LENFEST OCEAN PROGRAM

Executive Summary
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BUILDING EFFECTIVE FISHERY ECOSYSTEM PLANS

A REPORT FROM THE LENFEST FISHERY ECOSYSTEM TASK FORCE

INTRODUCTION

Connections matter. That is the unifying principle of ecosystem-based fisheries management (EBFM). Ecological connections matter because fishing affects target species, predators, prey, competitors, bycatch species, and habitat. Economic connections matter because management affects fishermen, wholesalers, retailers, and recreational fishing guides. And social connections matter because fishing supports families and communities.

U.S. fisheries management has made tremendous strides under the current management framework, which centers on single stocks or stock complexes rather than ecosystems. In addition, fishermen, managers, and many others have cooperated to reduce bycatch, conserve habitats, and improve the equity and safety of fisheries.

However, conventional management has certain limitations. It generally focuses on one fishing sector at a time, which may unexpectedly lead to worse outcomes in another sector. It often considers a narrow range of issues, potentially overlooking other factors that shape fishery systems, such as loss of habitat and the behavior of people and markets. And fundamentally, the current system is atomized into individual fishery management plans (FMPs), often leaving little opportunity to consider overarching management goals or the trade-offs across fisheries that attend almost every decision.

EBFM provides mechanisms to address these issues and many others. Yet despite this, and despite many other reports and studies that have made the case for EBFM, it has not been widely adopted. The Task Force believes a major reason is that there is no clear way to put its principles into practice.

A BLUEPRINT FOR NEXT-GENERATION FEPS

This document summarizes a new report from the Lenfest Fishery Ecosystem Task Force, *Building Effective Fishery Ecosystem Plans*. The purpose of this report is to offer a blueprint for Fishery Ecosystem Plans (FEPs) as a means to translate EBFM into action. FEPs have been proposed for this purpose before, and most U.S. Regional Fishery Management Councils have since either started or completed an FEP. But these plans often focus on system description rather than management action.

The Task Force envisions FEPs as a structured planning process that uses adaptive management to operationalize EBFM. This "FEP Loop" process starts by identifying the key factors that shape a fishery system and considering them simultaneously, as a coherent whole. It then helps managers and stakeholders delineate their overarching goals for the system and refine them into specific, realistic projects. And it charts a course forward with a set of management actions that work in concert to achieve the highest-priority objectives.

This report contains no new science or policy innovations. This is because the Task Force found—through deliberation, document review, and conversations with managers and stakeholders—that EBFM is feasible today using existing science tools, policy instruments, and management structures. Not only that, nearly all of the steps in the proposed "FEP Loop" process are already being carried out by U.S. fishery managers.


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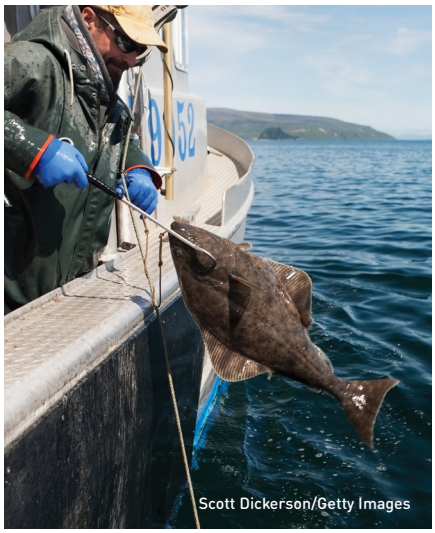
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U.S. fisheries have taken steps to minimize bycatch, respond to climate change, and protect vulnerable habitats and species. Left: Commercial fishing boats in Dutch Harbor, Alaska. Right: Gaffing halibut in southwest Alaska.

THE FEP LOOP PROCESS

This section describes the FEP Loop and illustrates its steps. The process is a general guide rather than a detailed recipe, and what is most critical is that it begin with a big-picture understanding of the system to be managed and of stakeholders' goals, followed by the development of concrete, practical actions to address the highest-priority goals.

Figure 1

THE STRUCTURE AND PROCESS OF FISHERY ECOSYSTEM PLANS

Step 1: "Where are we now?"

Managers, scientists, and stakeholders should begin by looking broadly at the entire fishery system. The FEP Loop calls for creating a conceptual model of the fishery system, a set of "vital sign" indicators, and a list of threats.

