Science, Service, Stewardship

Ecosystem-Based Fisheries Management

Kenric Osgood, Ph.D.
Chief, Marine Ecosystems Division
Office of Science & Technology

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New Council Member Training
November 30, 2011

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Outline

- Definitions
- Why do we need more focus on ecosystems?
- What are the important characteristics and benefits of Ecosystem-Based (Fisheries) Management (EB(F)M)?
- Some ongoing efforts to coordinate science & management for EBFM.
- Transition from traditional fisheries management to EBFM

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What is an ecosystem?

<u>NOAA's Ecosystem Definition</u>

A geographically specified system of organisms (including humans), and the environment and the processes that control its dynamics.

The environment is the biological, chemical, physical and social conditions that surround organisms.

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What is Ecosystem-Based Management?

- Ecosystem-based management (EBM) is:
  - geographically specified
  - adaptive
  - takes account of ecosystem knowledge & uncertainties
  - considers multiple external influences
  - strives to balance diverse social objectives (tradeoffs)

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What is Ecosystem-Based Fisheries Management

- The dimension of EBM that deals specifically with fisheries.
- Need to make sure that as an EBFM approach is developed, it can be fully integrated into the more comprehensive EBM framework.
- Ultimately, EBFM initiatives by the Councils will become a key component of EBM

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Why an Ecosystem Approach to Management?

Finding #11:
A number of the Fishery Management Councils have demonstrated significant progress in ***integrating ecosystem considerations in fisheries management using the existing authorities provided under this Act.***

Definition of Optimum Yield:
…will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the ***protection of marine ecosystems.***

Establishment of Ecosystem Panel:
Not later than 180 days after the date of enactment of the Sustainable Fisheries Act, the Secretary shall establish an advisory panel under this Act to develop recommendations to ***expand the application of ecosystem principles in fishery conservation and management activities.***

MSA 2007

Magnuson-Stevens Fishery Conservation and Management Act

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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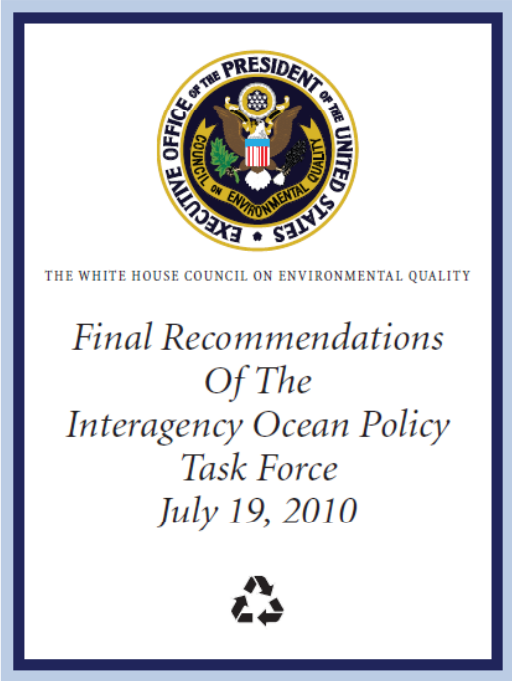
Why an Ecosystem Approach to Management?


THE WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY

Final Recommendations Of The Interagency Ocean Policy Task Force
July 19, 2010

In 2010, President Obama signed an Executive order implementing a new National Ocean Policy. The Policy establishes Ecosystem-Based Management as a foundational principle for ocean resource management in the United States.

"U.S. ocean and coastal resources should be managed to reflect the relationships among all ecosystem components, including human and nonhuman species and the environments in which they live. Applying this principle will require defining relevant geographic management areas based on ecosystem, rather than political, boundaries."

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Why an Ecosystem Approach to Management? Example Interactions

Biological (e.g. predator-prey, competition)

Physical & Chemical (including climate)

Fishing Effects

Regulatory

Other Socio-economic Activities

If manage a stock in a vacuum and don't take linked biological, physical, and/or chemical components in the system into account, will have "sub-optimal" management results…

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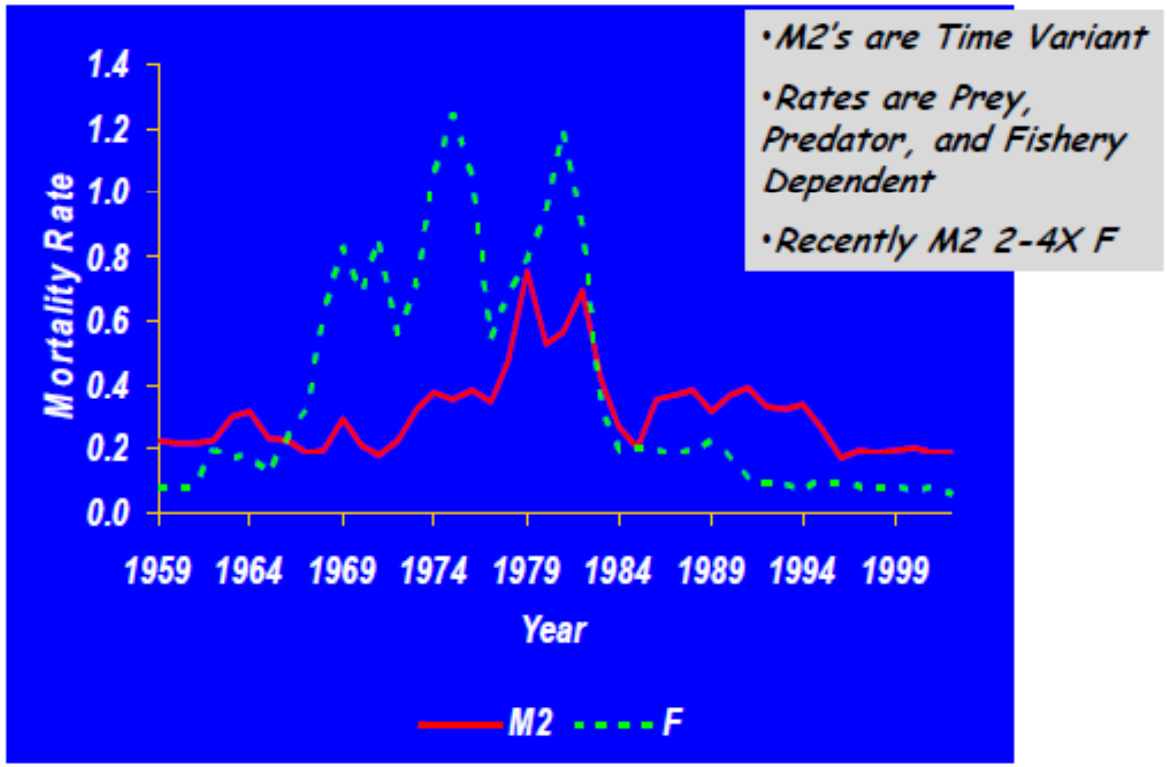
Common Observations



Mortality rates (M2 & F) for Atlantic herring

Overholtz & Link. 2007.
ICES J. Mar. Sci. 64:83-96.

