Ecosystem-Based Fisheries Management

New Council Member Training

NOAA FISHERIES

Office of Science & Technology

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Chief, Marine Ecosystems Division

October 24, 2012

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

What is an ecosystem?

NOAA's Ecosystem Definition

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.

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)

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.

Ecosystem-based fishery management recognizes the physical, biological, economic and social interactions among the affected components of the ecosystem and attempts to manage fisheries to achieve a stipulated spectrum of societal goals, some of which may be in competition.

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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.***

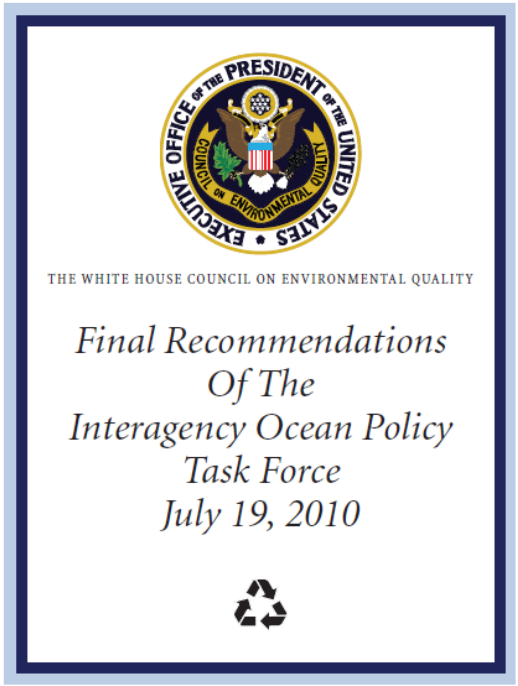
Establishment of Ecosystem Panel:
Not later than 180 days after the date of enactment of the Sustainable Fisheries Act, the Secretary shall establish an advisory panel under this Act to develop recommendations to ***expand the application of ecosystem principles in fishery conservation and management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

MSA 2007

Magnuson-Stevens Fishery Conservation and Management Act

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

Why an Ecosystem Approach to Management?



In 2010, the President 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.

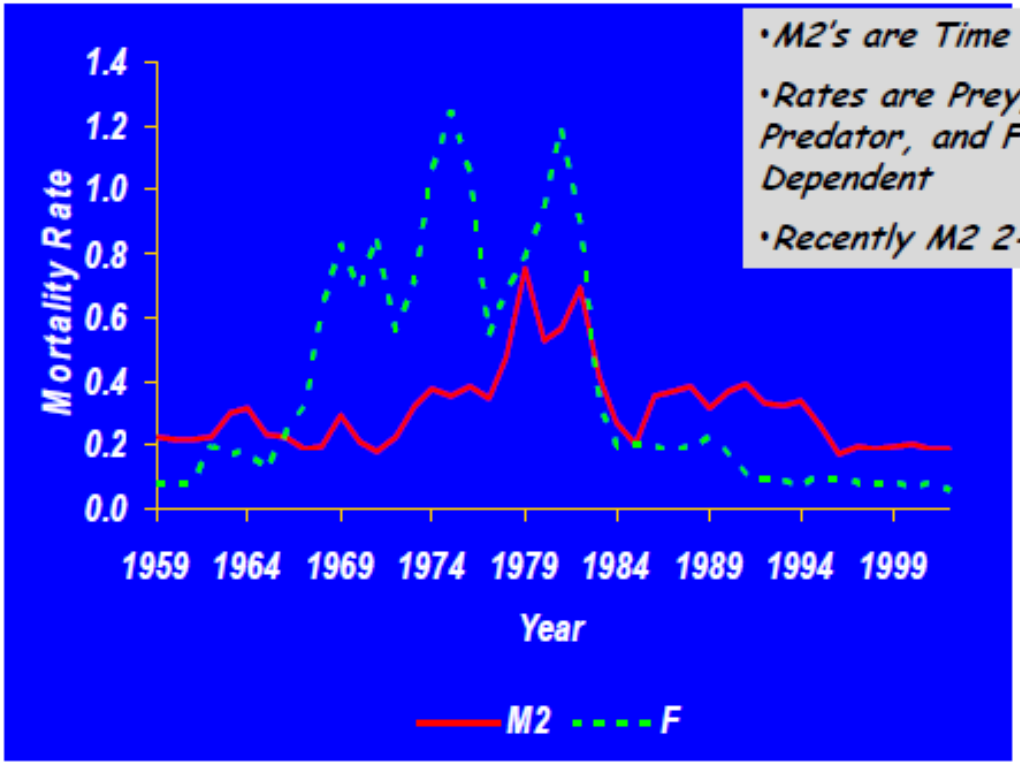
"U.S. ocean and coastal resources should be managed to reflect the relationships among all ecosystem components, including human and nonhuman species and the environments in which they live. Applying this principle will require defining relevant geographic management areas based on ecosystem, rather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

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 chemical components in the system into account, will have "sub-optimal" management results…

