Ecosystem Approaches to Fisheries Management: Why the Interest and Aren't We Doing this Already?

- **Why do we need more focus on ecosystems?**
- **What are the important objectives of an Ecosystem Approach to Fisheries (EAF)?**
- **To what extent are they addressed now by the NOAA and the Councils?**
- **Some ongoing efforts to coordinate science & management**

Dr. Ned Cyr
Chief, Marine Ecosystems Division
NMFS Office of Science and Technology

New Council Member Training
October 23, 2007, Silver Spring

NOAA Fisheries Service - Mission

Stewardship of living marine resources through science-based conservation and management and the promotion of healthy ecosystems

Why Do We Need More Emphasis on Ecosystems in Fisheries Management?

- more credibility in “non-fisheries” governance forums and with wider groups of stakeholders
- get “credit” for what councils are already doing
- better, more integrated management
- leverage more and different resources to understand complex relationships affecting fisheries

Ecosystem Mandates: A Paradigm Shift or Evolution?

Current Mandates

Individual Species

Narrow Perspective & Scale

Human Activities Evaluated for Individual activities

Resource Management by Sectors

Scientific Monitoring programs Focused narrowly

Single Use and Purpose Observations

Future Mandates

Multiple Species

Broad Perspective & Scale

Humans Integral to Ecosystem

Integrated Resource Management

Adaptive Management Based On Scientific Monitoring

Shared and Standardized Observations

Focus on Managing Ecosystem parts

Focus on Ecosystem Relationships, Processes, and Tradeoffs

What is an Ecosystem Approach to Management (EAM)?

"Look at the whole picture, not just the parts."

Dave Goethel
New England Fishery Management Council
SIMOR Fisheries Constituent Listening Session - October 2006

An ecosystem approach to management is one that provides a comprehensive framework for living marine resource decision making. In contrast to individual species or single issue management, EAM considers a wider range of relevant ecological, environmental, and human factors bearing on societal choices regarding resource use.

The #1 ***Myth*** Concerning EAM*:*

"***Ecosystem approaches to ocean resource management are not well defined and we do not know how to implement them***"

UN Law of the Sea Meeting, June 2006

What is an Ecosystem?

An *ecosystem* is a geographically specified system of organisms (including humans), the environment, and the processes that control its dynamics.

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

When appropriate, the term environment should be qualified as biological, chemical, physical, and/or social.

Definitions*

- **An *ecosystem* is a *geographically specified* system of organisms (including humans), the environment, and the processes that control its dynamics.**

- **An *ecosystem approach to management (EAM)* is one that is *geographically specified*, adaptive, takes account of ecosystem knowledge and uncertainties, considers multiple external influences, and strives to balance diverse social objectives**

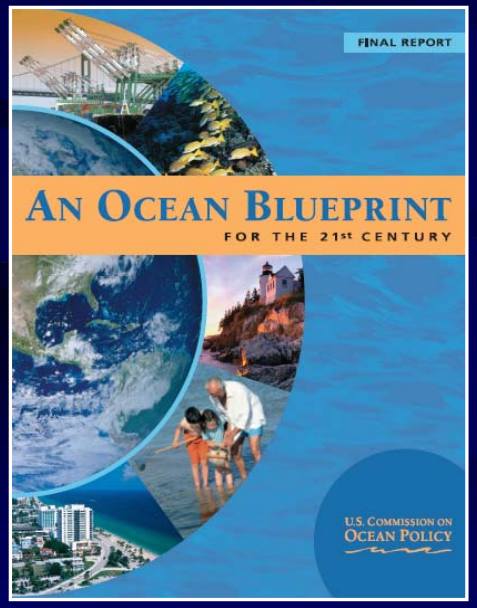
- **Implies expanding mandates of existing institutions, better coordination among them, or creation of new ones, to address broader suites of societal goals**

* NOAA Ecosystem Goal Team (EGT)

Why an Ecosystem Approach to Management?