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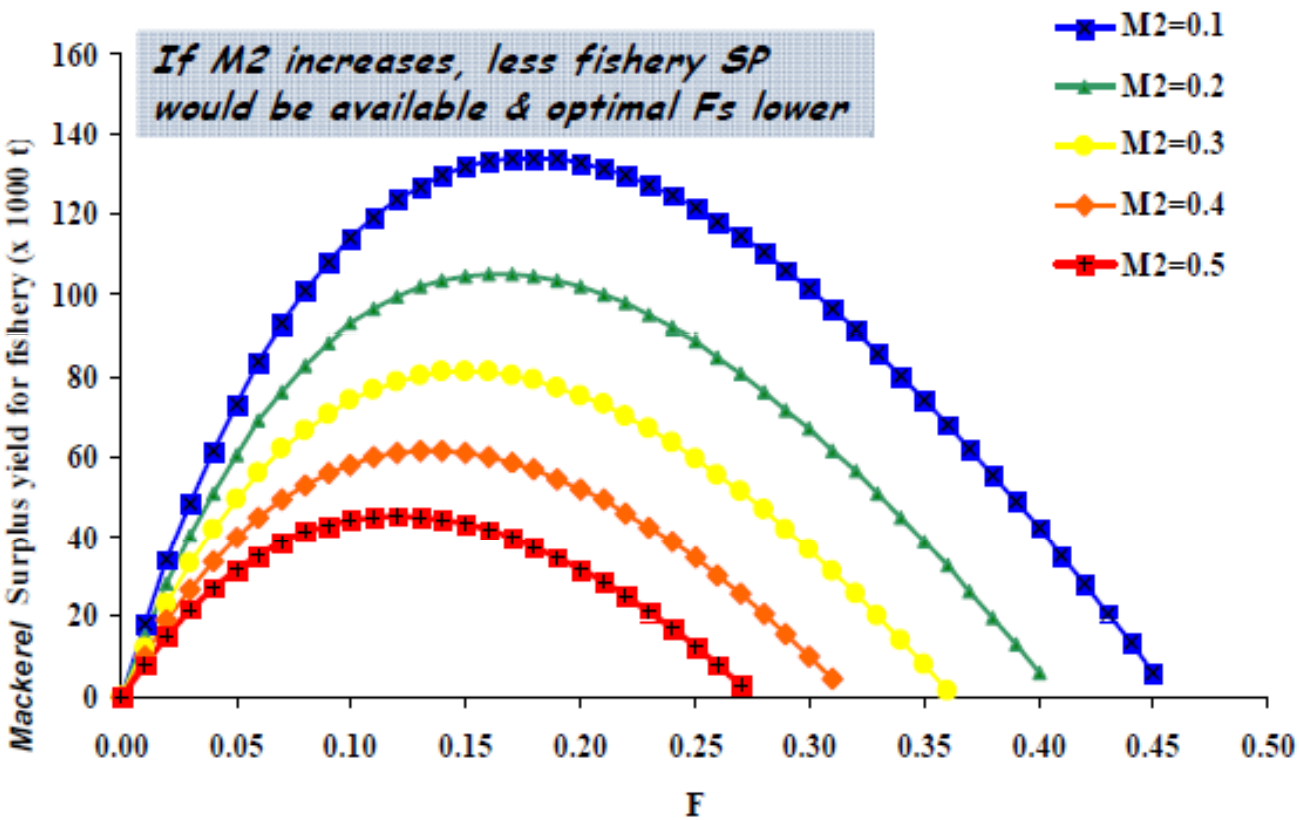
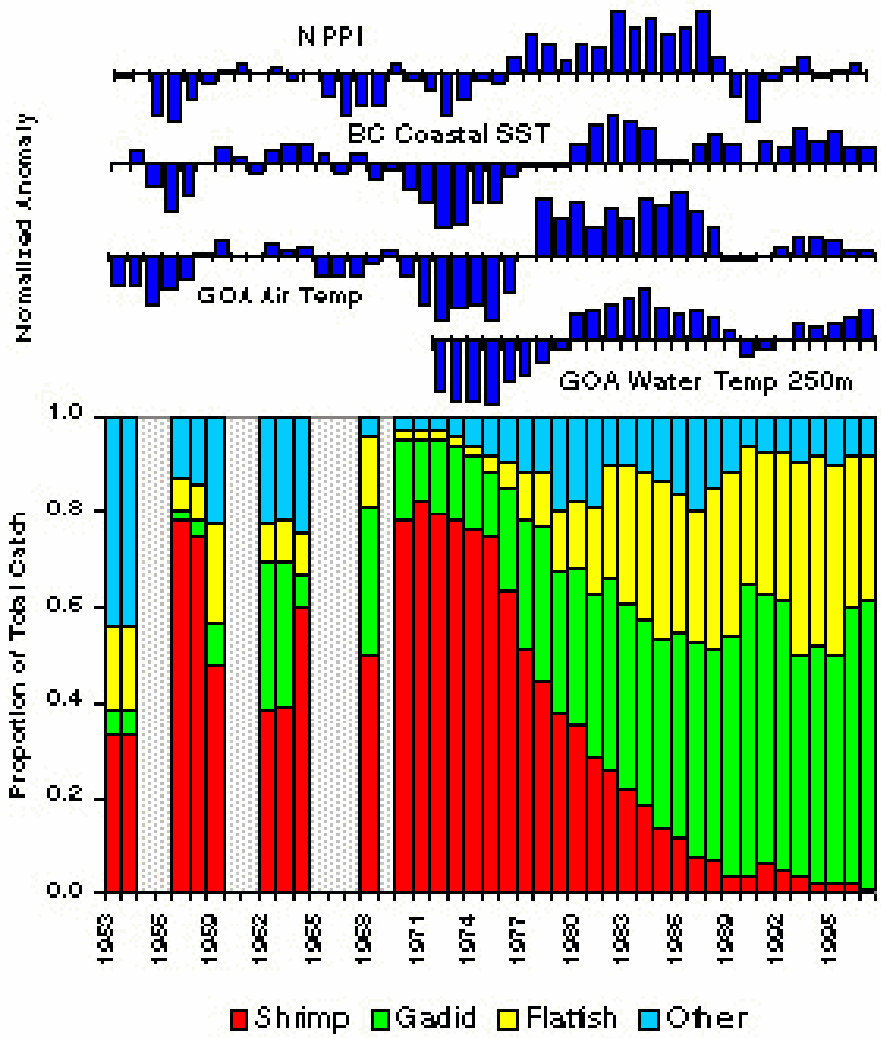
So what difference does it make?



