporal and spatial disconnects between the scales of management and science.
- Oceans around the world are changing; while that change may be less obvious in some parts of the Pacific, the effects will still be significant.
- The extents and rates of change are unpredictable, making our task even more difficult.
- The need to identify and incorporate appropriate and equitable environmental and social indicators may lead to extraction constraints and stakeholder conflicts.
- Integrating ecosystems conditions into stock assessments.
- Addressing the dearth of habitat data, especially related to early life history of our most important commercial species.
- Possible institutional resistance to making the necessary changes.

While implementing EBFM is a stated national priority, meaningful successes and our ability to overcome challenges will depend on adequate funding and renewed commitment from NOAA leadership. Currently, more funding and attention is being focused on climate change. EBFM is a new paradigm for NOAA; it will require us to conduct business in a new way as the status quo will not enable success. We need to approach EBFM as an opportunity to re-evaluate our standard approaches to science and management, recognize our common connections, and move forward together.

## **PIRO Mandates**

This portion of the workshop provided an opportunity for PIRO managers to explain the authorities and responsibilities that are inherent in their mandates. Staff from each of the following divisions—Habitat Conservation (HCD), International Fisheries (IFD), Protected Resources (PRD), and Sustainable Fisheries (SFD)—gave presentations on the most significant authority wielded by that division.

### ***Magnuson-Stevens Fishery Conservation and Management Act (Sarah Ellgen—SFD)***

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) was created in response to improving fishing technology, and the need to protect marine resources from foreign fleets fishing in the U.S. Economic Exclusion Zone. The goals of MSA are to prevent overfishing, rebuild overfished stocks, and increase long-term economic and social benefits.

Passed in 1976, the MSA established U.S. fishing jurisdiction from 3 to 200 nm and established the 8 regional management councils. The 1996 amendments defined “overfishing” and “overfished” and dictated that Fishery Management Plans (FMPs) must establish measures to rebuild overfished stocks and identify essential fish habitat (EFH). The 2006 Reauthorization Act strengthened the role of science and established annual catch limits and accountability measures.

While the National Standards and FMP requirements have elements of EBFM—such as consideration of fishing communities, fair and equitable allocation of resources—the move to Fishery Ecosystem Plans (FEPs) was a significant shift towards managing fisheries in an EBFM way. FEPs shifted the focus from single-species management to management on a geographic scale. The move to FEPs was in part due to the growing realization that the focus on single-species management was incomplete and signaled a shift to greater ecological awareness.

For SFD the most obvious link that management must consider beyond just the fish stocks are the fisheries interactions with protected species, and the role that bycatch of those species play in economic impact on the fishery from closures from reaching the allowable take of protected species.

For SFD, implementing EBFM provides the opportunity for increasing coordination and collaboration with the Science Center and Habitat Division with the goal of discussing management needs and working to collect the science information to meet those needs.

### ***Endangered Species Act (Joel Moribe—PRD)***

The purpose of the Endangered Species Act (ESA) is to provide the means to conserve ecosystems where listed species live. Nevertheless, the focus of the Act is on species, so in practice, ecosystems are not given a great deal of consideration.

PIFSC provides the scientific information that PIRO Protected Resources Division (PRD) uses to manage listed species. Monitoring surveys provide the information needed to determine species listings, and the results of recovery efforts. The information on distribution allows for determining risks, and setting take limits. The relatively recent addition of a number of coral species listed as “endangered” provides the opportunity to strengthen partnerships among the



PIFSC Ecosystem Sciences Division (ESD), the PIRO Habitat Conservation Division (HCD) and the Protected Species groups from their respective offices that will focus on the habitat aspects of protected resources challenges.

### *MSA (Alex Kahl—IFD)*

The International Fisheries Division (IFD) negotiates and implements provisions of international fisheries agreements in the western and central Pacific. Fisheries in the region are managed by several fishery management organizations, which includes participation of countries from Asia, Europe, Central and South America, and the Pacific Island nations.

The Western and Central Pacific Fisheries Convention Implementation Act authorizes implementation of international agreements made under the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Objectives of the Act are to ensure the long-term conservation and sustainable use of tuna and other highly migratory stocks in the region, minimize disadvantage to U.S. fishermen, and ensure the management measures consider traditional fishing patterns.

### *Essential Fish Habitat (Stuart Goldberg—HCD)*

The essential fish habitat (EFH) provision of the MSA was established through the first reauthorization of the MSA in 1996. EFH is defined as “those waters and substrate necessary for (federally managed) fish to spawn breed, feed, and/or grow to maturity.”

EFH is designated by the regional Councils for the Management Unit Species (MUS) under their authority using an ecosystem approach in FEPs. EFH is designated for various life stages of species within five MUS groupings in the Pacific—Pelagics, Coral Reef Ecosystems, Bottomfish, Crustaceans, and Precious Coral.

Federal agencies are required to consult with NOAA Fisheries if their non-fishing actions may adversely affect EFH. An adverse effect is any effect that reduces the quality or quantity of the habitat. An EFH consultation is designed to avoid, minimize, or offset potential adverse effects, with the goal of maintaining ecosystem services and function to ensure sustainable fisheries.

With regards to EFH, PIRO works with PIFSC to ensure that the best scientific information are available to reassess and redefine EFH designations, and through coordination with PIFSC to develop and implement targeted research to collect the information needed. The EFH mandate also presents the opportunity to align PIRO and PIFSC efforts to elucidate the importance of habitat science for fisheries management and develop priorities to support EBFM.

### *Fish and Wildlife Coordination Act (Steve Kolinski—HCD)*

The Fish and Wildlife Coordination Act (FWCA) provides for a consultation process on any federal action that proposes to impound, divert, or otherwise control or modify waters of any stream or other body of water in the United States and territories. FWCA also requires that wildlife conservation receives equal consideration in project development, and establishes fish and wildlife conservation as a coequal purpose of federally funded or permitted water resource development projects.

Consultations under FWCA are designed to prevent loss or damage to wildlife resources, as well as for the development or improvement of those resources. The consultation primarily focus on impacts and effects analysis; avoiding, minimizing, rectifying, or reducing impacts over time; compensating for residual impacts; and resource enhancement.