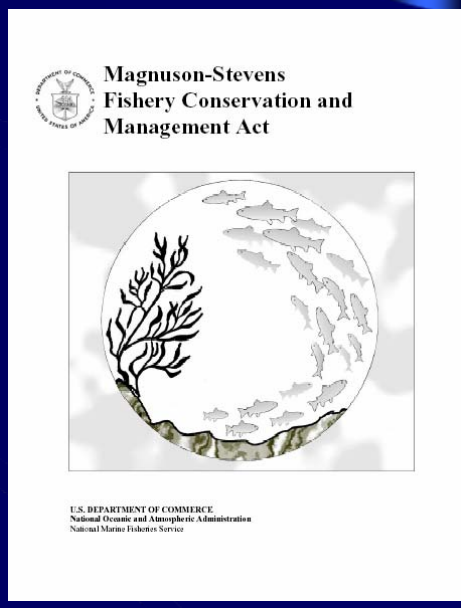
Oceans Act 2000

USCOP Report 2004

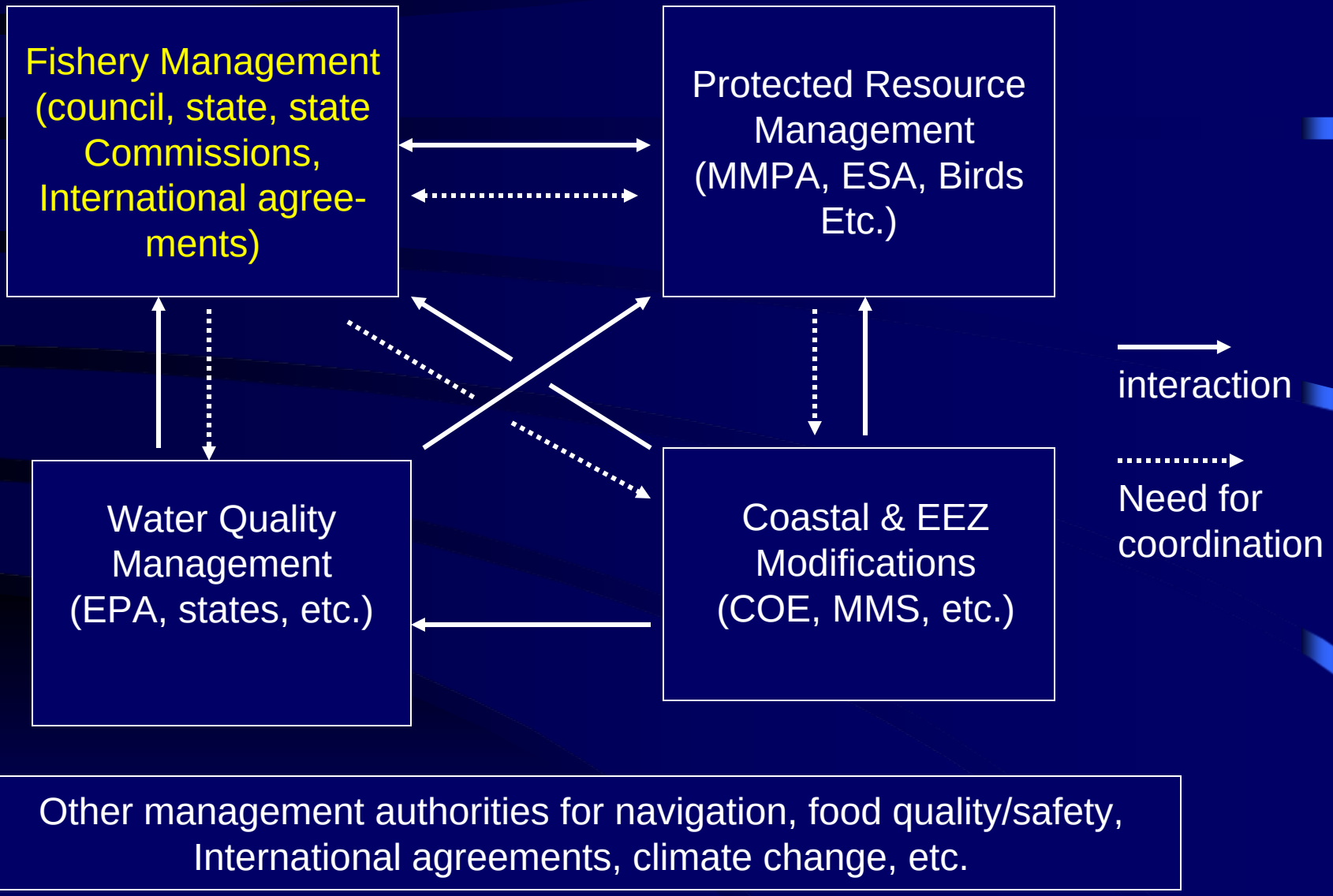


Admin Response 2004

MSA 2007



Elements of Regional Ecosystem Governance



Operational Objectives for EAF

- **Conserve and Manage Species**
  - Target species, assemblages, non-target species, PET species, biodiversity protection*

- **Minimize Bycatch**
  - target, non-target & PET species, and minimize waste

- **Manage Tradeoffs**
  - among fisheries sectors, optimize fishery benefits, prevent sequential depletion/effort transfer, use management processes that are fair, equitable and transparent, consider cumulative impacts, evaluate impacts of non-fishery sectors, include diverse stakeholder views

*** PET = Protected, Endangered or Threatened Species**

Objectives for EAF, continued…

- **Account for Feedback Effects**

  - predator-prey relationships, gear impacts on habitat productivity, irreversibility of fishing impacts, harvesting-induced regime change

- **Establish Appropriate Ecosystem Boundaries**

  - allows for interconnections between adjacent ecosystems, allows for imports and exports, includes multiple spatial scales depending on issue

- **Maintain Ecosystem Productivity, Balance Ecosystem Structure**

  - evaluate ecosystem carrying capacity,

  maintain resilience/resistance to perturbations, attain trophic balance

Objectives for EAF, continued.

- **Account for Climate Variability**

  - low-frequency variation (decadal scale changes), High-frequency variation (year-to-year or more frequent), climate-based regime change

- **Use Adaptive Approaches to Management**

  - consider multiple causes for observed changes and sources of uncertainty in assessment & prediction, reverse burden of proof where consequences are great, imbed experiments in management approaches to increase ecosystem knowledge

Operational Objectives for EAM-(EAF)

(1) Develop broad Stakeholder-Based Governance system

(2) Conserve essential Parts of the ecosystem

(3) Conserve essential ecosystem Processes

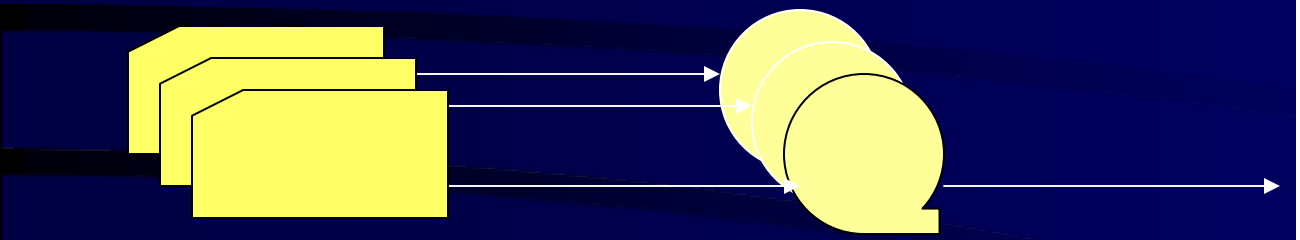
Question, if (2) is done well, is (3) necessary?