Moustahfid et al. 2009. *ICES J. Mar. Sci. 66: 445-454*

Climate shifts perturb fisheries and have socio-economic impacts.



(from Anderson and Piatt, 1999)

Late 1960's

Late 1970's

1980's

Bottom trawl surveys, Pavlov Bay, AK

(from Botsford et al. 1997)

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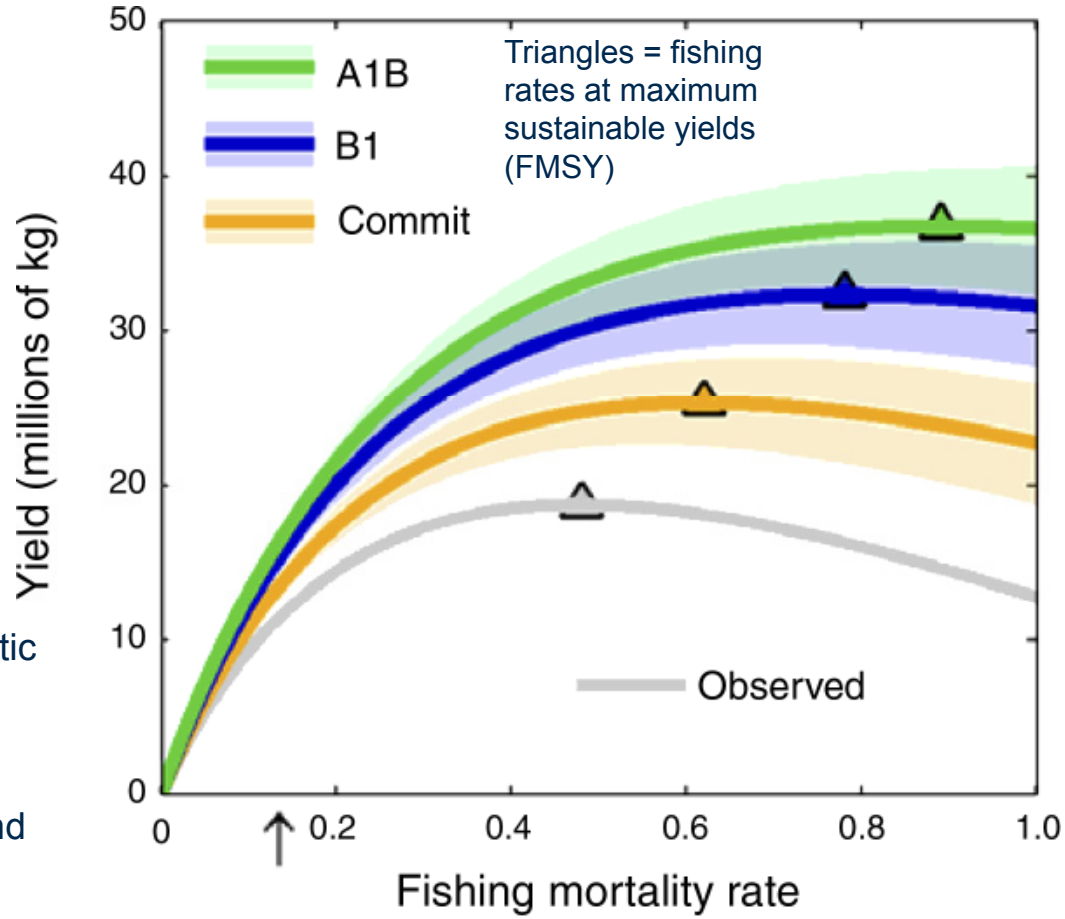
Resource levels under future climate conditions?



Atlantic croaker fishery yield, in the mid-Atlantic region, as a function of fishing mortality rate based on the temperature-dependent stock–recruitment model and ensemble multi-model mean of three climate scenarios (A1B, B1, and commit). (Hare et al. 2010)

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Evolution in Approach to Science and Management: An Ecosystem-Based Approach

Focus on Managing Ecosystem Parts

Focus on Ecosystem Relationships, Processes, and Tradeoffs

FROM	TO
Individual species	**Ecosystems**
Small spatial scale	**Multiple scales**
Short-term perspective	**Long-term perspective**
Humans: independent of ecosystems	**Humans: integral part of ecosystems**
Management divorced from research	**Adaptive management**
Managing commodities	**Sustaining production potential for goods and services**

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Some Benefits of Adopting EBFM

• Potential simplification of management in moving from a large number of stock-based management plans to fewer integrated plans for ecologically defined areas

• More effective coordination of management actions for fisheries, protected resource species, biodiversity conservation, and habitat protection

• Direct accounting for fishery interactions (e.g., bycatch) and biological considerations (e.g., predation, biodiversity, habitat requirements, protected resources) along with climate change and environmental variability within a single framework

• Consideration of biological constraints on simultaneous efforts to rebuild stocks to long-term target levels and evaluation of compatibility with stock– specific recovery plans

• Increased stewardship from broader participation of stakeholders, wider sharing of ecological and fisheries knowledge, and greater opportunities for developing place-based governance approaches and co-management

• Potential for greater stability and predictability by focusing on higher-level ecosystem processes, resulting in more predictable planning horizons for the fishing industry

NEFSC EBFM brochure, 2010

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NOAA's Integrated Ecosystem Assessment (IEA) Program

- IEAs provide a sound scientific basis for EBM.
- IEAs provide a framework for organizing & synthesizing science to inform multi-scale, multi-sector EBM.
- They are "a synthesis and quantitative analysis of information on relevant physical, chemical, ecological, and human processes in relation to specified management objectives"
- The resulting analyses, done at scales relevant to management questions, provide resource managers with information to make more informed and effective management decisions.