The Act is closely related to other federal mandates, such as the MSA, ESA, and National Environmental Policy Act. The Act applies directly to U.S. Army Corps of Engineer civil work projects and Corps permits issued pursuant to Section 404 (Clean Water Act (CWA)) and Section 10 (Rivers and Harbors Act).

The CWA establishes a program to regulate the discharge of dredge or fill material into U.S. waters, and identifies special aquatic sites (e.g., coral reefs, vegetated shallows, mudflats). Pursuant to FWCA, for a permit that authorizes a discharge, NOAA Fisheries addresses the need that the issued permit will prevent loss and damage to wildlife resources, and that there is a provision for the development and improvement of those resources.

Concerning the FWCA, the monitoring and assessment data collected by PIFSC is crucial for PIRO in evaluating and calculating functional offset in compensatory mitigation, for appropriate regulatory impact and mitigation assessments, and for the establishment of special habitat take-reduction linkages.

## **PIFSC Research Priorities Relative to EBFM**

PIFSC staff gave presentations to explain research and science priorities in each of the following divisions in PIFSC: Fisheries and Monitoring, Ecosystems Science, Protected Species, and Science Operations.

### *Fisheries Research and Monitoring Division (Robert Ahrens)*

The Fisheries Research and Monitoring Division consists of several programs: Life History Program, Stock Assessment Program, Fisheries Reporting and Bycatch Program, and Fisheries Monitoring Program.

These programs work on a wide-range of scales, from the individuals within a species, to the distribution of stocks across the region, and across programs; dealing with commercial and recreational catch issues for the fisheries; and the interactions of bycatch, particularly protected species, in the fisheries.

Climate change is a major focus for the division. Warmer oceans are resulting in stocks redistribution across the region, and subsequently changing fishing patterns of the commercial fishing industry; at the same time, they are affecting the number and species that are interacting with the industry. In an attempt to understand how species may adapt to climate change and what those adaptations may mean for the fishing industry, the division is also researching how warmer oceans are affecting the individual growth rates of target species across the region.

### *Ecosystem Sciences Division (Jennifer Samson)*

The Ecosystem Sciences Division conducts research and monitoring of marine ecosystems and their human communities across the western and central Pacific to inform stewardship of fisheries, protected resources, and habitats. The division consists of three programs: Social-ecological and Economic Systems (SEES), Pelagic Research, and Archipelagic Research.

ESD supports the implementation of EBFM by collecting biological, environmental, and socioeconomic field data and conducting analyses at appropriate spatial and temporal scales that support an EBFM approach to enhance effective research and management.

Robust economic analyses undertaken by the SEES Program contribute to improved management, healthier ecosystems, more profitable businesses, and sustainable communities. The research conducted by the Pelagic Research Program enhances our understanding of open-ocean ecosystems processes, and provides value-added climate and oceanographic analyses and information. The Archipelagic Research Program monitors and assesses biological and environmental impacts related to climate change and anthropogenic effects on near-shore habitats throughout the region.

### *Protected Species Division (Jason Baker)*

The Protected Species Division's research is driven by three guiding principles: 1) prioritize vulnerability and risks to protected species ecosystems and their components, 2) explore and address trade-offs within an ecosystem, and 3) incorporate ecosystem considerations into management advice.

The enormous geographic area and large number of species in the region, the challenge of working with limited data and resources to address the data limitations, and the problems created by a rapidly changing environment are just some of the challenges facing this division.

The Protected Species Division has identified the following priorities to address their most pressing research needs: enhancing data and analytical capacity for ecosystem and listed species modeling efforts, developing and expanding modelling tools, and conducting vulnerability /impact studies.

### *Science Operations Division (Noriko Shoji and Benjamin Richards)*

The Science Operations Division (SOD) provides logistical and support services, as well as, designs and develops innovative tools, equipment, instrumentation, and other physical products to enhance ecological data sampling efforts that support the conservation and management of the coastal and marine ecosystems of the Pacific Islands.

Part of SOD is the Marine and Applied Knowledge for Ecosystem Research Laboratory (MAKER Lab). The MAKER Lab designs and develops innovative tools, equipment, and other products in support of the research and management efforts in the Pacific Islands region. Examples of previous projects include the following: the development of turtle restraining devices for improved animal handling, acoustic buoy recorders for biological communication research, and imagery and photogrammetry technology for coral and fish research.

Another component of SOD is the Pacific Islands Data Enterprise. The goal of this program is to ensure high-quality science data through dedication to accuracy, integrity, defensibility, reproducibility, and transparency. The strategy of the program is to provide an environment that empowers scientists to manage their own data sets directly in the enterprise database.

An exciting area housed within SOD is the development of Artificial Intelligence and Machine Learning. Advances in this area will provide much more efficient data processing in research that relies heavily on imagery and acoustics that generate massive amounts of data.

## **EBFM Presentations**

The last session of Day 1 highlighted EBFM projects that are currently underway (or are proposed) in the Pacific region. The intent of the session was to be both informational and to broaden staff perspectives regarding EBFM. A summary of each of the presentations is below.

### *Protected Species Interaction Patterns in Longline Fisheries (Robert Ahrens)*

This project examines the ecology of protected species interactions with the longline fisheries, is a collaborative effort that involves several divisions within PIFSC and an external collaborator. The roots of the project can be traced back to TurtleWatch, and the recognition that there is a relationship between specific ocean temperatures and higher interaction rates with turtles.

The work involved the development of a habitat-based model designed to describe Hawai'i and American Samoa longline fisheries interactions with protected species. The model provides information that would allow fishermen to avoid areas of higher probability of catching turtles. Results of the first generation of the model proved to be effective at predicting areas of potential interactions.

Using the lessons learned from the first generation of the model, researchers developed a second-generation model with updated fishing effort data and key oceanographic features. The model developed was based on weekly products that would facilitate timely updates on areas of high encounter probabilities for potential use in Dynamic Ocean Management.

Current state of the project is to develop a multi-species model as a forecasting tool to aid managers and the fishing industry; and with the incorporation of telemetry data, the project can provide information on the distribution of species as well.

Future questions to be analyzed may include:

- Do observed interactions equal predicted interactions?
- If fishing effort redistributes, how will (protected species) catch rates change?
- What management options are we testing?
- How will fishing effort redistribute?