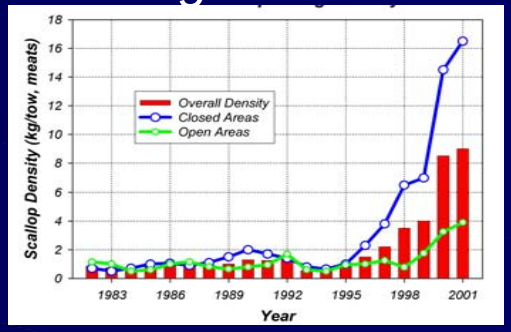
Science Support: Integrating Data, Assessments, Models & Forecasts: A priority supporting EAM

NOAA's Current Ecosystem Data Streams

Each with individual data archives

Serving specific Management needs

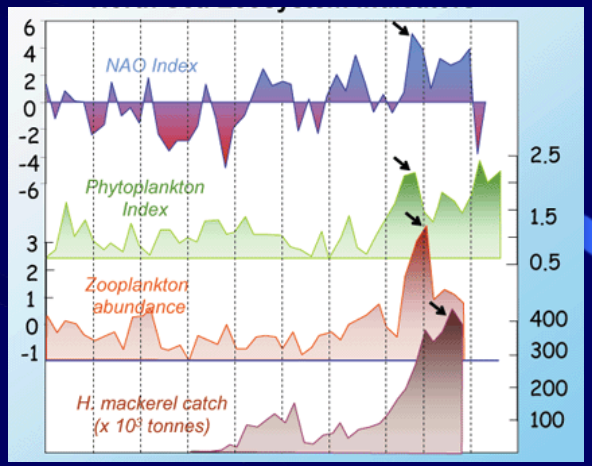




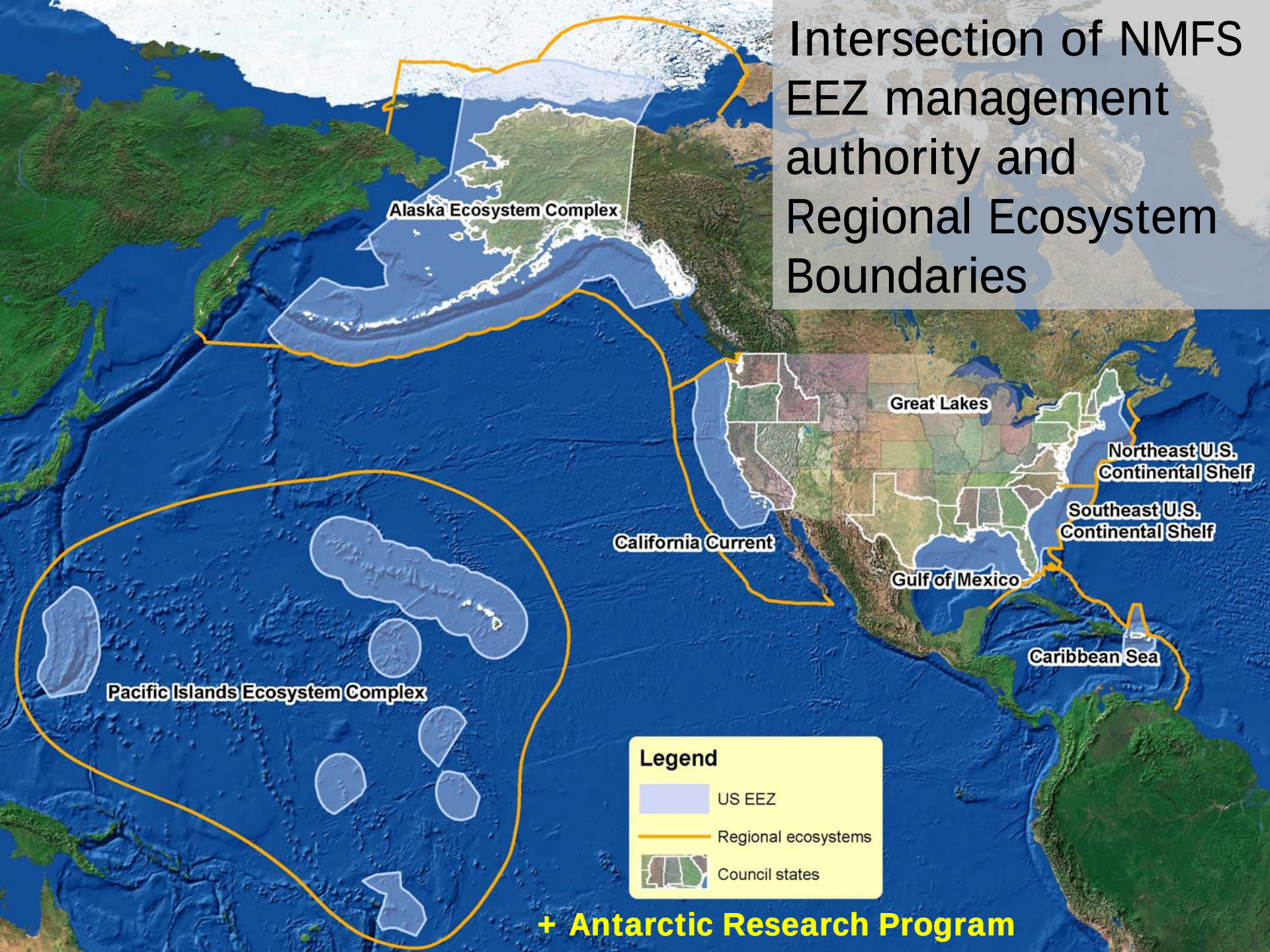
Ecosystem Vision:

Integrated regional data prioritization, collection & archival

Enabling: Regional Integrated Ecosystem assessments



Supporting: enhanced Modeling & forecasting


Intersection of NMFS EEZ management authority and Regional Ecosystem Boundaries
Alaska Ecosystem Complex
Great Lakes
Northeast U.S. Continental Shelf
Southeast U.S. Continental Shelf
California Current
Gulf of Mexico
Caribbean Sea
Pacific Islands Ecosystem Complex
Legend
US EEZ
Regional ecosystems
Council states
+ Antarctic Research Program

How are Councils Implementing EAF Now?