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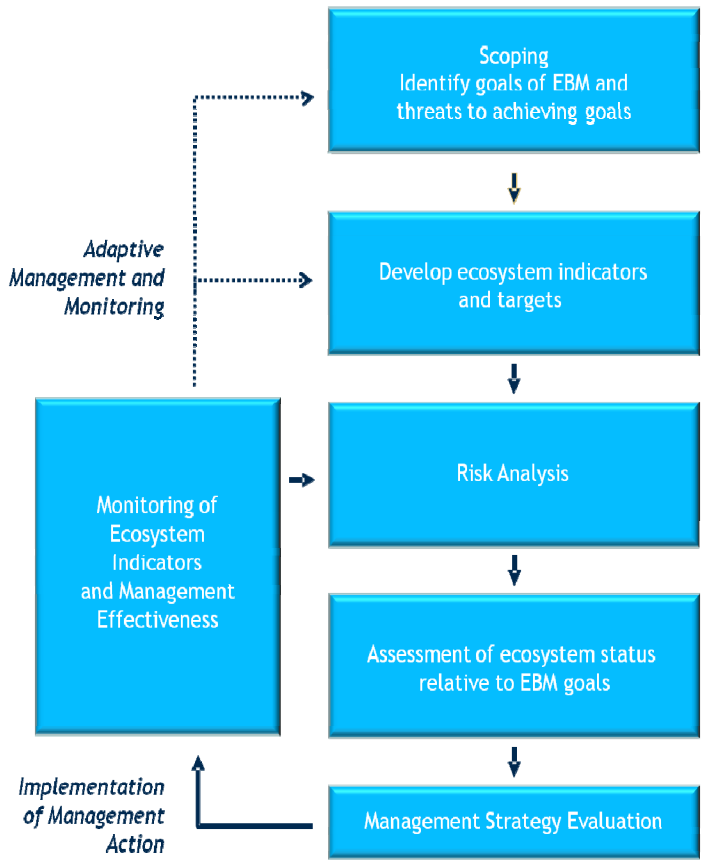
NOAA's Integrated Ecosystem Assessment (IEA) Program

- NOAA's IEA approach is an iterative decision-support process that uses diverse data and ecosystem models.
- Once EBM objectives are agreed to by resource managers and stakeholders, models are used to simulate the future outcome of potential management actions.
- These outcomes allow a comparison of the possible economic and ecological trade-offs to guide management decisions.
- After a management plan has been implemented, the process can be repeated in the future to evaluate the effectiveness of the plan (adaptive management)
- Each step of the IEA contributes to this process to provide for better management of ocean and coastal resources through an ecosystem-based approach



The IEA loop
(Levin et al. 2008, 2009)

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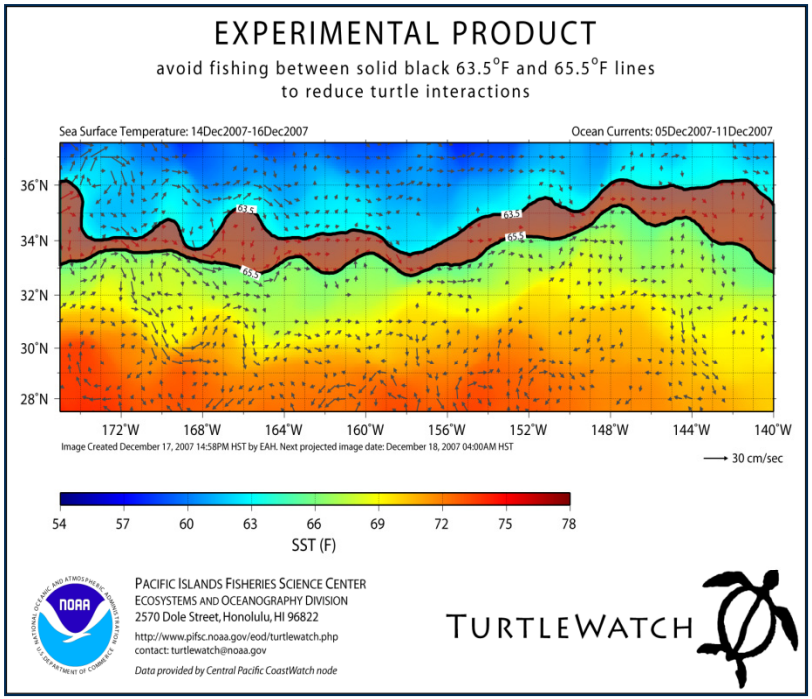
Fisheries and the Environment (FATE)



Indicators summarized in a stoplight chart

Environmental Variables	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
PDO (December-March)	11	4	2	8	5	12	7	10	9	6	3	1
PDO (May-September)	9	2	3	4	6	11	10	12	8	7	1	5
MEI Annual	12	1	3	5	11	10	8	9	6	4	2	7
MEI Jan-June	12	2	3	5	8	10	7	11	4	9	1	6
SST at 46050 (May-Sept)	10	8	3	4	1	6	12	9	5	11	2	7
SST at NH 05 (May-Sept)	8	2	1	4	6	7	12	11	5	9	3	10
SST winter before going to sea	12	7	5	6	4	8	11	10	9	3	1	2
Physical Spring Trans (Logerwell)	8	7	2	1	4	10	9	12	10	3	6	5
Upwelling (Apr-May)	7	1	11	3	6	10	9	12	7	2	4	5
Deep Temperature at NH 05	12	5	6	3	1	8	9	10	11	4	2	7
Deep Salinity at NH05	12	5	6	4	3	10	11	8	7	1	2	9
Length of upwelling season	7	3	2	10	1	11	9	12	6	5	8	4
Copepod richness	12	2	1	5	3	9	8	11	10	6	4	7
N.Copepod Anomaly	12	9	3	6	2	10	7	11	8	5	1	4
Biological Transition	11	5	4	7	6	10	8	12	9	2	1	3
Copepod Community structure	12	3	4	6	1	8	9	11	10	7	2	5
Catches of salmon in surveys												
June-Chinook Catches	11	2	3	9	6	8	10	12	7	5	1	4
Sept-Coho Catches	9	2	1	4	3	5	10	11	7	8	6	12
Mean of Ranks of Environmental Data	10.4	3.9	3.5	5.2	4.3	9.1	9.2	10.8	7.7	5.4	2.8	5.7
RANK of the mean rank	11	3	2	5	4	9	10	12	8	6	1	7