### *West Hawai'i Integrated Ecosystem Assessment (Jamison Gove)*

An Integrated Ecosystem Assessment (IEA) is a process to inform EBFM. The process involves defining the goals and the targets, develop indicators, assess the ecosystem, analyze the results, and evaluate the efficacy of the ecosystem management strategy. The IEA is a national program that crosses several NOAA line offices, including the following: NOAA Fisheries, National Ocean Service, Oceanic and Atmospheric Research; National Environmental Satellite, Data, and Information Service; and the National Weather Service.

West Hawai'i IEA is an interdisciplinary science project designed to support EBFM. The project focuses on ocean processes that drive fisheries productivity; drivers of ecosystem change across space and time; and cultural ecosystem services and human well-being.

One specific area of ocean processes studied was surface slicks. Surface slicks were found to be areas of concentrated phytoplankton, zooplankton, and larvae. The results indicated that ocean slicks serve as nursery habitats for organisms that drive trophodynamics across multiple ocean habitats.

Most ecosystem research lacks the appropriate driver data to determine the root cause of ecosystem change. This study compiled high-resolution data on a number of anthropogenic and natural drivers, including population, sewage input, golf courses, wave power, and peak rainfall, to name a few. The data on these human and natural drivers, along with information on fish communities, can be used to determine the conditions that result in varying reef responses.

The incorporation of the social-ecological system into the West Hawai‘i IEA was among the most difficult. Cultural services represent the non-material benefits of a communities’ relationship with the ecosystem. Through a series of interviews and workshops, the best representation was determined to be place-based indicators. These indicators came to represent that sense of connection between the people and the ocean, and they emphasized the importance of thinking about place with respect to EBFM.

### *Pacific Remote Islands Marine National Monument Management Planning and EBFM (Heidi Hirsh)*

The draft management plan for the Pacific Remote Islands Marine National Monument (PRIMNM) is being developed. It will incorporate EBFM Guiding Principles as a way to address the interconnectedness of the ecosystem services of these uniquely different areas. The management planning process is a 13-step process that will lead to the development of conservation targets and management focus areas. In addition, goals, objectives, and strategies for management will incorporate EBFM Guiding Principles and PRIMNM Guiding Principles developed specifically for Monument management planning.

The following are PRIMNM Guiding Principles:

1. Promote healthy and resilient ecosystems to fulfill proclamations and roles in Pacific Ocean conservation.
2. Promote sound science and incorporate adaptive management, research, monitoring and connectivity into management goals, objectives, and strategies.
3. Recognize uncertainty and plan for a changing climate using an adaptive approach.
4. Represent the biological and ecological features of the PRIMNM utilizing conservation targets.
5. Enhance public appreciation and support of the Monument through effective education and outreach.
6. Promote cooperation between NOAA Fisheries and the U.S. Fish and Wildlife Service, and ensure compliance with the proclamations.
7. Incorporate social, cultural, and traditional values and knowledge.

PRIMNM Guiding Principle 7 is an important part of management planning that will allow managers to better understand and document indigenous cultures and histories related to the Monument; effectively manage cultural resources; and ensure that integration of the cultural perspectives and values of the indigenous peoples of the region are included in day-to-day management practices.

### *Social-Ecological and Economic Systems—Priorities on EBFM (Mia Iwane)*

For effective EBFM implementation, people (communities) must be included as part of the ecosystem. Three approaches are used to incorporate the role that communities play in their social-ecological and economic systems: monitor and describe, understand change, and share knowledge and build relationships.

The communities engage in fisheries in a variety of ways; accurately monitoring and describing the system has to include not only the commercial and non-commercial fisheries, but cultural and traditional fishing practices as well.

Understanding change requires modelling and assessing the dynamic relationships between the fishing communities, governance, climate, and the ecosystem. Fishing communities, however, are not monochromatic; to accurately portray them, consideration must be given to the following:

- economic reasons for participating in the fisheries,
- their particular fishing preferences and behaviors,
- their particular vulnerabilities, resilience and well-being that are tied to the ability to fish,
- the state of equality and equity of access to the fisheries, and
- the cultural significance that fishing plays in their daily lives.

Effective knowledge sharing and relationship building requires broad access and participation in science and management. This requires sharing findings with the public, managers, and other scientists; building capacity that allows for social science innovation and literacy, and improving integration into management; and facilitating engagement in the science and management processes.

### *Coastal Fisheries Strategies in the Pacific (Michael Lameier and Alex Kahl)*

NOAA Fisheries' efforts to advance EBFM will re-define PIFSC and PIRO operations in the Pacific Islands region. In response to the shift, PIFSC and PIRO will be able to strengthen collaboration on habitat conservation and coastal fisheries management across the region. This change will also likely require a change in the scale of ecosystem data collection, which will benefit to coastal fisheries management across various jurisdictional levels.

Coastal fisheries management is an area that provides an opportunity for the United States to exchange knowledge and strengthen international relationships. In the Pacific Islands region, much of that focus is on partnerships with the Freely Associated States (Palau, Federated States of Micronesia, and the Republic of the Marshall Islands). Partnerships being developed include the Micronesian Challenge 2030, which looks to expand the areas under conservation management from 50% of the marine environment and 30% of the terrestrial environments.

Opportunities for continued growth can be found through the continued development of sustainable fisheries practices, improvements in data collection and management, and continued efforts in compliance and enforcement.

## *Coral Restoration (Shannon Ruseborn and Tom Oliver)*

Active coral restoration is moving beyond traditional management actions to actively trying to assist in the recovery of the ecosystem and the ecosystem services that corals provide. While coral restoration cannot stop the impacts of climate change, it can be a useful tool to support reef resilience. For their part, PIFSC and PIRO are coordinating efforts to plan and implement coral restoration with the State of Hawaii, Division of Aquatic Resources and The Nature Conservancy.

Currently NOAA Fisheries is in year 2 of a cooperative agreement with The Nature Conservancy to assist in the development of draft coral restoration plans across the Pacific Islands region. Each jurisdiction has formed a planning team and is drafting a coral restoration plan. Each plan is a four-step process:

- 1) Set goals and geographic focus.
- 2) Identify and select sites.
- 3) Identify and select interventions.
- 4) Develop objectives and implement the plan.