- Management of target species
- minimization of bycatch
- consider habitat impacts
- consult with diverse groups
- understand and incorporate species interactions

EAF in Alaska

Research Priorities for Ecosystem Studies in Alaska

Define Natural Range of Variability In Ecosystem-Level Measures

LH, Distribution, Functional role Of HAPC Biota

Climate and Fishing Effects on Forage Species Dynamics

Relation between Climate and Ecosystem Production

Assessing Genetic Diversity

Improving predictions of multi-species And ecosystem models

System for prioritizing research On non-target species

Defining Spatial-temporal Needs Of Predators

Ecosystem-based Management Actions

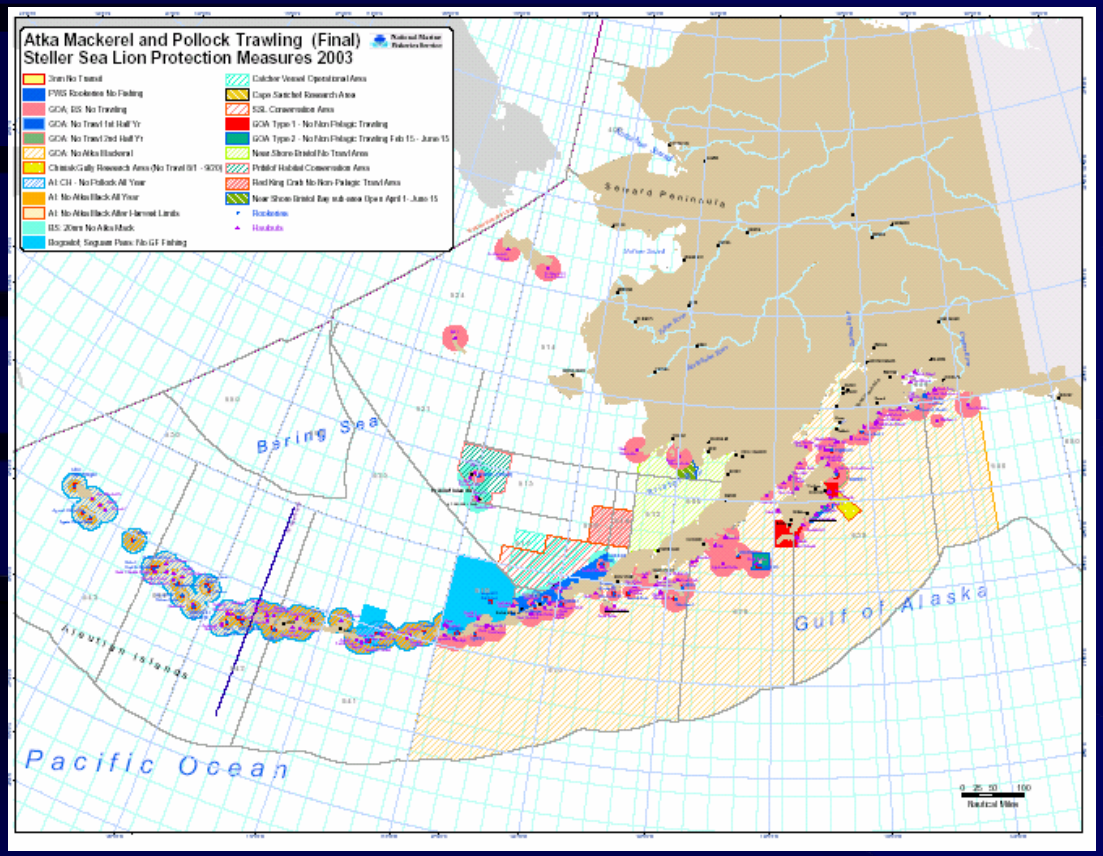
- TAC less than ABC for individual stocks.
- OY Cap on total groundfish yield.
- No target fisheries on forage species.
- Short-tailed albatross take restrictions, Seabird bycatch mitigation devices.
- No fishing in Steller sea lion foraging area and minimum biomass threshold for sea lion prey.
- Trawl closures, bottom trawling restrictions.
- Bycatch and discard controls.