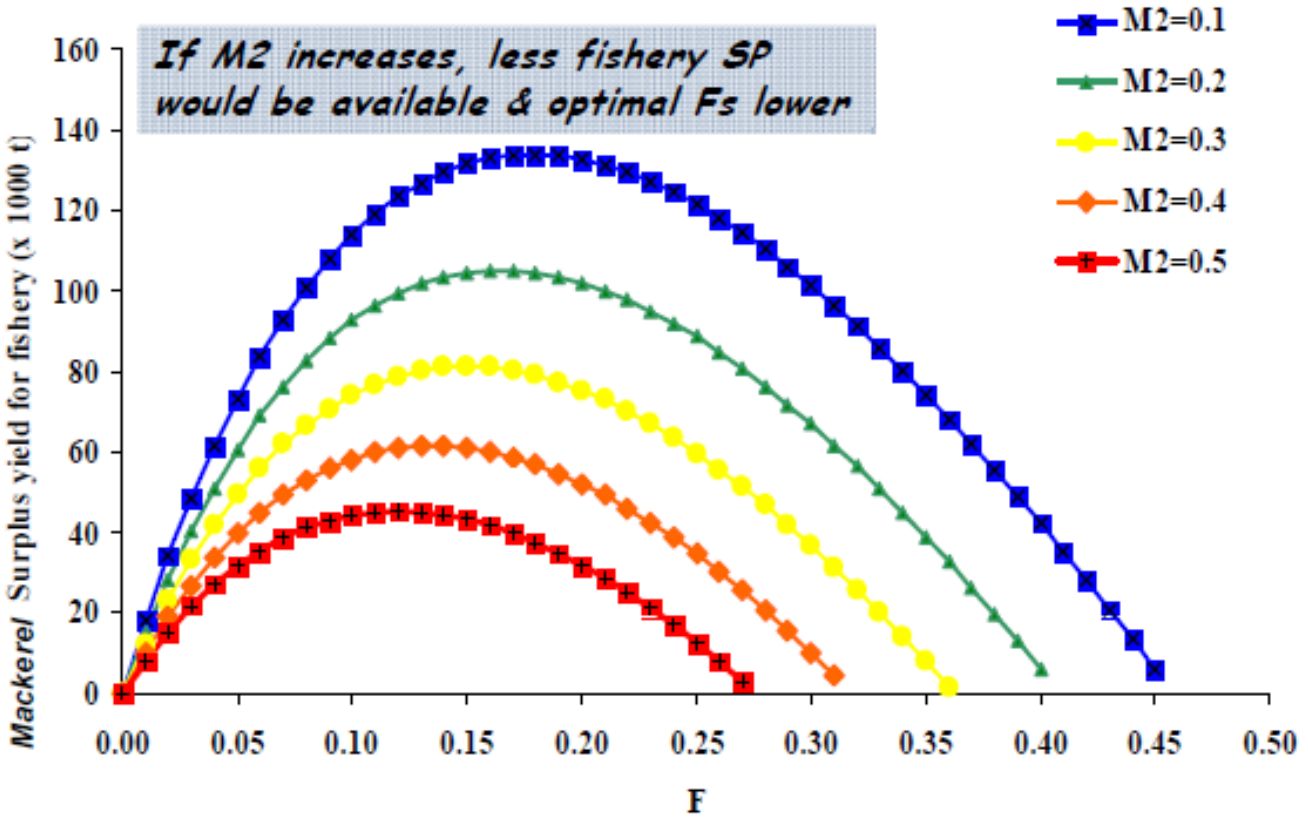
Common Observations



Mortality rates (M2 & F) for Atlantic herring

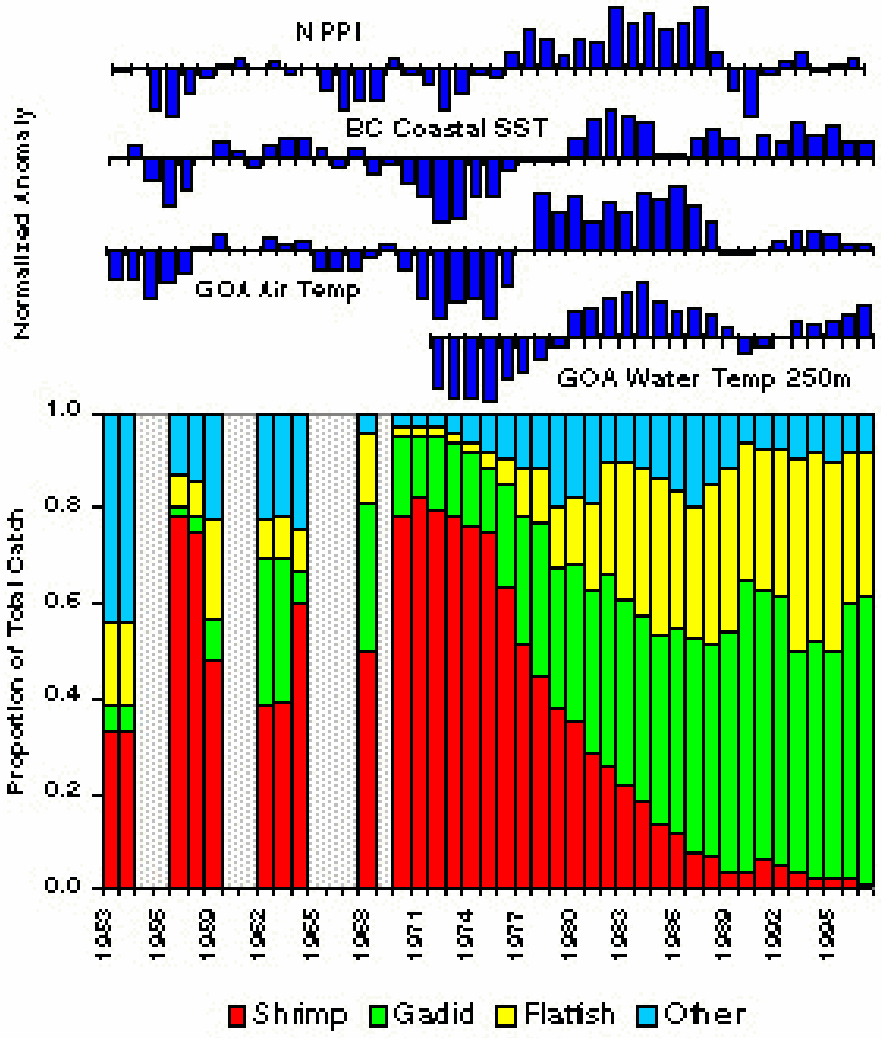
Overholtz & Link. 2007.
ICES J. Mar. Sci. 64:83-96.