Thermal habitat of loggerhead sea turtles to help Hawaiian long-line fishery avoid by-catch.
E. Howell (PIFSC)

Summary of ecosystem indicators used to predict coho salmon ocean survival. Forecast updated January 2011 W. Peterson (NWFSC)

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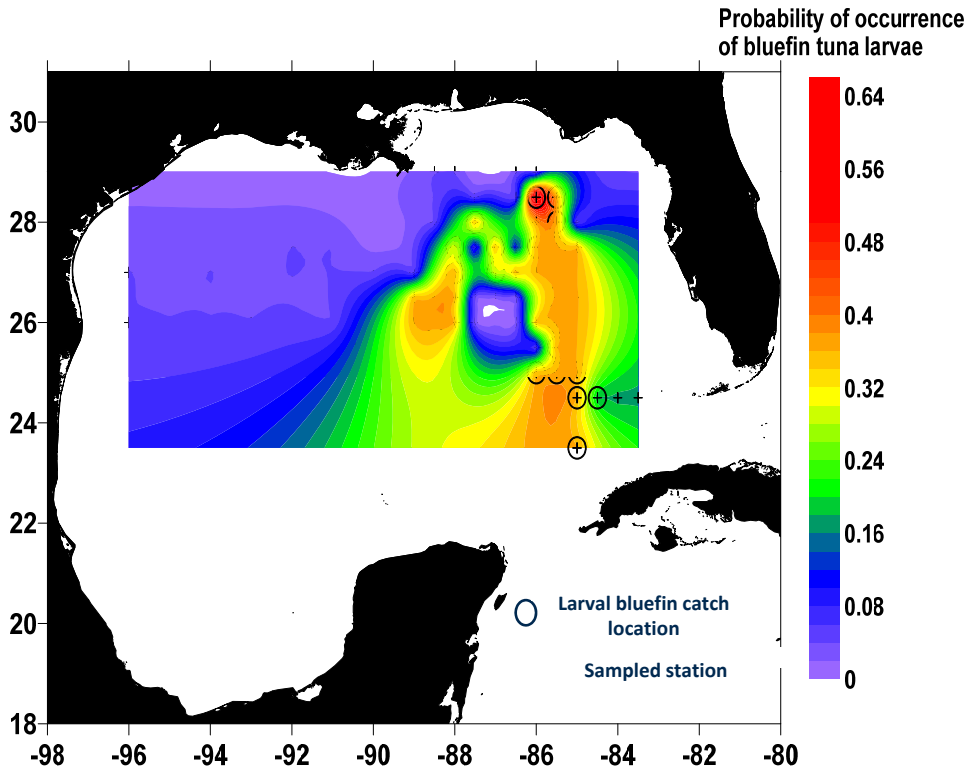
Fisheries and the Environment (FATE)



Probability of bluefin tuna larvae relative to ocean habitat. B. Muhling (SEFSC)

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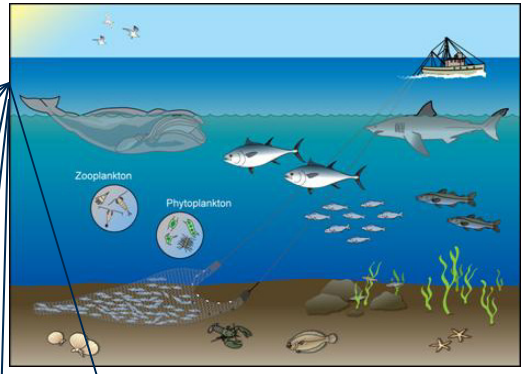
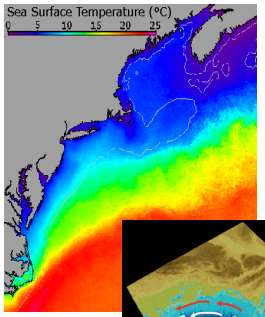
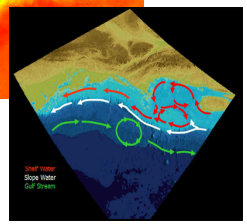
NEFSC