CAP on TOTAL TARGET CATCH
BSAI Total Yield < 2 million mt

Catch ≤ TAC ≤ ABC < OFL

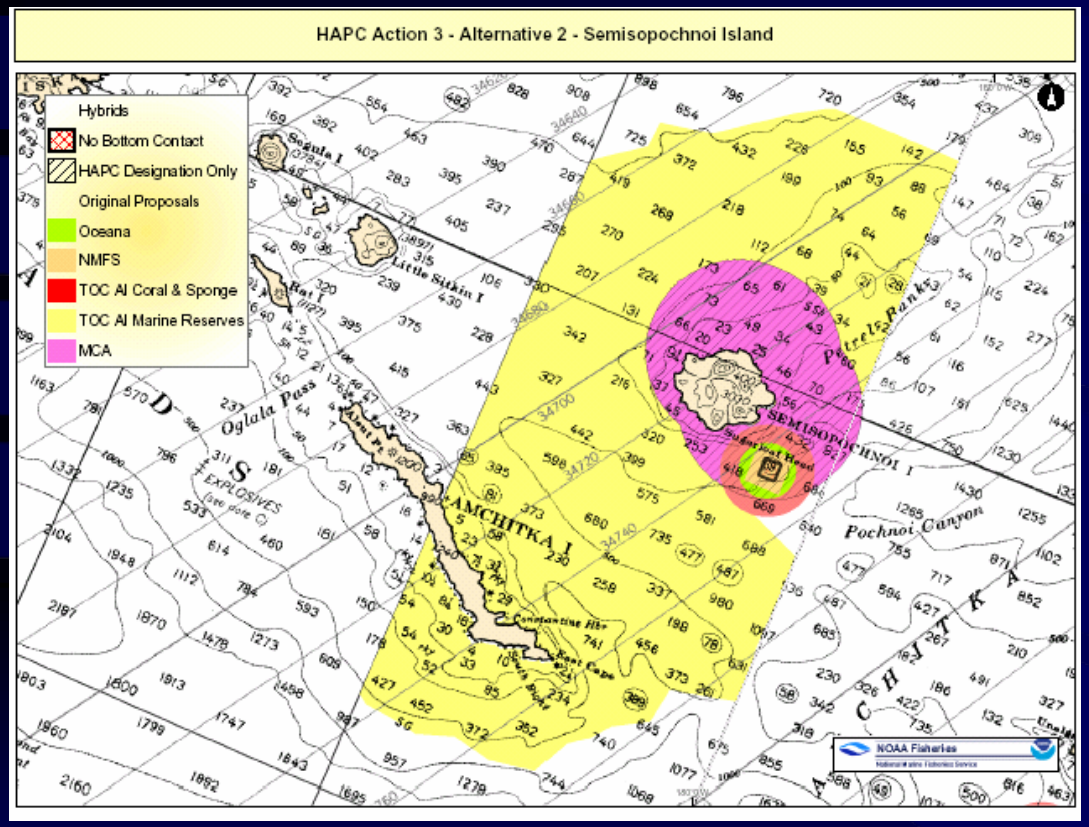
Conservative single-species targets

Steller Sea Lion Protection Measures



No Trawl Areas and Seasonal Closures

Cold-water Coral Research and Protection

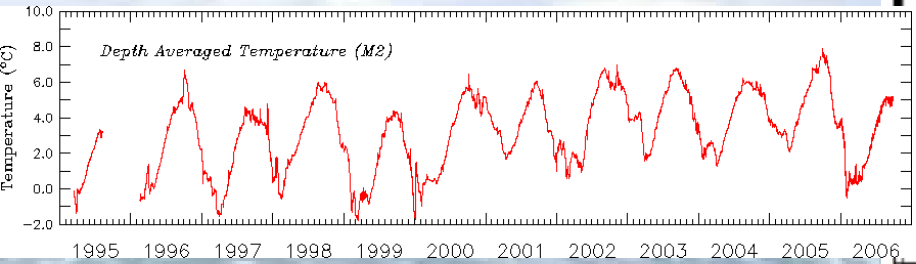


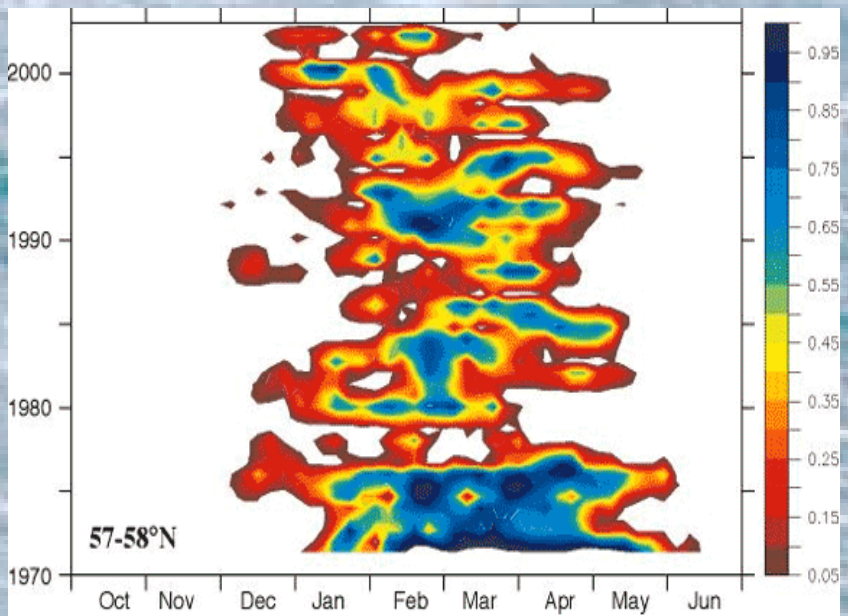
Habitat of Particular Concern

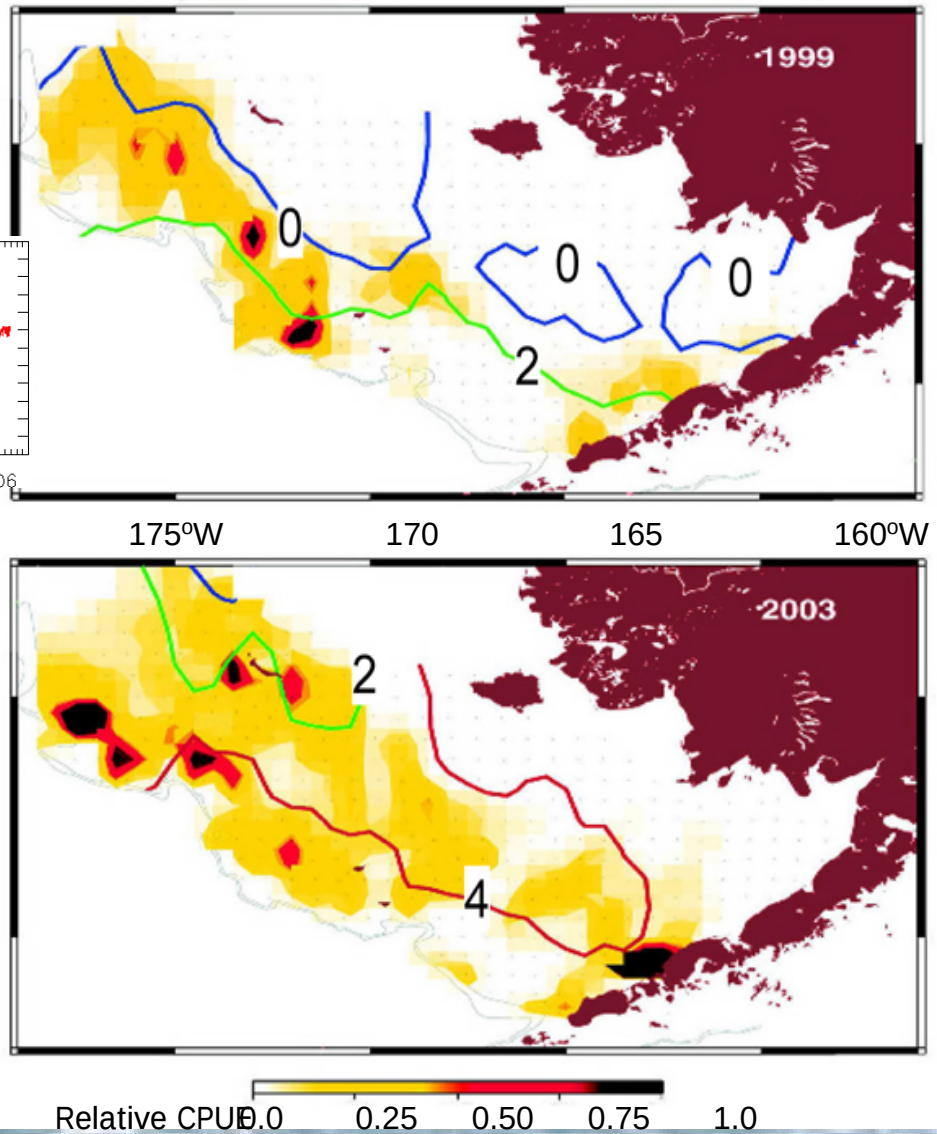
Climate Effects

Ocean conditions determine the abundance, distribution and condition of marine animals