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

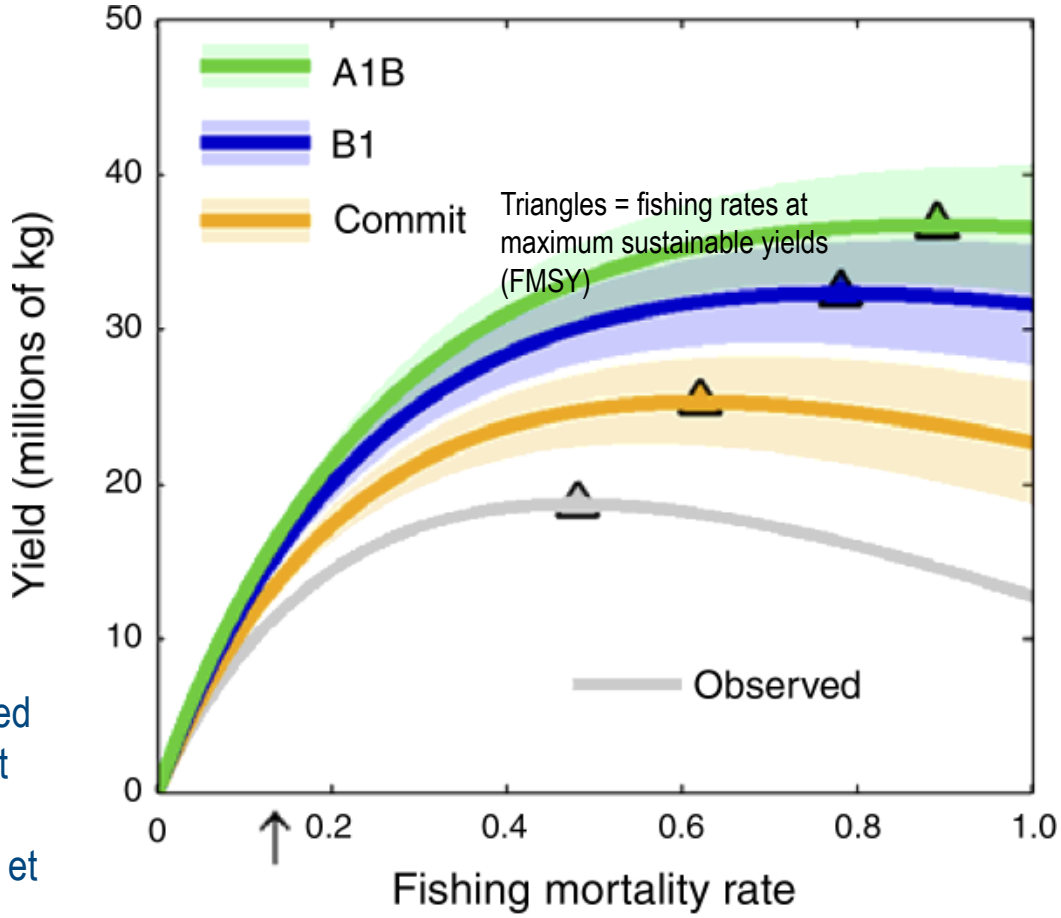
Late 1970's

1980's

Bottom trawl surveys, Pavlov Bay, AK
(from Botsford et al. 1997)

NOAA FISHERIES

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**
Short-term perspective	**Long-term perspective**
Humans: independent of ecosystems	**Humans: integral part of ecosystems**
Resolute management	**Adaptive management**
Managing commodities	**Sustaining production potential for goods and services**

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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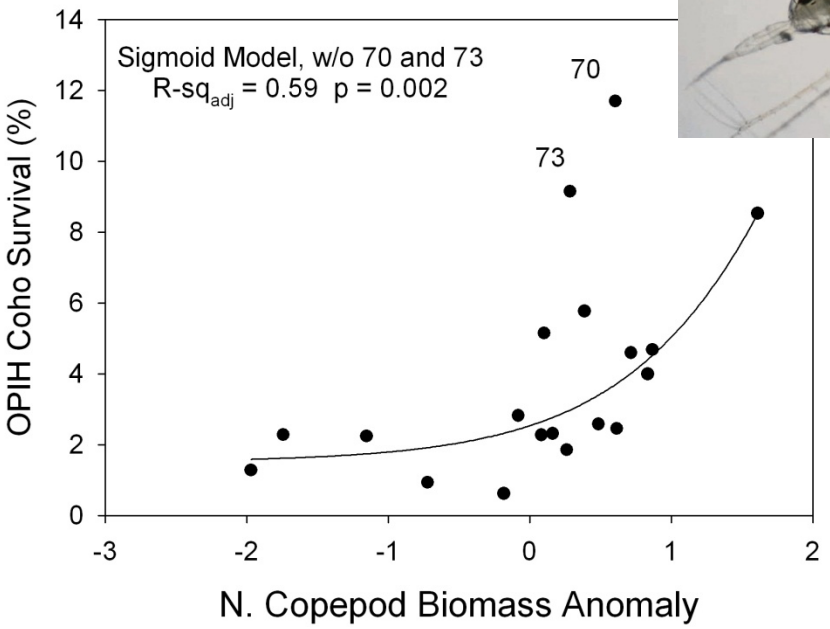
Fisheries and the Environment (FATE)

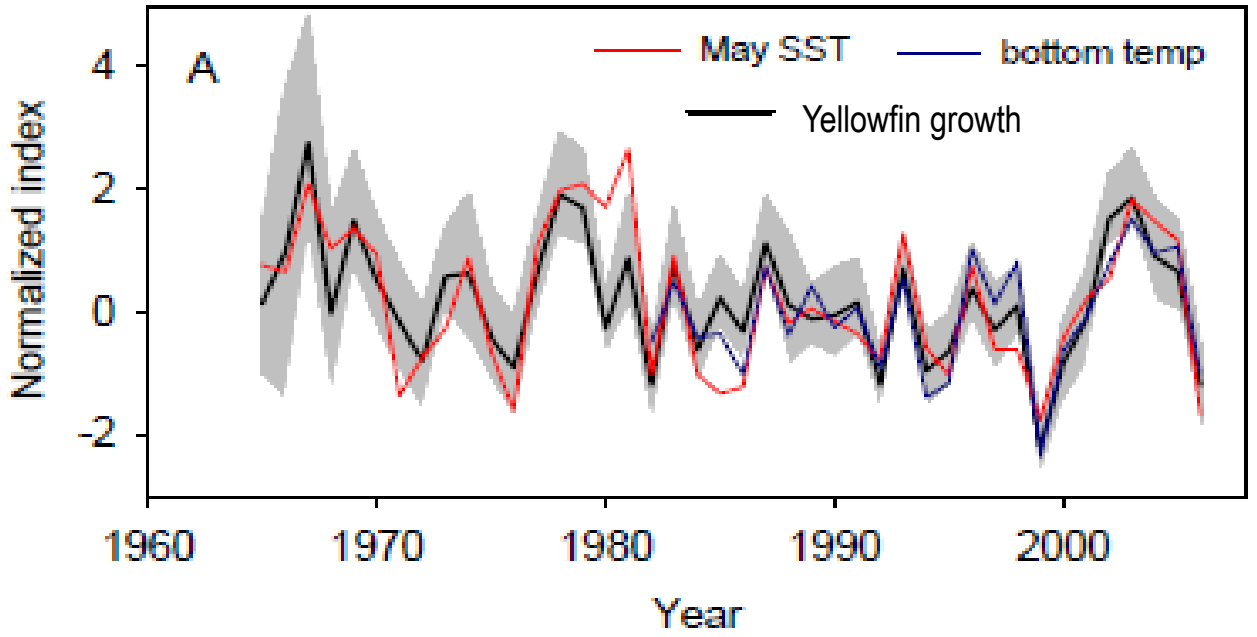


Relationships between plankton (copepods) and Coho Salmon off Oregon allow predictions of survival.