Progress made by the territorial governments across the region include American Samoa has finished a draft plan, the Commonwealth of the Northern Mariana Islands is on step 4, and the State of Hawai‘i is entering step 4.

The Hawai‘i plan has a goal of “Build capacity to develop, test, and apply restoration methods that enhance the resistance and recovery of coral reefs impacted by bleaching.” The Hawai‘i restoration efforts will concentrate on five geographic areas including Waikīkī and Hanauma Bay in Oahu, Olowalu in Maui, and Kealakekua Bay on the Big Island. The Hawai‘i restoration team is considering six restoration methods:

- Opportunistic fragment, colony, and/or substrate stabilization (within site).
- Direct transplantation of corals of opportunity to resilient sites (from adjacent sites).
- Coral gardening with corals of opportunity (in situ and ex situ).
- Coral gardening through selective collection and propagation.
- Gamete and larval seeding and larval tenting.
- Substrate addition (artificial reefs, bio-rock, live rock/crustose coralline algae).

As the Hawai‘i project moves forward, there will be the need to develop strong baselines for efficacy and risk monitoring at the colony scale. Monitoring will include the use of new technology, such as fixed-site photogrammetry, to determine success at the colony scale. Hawai‘i has identified that the tier-1 sites will be in Waikīkī and Hanauma Bay.

These efforts at coral restoration will be a valuable component of EBFM in the future, as bleaching events around the Pacific region are expected to increase in the coming years, with forecasts indicating the likelihood of annual severe bleaching events across the region by the year 2038.



## **EBFM Workshop Day 2**

While Day 1 of the EBFM workshop was designed to socialize EBFM to PIFSC and PIRO staff, Day 2 was intended to begin moving the needle towards actual implementation of EBFM in the region. Three sessions were scheduled for the second day of the workshop: Breakouts, Climate Change, and a Panel Discussion.

## Breakout Sessions

The second day of the workshop focused on breakout sessions across four different themes: Coral Reefs and Insular Fisheries, Fishing (Indigenous) Communities, Pelagic Fisheries, and Protected Species. The sessions were designed to bring together interested employees and theme experts to discuss issues associated with implementing EBFM in the region with staff self-selecting their participation. Each group discussed three similar questions:

Question #1: EBFM requires the consideration of all ecosystem components (multiple fisheries, protected species, habitat, human communities) instead of the single-species approach. How does the consideration of these additional components change the approach to research/management of (*theme*)?

Question #2: How will EBFM help to identify and address the unique pressures on (*theme*) in the region?

Question #3: Does EBFM create demands for more/different data collection, management, and analyses? How can we best address data gaps and analytical challenges to enhance effective research/management of (*theme*) at appropriate spatial and temporal scales in the region?

### Coral Reefs and Insular Fisheries

The Coral Reefs and Insular Fisheries Breakout Session had the most participants of the four breakout sessions. Although the majority of participants were from PIFSC, PIRO was well-represented in this session. To accommodate the large number of participants, the facilitator created three groups, and had each group focus on answering one of the three questions and identifying priorities for that question alone. A summary of comments on each question is below.

Comments Summary to Question #1—Implementing EBFM will require thinking about management and research in new ways and at new scales, and this would include working more closely with other stakeholders and considering both larger and smaller scales. There is a need for greater internal and external communication and cooperation to ensure that all stakeholders are allowed to participate, and that everyone is working towards common goals. This approach would lend itself to an increased sharing of resources and better outcomes. The group recognized that one of the big challenges will require a need to develop criteria to define a baseline fisheries ecosystems condition and to develop corresponding metrics to evaluate a change in conditions over time.

Comments Summary to Question #2—EBFM will allow for a broader and more collaborative effort across the region, starting first within NOAA Fisheries and then by bringing together partners at various government levels and allowing for broader incorporation of expertise and authorities. Implementing EBFM is a way to bring new resources together to address the threats to coral reefs from climate change and to establish better communication and cooperation with the stakeholders in the region. Truly this is where the EBFM approach can have the greatest benefit. While the EBFM concept presents a tremendous opportunity, it also poses a challenge in that this approach will require increased efforts to build capacity upfront. There is a need to find the right balance to maximize benefits. Given that little new funding is attached yet to this effort,

steady incremental steps in leveraging existing resources are needed to make progress using the EBFM approach.

Comments Summary to Question #3—The importance of data quality and integrity was a major point of the discussion, with an emphasis on the need to collect data at the appropriate scale. Identifying and overcoming current data gaps to properly implement EBFM is presently a major limitation and will be a major challenge in moving forward. EBFM needs to facilitate the inclusion of overlooked or under-utilized data from partners and stakeholders in the region. The group recognized the need for a major shift to a much more inclusive data framework to effectively move from species management to ecosystem management. A major point of emphasis was the need to include better and more representative social science data. Implementation of EBFM will be an incremental process given limited funds and staffing. To be effective, improved methods for merging and sharing data among NOAA Fisheries and partners will need to be developed

The following key focus areas were identified by the participants in the Coral Reef and Insular Fisheries Breakout Session:

- Increase regional collaboration (within and external to NMFS), including input from jurisdictions on their community, management, and science needs across a more robust community-aware and ecosystem-focused research and data enterprise.
- Define, improve, and institutionalize internal and external communication and coordination for EBFM implementation.
- Improve data readiness, standards, and access, address gaps and scale mismatches.
- Priority: Embed EBFM concept into annual and multi-year project development guidelines and budget process. This includes placeholders in the Annual Guidance Memo and Regional Priorities for PIFSC and PIRO to Improve Data Readiness, Standards, and Access, Address Gaps and Mismatches.
- Define and establish leadership-level priorities to implement EBFM.
- Develop clear, management-driven research-level priorities to support EBFM.

### **Fishing (Indigenous) Communities**

The Fishing (Indigenous) Communities Breakout Session had the fewest number of participants out of the four sessions, but it was very balanced with a nearly equal number of staff from PIFSC and PIRO. A summary of comments on each question is below.

Comments Summary to Question #1—Define pathways and establish opportunities for communities in research and management discussions to ensure that traditional local knowledge is considered in research and management decisions and to go beyond what is required by our mandates and policies in terms of engagement. The Federal Government needs to be more sensitive to local culture and customs. Island communities have practiced EBM for a long time out of necessity.