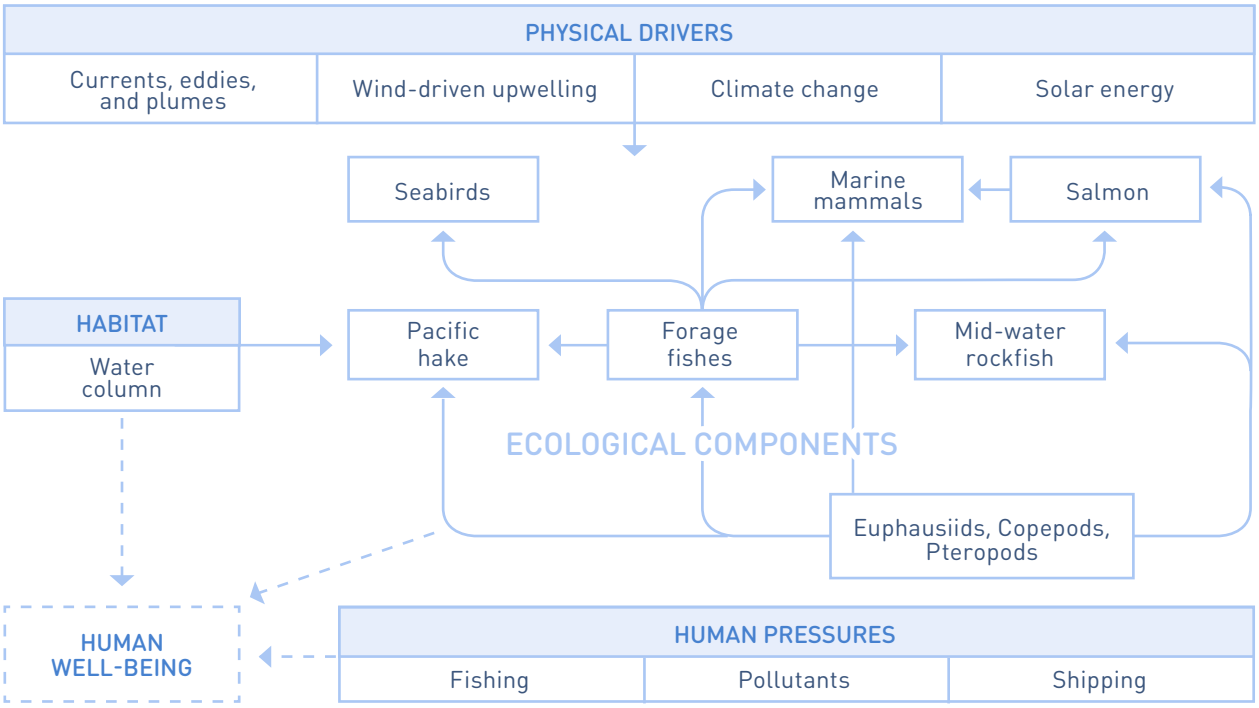
Conceptual models provide an inventory of system components and interactions and are already in use in several U.S. regions. The models should include the linkages between human and natural systems (Figure 2).

Another part of this step is the development of "vital sign" indicators, which provide a snapshot of health and are familiar tools in fisheries. For the California Current, one conceptual model proposed using indicators that draw on existing data. For example, forage fish biomass is an indicator of prey availability, rockfish population status reflects management effectiveness, and the Pacific Decadal Oscillation captures a suite of climate-driven environmental processes. The model also proposes two overall indicators based on existing data: diversity and mean trophic level.

This step should also include a list of threats to and pressures on the fishery system—for example, aquaculture, invasive species, or coastal development—to help prioritize objectives.

Figure 2

A CONCEPTUAL MODEL OF THE COASTAL PELAGIC SYSTEM IN THE NORTHERN CALIFORNIA CURRENT



Source: Andrews et al. (2013)

Step 2: "Where are we going?"

Next, managers, scientists, and stakeholders collaborate to develop and prioritize explicit, transparent goals for the fishery system. This kind of exercise is common in fisheries, and it is critical for EBFM because it helps pare down the potentially large scope of activities. Fundamentally, this involves moving from a shared broad vision for the fishery system to a clear set of specific, measurable, and actionable objectives.

Several management bodies already have overall vision statements. For example, the vision of the U.S. Mid-Atlantic Fishery Management Council is, "Healthy and productive marine ecosystems supporting thriving, sustainable marine fisheries that provide the greatest overall benefit to stakeholders."

Managers should next translate vision statements into action by setting and prioritizing high-level or "strategic" objectives. For instance, management might set objectives regarding habitat protection, preserving fishing-dependent communities, maintaining resilience, and preparing for climate change.

To complete this step, it is important to break the high-level objectives down into tangible desired outcomes, or operational objectives. These should include clear statements of what is to be achieved and how success will be measured. For example, the Puget Sound Partnership set the following objective: "Increase the overall abundance of spawning herring to 19,380 tons by 2020."

Step 3: "How will we get there?"