Ecosystem Indicators	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
PDO (December-March)	13	5	2	9	6	14	8	12	10	7	4	1	11	3
PDO (May-September)	8	3	5	4	9	13	12	14	10	11	1	7	6	2
ONI Jan-June	14	1	1	5	10	11	9	12	6	8	3	7	13	4
SST at 46050 (May-Sept)	12	8	3	4	1	7	14	11	5	13	2	9	6	10
SST at NH 05 (May-Sept)	8	4	1	6	2	5	14	11	7	13	3	12	10	9
SST winter before (Nov-Mar)	14	11	3	5	7	10	12	9	8	2	1	4	13	5
Physical Spring Trans (UI Based)	3	6	13	12	4	9	11	14	9	1	5	2	7	8
Upwelling Anomaly (Apr-May)	7	1	12	3	6	10	9	14	7	2	4	5	11	12
Length of upwelling season (UI Based)	6	2	13	9	1	10	8	14	5	3	7	3	11	12
Deep Temperature at NH 05	14	4	7	3	1	10	11	12	13	5	2	9	8	6
Deep Salinity at NH05	14	3	6	2	5	12	13	9	7	1	4	10	11	8
Copepod Richness Anomaly	14	2	1	5	4	10	9	13	11	8	6	7	12	3
N.Copepod Anomaly	13	9	5	6	3	12	11	14	10	8	2	7	4	1
Biological Transition	13	9	6	5	7	12	8	14	11	2	1	4	10	3
Copepod Community structure	14	4	3	6	1	10	11	13	12	8	2	5	9	7
Winter Ichthyoplankton	14	6	2	4	5	13	12	8	11	10	1	7	3	9

Assembling relationships between oceanography and plankton with salmon provide yearly assessments of the conditions surrounding salmon.
William Peterson et al. 2012, NWFSC

Fisheries and the Environment (FATE)

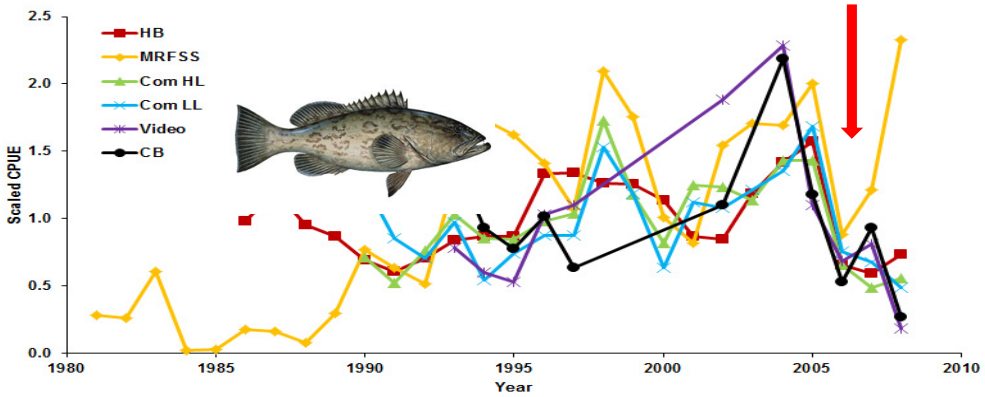


40-year time series of yellowfin sole (Eastern Bering Sea) data allows analysis of the effects of climate.

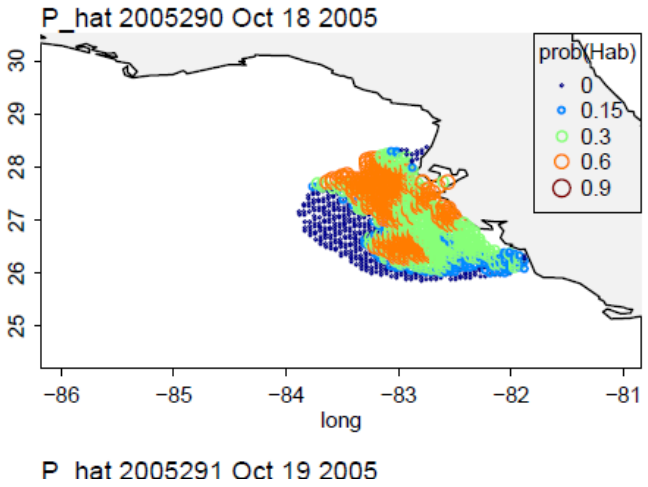
Trend closely follows bottom and surface temperature, which suggests growth Is susceptible to changes in climate.

Bryan Black et al. 2012, OSU and AFSC

Fisheries and the Environment (FATE)



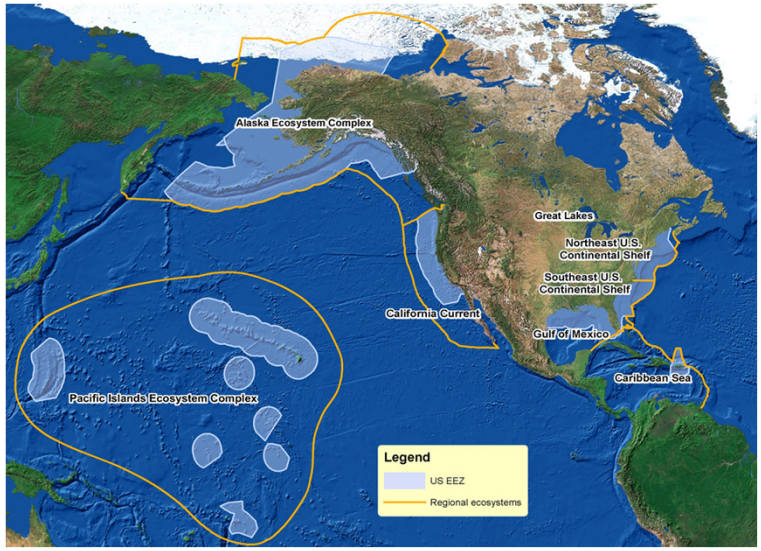
Red and Gag Grouper indices drop ~50% due to mortality from red tides (harmful algal blooms).