Comments Summary to Question #2—Need to be inclusive and work hard to develop partnerships that are based on mutual respect. Need for sharing responsibility, Create a better understanding of what is important to local cultures. Highlight the need for NOAA Fisheries to

find a constructive path to adhere to their mandates while respecting community needs. The holistic approach of EBFM can be a powerful framework for representing community interests.

Comments Summary to Question #3—Desire to see the Federal Government be more willing to consider local data on fishing, and to develop a better understanding of where to obtain that data. Stressed the need to ensure the inclusion of communities and their ideas, and to understand how to engage and who to approach in the communities.

The following priorities were identified by the participants in the Fishing (indigenous) Communities Breakout Session:

- Design and adopt communication and collaboration processes with community needs in mind.
- Increase and improve efforts to collect relevant socio-economic data and develop partnerships with communities and other agencies that will encourage participation and improve relational understanding.
- Carefully examine agency practices to allow the EBFM process to better reflect how community priorities interact with management priorities. The ordering of this target is intentional to highlight that the Agency should try to put equal emphasis on integrating community interests wherever possible when meeting their mandates.

## **Pelagic Fisheries**

The Pelagic Fisheries Breakout Session consisted of a large number of participants, with just a few less than the Coral Reefs Session. This session had the largest difference in those participating from PIFSC and PIRO, with the vast majority being PIFSC staff. A summary of comments on each question is below.

Comments Summary to Question #1—EBFM is a holistic approach to fishery science and management, and highlights the need for specific data (fishery-independent data, early life history data, and habitat utilization data) that is not currently being collected. The objectives of NOAA Fisheries mandates (MSA and ESA) that most influence fisheries can compete and limit management options. EBFM may be an opportunity to improve this balance and provide new management approaches.

Comments Summary to Question #2—We need to develop a comprehensive approach to science and management, including the habitats/ecosystems, multiple species, and foreign fleet interactions. A few comments also addressed the economic impact related to displaced fisheries and how to best describe any impacts.

Comments Summary to Question #3—The lack of comprehensive data sets does not allow for a full implementation of EBFM. The gaps identified include pelagic species estimates, lack of fisheries-independent data, lack of food web dynamics, and the need for more ship time to collect the required data.

The following are priorities identified by the participants in the Pelagic Fisheries Breakout Session:

- Recognize the need for fishery-independent data on habitat, life history, basic ecological, oceanographic, and biogeochemical research for target, non-target, prey, forage, and

bycatch species, and drivers of fisher behavior. Commit the resources necessary to study dynamic pelagic habitat, larval stages, distribution, movement, diet. Use more fishery-independent data in our scientific analyses.

- Conduct management strategy evaluation of management scenarios. Pull all the scientific components together to evaluate management decisions. Develop scenarios from the perspective of the fisheries responses. Reassess current and past management regimes to see if they are working.
- Apply climate change scenarios to project impacts of environmental change on the ecosystems, habitats, and fisheries.

## **Protected Species**

Overall, the small group size was likely due to a competing workshop that was attended by both PIFSC Protected Species and PIRO Protected Resources staff and was held concurrent to the EBFM Workshop. The number of staff that participated was only slightly larger than those who attended the Fishing Communities session, with more staff from PIFSC participating, but not a large majority. A summary of comments on each question is below.

Comments Summary to Question #1—Successful implementation of EBFM would allow for consideration across multiple species and multiple fisheries and this could prove beneficial and help identify priorities. Addressing current data gaps is needed to properly move to implementing EBFM.

Comments Summary to Question #2—Exactly what implementing EBFM would look like still needs to be determined, but the holistic approach would help identify alternatives that would have wide-ranging benefits.

Comments Summary to Question #3—Lack of modelling was highlighted; yet, much of the data that will be needed for good models does not exist, or does not exist in the appropriate form. New forms of data collection (eDNA, etc.) may address some of those data shortfalls. The primary gaps identified were related to predator/prey interactions, domestic and foreign fisheries activities, and the habitat/environment. New technologies (drones, etc.) could help to address those data gaps.

The following priorities were identified by participants in the Protected Species Breakout Session:

- Develop a clear understanding of the objectives and risk tolerance of managers and stakeholders towards various management measures and the science that will be required to identify and evaluate them.
- Understand how climate change will affect protected species and fish stocks distribution, and how those changes might affect protected species interactions (i.e., bycatch) with the fisheries.
- Determine how fishers (and other stakeholders) and the status of protected species will be included in and respond to policy and management changes (i.e., trade-offs) implemented as part of the new EBFM approach.

## **Climate Change and EBFM**

Addressing climate change is one of the top priorities for both PIFSC and PIRO. For this reason, a climate change session was included in the workshop agenda. The session hosted two presentations: the first was an overview of the 4<sup>th</sup> Climate Workshop, and the second was a presentation on the development of a Climate Vulnerability Assessment for the Pacific.

### **Overview of Climate Workshop (Phoebe Woodworth-Jefcoats)**

The 4<sup>th</sup> Annual Climate Science Workshop was held in 2020. The workshop has been an iterative process. Beginning with the first workshop held in 2017, each year has built on outcomes and successes from the previous years.

The focus of the 4<sup>th</sup> workshop was a gap analysis on prioritizing the issues that could best advance EBFM and climate change management with the limited resources and capacity available. Another priority area covered in the Climate Workshop was the need for baseline information around priority species (e.g., monk seals and turtles) in the region.

While the need to address climate change is urgent, PIFSC and PIRO are well positioned to take meaningful actions to combat the growing threat. NOAA Fisheries leadership, at the national and regional level, has made climate science a priority in recent years, and the United Nations Decade of the Ocean will heighten attention on this issue. NOAA Fisheries' emphasis on EBFM, with climate and habitat being central tenets of the process, adds extra attention to the issue.

While PIFSC and PIRO are posed to address climate change, many obstacles stand in the way of meeting our goals. There is a continued need for the following:

- Scientist and manager collaboration; while both sides are excited about the prospects, it is less clear how to get where they need to be.
- Leadership attention and efforts to address climate change as a regional priority.
- Data sharing within NOAA, and with our partners across the region.