Marine Ecosystem

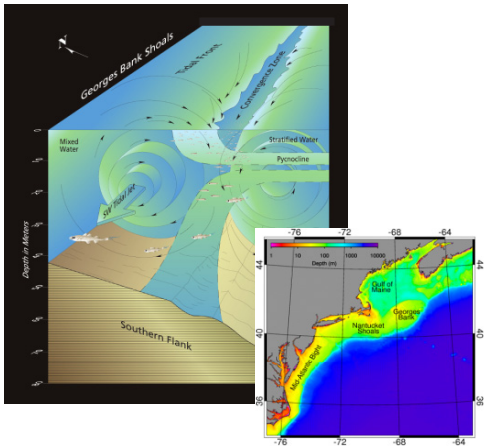




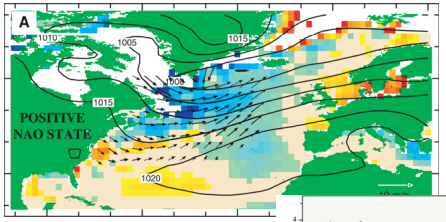


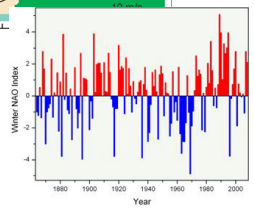
Oceanography

Phytoplankton: The Base of the Food Web



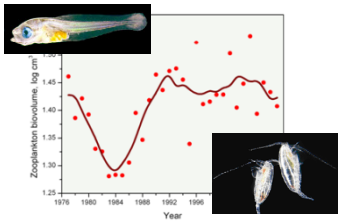
Physical Setting and Habitat





Climate

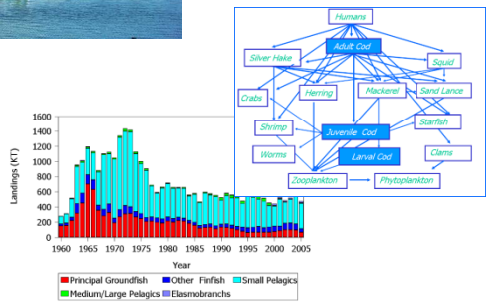
Invasive Species

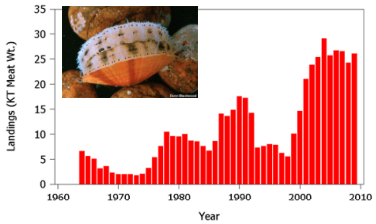


Zooplankton

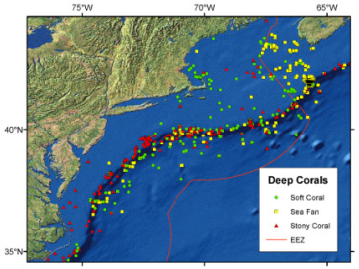
Human Dimensions

Fish and Squid





Bottom Life



Deep Corals

Protected Species

http://www.nefsc.noaa.gov/ecosys/ecology/index.html

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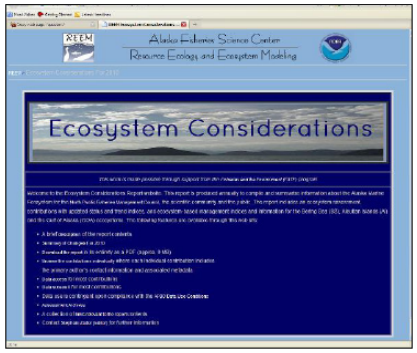
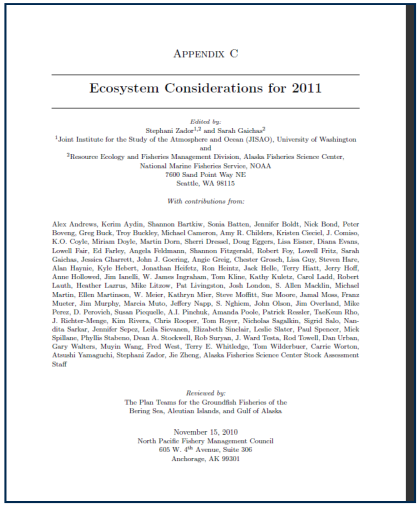
AFSC

Resource Ecology and Ecosystem Management: Ecosystems Considerations Report

- Ultimate goal is to have quantitative predictions from this research to guide management.
- However, these efforts already serve as indicators of ecosystem status and trends.
- These indicators can provide an early warning system for managers, signaling human or environmentally-induced changes that may warrant management action.
- They can also serve to track the success of previous ecosystem-oriented management efforts.

http://access.afsc.noaa.gov/reem/ecoweb/index.cfm





Appendix C

Ecosystem Considerations for 2011

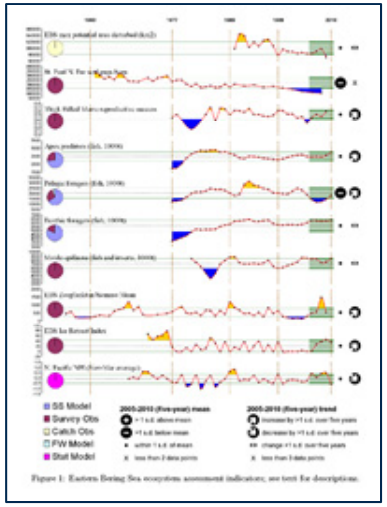
Edited by:
Stephani Zador[1,2] and Sarah Gaichas[2]
[1]Joint Institute for the Study of the Atmosphere and Ocean (JISAO), University of Washington
and
[2]Resource Ecology and Fisheries Management Division, Alaska Fisheries Science Center,
National Marine Fisheries Service, NOAA
7600 Sand Point Way NE
Seattle, WA 98115

With contributions from:

Alex Andrews, Kerim Aydin, Shannon Bartkiw, Sonia Batten, Jennifer Boldt, Nick Bond, Peter Bovong, Greg Buck, Troy Buckley, Michael Cameron, Amy R. Childers, Kristen Cieciel, J. Comiso, K.O. Coyle, Miriam Doyle, Martin Dorn, Sherri Dressel, Doug Eggers, Lisa Eisner, Diana Evans, Lowell Fair, Ed Farley, Angela Feldmann, Shannon Fitzgerald, Robert Foy, Lowell Fritz, Sarah Gaichas, Jessica Gharrett, John J. Goering, Angie Greig, Chester Grosch, Lisa Guy, Steven Hare, Alan Haynie, Kyle Hebert, Jonathan Heintz, Ron Heintz, Jack Helle, Terry Hiatt, Jerry Hoff, Anne Hollowed, Jim Ianelli, W. James Ingraham, Tom Kline, Kathy Kuletz, Carol Ladd, Robert Lauth, Heather Lazrus, Mike Litzow, Pat Livingston, Josh London, S. Allen Macklin, Michael Martin, Ellen Martinson, W. Meier, Kathryn Mier, Steve Moffitt, Sue Moore, Jamal Moss, Franz Mueter, Jim Murphy, Marcia Muto, Jeffery Napp, S. Nghiem, John Olson, Jim Overland, Mike Perez, D. Petrovich, Susan Picquelle, A.I. Pinchuk, Amanda Poole, Patrick Ressler, TaeKeun Rho, J. Richter-Menge, Kim Rivera, Chris Roeper, Tom Royer, Nicholas Sagalkin, Sigrid Salo, Nandita Sarkar, Jennifer Sepez, Leila Sievanen, Elizabeth Sinclair, Leslie Slater, Paul Spencer, Mick Spillane, Phyllis Stabeno, Dean A. Stockwell, Rob Suryan, J. Ward Testa, Rod Towell, Dan Urban, Gary Walters, Muyin Wang, Fred West, Terry E. Whitledge, Tom Wilderbuer, Carrie Worton, Atsushi Yamaguchi, Stephani Zador, Jie Zheng, Alaska Fisheries Science Center Stock Assessment Staff

Reviewed by:
The Plan Teams for the Groundfish Fisheries of the
Bering Sea, Aleutian Islands, and Gulf of Alaska

November 15, 2010
North Pacific Fishery Management Council
605 W. 4th Avenue, Suite 306
Anchorage, AK 99301