New predictive model for red tides off FL coast
Allow incorporation into stock assessment.

John Walter et al. 2012 (SEFSC)

NOAA's Integrated Ecosystem Assessment (IEA) Program

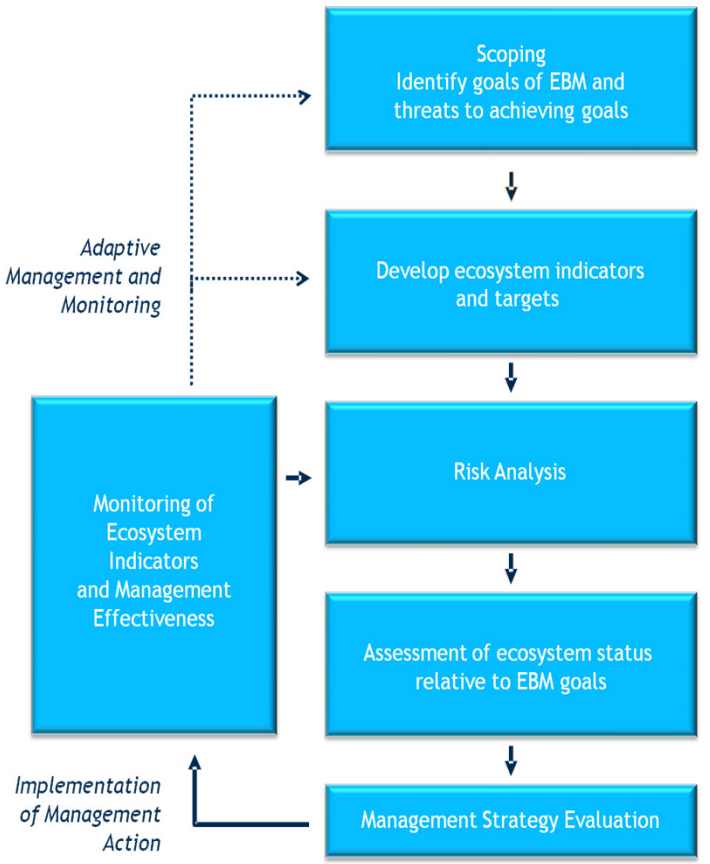


- NOAA's approach to IEAs offers a way to better manage resources to achieve ecologic, economic, and societal objectives.
- IEAs provide a sound scientific basis for EB(F)M.
- They provide a framework for organizing & synthesizing science to inform multi-scale, multi-sector EB(F)M.
- Their primary objective is to make comprehensive information available to inform management decisions.
- IEAs 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.
- NOAA's IEA approach defines a national framework that provides IEA practitioners a consistent, yet flexible, architecture to tailor the process for regional needs.

NOAA's Integrated Ecosystem Assessment (IEA) Program

Integrated Ecosystem Assessments Provide the Analytical Toolbox to Support EB(F)M

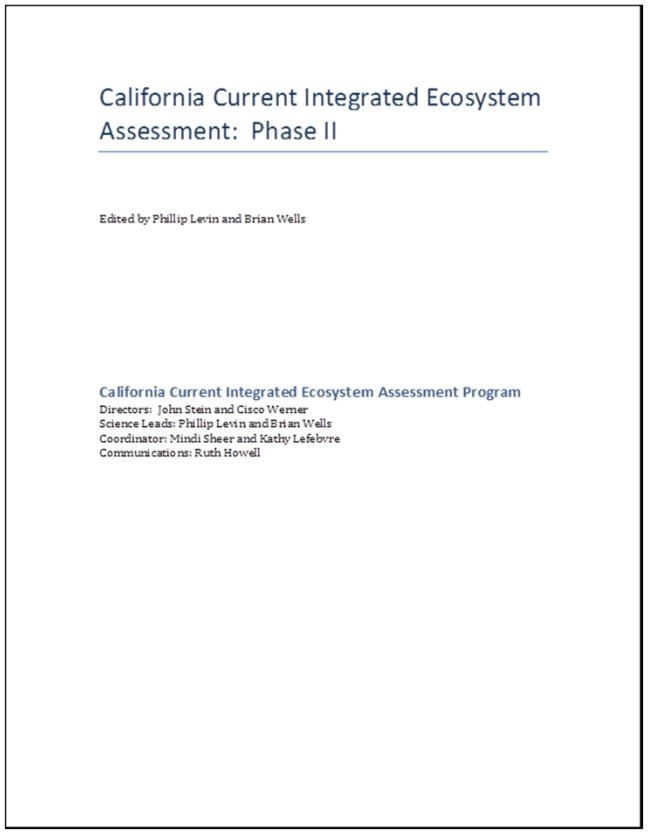
- It is an iterative decision-support process that uses diverse data and ecosystem models.
- Once EB(F)M objectives and targets are defined by resource managers and stakeholders, models are used to simulate the future outcome of potential management actions.**
- These outcomes allow a comparison of the possible economic and ecological trade-offs to guide management decisions.
- Results of the analysis are provided to managers who decide which management action to implement.
- 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)

**Participation and communication with managers and stakeholders is meant to be ongoing through the IEA process

West Coast/ California Current



California Current Integrated Ecosystem Assessment: Phase II

Edited by Phillip Levin and Brian Wells

California Current Integrated Ecosystem Assessment Program
Directors: John Stein and Cisco Werner
Science Leads: Phillip Levin and Brian Wells
Coordinator: Mindi Sheer and Kathy Lefebvre
Communications: Ruth Howell

DISCUSSION DOCUMENT:

DEVELOPMENT OF AN ANNUAL REPORT ON CONDITIONS IN THE CALIFORNIA CURRENT ECOSYSTEM

PART I. INTRODUCTION AND SUMMARY

The Ecosystem Plan Development Team is reviewing the 2012 IEA report to help us prepare a sub-report specific to the needs of the PFMC.

