Ecosystem-Based Fisheries Management

Council Member Training

NOAA FISHERIES

Office of Science & Technology

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October 29, 2014

Outline

- **Definitions**
- **Why do we need to focus on ecosystems?**
- **Some ongoing efforts to coordinate science & management for 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.

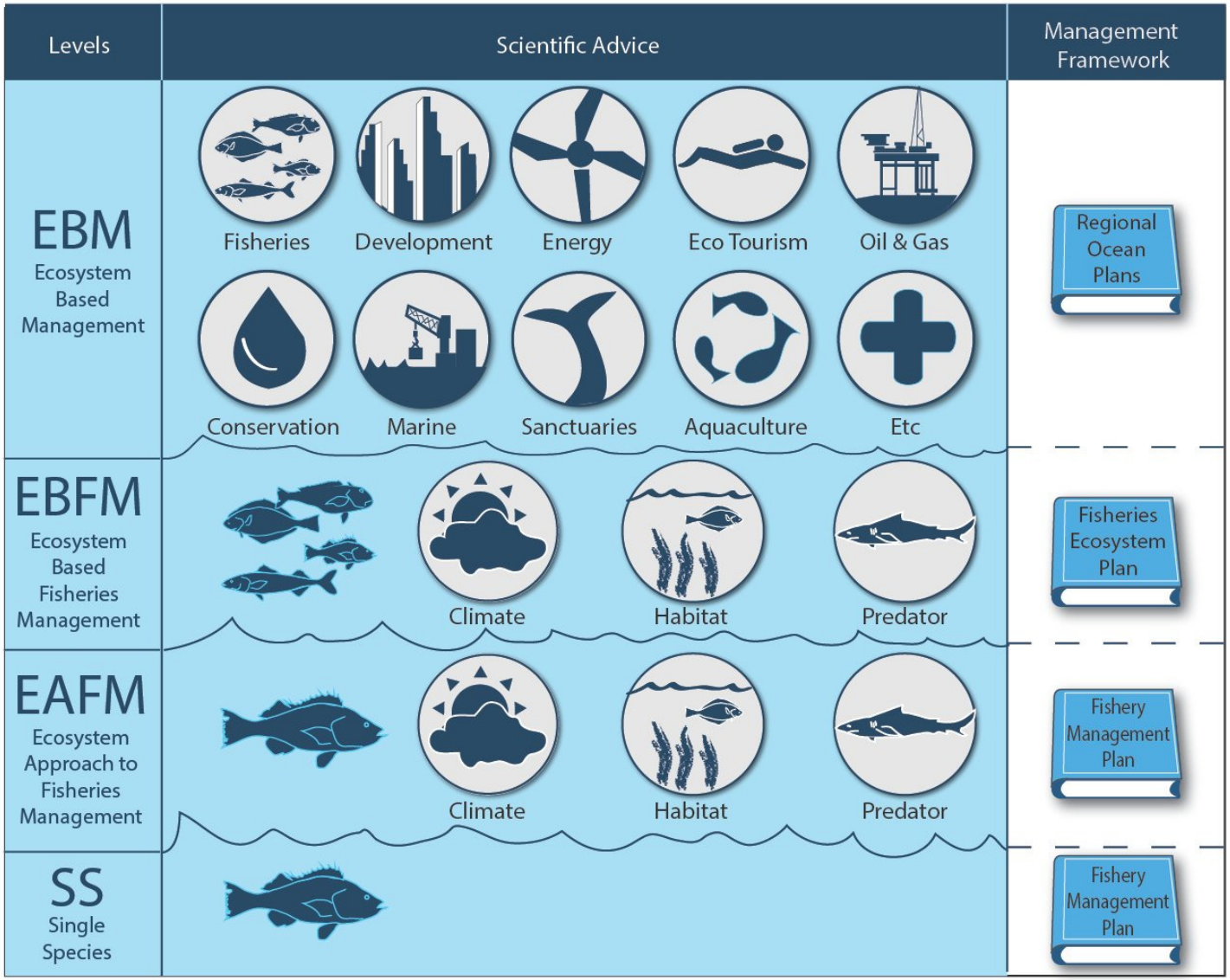
The environment is the biological, chemical, physical and social conditions that surround organisms.

What is Ecosystem-Based Management?

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

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.



http://www.st.nmfs.noaa.gov/ecosystems/ebfm/index

3 Levels of Marine Ecosystem Management

(in relation to fisheries)

1. Ecosystem-Based Management (EBM)

– an integrated and multi-sectored approach to protecting and sustaining diverse and productive marine ecosystems, and the services they provide. Informed by science, marine ecosystem-based management incorporates interdependent components of the ecosystem, including humans, into resource management decisions related to living marine resources, habitats, and tradeoffs among competing economic activities.

2. Ecosystem-Based Fisheries Management (EBFM)

– focuses on the fisheries sector of the ecosystem, which includes recreational and commercial fisheries, and 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.

3. Ecosystem Approach to Fisheries Management (EAFM)

– includes ecosystem (e.g. predation) and environmental (e.g. temperature) factors into single species stock assessments, enhancing understanding of fishery dynamics and better informing management decisions. The majority of ecosystem management work performed in the United States and in other counties is considered EAFM.

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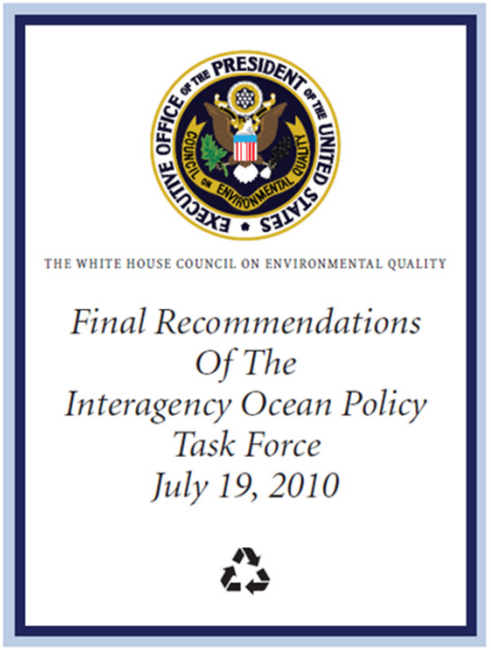
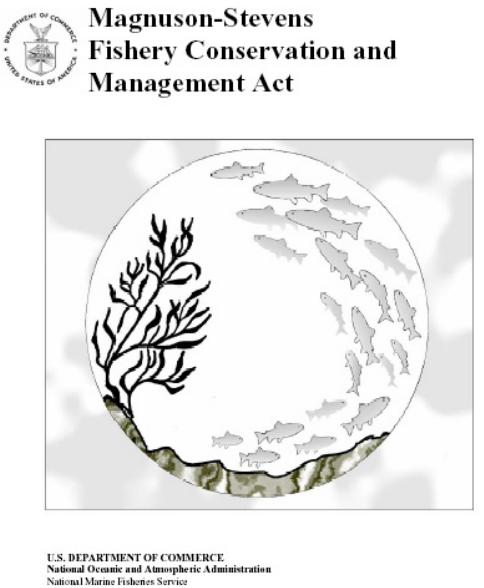
Why an Ecosystem Approach to Management?

Are we allowed to do ecosystem based management?

- Numerous mandates drive how we manage marine ecosystems in the U.S.
- Are able to do EBM under existing mandates.