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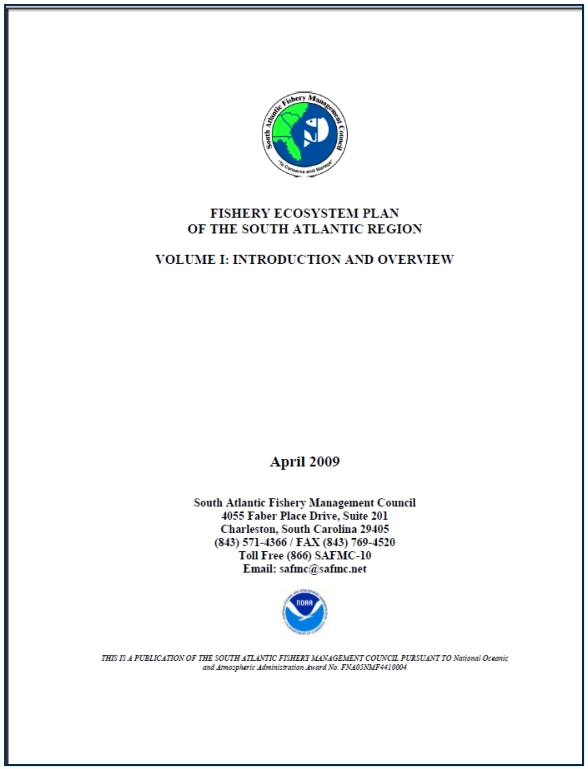
SAFMC Fishery Ecosystem Plan and Comprehensive Ecosystem-Based Management Amendment



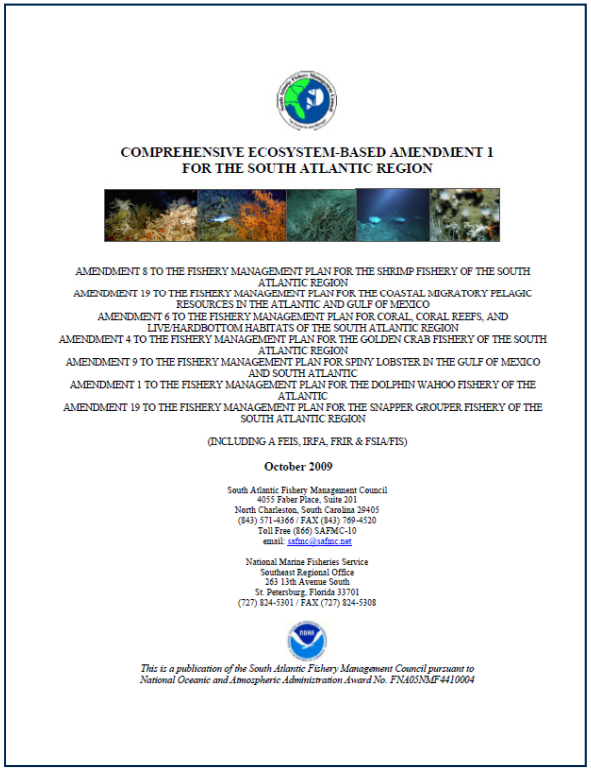
FISHERY ECOSYSTEM PLAN
OF THE SOUTH ATLANTIC REGION

VOLUME I: INTRODUCTION AND OVERVIEW

April 2009

South Atlantic Fishery Management Council
4055 Faber Place Drive, Suite 201
Charleston, South Carolina 29405
(843) 571-4366 / FAX (843) 769-4520
Toll Free (866) SAFMC-10
Email: safmc@safmc.net

THIS IS A PUBLICATION OF THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL PURSUANT TO National Oceanic and Atmospheric Administration Award No. FNA05NMF4410004



COMPREHENSIVE ECOSYSTEM-BASED AMENDMENT 1
FOR THE SOUTH ATLANTIC REGION

AMENDMENT 8 TO THE FISHERY MANAGEMENT PLAN FOR THE SHRIMP FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 19 TO THE FISHERY MANAGEMENT PLAN FOR THE COASTAL MIGRATORY PELAGIC RESOURCES IN THE ATLANTIC AND GULF OF MEXICO
AMENDMENT 6 TO THE FISHERY MANAGEMENT PLAN FOR CORAL, CORAL REEFS, AND LIVE/HARDBOTTOM HABITATS OF THE SOUTH ATLANTIC REGION
AMENDMENT 4 TO THE FISHERY MANAGEMENT PLAN FOR THE GOLDEN CRAB FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 9 TO THE FISHERY MANAGEMENT PLAN FOR SPINY LOBSTER IN THE GULF OF MEXICO AND SOUTH ATLANTIC
AMENDMENT 1 TO THE FISHERY MANAGEMENT PLAN FOR THE DOLPHIN WAHOO FISHERY OF THE ATLANTIC
AMENDMENT 19 TO THE FISHERY MANAGEMENT PLAN FOR THE SNAPPER GROUPER FISHERY OF THE SOUTH ATLANTIC REGION

(INCLUDING A FEIS, IRFA, FRIR & FSIA/FIS)

October 2009

South Atlantic Fishery Management Council
4055 Faber Place, Suite 201
North Charleston, South Carolina 29405
(843) 571-4366 / FAX (843) 769-4520
Toll Free (866) SAFMC-10
email: safmc@safmc.net

National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701
(727) 824-5301 / FAX (727) 824-5308

This is a publication of the South Atlantic Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award No. FNA05NMF4410004

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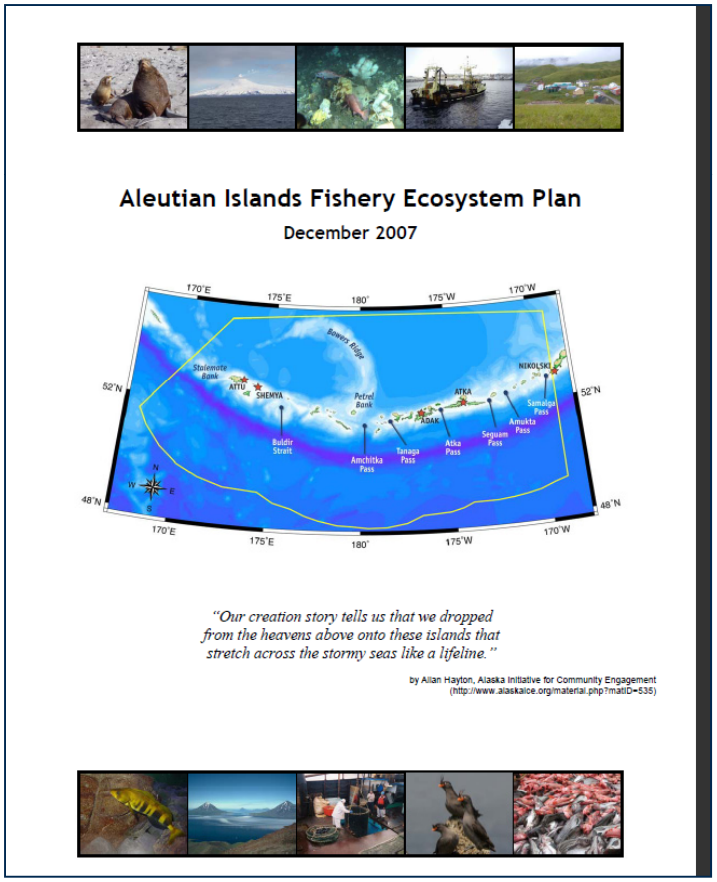
NPFMC – Aleutian Islands FEP and Alaska Marine Ecosystem Forum