Managers and stakeholders must then create specific performance measures and use them to evaluate several alternative management strategies. This step allows for simultaneous consideration of multiple factors, their interactions, and their cumulative effects, which is a key benefit of EBFM.

The FEP Loop begins this step by developing performance measures that address the "triple bottom line" of ecological, socio-cultural, and economic objectives. A fishery in southeast Australia provides a useful set of examples. (See Performance Measures box.)

Managers and stakeholders then develop a range of alternative management strategies for reaching the operational objectives from step 2. The strategies should include management triggers in which reaching a predetermined value leads to a predetermined action, as well as a means of incorporating changes into FMPs. They should be adaptive, with plans built in for monitoring the system and responding to change.

The strategies should then be evaluated. A range of tools exists for evaluation, including management strategy evaluation (MSE), cost-benefit analysis, and expert judgment. The evaluation may uncover win-win strategies or expose unavoidable trade-offs inherent in a decision.

PERFORMANCE MEASURES

In Australia, an extensive management strategy evaluation involving 33 performance measures was undertaken for the southern and eastern scalefish and shark fishery. The following gives examples of those measures, along with the corresponding fishery objectives. (Management did not set target values for these measures, but in general higher values were considered desirable.)

Example 1

Objective: Maximize socio-economic impact

Performance measures:

- Level of port activity (as an indicator of social benefits of fishing).
- Total profits.
- Profit per ton landed.

Example 2

Objective: Ecologically sustainable development

Performance measures:

- Biomass of higher trophic level species.
- Proportional habitat cover.
- Demersal:pelagic biomass ratio.
- Piscivore:planktivore biomass ratio.

Source: Fulton et al. (2014)

Step 4: "Implement the plan"

Here, the managers initiate the alternative selected in step 3. This can be done entirely using existing processes for assessing scientific information and for amending regulatory documents such as FMPs. The Task Force recommends creating work plans that describe resources needed, timelines, and expected outputs for each of the actions identified in step 3.

Step 5: "Did we make it?"

Completing the cycle of adaptive management, policies are formulated not only to move the system to a more desirable state, but also to learn more about how the system works. For example, closing an area of critical habitat to fishing can promote species recovery and reveal the capacity of that species to rebound from depletion. The management alternatives formulated in step 3 should include a plan for monitoring that tracks progress toward objectives and produces data that can answer key questions about the system.

CASE STUDIES

The Task Force conducted 10 case studies of management bodies that have undertaken EBFM to identify tasks that such bodies are already undertaking that fit within the FEP Loop process. It found that managers are carrying out nearly every step of the process using existing management and regulatory processes, although no case included all five steps. (See Table 1.) In light of the case study data, the Task Force concluded that the FEP Loop is a realistic, practical way to implement EBFM.

It is important to note that much of the work represented in Table 1 was conducted for a subset of each system, such as a single species or the habitat for one group of species, rather than for the full system. Moreover, none of this work was carried out within the systematic framework of an FEP. The Task Force recommends that managers use a structured planning process such as the one described in the report to ensure that they consider all of the key drivers of the system and the highest priorities of stakeholders.

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Salmon fishing in Alaska (top). Male sea lions in Newport, Oregon, at the Historic Newport Docks (bottom left). Driftnet fishing for sockeye salmon along the Nushagak River, Alaska (bottom right).

Table 1

EXISTING CASE STUDIES OF THE FEP LOOP

This table shows 10 case studies of management bodies that have undertaken EBFM (see report for full details). A checkmark indicates that parts of the FEP Loop have been developed for one or more species. This illustrates that the process is feasible using existing tools. However, most of these actions did not take place within the systematic framework of an FEP and therefore did not realize the main advantages of EBFM.

STEPS	NEW ENGLAND GROUNDFISH	MID-ATLANTIC BUTTERFISH	ATLANTIC MENHADEN	GULF OF MEXICO GAG GROUPER
1. WHERE ARE WE NOW?				
System inventory and conceptual model	✓	✓	✓	✓
Select indicators		✓		✓
Inventory threats				
2. WHERE ARE WE GOING?				
Vision statement		✓	✓	
Strategic objectives	✓	✓	✓	
Assess risk to objectives				
Prioritize objectives				
Operational objectives	✓			
3. HOW WILL WE GET THERE?				
Performance measures	✓			
Management strategies	✓			
Evaluate strategies	✓			
Select strategy	*	✓	✓	✓
4. IMPLEMENTATION		✓	✓	✓
5. DID WE MAKE IT?				

* Management alternatives have been voted on by the council but not adopted.