MSA 2007



Why an Ecosystem Approach to Management?
Example Interactions

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

Physical & Chemical (including climate)

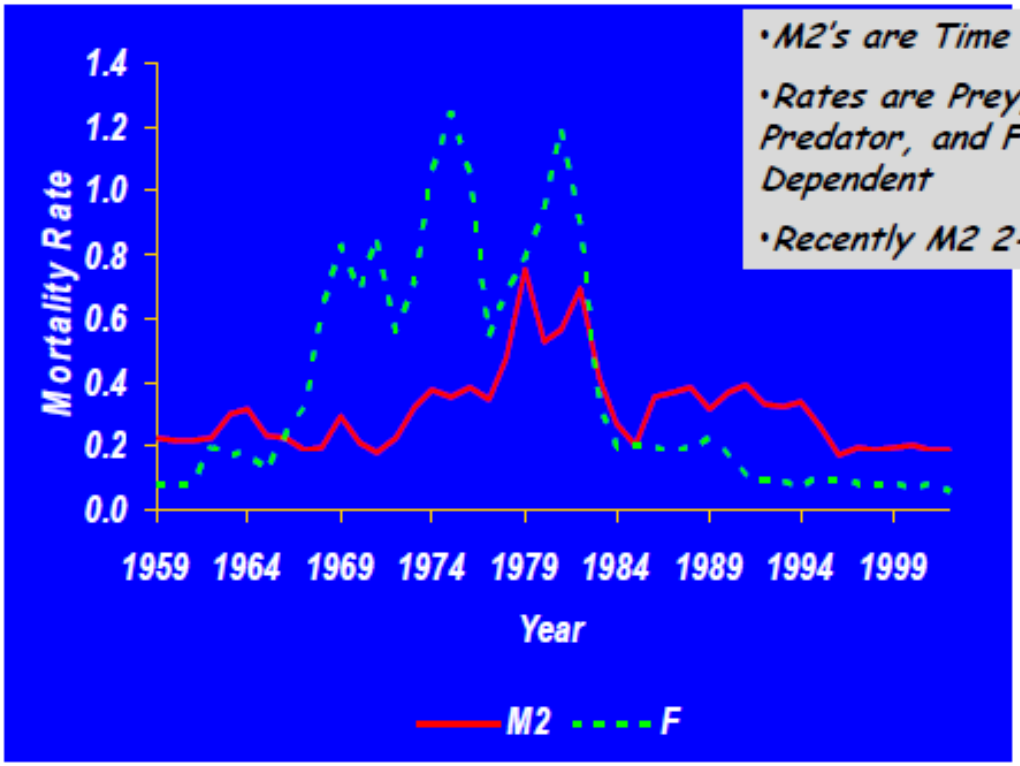
Fishing Effects

Regulatory

Other Socio-economic Activities

If manage a stock without taking the linked biological, physical, and chemical components in the system into account, will have "sub-optimal" management results.

Common Observations

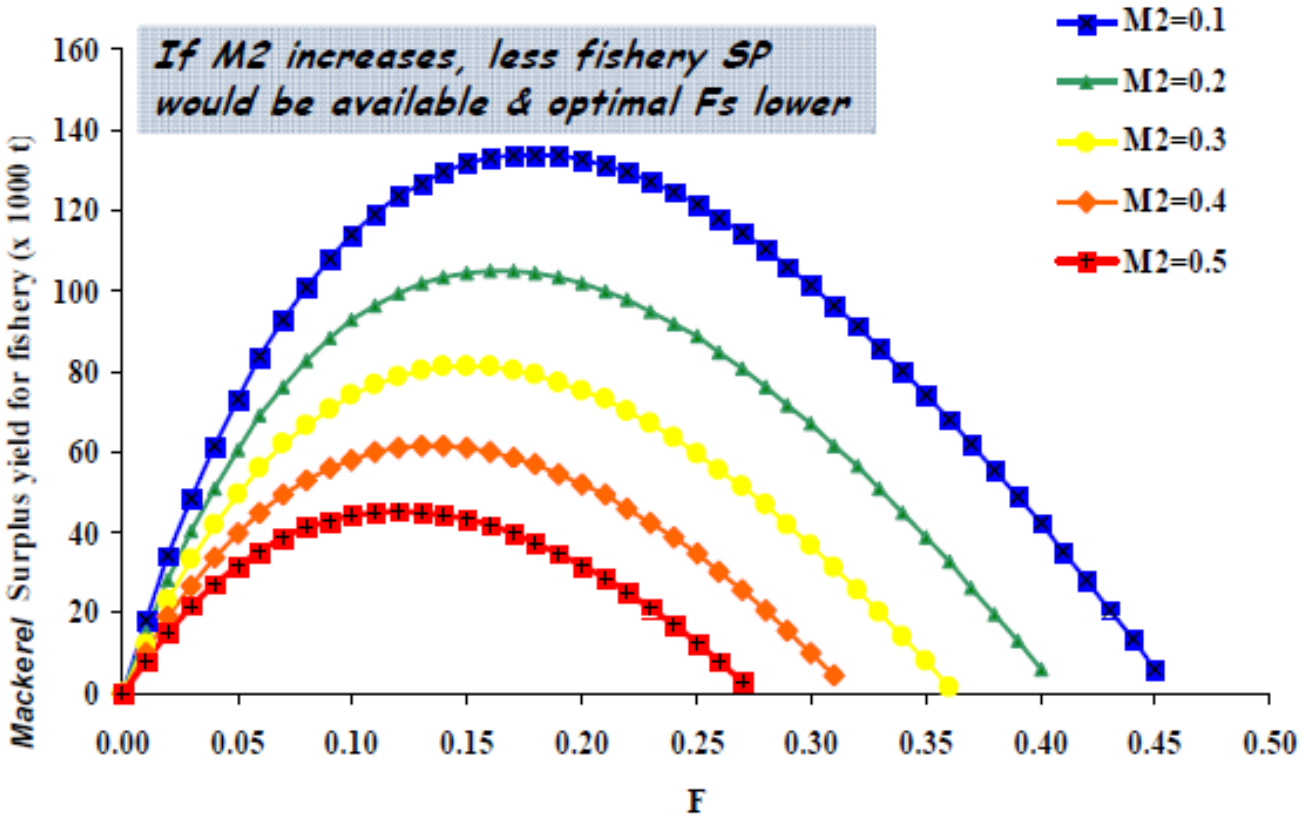


Mortality rates (M2 & F) for Atlantic herring

M2=predation, F=fishing

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

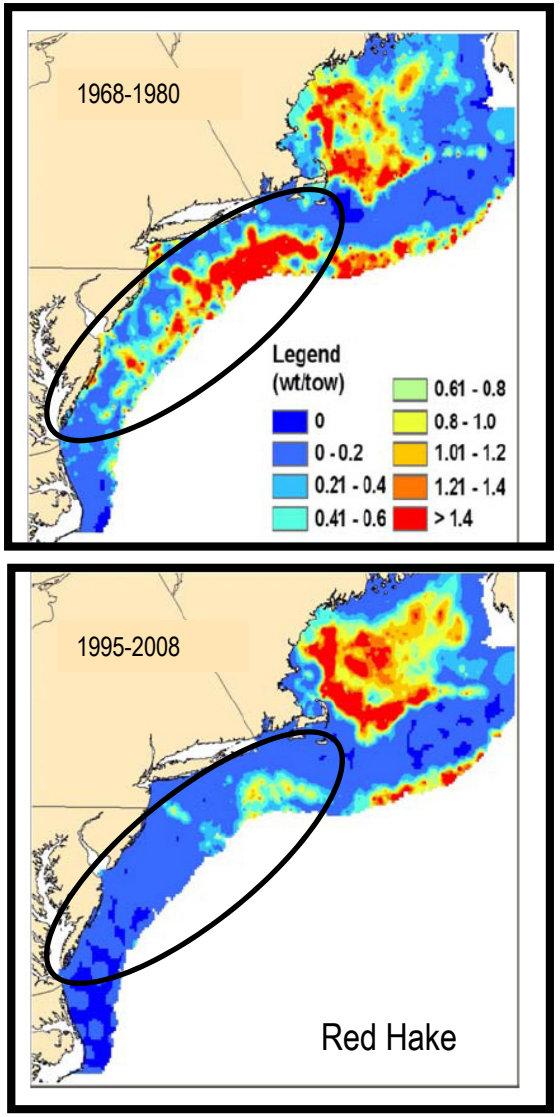
So what difference does it make?