We also prepared specific reports applicable to the direct needs of management to consider ecosystem relationships to fishery resources.

Working with Fishery Management Councils to Implement EBM and IEAs

- 2005. NOAA funds EBM Scoping Sessions run by New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC)
- 2008. NEFMC directs Scientific and Statistical Committee (SSC) to develop a White Paper on strategies for Ecosystem-Based Fishery Management (EBFM) in the Northeast.
- 2010. SSC delivers White Paper to NEFMC.
  MAFMC establishes Ecosystem Subcommittee of SSC.
- 2011. MAFMC adopts standard Ecosystem Considerations Terms of Reference
- NEFMC forms Ecosystems Committee
- Both NEFMC and MAFMC request development of Fishery Ecosystem Plans for their regions.
- 2012. NEFMC establishes Plan Development Team for EBFM.

Ecosystem AdvisoryFor the Northeast Shelf Large Marine Ecosystem - Fall 2012 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

National Oceanic and Atmospheric Admini... | Ecosystem AdvisoryFor the Northeast Sh...

www.nefsc.noaa.gov/ecosys/advisory/current/advisory.html

Ecosystem Advisory

For the Northeast Shelf Large Marine Ecosystem

Northeast Fisheries Science Center — Advisory 2012-No.2

Summary of Conditions of the Northeast Shelf Ecosystem

- Sea surface temperature (SST) in the Northeast Shelf Large Marine Ecosystem during the first half of 2012 was the highest on record based on both contemporary satellites remote sensing data and long-term ship-board measurements.
- The Northeast Shelf warming was pervasive showing above average temperatures in all parts of the ecosystem; the above average temperatures extended beyond the shelf break front to the Gulf Stream.
- Spring survey hydrocast data shows that bottom temperatures have risen concomitantly with surface temperatures.
- The 2012 spring bloom was a long duration, intense bloom that started at the earliest date recorded in the ocean color remote sensing data time series dating back to 1998. In some areas the spring bloom started as early as February.
- The spring bloom was fully developed by March in all areas except Georges Bank, which had an average, though variable bloom.
- Spring zooplankton biomass on the Northeast Shelf was above average in 2012.
- Cod distribution continues to be highly dynamic with northerly shifts detected in the spring 2012 data consistent with a response to ecosystem warming.

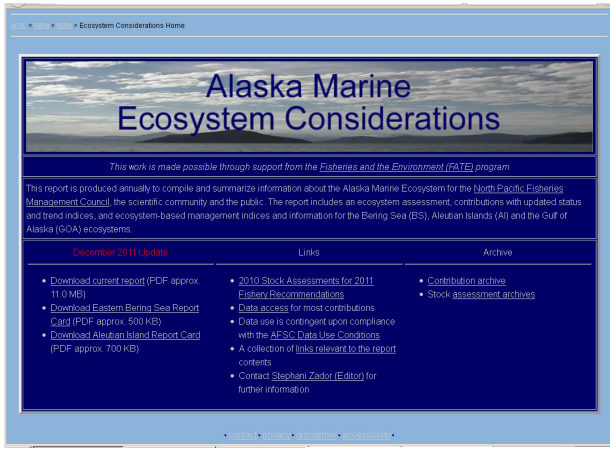
Data Sources

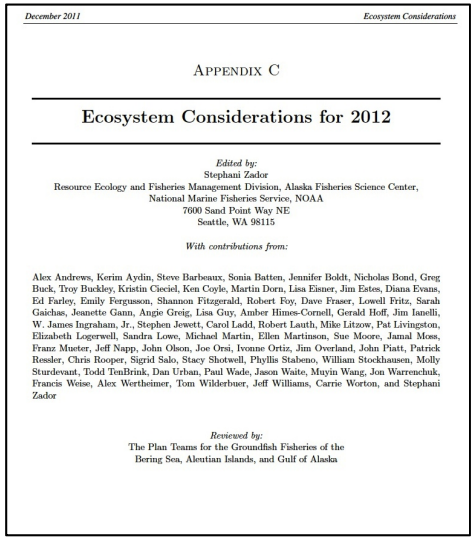
AFSC

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

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.