The second Phase of the Pacific Islands Regional Action Plan for climate science (2022–2024) will be part of that bridge that gets us where we need to be. PIRAP 2.0 has five themes that encompass the region's climate-related goals. Each theme has a number of action items, and there are concrete metrics associated with them so that we may gauge our progress in implementing PIRAP 2.0.

### **Assessing the Vulnerability of Marine Life to Climate Change in the Pacific Region (Donald Kobayashi)**

The Pacific Climate Vulnerability Assessment is an exercise to examine the likely responses of fishes and invertebrates to climate change. Vulnerability Assessments were first developed in the New England and Mid-Atlantic Region in 2015. Later, NOAA Fisheries Climate Science Strategy called for each region to develop assessments for the species being managed.

The Pacific Islands assessment focused on 83 species from 6 functional groups and 33 families. Species were selected based on regional expert opinion, commercial and regional catch records, and cultural and conservation importance.

Both exposure variables and sensitivity attributes are used to determine climate change vulnerability. Exposure measures how likely it is that a species will be subjected to changes in physical environmental variables. The exposure variables used in this assessment were: temperature, salinity, ocean acidification, mixed-layer depths, precipitation, currents, wind stress, surface oxygen, sea level rise, wave height, chlorophyll, and primary productivity. Sensitivity estimates how vulnerable a species might be based on biological traits.variable. Sensitivity was based on existing literature and expert opinion.

While sensitivity scores ranged from low to very high across the 83 species, all the species ranked very high in the overall exposure assessment. The group that scored the highest in vulnerability was the invertebrates. The dominant factors driving the high rankings were: 1) oxygen concentration, which is expected to decrease across the Pacific; 2) rise in sea surface temperature; and 3) increase in ocean acidification.

The assessment narrative also explained that many data gaps exist. In particular, early life history and settlement requirements are important sensitivity attributes that are data deficient.

## **Panel Discussion—Future of EBFM in the Pacific Region**

The last session of the EBFM workshop was a panel discussion. Each panel member was given the opportunity to provide an opening statement, with guidance that the statement should address their observations of the workshop, and provide their insights related to the future of EBFM in the region. The panel consisted of Michael Seki, Director of the Pacific Islands Fisheries Science Center; Michael Tosatto, the Regional Administrator for the Pacific Islands Regional Office; Frank Parrish, the Director of the Ecosystem Sciences Division (PIFSC); and Gerry Davis, the Assistant Regional Administrator for the Habitat Conservation Division (PIRO).

### **Opening Statements**

*Michael Seki*

Mike opened his statements with an observation; throughout the workshop, he noticed staff tended to only participate in areas within their expertise. Mike then identified several challenges, which PIFSC and PIRO must overcome to address the goal of implementing EBFM in the region; these include the need for pelagic and fishery-independent data, and finding the resources to address climate change. For climate change, the task will be choosing between the options available but will likely hinge on the time-sensitivity of the issue. Mike then struck an optimistic note that there is a shared goal of adopting an ecosystem science and management approach within PIFSC and PIRO, and our task will be figuring out how to include our regional partners into our efforts.

*Michael Tosatto*

Mike noted that the PIRO and PIFSC directorates have EBFM engagement structures in place, and there are several mini-structures used by divisions for coordination. This is a process that needs to be cultivated based on the needs at the time, and issues that have to be addressed. Regarding the implementation of EBFM, Mike noted that while we are not looking to drop any current activities, going forward will require making strategic decisions that will improve the work we do. This process will be incremental; we need to focus on the problems we can solve, and set priorities on addressing the larger issues, and work to close the gaps between where we are in addressing them and where we need to be. The work will require bringing along our partners in the region and will likely include supporting them when we can due to the limited resources across the region. PIFSC and PIRO will need to continue to strengthen our coordination, and we will need to look to partner with other groups, both domestic and international.

*Frank Parrish*

Frank's opening statement indicated that the NOAA EBFM Policy and Road Map documents are guides to implementing EBFM, but the goals they set are too much for any one division to achieve alone, and we must work together. Frank observed that to implement EBFM, problems of scale need to be accurately identified and properly addressed. Depending on the issue, success may be quick or will require more time and several small steps.



*Gerry Davis*

Gerry began his remarks mentioning that he is always struck with a sense of awe at the amount of work that is being done when given the opportunity to participate in an event like the workshop. Gerry explained that he was keenly aware that staff participation was going to be key to the success of the workshop, and that the level of participation and interest more than exceeded his expectations. Regarding the implementation of EBFM in the region, his vision was to make sure that PIFSC and PIRO were on the same page first, then we could take the concept to our partners with a unified voice. In going forward with EBFM in the region, Gerry suggested that moving EBFM to the next level of successful implementation will require integrating EBFM into the Regional prioritization process for programs and budget issues.

After the opening statements by the panel members, staff were invited to ask questions or raise observations that they wanted to bring to the panel. The results of that open forum are below.

*Comment by Megan Asher (PIFSC)* – Making the process (EBM, EBFM) a joint effort with the stakeholders is an important component of successful implementation, and is needed for buy-in. Also, the added participation helps to address gaps (data, coverage) that will occur with implementation. Showing stakeholders how the implementation benefits them is important, in particular, the priorities to be addressed should be joint priorities.

*Question from Michael Parke (PIFSC)* – What is the next step or process that we will follow to move forward some of the priorities that we have identified in the workshop?

Response by Michael Tosatto – PIRO will look internally to see how we address the need to successfully implement EBFM. We then have to look at what the outputs would be, and what that will look like.

Response by Michael Seki – PIFSC has already taken the first steps, and is doing EBFM in some ways. The question we need to address is, how do we take the next steps and with who (Council?)? This will be an iterative process, and we will have to reevaluate continuously as we move forward.

*Question from Malia Chow (PIRO)* – There are a lot of “priorities” that have been identified across NOAA Fisheries. From a leadership perspective, where does EBFM fit in the list of priorities that have already been identified?

Response by Michael Tosatto – Because they are identified as priorities, the goal is to address all of them. That’s part of the benefit of EBFM, it allows for analysis and the development of trade-offs between priorities.