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

Why We Should Move Forward

- We know marine ecosystems are changing
- These changes are impacting these systems and us
- We have the tools available to move forward with ecosystem-based management



Nye et al. 2009. MEPS 393: 111-139

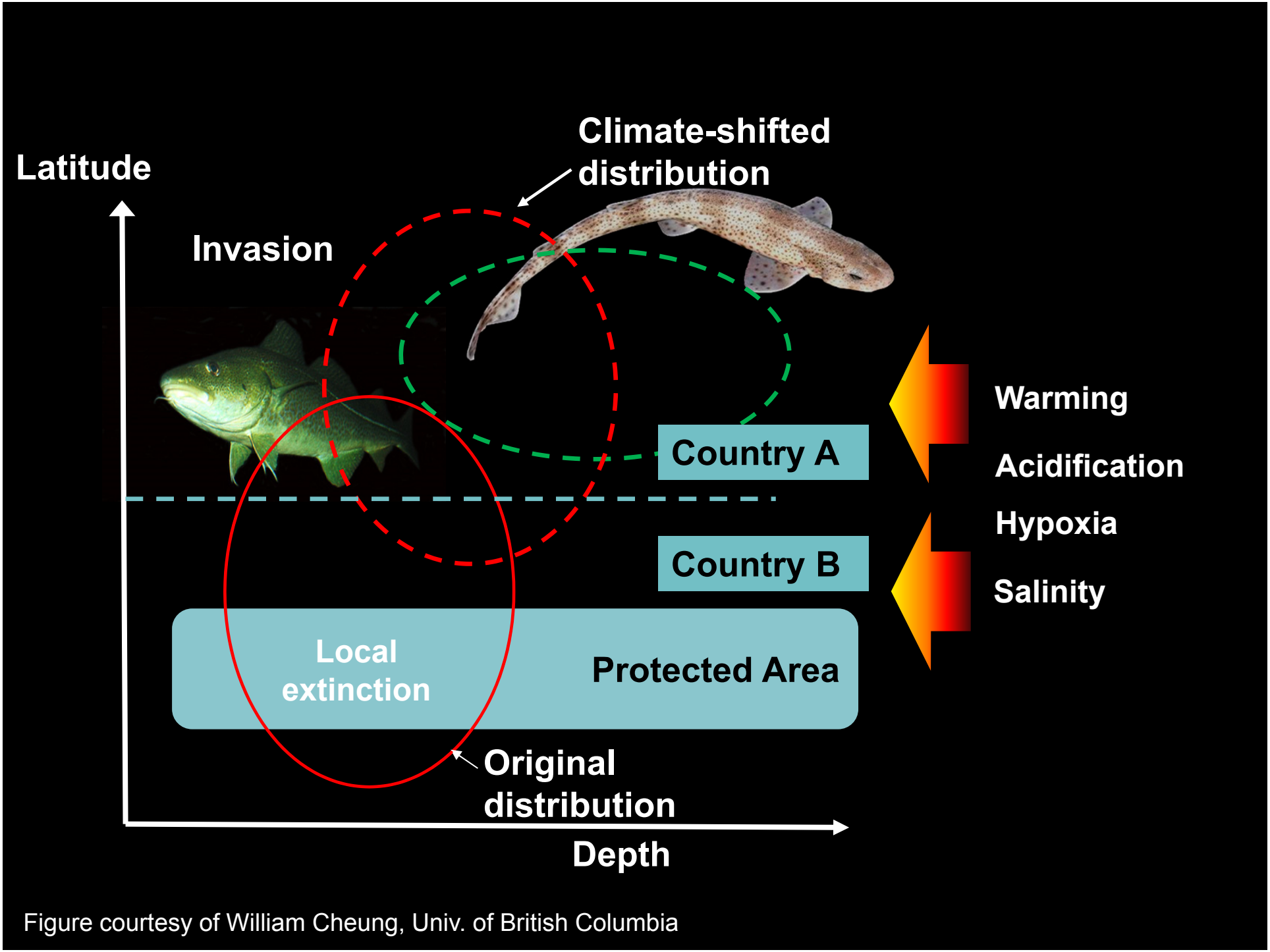
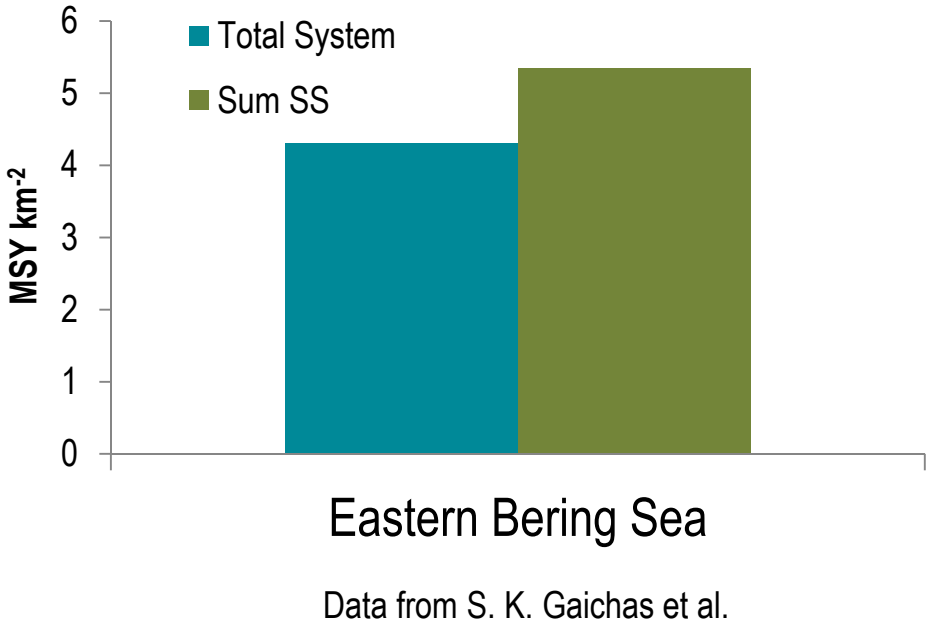