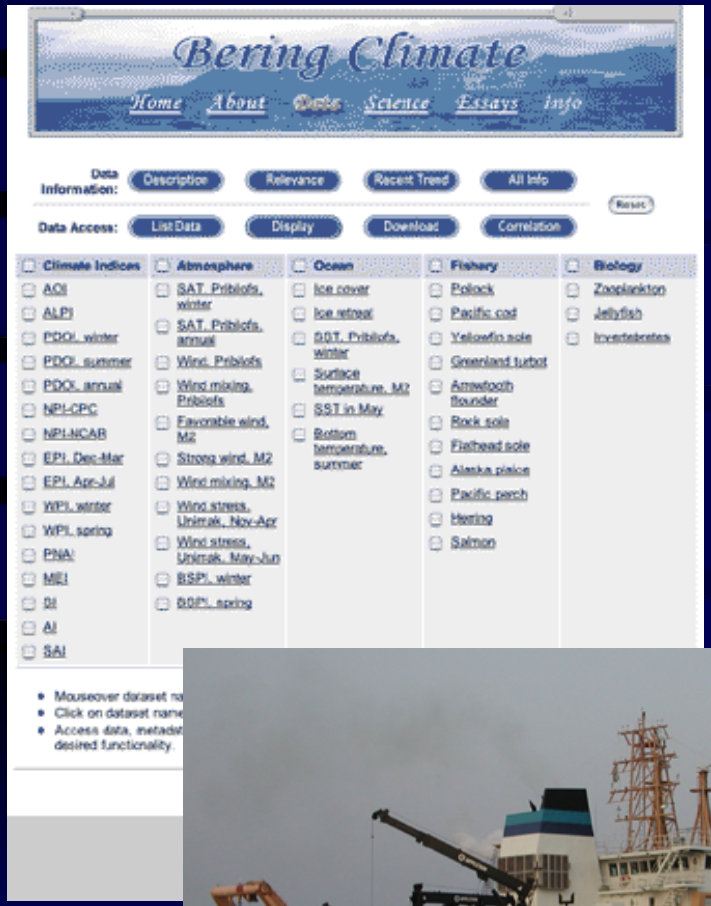
Bering Sea Pollock and Bottom Temperature

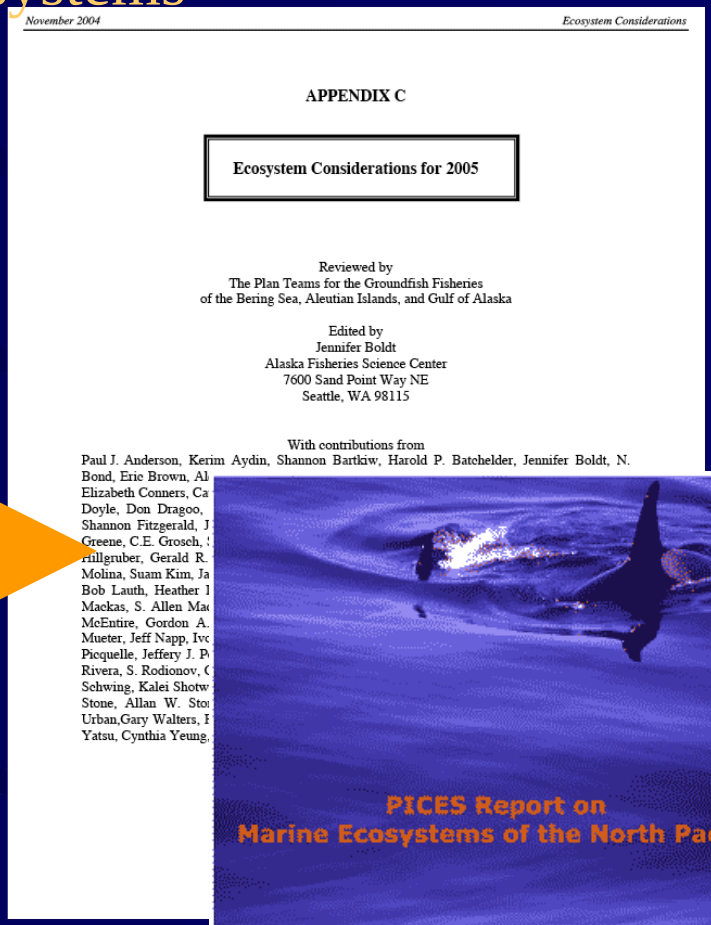






Integrated Assessment Reports for Alaska Groundfish Ecosystems





November 2004 — Ecosystem Considerations

APPENDIX C

Ecosystem Considerations for 2005

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

Edited by
Jennifer Boldt
Alaska Fisheries Science Center
7600 Sand Point Way NE
Seattle, WA 98115

With contributions from
Paul J. Anderson, Kerim Aydin, Shannon Bartkiw, Harold P. Batchelder, Jennifer Boldt, N. Bond, Eric Brown, Al
Elizabeth Conners, Ca
Doyle, Don Dragoo,
Shannon Fitzgerald, J
Greene, C.E. Grosch,
Hillgruber, Gerald R.
Molina, Suam Kim, Ja
Bob Lauth, Heather I
Mackas, S. Allen Mac
McEntire, Gordon A.
Mueter, Jeff Napp, Ivc
Picquelle, Jeffery J. P
Rivera, S. Rodionov, C
Schwing, Kalei Shotw
Stone, Allan W. Sto
Urban,Gary Walters, I
Yatsu, Cynthia Yeung,

What are Integrated Ecosystem Assessments?

Integrated Ecosystem Assessment (IEA):

- "A synthesis and quantitative analysis of information on relevant physical, chemical, ecological and human processes *in relation to specified ecosystem management objectives*".