	PACIFIC SARDINES	PACIFIC WHALES AND SALMON	ALASKA GROUNDFISH	SCOTIAN SHELF FISH AND INVERTEBRATES	BALTIC COD, HERRING, AND SPRAT	AUSTRALIAN SMALL PELAGICS
	✓	✓	✓	✓	✓	
	✓	✓	✓	✓	✓	
			✓			
			✓	✓	✓	
	✓	✓	✓	✓	✓	
		✓	✓			✓
			✓			✓
	✓		✓			✓
	✓	✓	✓			✓
	✓	✓	✓			✓
	✓	✓	✓		✓	✓
	✓		✓		✓	✓
	✓					

CONCLUSION

The Task Force report recommends that managers develop and use FEPs to initiate a structured process for establishing goals and translating them into action. It concludes that such a process is critical for overcoming many of the barriers to EBFM—arguably more so than the creation of scientific knowledge, management capacity, or legal authority. Finally, it finds that managers have the tools to create FEPs in light of evidence that they are already carrying out nearly all the necessary steps.

The full report and a companion Implementation Volume providing extensive guidance on developing FEPs are available at www.LenfestOcean.org/EBFM.

A school of mackerel.

REFERENCES

Andrews, K.S., C.J. Harvey, and P.S. Levin. 2013. Conceptual models and indicator selection process for Washington state's marine spatial planning process. Final report to the Washington Coastal Marine Advisory Council. Available from http://www.msp.wa.gov/wp-content/uploads/2013/07/NOAA_NWFSC_ConceptualModel_FinalReport.pdf.

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About the Lenfest Fishery Ecosystem Task Force

The Task Force is a 14-member panel of natural and social scientists convened by the University of Washington with support from the Lenfest Ocean Program. Its mission was to provide guidance to mangers on implementing EBFM. It held workshops with managers and stakeholders in four U.S. locations (Seattle; New Orleans; Portland, Maine; and Baltimore) from September 2014 to February 2016, deliberated on the benefits, challenges, principles, and best ways to implement EBFM, conducted numerous case studies, and reviewed the literature on EBFM. An advisory panel consisting of past and present fishery management council members, scientists from the National Oceanic and Atmospheric Administration (NOAA), and other management experts provided guidance throughout the process and reviewed the draft report.

TASK FORCE

Timothy Essington, chair, University of Washington

Phillip Levin, co-chair, The Nature Conservancy, University of Washington (formerly NOAA Northwest Fisheries Science Center)

Lee Anderson, University of Delaware

Alida Bundy, Bedford Institute of Oceanography

Courtney Carothers, University of Alaska, Fairbanks

Felicia Coleman, Florida State University

Leah Gerber, Arizona State University

Jonathan Grabowski, Northeastern University

Edward Houde, University of Maryland Center for Environmental Science

Olaf Jensen, Rutgers University

Christian Möllmann, University of Hamburg

Kenneth Rose, Louisiana State University

James Sanchirico, University of California, Davis

Tony Smith, CSIRO Australia

NOAA FISHERIES LIAISONS

Jason Link, Senior Scientist for Ecological Research

Douglas Lipton, Senior Research Economist

Richard Methot, Science Advisor for Stock Assessments

ADVISORY PANEL

Phillip Levin, chair, The Nature Conservancy, University of Washington (formerly NOAA Northwest Fisheries Science Center)

Michele Culver, Washington Department of Fish and Wildlife

Mark Dickey-Collas, International Council for the Exploration of the Sea

Michelle Duval, North Carolina Department of Environment and Natural Resources

Michael Fogarty, NOAA Northeast Fisheries Science Center

Peter Kendall, commercial fisherman

Julie Morris, New College of Florida

Galen Tromble, NOAA Fisheries

Bill Tweit, Washington Department of Fish and Wildlife

PROJECT MANAGEMENT TEAM

Kristin Marshall, University of Washington

Laura Koehn, University of Washington

The Lenfest Ocean Program is a grantmaking program that funds scientific research on policy-relevant topics concerning the world's oceans and communicates the results. Supported research projects are motivated by policy questions for which additional scientific information could help inform decision makers of relevant marine science. The Program was established in 2004 by the Lenfest Foundation and is managed by The Pew Charitable Trusts (www.lenfestocean.org, Twitter handle: @LenfestOcean).

Founded in 1919, the **School of Aquatic and Fishery Sciences** (SAFS) is dedicated to sustaining healthy marine and freshwater environments. Our faculty conduct innovative research from the organism to the ecosystem scale and are recognized leaders in aquatic biology, sustainable fisheries management, aquatic resource conservation, and resource management. We study natural systems and species and present solutions to foster the sustainable use of aquatic resources.

901 E Street NW,
Washington DC 20004

info@lenfestocean.org
lenfestocean.org

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