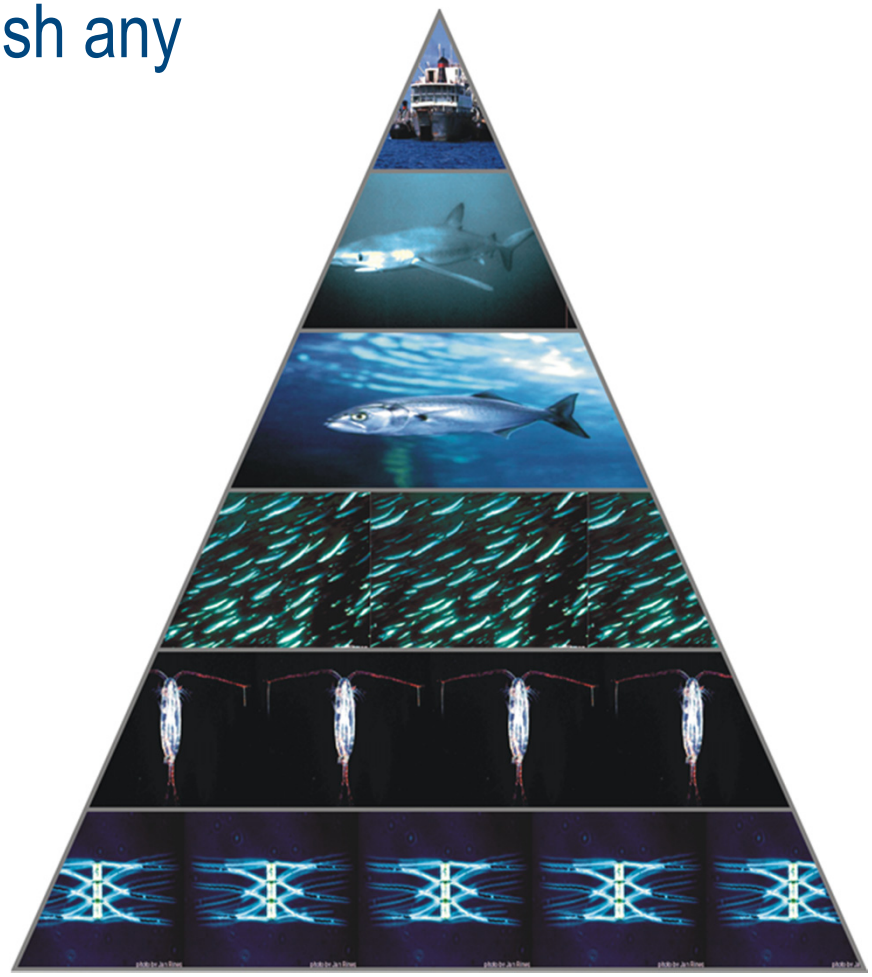
Figure courtesy of William Cheung, Univ. of British Columbia

Understanding System Production Limits Is Critical

- There are limits to how much fish any ecosystem can produce
- The challenge of energy flow



Data from S. K. Gaichas et al.



Some Benefits of EB(F)M

- Provides more information to make management decisions, which should improve our ability to sustainably manage fisheries
  - There will be fewer and smaller gaps between what occurs and what we expected to occur, and better understanding of the factors with the most impact on our fisheries
  - In short, fewer surprises, fewer mistakes
- Contributes to an increased ability to predict likely outcomes of management actions
  - Forecasts pressures and impacts on both single and aggregated components of a marine ecosystem
  - Provides a better understanding of how ecosystems and their components respond to multiple stressors
- Provides more stability of ecosystem level measures which translates into better regulatory stability and business plans
  - Is cost-effective
  - Provides a more effective management framework
  - Is designed to be adaptive
- Facilitates trade-offs between different stakeholder priorities, balancing social and ecological needs
  - Addresses multiple legal mandates simultaneously
  - Maintaining ecosystem goods and services for delivering social, economic and cultural benefits to society
  - Addresses cumulative impacts
  - Increased stakeholder participation

Outline

- **Definitions**
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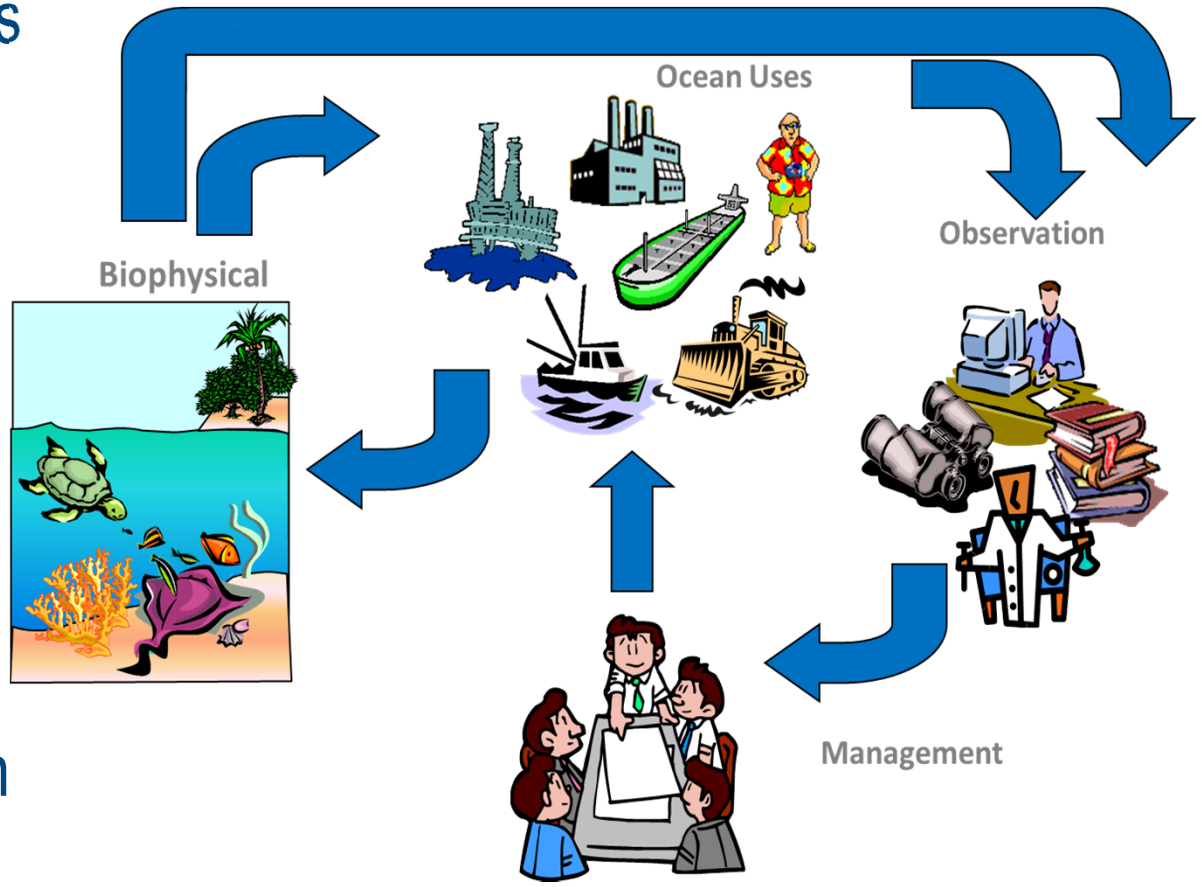
- **Some ongoing efforts to coordinate science & management for EBFM.**