December 2011 Ecosystem Considerations

APPENDIX C

Ecosystem Considerations for 2012

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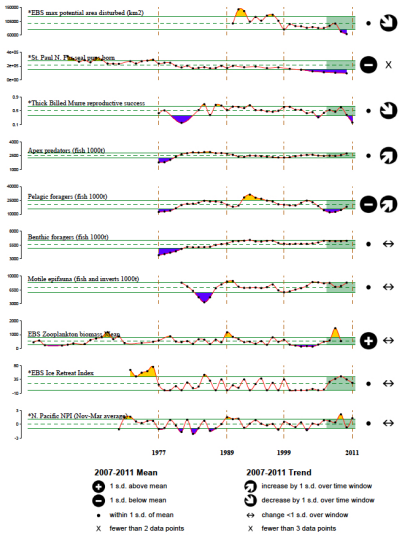
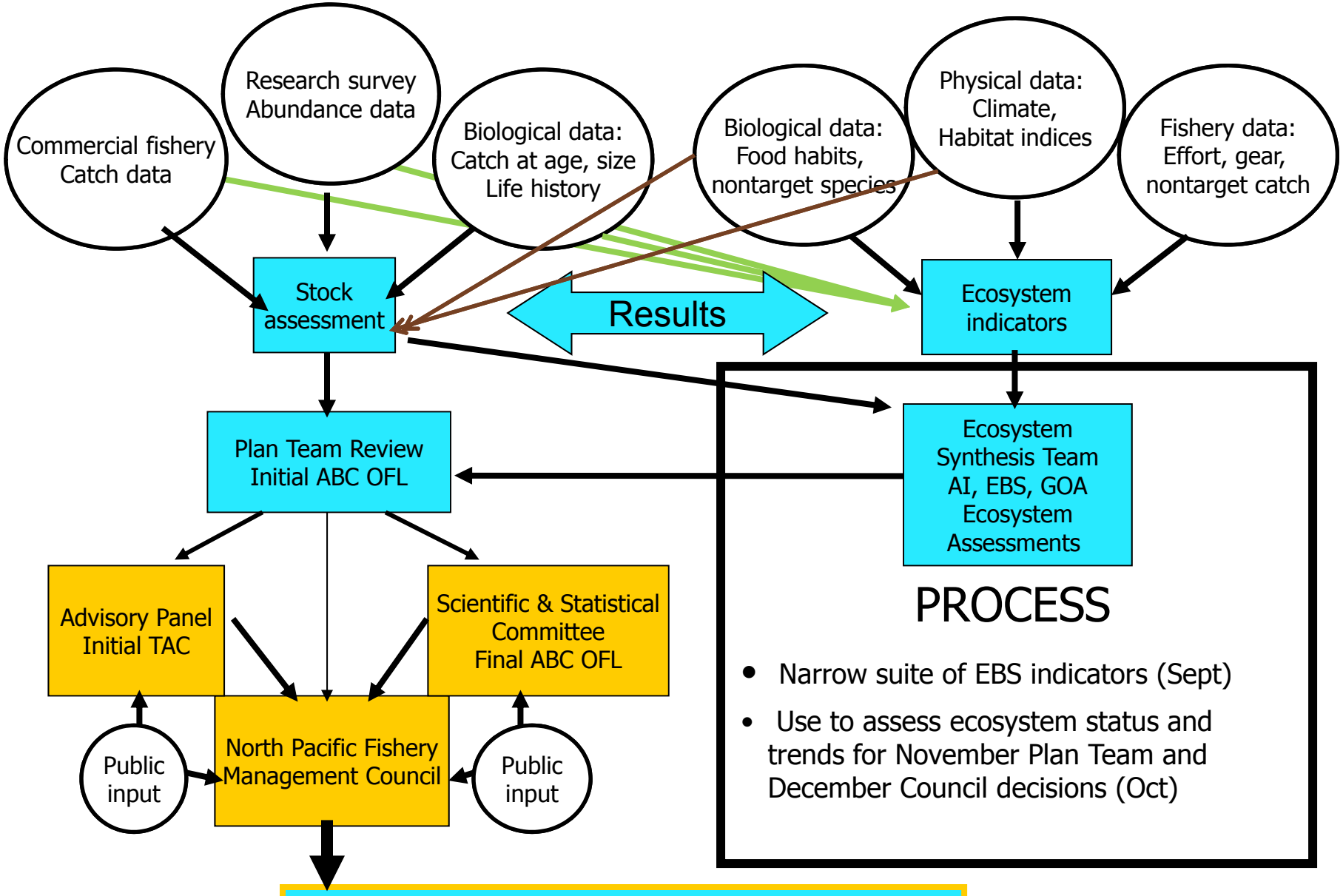
Reviewed by:
The Plan Teams for the Groundfish Fisheries of the
Bering Sea, Aleutian Islands, and Gulf of Alaska




Commercial fishery
Catch data
Research survey
Abundance data
Biological data:
Catch at age, size
Life history
Biological data:
Food habits,
nontarget species
Physical data:
Climate,
Habitat indices
Fishery data:
Effort, gear,
nontarget catch
Stock
assessment
Results
Ecosystem
indicators
Plan Team Review
Initial ABC OFL
Ecosystem
Synthesis Team
AI, EBS, GOA
Ecosystem
Assessments
PROCESS
• Narrow suite of EBS indicators (Sept)
• Use to assess ecosystem status and trends for November Plan Team and December Council decisions (Oct)
Advisory Panel
Initial TAC
Scientific & Statistical
Committee
Final ABC OFL
Public
input
North Pacific Fishery
Management Council
Public
input
Final TAC specifications

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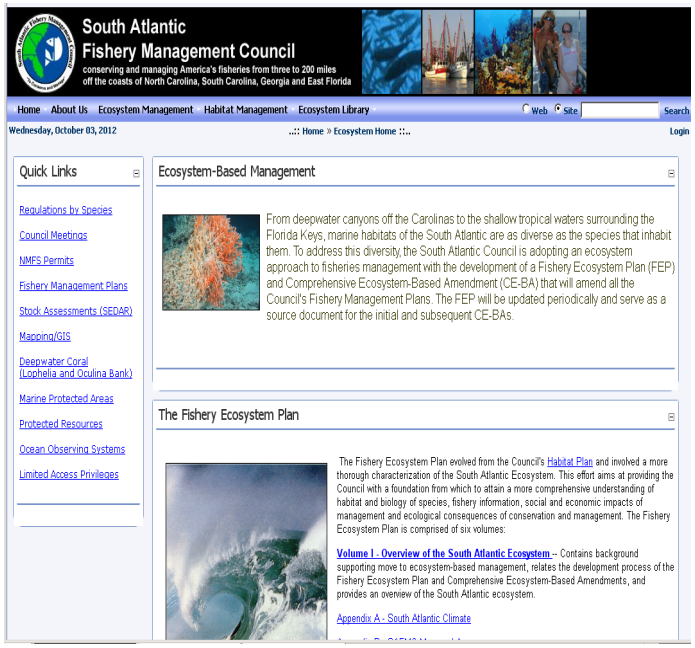
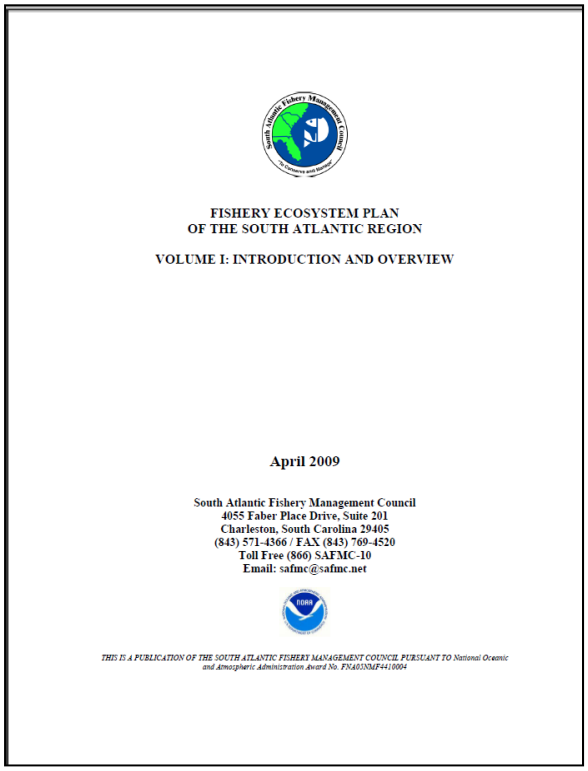
SAFMC Fishery Ecosystem Plan & Comprehensive Ecosystem-Based Management Amendment