Aleutian Islands Fishery Ecosystem Plan

December 2007

"Our creation story tells us that we dropped from the heavens above onto these islands that stretch across the stormy seas like a lifeline."

by Allan Hayton, Alaska Initiative for Community Engagement (http://www.alaskaice.org/material.php?matID=535)

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NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

Managing our Nation's Fisheries off the Coast of Alaska

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- Annual Catch Limits
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- Bycatch Controls
- Fishery Management Plans

HOW DO I?

How do I get involved?

How do I navigate the NPFMC process?

RURAL OUTREACH

Alaska Marine Ecosystem Forum

The Council has signed a Memorandum of Understanding (MOU) with 10 Federal agencies and 4 State agencies, to create the Alaska Marine Ecosystem Forum (AMEF). The AMEF seeks to improve coordination and cooperative understanding between the agencies on issues of shared responsibilities related to the marine ecosystems off Alaska's coast. The purpose of the forum is to:

- Promote dialogue and information exchange.
- Improve agency coordination by sharing priorities and data.
- Allow agencies to understand the ecosystem impact of other activities.
- Provide opportunities for problem solving and joint work.

Meetings

2011 - August 9: Agenda
2010 - January 25: Agenda, Meeting Summary, Handouts
2009 - June 10: Agenda; Meeting Summary, Handouts
2008 - August 7: Agenda, Meeting Summary
2008 - January 28: Agenda; Meeting Summary, Handouts
2007 - July 26: Agenda; Meeting Summary, Handouts
2006 - September 18: Agenda; Meeting Summary

Alaska Marine Ecosystem Forum Members - Agency heads or Representatives

- North Pacific Fishery Management Council

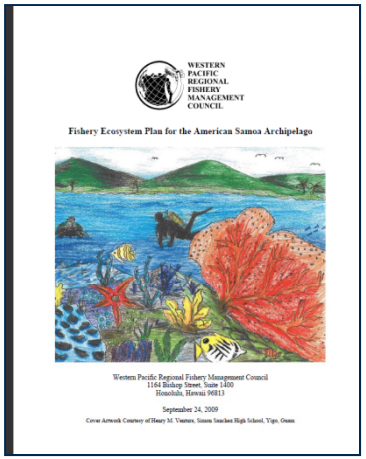
Federal

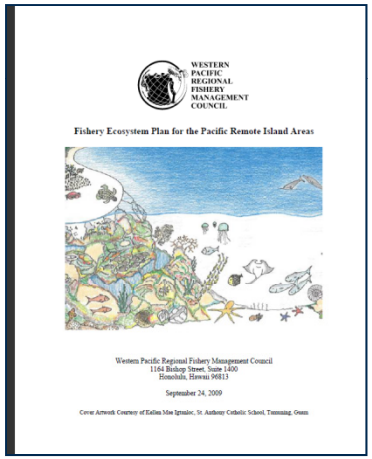
- National Marine Fisheries Service
- Fish and Wildlife Service
- Minerals Management Service
- National Park Service
- Bureau of Land Management
- Environmental Protection Agency
- United States Forest Service
- United States Coast Guard
- Alaskan Command
- United States Army Corps of Engineers

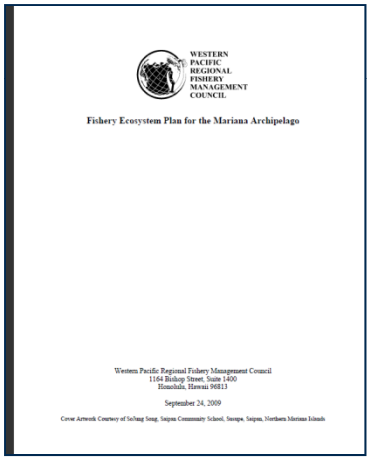
State

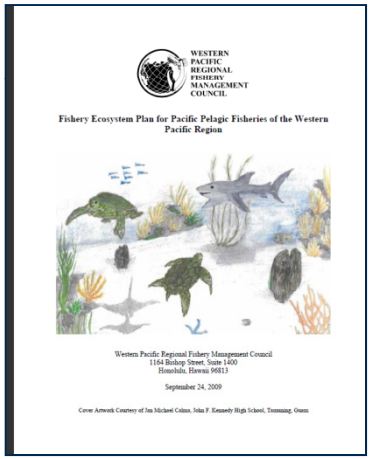
NOAA FISHERIES SERVICE

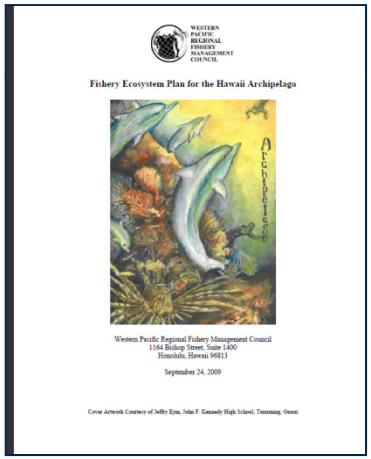
WPFMC: An Ecosystem-Based Approach to Fisheries Management in the US Pacific Islands

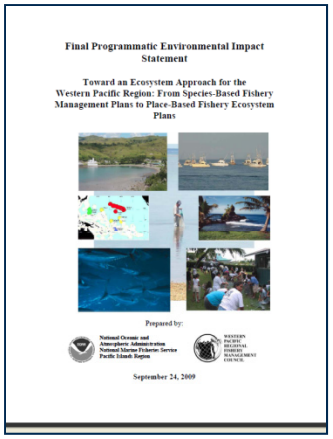












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Implementing Marine Ecosystem-Based Management

- Ecosystem-Based Management is feasible now and we cannot afford not to adopt it. Ignoring interactions among system components can only lead to sub-optimal results.

- Ecosystem-Based Management requires that we directly confront tradeoffs among competing objectives within and among ocean use sectors – this will require deft negotiation. Tradeoffs do not, however, go away if they are ignored.