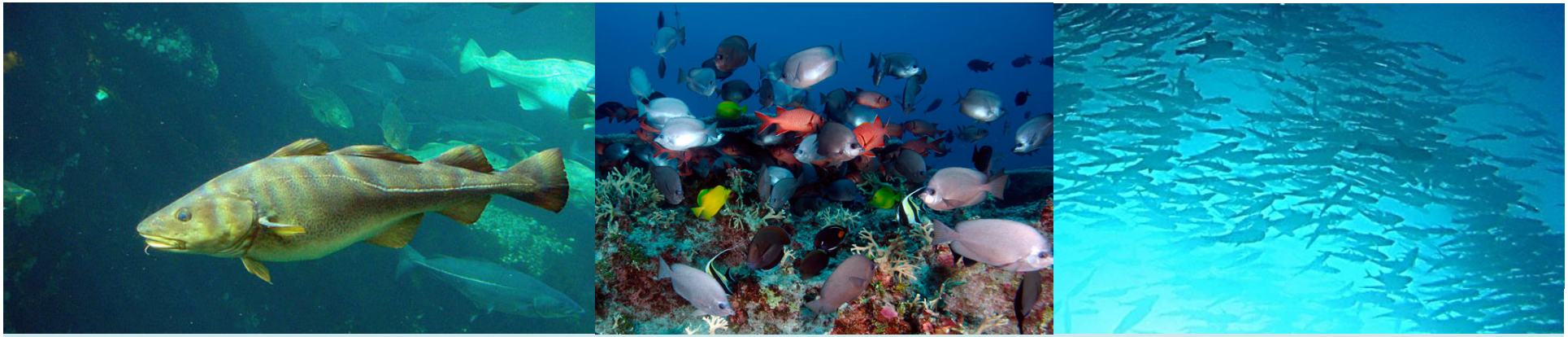
How Do We Move Forward?

- Develop and use tools to make connections.
  - Need to link climate and habitat with fish production
- We must move forward or we run the risk of doing things incorrectly with impacts to the system and our livelihoods.



How Do We Move Forward?

- EAF
  - Develop reference points (e.g. overfishing limits, population targets and thresholds) that are calculated with inclusion of ecosystem considerations - e.g. inclusion of predation, environmental (e.g. T), or habitat variables into stock assessments
- EBFM
  - Develop reference points at the ecosystem level - e.g. ecosystem productivity thresholds, habitat thresholds
  - Area and seasonal closures, gear restrictions to protect sensitive areas, species, or life stages



Fisheries and the Environment (FATE)

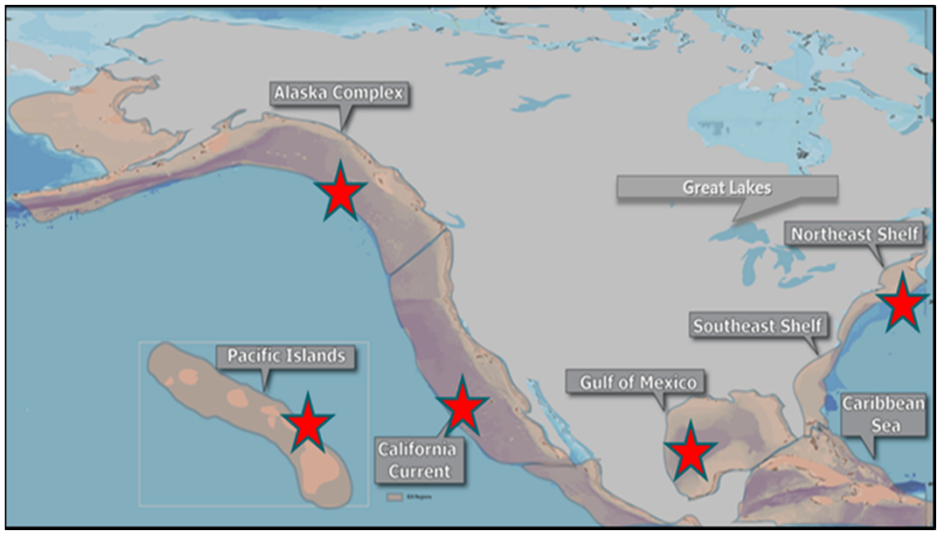
Goal: To advance the understanding of environmental impacts on living marine resources and to use this information to improve stock and ecosystem assessments.

Deliverables include:

- ecological and oceanographic indicators;
- next generation forecasting models;
- FATE products incorporated into stock and ecosystem assessments.

http://www.st.nmfs.noaa.gov/fate/

NOAA's Integrated Ecosystem Assessment (IEA) Program



NOAA IEA Regions

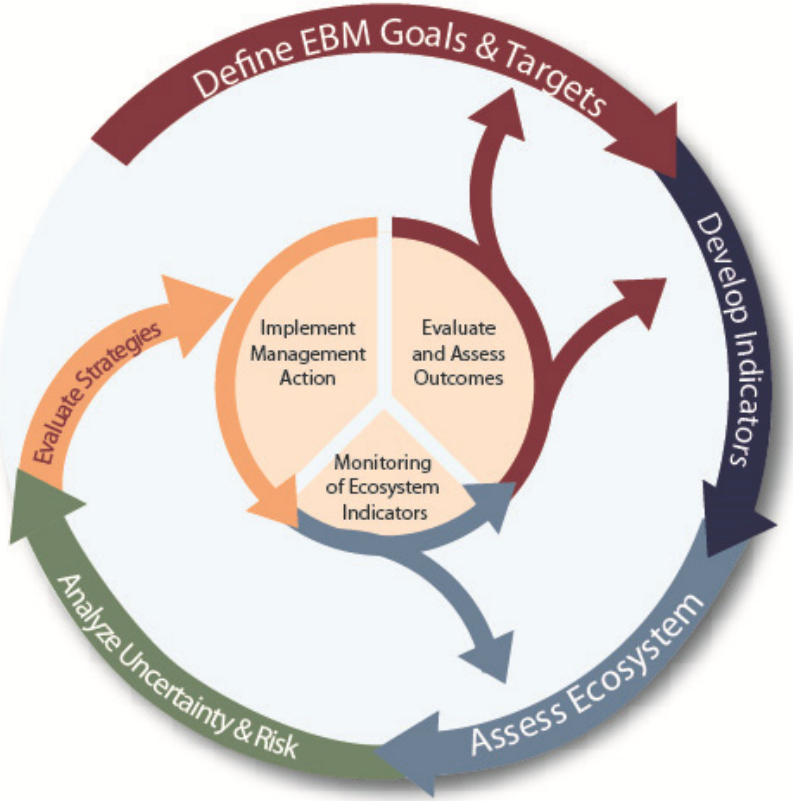
http://www.noaa.gov/iea/

- NOAA's IEA program supports implementation of EB(F)M by providing analytical tools and helping transfer comprehensive scientific knowledge to management.
- IEAs provide a framework for organizing & synthesizing science to inform multi-scale, multi-sector EBM.
- They are intended to provide a structure to assess ecosystem status relative to objectives, account for the holistic impact of management decisions, and guide management evaluations.
- IEAs provide 'a synthesis and integration 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 Integrated Ecosystem Assessment (IEA) Program

IEAs Provide an Analytical Framework to Implement EB(F)M

- Is a decision-support process that synthesizes and analyzes diverse data and ecosystem model outputs
- Is modular, iterative, scaleable, and adaptable
- Shares a common national framework, yet with regional variation in implementation
- Provides assessments of the ecosystem across and within multiple ocean-use sectors