*Question from Jamison Gove (PIFSC)* – Can leadership comment on whether there is hierarchy with respect to EBFM and meeting our management partners’ needs? Specifically, whether there is prioritization of Council over State needs from a PIFSC/PIRO perspective.

Response by Michael Tosatto – As we implement EBFM, we will find that there are lots of crossover between the needs of our partners. We are most successful when ours and our partner’s needs are aligned. Then everybody is better off.

Response by Michael Seki – The answer depends on the question being asked. We are a mandate driven organization, and because of that some things are just not possible. When the task aligns with our mandates (e.g., MMPA, ESA) that carries more weight in the decision hierarchy.

*Question from Heidi Hirsh (PIRO) to Megan Asher – Your EAFM process is great and mirrors EBFM. Do you think that could be applied in the local Hawai‘i and territorial communities?*

Response by Megan Asher – Yes. While EAFM may be an even broader tool, the process is the same as EBFM. You engage the stakeholders, identify the areas that overlap, identify the needs, and work together to find solutions. The concept can be applied at any scale.

Response by Michael Tosatto –The Council process is already inclusive, EBFM fits partly into that process. Moving forward, we need to take advantage of those parts that already in place.

*Question from Colby Brady (PIRO) – Regarding the need to fill data gaps given limited budgetary resources and ever-increasing scientific and management needs, do you see utilization of fisheries independent autonomous technologies (e.g., computer recognition sensors, Sairdrones, drones) playing a larger role in ecosystem baseline assessment and EBFM implementation?*

Response by Michael Seki – Yes, but the development and implementation of those technologies and methods will take time. The integration of new technologies or methods take time, even when there are resources available to put them in place.

*Question from Jennifer Samson (PIFSC) – Given the scope and scale of our data needs and the limited funds, how do we build or expand relationships with other NOAA Line Offices and other federal agencies to gain access to more data or resources for shared needs on climate and ocean systems?*

Response by Michael Seki – There is management strength in numbers. EBFM will require a heavy investment with our partners. Our goal will be to get them to cooperate, while allowing them to do their work. That said, the work they do still needs to meet our needs.

## Results and Next Steps

One of the primary goals of the workshop was to identify priorities for advancing EBFM in the Pacific region. All of the sessions were designed to bring together subject-matter experts from PIFSC and PIRO to discuss the important issues facing us in the region, and to consider ways to address them. The topics covered during the workshop were wide-ranging, as were the discussions, but by the end of the workshop, several important reoccurring themes stood out.

**Climate Change.** The threat from climate change was identified as one of the single biggest challenges affecting the Pacific Islands region. We need to better understand how climate change will impact protected species and fish stocks distribution and how those changes might affect protected species interactions (i.e., bycatch) with the fisheries.

**Communication/Collaboration.** We need to improve both internal and external communications and cooperation. A particular area of emphasis was the need to better engage the local communities, to utilize their expertise, to respect their traditional perspectives, and to better address their concerns. Cross-agency communications within our region (between PIFSC and PIRO especially) and with other government and non-government partners also need to be cultivated and enhanced.

**Data Gaps.** Successful implementation of EBFM in the Pacific Islands region will require the collection of new data and access to and innovative synthetic analyses of existing data. Notable data improvements include the development of pathways for gathering and using input from the entire range of partner communities engaged in EBFM; collection of relevant and contemporary social and economic data; collection of a broader suite of basic ecological, oceanographic, and habitat data for both target and non-target species; and research to reveal habitat utilization, distribution, movement, and diets of larval stages of key species.

**Resource Limitations.** Funding and personnel limitations will impede EBFM implementation. To understand the needs in these areas, one of the first priorities should be for PIFSC and PIRO leadership to develop a clear understanding of their objectives and risk tolerance relative to critical management issues in the region. Development of a framework designed to recognize and incorporate community and partner interests while meeting federal mandates will be essential to success. We also need to clearly define and institutionalize internal and external cooperative endeavors.

### Next Steps

Implementation of EBFM in the Pacific region will not be easy and will not happen overnight. The EBFM Workshop was the first step to develop a coordinated response to the challenges presented by this new approach. Subject-matter experts from all the divisions within PIFSC and PIRO identified what they perceive as the main obstacles to moving this initiative forward. Based on the breakout group discussions, several priority strategies were identified.

#### *Priority Strategies*

- Embed the EBFM concept into annual and multi-year project development guidelines and the budget process. This includes placeholders in all of the important and relevant

regional documents, such as the Annual Guidance Memo and regional priorities for PIFSC and PIRO.

- Establish processes of engagement between PIFSC and PIRO that works to advance EBFM regionally and nationally, identify opportunities to improve communications internally and externally, and explore future data and research needs.
- Develop the capacity to produce climate change scenarios to forecast impacts of environmental change on the ecosystems, habitats, and fisheries.
- Develop and implement regional and federal processes that will allow for better community engagement in the management consideration and decision processes.
- Develop and implement the capacity to determine how fishers (and other stakeholders) and protected species will respond to policy and management changes implemented as part of the new EBFM approach.

## Summary

The 2-day EBFM Workshop successfully introduced 120 staff members from PIRO and PIFSC to EBFM basic concepts. Both PIRO and PIFSC provided information that helped clarify the mandates and typical research deliberations that influence the way they conduct NMFS business. This exchange created greater awareness among participants and helped to identify potential areas for collaboration and the potential benefits of a more holistic approach to fisheries management using EBFM.

The workshop contributed to an increased understanding of the EBFM approach, and highlighted the data and capacity challenges that will need to be overcome to fully realize EBFM in the Pacific Islands region. Adopting EBFM will necessitate major changes to the way that PIFSC/PIRO have historically operated. In addition to overcoming institutional inertia, other concerns include the lack of essential and adequate targeted data to answer the more complex questions that an EBFM approach will generate, the need for additional resources and capacity to successfully implement this approach, and the challenges of improved communication, cooperation, and collaboration from our internal and external partners in the region. Focused and sustained efforts by leadership and staff are essential to build an adaptive management framework based on ecosystem concepts that can be implemented across mandates.