FISHERY ECOSYSTEM PLAN
OF THE SOUTH ATLANTIC REGION

VOLUME I: INTRODUCTION AND OVERVIEW

April 2009

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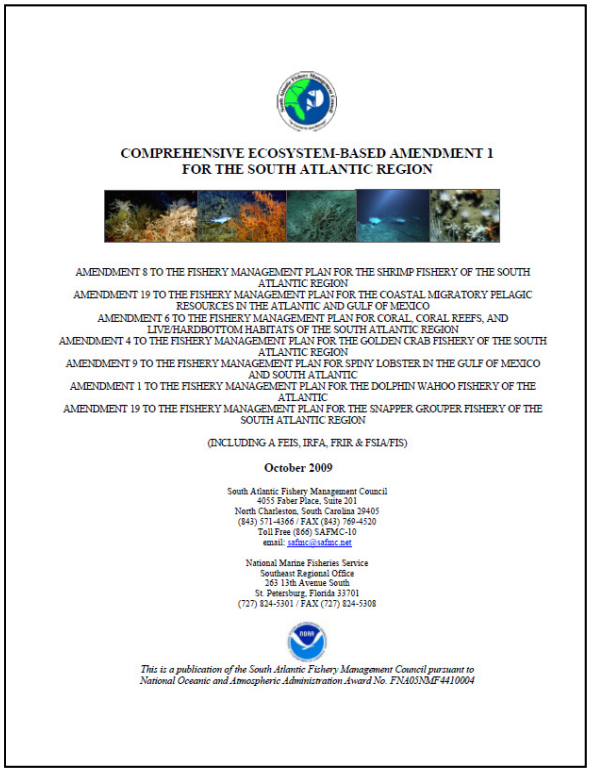
THIS IS A PUBLICATION OF THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL PURSUANT TO National Oceanic and Atmospheric Administration Award No. FNA03NMF4410004



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

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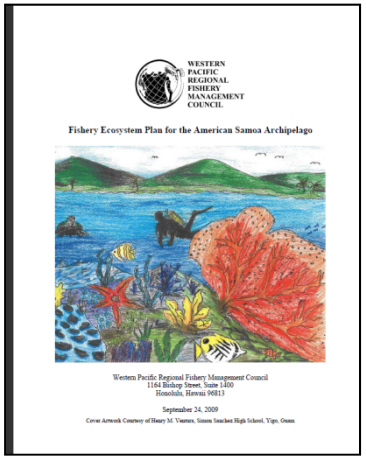
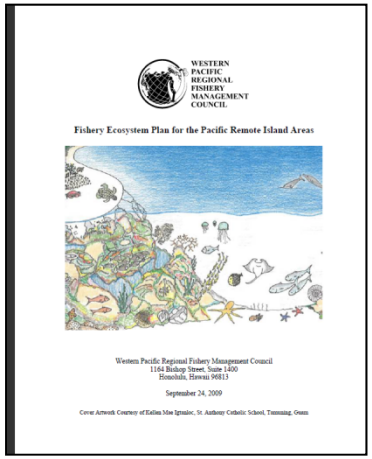
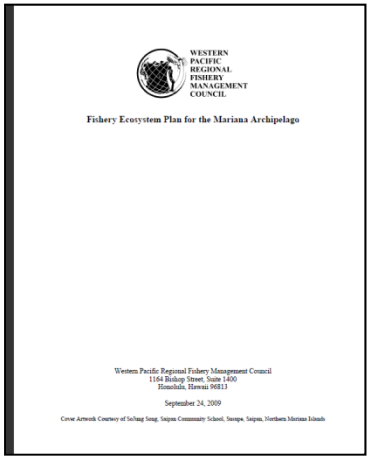
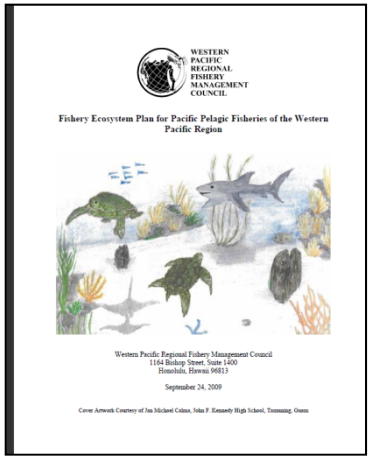
This is a publication of the South Atlantic Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award No. FNA03NMF4410004

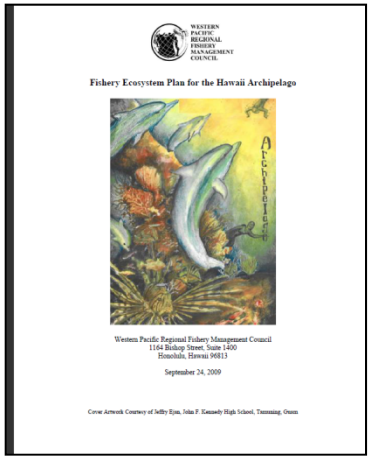
WPFMC: An Ecosystem-Based Approach to Fisheries Management in the US Pacific Islands

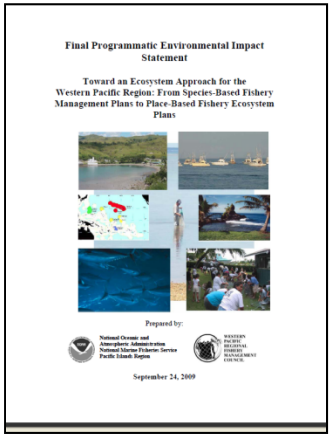












Implementing Marine Ecosystem-Based Management

- 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.