Example Uses of Ecosystem Information

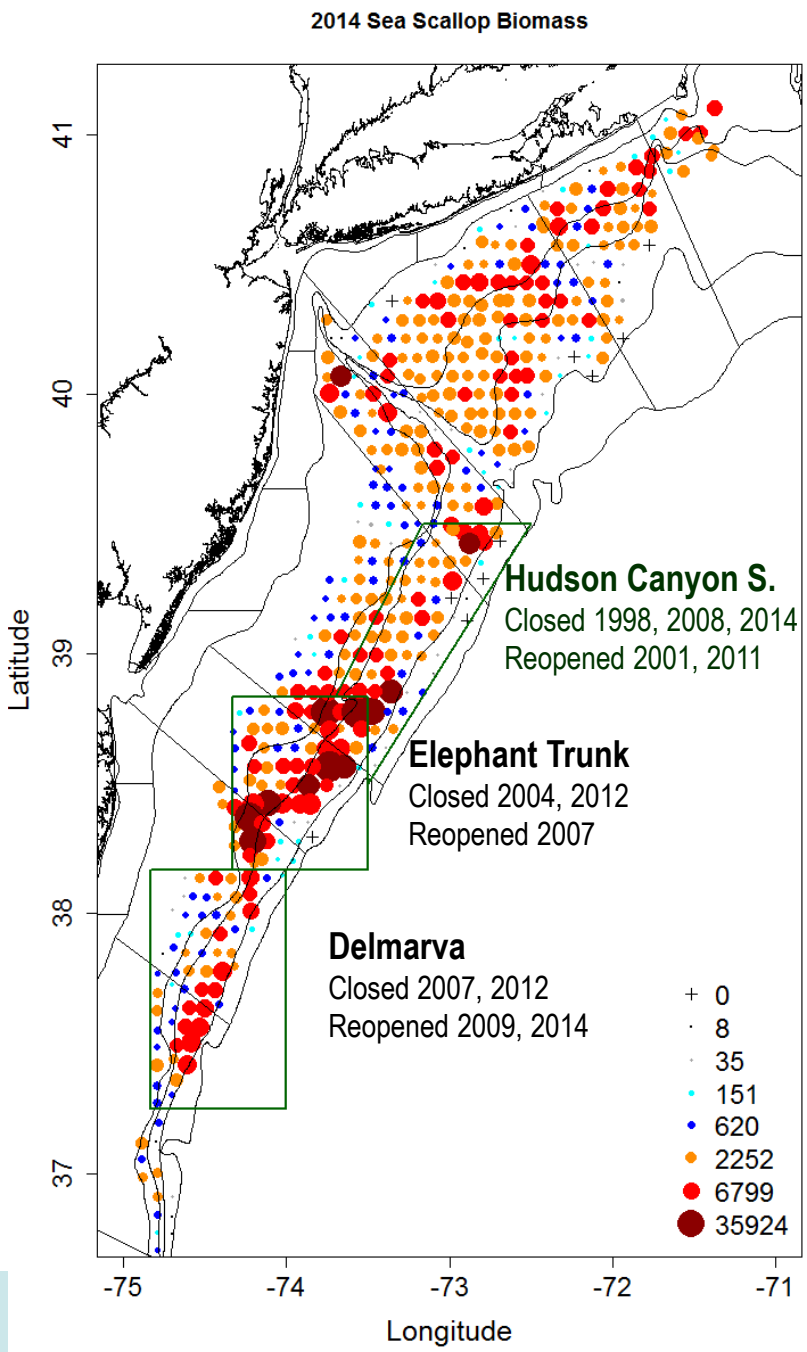
- Gulf of Mexico: In 2013 ecosystem considerations were introduced into the Stock Synthesis assessment model for gag grouper. Included red-tide mortality and estimates of recruitment anomalies due to environmental factors.
- Gulf of Mexico: Requested evaluation of the current red grouper Harvest Control Rule to determine if it is robust to possible future changes in intensity & frequency of episodic events of non-fishing mortality.
- California Current: Development of an ecosystem model (Atlantis) for use by PFMC for 20-30 yr projections for ranking management alternatives.
- NE Shelf: Butterfish - T driven catchability, Northern shrimp – T dependent distribution & productivity, Atalntic Croaker – T dependent recruitment, Atlantic Cod – T dependent recruitment & distribution
- Alaska: Use of multi-species food-web and assessment models to link changes in the physical environment and trophodynamics to recruitment and survival and help distinguish fishery impacts from climate pressures.
- Pacific Islands: Use of cetacean electronic tagging and oceanographic data to better understand their forage habitat and spatial distributions to decrease cetacean bycatch.
- Pacific Islands: Requested to use ecosystem models to estimate Annual Catch Limits for the multispecies coral reef ecosystem.

Evaluation of Larval Sources and Connectivity in Mid-Atlantic Sea Scallop Populations

D. Hart and B. Shank, NEFSC, D. Munroe, J. Wang and D. Haidvogel, Rutgers, J. Klinck and E. Hoffmann, Old Dominion U., E. Powell, U. So. Mississippi

The sea scallop fishery in the southern Mid-Atlantic is managed in part by three rotating closed areas. These areas are closed for 2-3 years to allow small scallops to grow and then are reopened for harvesting.

This project is investigating whether the larvae from these closed areas are seeding the areas "downstream" to the southwest. For example, there is a strong 2010 year class in the Elephant Trunk (see chart) that potentially originated in the Hudson Canyon South area which was closed during 2010. There was also a very strong 2001 year class in the Elephant Trunk, after the first Hudson Canyon South rotational closure.



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Ecosystem Status Report - Alaska

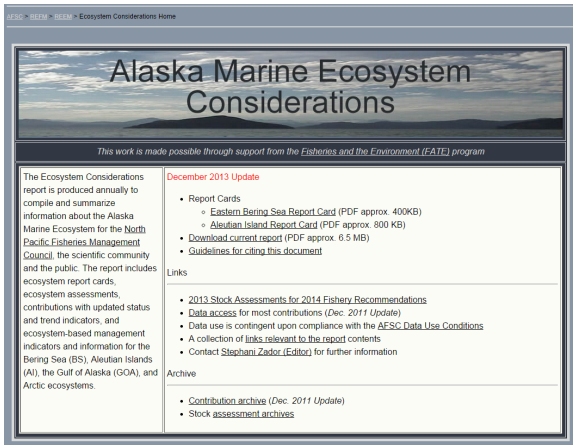
http://access.afsc.noaa.gov/reem/ecoweb/Index.php

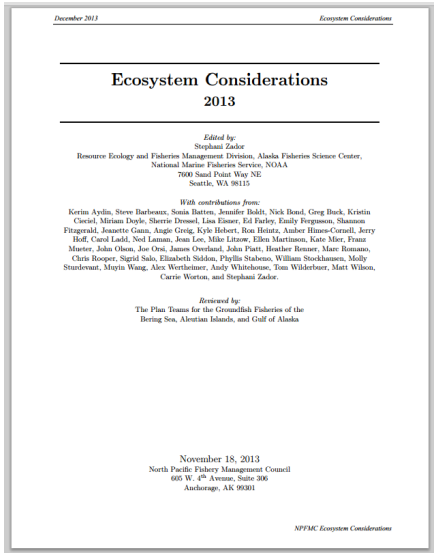
Alaska Ecosystems Considerations Report

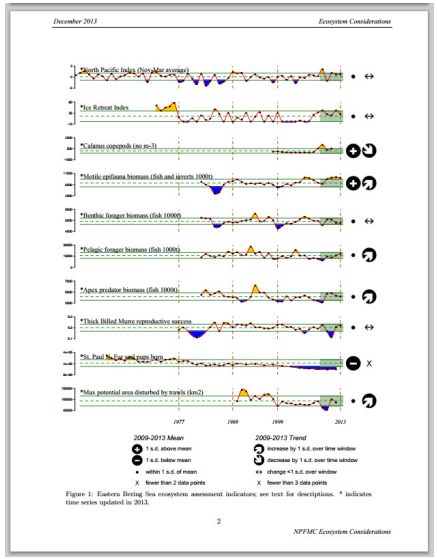
- Produced annually to compile and summarize information about the Alaska Marine Ecosystem for the North Pacific Fisheries Management Council, the scientific community and the public.