An IEA:

- Incorporates multiple indicators of the physical environment, human factors affecting ecosystems, and the abundance and production of ecosystem goods and services,
- Is geographically specified,
- Establishes target levels and thresholds for important ecosystem components,
- Evaluates the impacts of management options and risks of not attaining target ecosystem states.

Components of an IEA

- An IEA typically consists of the following components:

  - Assessment of ecosystem baseline conditions (States)
  - Assessment of stressors on the ecosystem (Drivers, Pressures)
  - Prediction of the ecosystem status with no change in management actions (status quo response)
  - Prediction of the ecosystem status under different management strategies to meet target states (optional responses)
  - Evaluation of the success of management actions (update states relative to targets and thresholds)

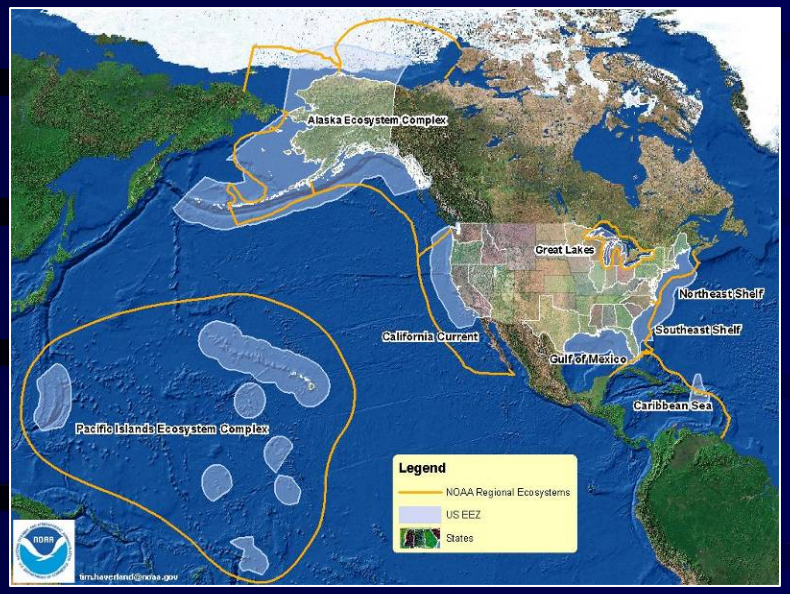
  N.B. Ecosystem status reports ARE NOT integrated ecosystem assessments (DPSIRs)

Types of Indicators and Issues considered in IEAs

Drivers & Pressures → **States & Impacts**

Physical	Human-Related	Conditions	Goods & Services
air temperature	nutrient input	extent of hypoxia	species
sea temperature	contaminants	HAB events	-abundance
weather patterns	microbiological inputs	invasive species interactions	-biomass
waves	radioactive input	primary production	-recruitment
salinity	hydrocarbons	secondary production	fishery catch
pH	atmos. deposition	benthic production	fishery revenue
circulation	wetlands change	species richness	recreational use
sea level	fishing effort	species diversity	aquaculture production
decadal indices	vessel traffic	protected species status & mortality	non-consumptive uses
upwelling	bycatch	overfishing status	social use and Importance
wind stress	non-native species introductions	trophic balance	transportation
sediment transport	marine debris	body burden of contaminants	commerce
freshwater input	coastal & seabed modifications	distributions of biota	energy
sea ice cover	marine sound	human factors	
extreme events			

What are the appropriate geographical scales for IEAs?



Assessing the Status of Ocean and Coastal Ecosystems of the United States

National

National Overview

+ International collaborations

Hierarchical Structure of IEAs

Regional

-Large Marine Ecosystems
-Sub-Regional Ecosystems
(as appropriate)

Local

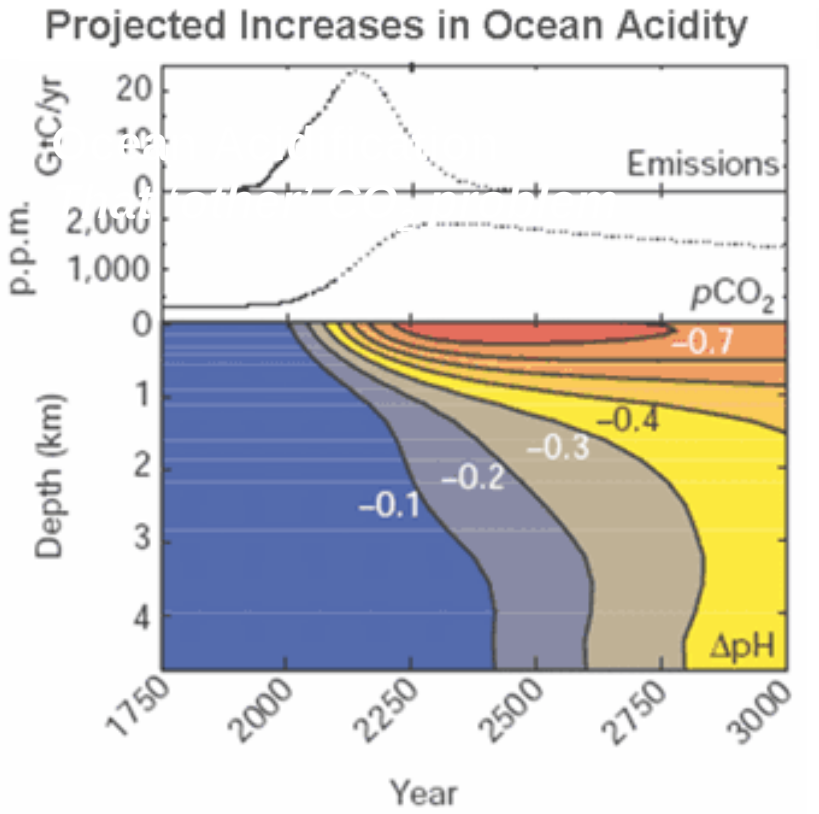
-Place based
(e.g., sanctuaries, NERRs)
-Bays, Harbors, Estuaries