The EBFM workshop achieved its objective by allowing PIFSC and PIRO staff to convene, collaborate, and identify some approaches to implement EBFM in the Pacific as one NOAA Fisheries. This workshop was only the first step. In the face of accelerating climate change across the Pacific Islands region, and the impacts of more intense storms, sea level rise, ocean acidification, warming oceans, beach erosion, saltwater intrusion, etc., we face a new urgency to implement EBFM to develop innovative, integrated, equitable, and cooperative solutions to extremely complex problems.

## References

NOAA 2016a. Ecosystem-Based Fisheries Management Policy of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration. National Marine Fisheries Service Policy Directive 01-120. May 23, 2016. 8 pp.

NOAA 2016b. NOAA Fisheries Ecosystem-Based Fisheries Management Road Map. National Marine Fisheries Service Instruction 01-120-01. November 17, 2016. 50 pp.

## Appendix A EBFM Workshop Agenda

### PIFSC–PIRO Ecosystem-based Fisheries Management Workshop Agenda

April 6–7, 1200–1600

#### Day 1

1200–1220: EBFM Welcome and NOAA Priority Perspective

- Joint opening by Mike Tosatto and Mike Seki

1220–1245: EBFM Overview

- Overview of goal/objectives (*Gerry Davis*)
- EBFM 101 from PIFSC and PIRO perspectives (*Michael Parke and Gerry Davis*)

1245–1330: PIRO Mandate Presentation

- Sustainable Fisheries Division
  - Magnuson-Stevens Act (*Sarah Ellgen*)
- Protected Resources Division
  - *Endangered Species Act* (*Joel Moribe*)
- International Fisheries Division
  - MSA International (*Alex Kahl*)
- *Habitat Conservation Division*
  - *MSA-Essential Fish Habitat* (*Stuart Goldberg*)
  - Fish and Wildlife Coordination Act (*Steve Koliniski*)

1330–1415: PIFSC Research Priorities Relative to EBFM

- Fisheries Research and Monitoring Division (*Robert Ahrens*)
- Ecosystem Sciences Division (*Jennifer Samson*)
- Protected Species Division (*Jason Baker*)
- Science Operations Division (*Noriko Shoji*)

1415–1430: Break

1430–1545: EBFM Presentations

- Protected Species Interaction Patterns in Longline Fisheries (*Robert Ahrens*)
- West Hawai'i IEA (*Jamie Gove*)
- PRIMNM Management Planning and EBFM (*Heidi Hirsh*)
- Social-Ecological and Economic Systems: Contributions to EBFM (*Mia Iwane*)
- Coastal Fisheries Management (*Michael Lameier and Alex Kahl*)
- Coral Restoration (*Shannon Ruseborn and Tom Oliver*)

1545–1600: Review and Guidance for Day 2

## Day 2

1200–1215: Guidance for Breakout Session

1215–1415: Breakout session

- Session Themes
  - Pelagic Fisheries (*Facilitator Sarah Ellgen*)
  - Coral Reefs and Insular Fisheries (*Facilitator Jenni Samson*)
  - Fishing (Indigenous) Communities (*Facilitator Hoku Ka 'aekuahiwi-Pousima*)
  - Protected Species (*Facilitator Richard Hall*)

1415–1430: Break

1430–1515: Climate Change and EBFM

- Pacific Islands Region Climate Science (*Phoebe Woodworth-Jefcoats*)
- Pacific Climate Vulnerability Assessment (*Don Kobayashi*)
- Discussion Topic—How can implementing EBFM help to address climate change in the Pacific region?

1515–1600: Panel Discussion—Future of EBFM in the Pacific Region.

(*Panel Participants—Mike Tosatto, Mike Seki, Gerry Davis, and Frank Parrish*)

- Discussion Topic—How do we involve our various partners in these efforts?



## Appendix B List of Participants

Pacific Islands Fishery Science Center	Pacific Islands Regional Office
Michael Seki – Director	Michael Tosatto – Regional Administrator
Jesse Abdul	Sarah Malloy – Deputy Regional Administrator
Rober Ahrens	Scott Bloom
Megan Asher	Coby Brady
Michelle Barbieri	Jonathan Brown
Yvonne Barkley	Kristine Bucchianeri
Ingrid Biedron	Malia Chow
Keith Bigelow	Anne Chung
Erin Bohaboy	Shelby Creager
Jon Brodziak	Emily Crigler
Shandell Brunson	Gerry Davis
HingLing Chan	Ron Dean
Emily Contreras	Sarah Ellgen
Kristen Dahl	Tom Graham
Laura Damiami	Richard Hall
Katie Davis	Celeste Hanley
Crystal Dombrow	Lesley Hawn
Reka Domokos	Hilliard Hicks
Alexander Gaos	Heidi Hirsh
Jamie Gove	Ariel Jacobs
Tye Kindinger	Danielle Jayewardene
Justin Hospital	L. Alex Kahl
Brittany Huntington	Keith Kamikawa
Melanie Hutchinson	Irene Kelly
Kurt Ingeman	Holly King
Mia Iwane	Steve Kolinski
T. Todd Jones	Michael Lameier
Emeline Kalahiki	Michael Marsik
Mohammed Khan	Steve McKagan
Danika Kleiber	Ann Mooney
Donald Kobayashi	David O'Brien
Diana Kramer	Susanna Oliveros
Matthew Larsell	Lynn Rassel
Frances Lichowski	Emily Reynolds
Kimberly Lowe	Tori Spence
Beth Lumsden	Shannon Ruseborn
Kaylyn McCoy	Fatima Sauafea-Leau
Risa Oram	Robert Schroeder

Pacific Islands Fishery Science Center	Pacific Islands Regional Office
Megumi Oshima	Brett Schumacher
Minling Pan	Lillian Tuttle-Raz
Michael Parke	Lani Watson
Frank Parrish	Chelsey Young
Erin Reed	
Benjamin Richards	
Justin Rivera	
Jim Ruzicka	
Molly Scott	
Jessica Schem	
Noriko Shoji	
Sujuan Situ	
Joy Smith	
Taylor Souza	
Jennifer Stahl	
Yonat Swimmer	
Kisei Tanaka	
Jamie Thomton	
Ashley Tomita	
Damaris Torres-Pulliza	
Kevin Trick	
Johnathan Whitney	
Morgan Winston	
Phoebe Woodworth-Jefcoats	
Johanna Wren	