- Includes ecosystem report cards, ecosystem assessments, contributions with updated status and trend indicators, and ecosystem-based management indicators.

- Presents information for the Bering Sea, Aleutian Islands, the Gulf of Alaska, and Arctic ecosystems.





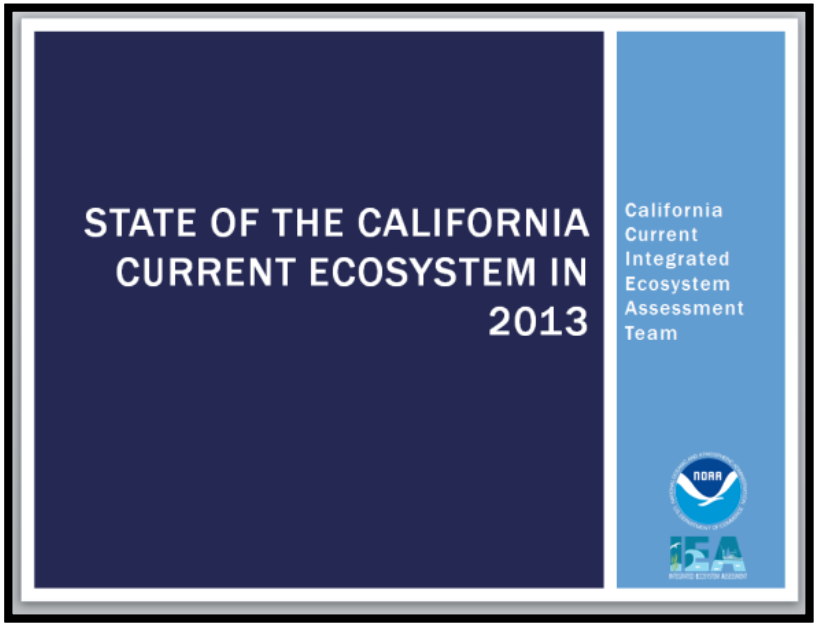


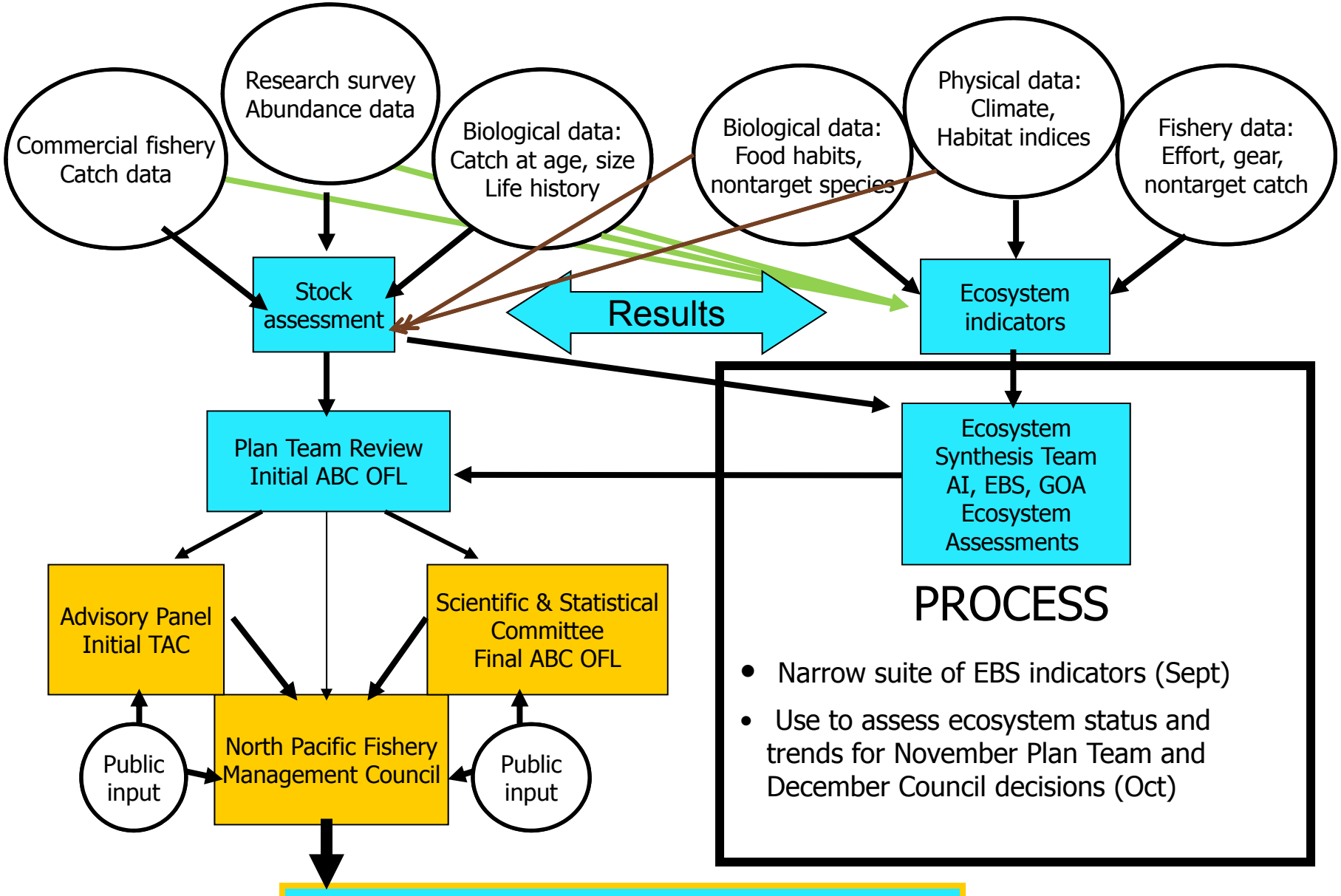
Ecosystem Status Reports

NE Shelf

http://www.nefsc.noaa.gov/ecosys/advisory/current/

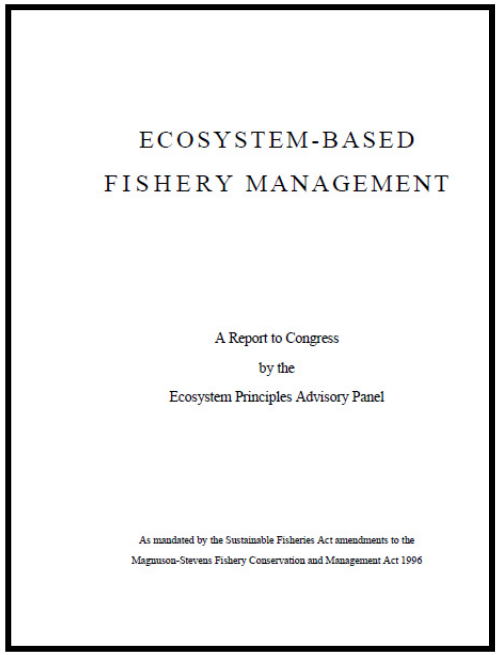
California Current





Modified from: Hollowed et al. 20011
Fish and Fisheries 12: 189-208

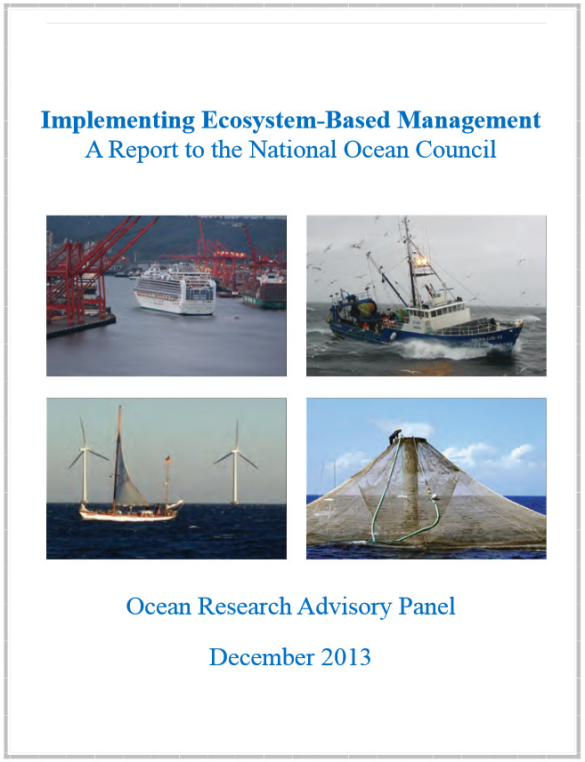
Early Guidance and Status



1999

- 9 FEPs exist, others in development
- Each of the Councils took a different approach in creating FEPs
  - Each varied in length, structure, and content and all nine emphasized different aspects of the EPAP recommendations
- Three broad categories:
  1. Information source
  2. Planning and policy setting
  3. Management document required for fishery management actions

Recent Recommendations



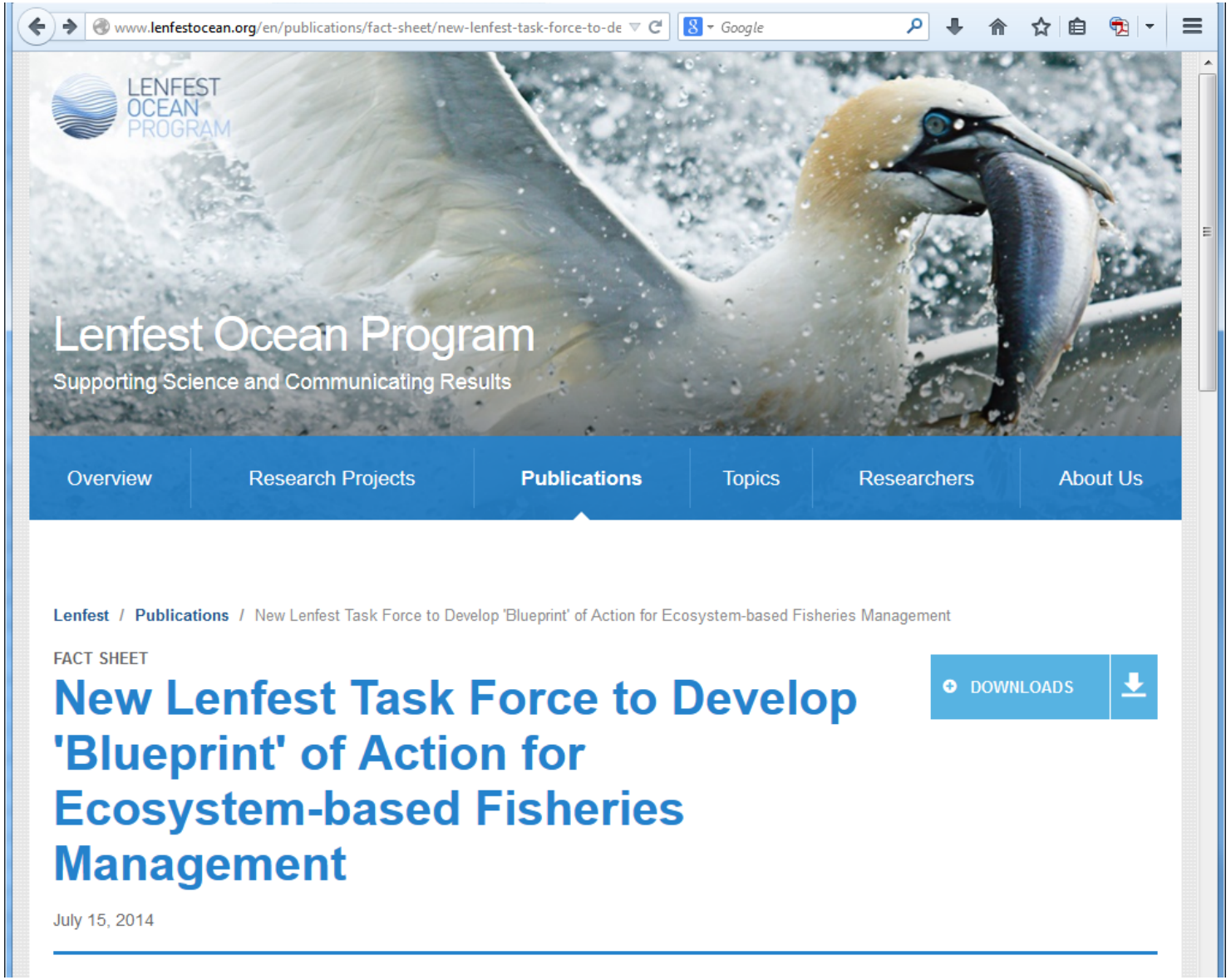
http://www.nopp.org/wp-content/uploads/2010/06/Implementing-EBM-v4.pdf

Recent Status & Recommendations

Ecosystem Sciences and Management Working Group
EXPLORATION OF ECOSYSTEM BASED FISHERY MANAGEMENT IN THE UNITED STATES
Report to the NOAA Science Advisory Board
June 23, 2014

- Recommendations for improving EBFM science & its use
- Appendix D – Regional EBFM Implementation Reports

http://www.sab.noaa.gov/Meetings/2014/june/ESMWG_EBFM%20final.pdf


www.lenfestocean.org/en/publications/fact-sheet/new-lenfest-task-force-to-de
Google
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Lenfest Ocean Program
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Publications
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Lenfest / Publications / New Lenfest Task Force to Develop 'Blueprint' of Action for Ecosystem-based Fisheries Management
FACT SHEET
New Lenfest Task Force to Develop 'Blueprint' of Action for Ecosystem-based Fisheries Management
DOWNLOADS
July 15, 2014

Fishery Management Council Activities

- "Ecosystem" Committees
- Fishery Ecosystem Plans
- Doing many things generally regarded as EBFM
  - ► Forage Fish – limit or prohibit fisheries on these species
  - ► Area and seasonal closures, gear restrictions
  - ► Use environmentally-based run size forecasts and harvest control rules
  - ► Implement bycatch restrictions

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. Tradeoffs do not go away if they are ignored.