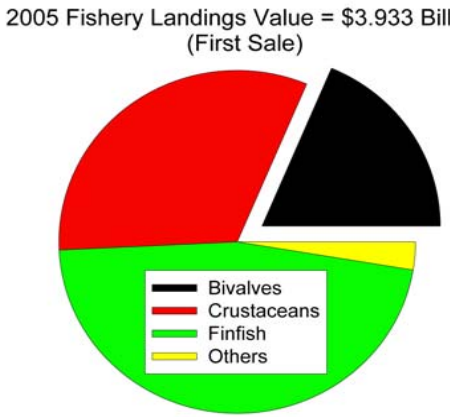
MSA Section 406 (2007)

(1) STUDY.—The Secretary shall undertake and complete a study on the state of the science for advancing the concepts and integration of ecosystem considerations in regional fishery management. The study should include—

- (A) recommendations for scientific data, information and technology requirements for understanding ecosystem processes, and methods for integrating such information from a variety of federal, state, and regional sources;
- (B) recommendations for incorporating broad stake holder participation;
- (C) recommendations to account for effects of environmental variation on fish stocks and fisheries; and
- (D) a description of existing and developing council efforts to implement ecosystem approaches, including lessons learned by the councils.
- (2) AGENCY TECHNICAL ADVICE AND ASSISTANCE, REGIONAL PILOT PROGRAMS.—The Secretary is authorized to provide necessary technical advice and assistance, including grants, to the Councils for the development and design of regional pilot programs that build upon the recommendations of the advisory panel and, when completed, the study.

Ocean Acidification: A Consequence of Human Production of Greenhouse Gasses – Ocean Impacts





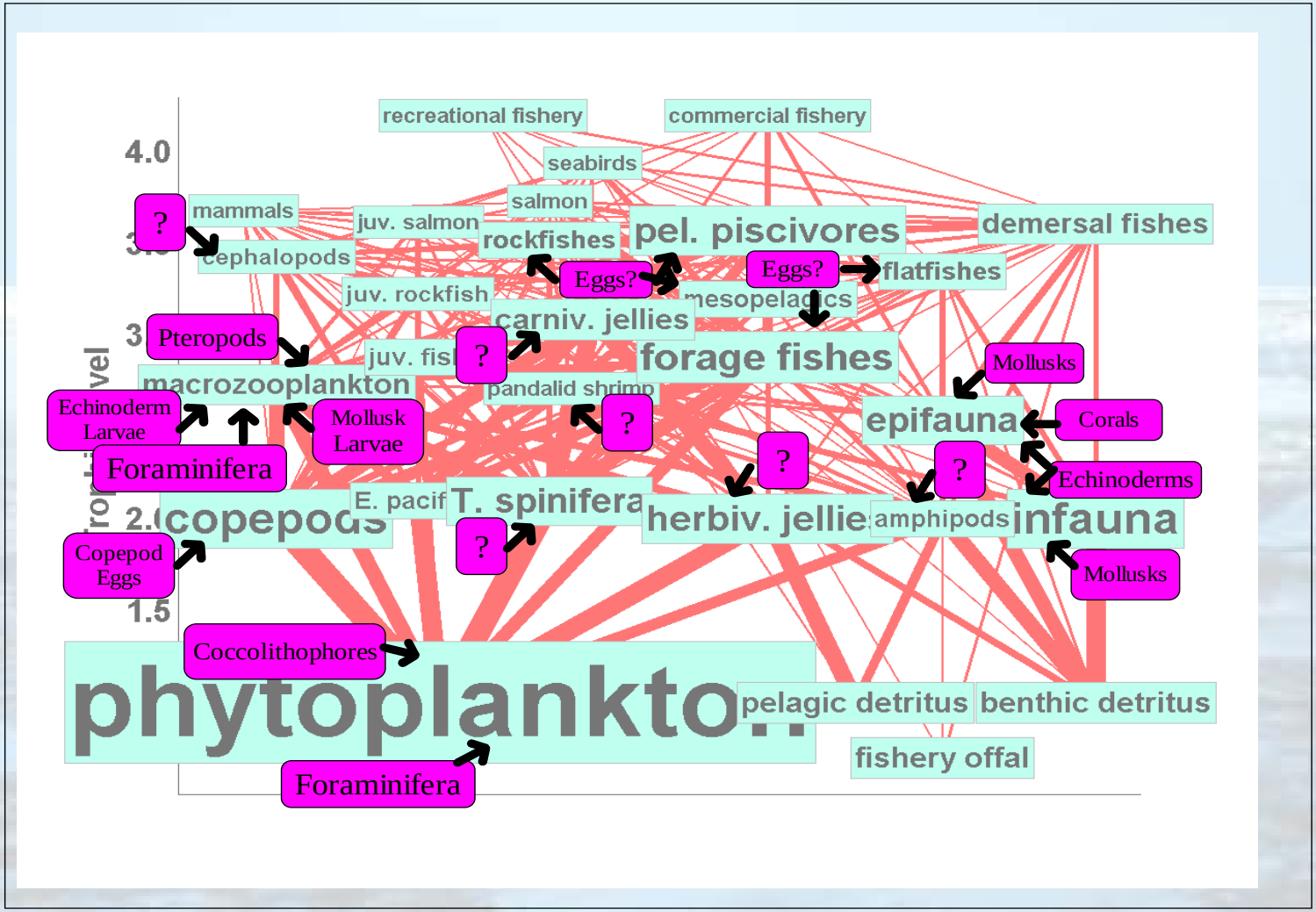
Value:
Bivalves: $732M ex-vessel commercial value
Crustaceans: $1,265M ex-vessel commercial value
Combined : $1,997M ex-vessel commercial value (51% of commercial catch by $)

As ocean calcium carbonate saturation state decreases, a concomitant reduction in calcification rates by marine organisms can occur.

- reduced calcification rates for bivalves, crustaceans, corals, phytoplankton?
- possibility of dissolution

Partial Ocean Acidification Effects on Food Webs

NMFS/NWFSC – Paul McElhany et al



Base food web of N. Calif. Current by Ruzicka et al. NMFS/NWFSC

Summary

- Trend to more ecosystem issues in fisheries management
- Need to work with more diverse communities of interests
- NOAA and other federal agencies will work towards this goal
- Key is regional approaches that work

Questions?