



**NOAA**  
**FISHERIES**  
Headquarters

# Advancing Ecosystem- Based Management: Ecosystem-Based Fisheries Management Policy and Roadmap

Dr. Jason Link

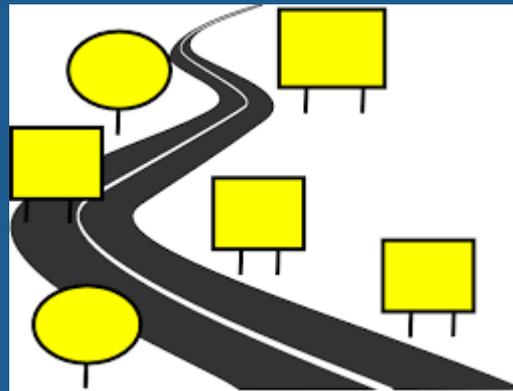
EBM Seminar Series: September 2, 2015

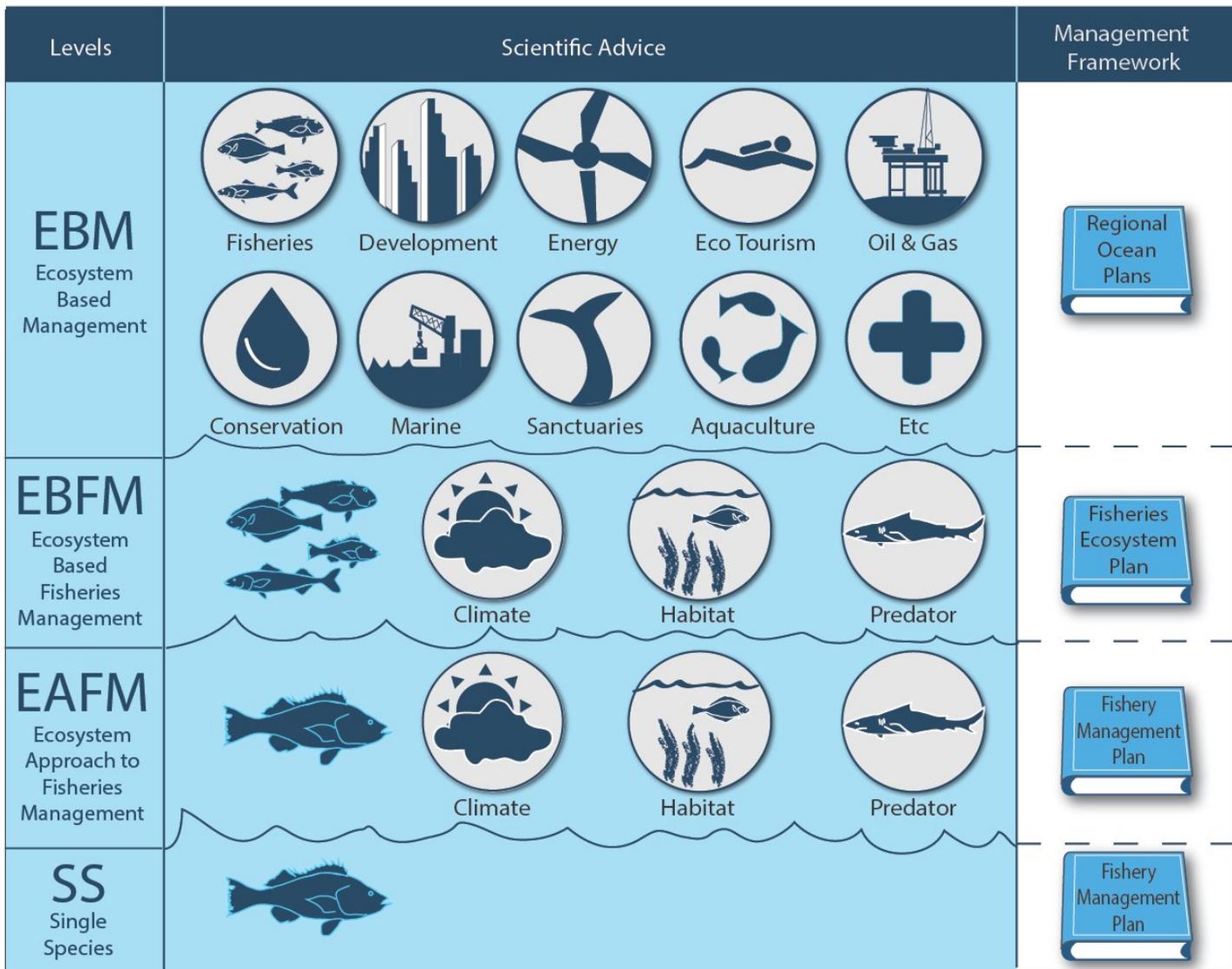
# Take Aways

- NOAA Fisheries needs to, can and is committed to doing EBFM
- Making EBFM operational remains a key challenge, but is one we are up for!

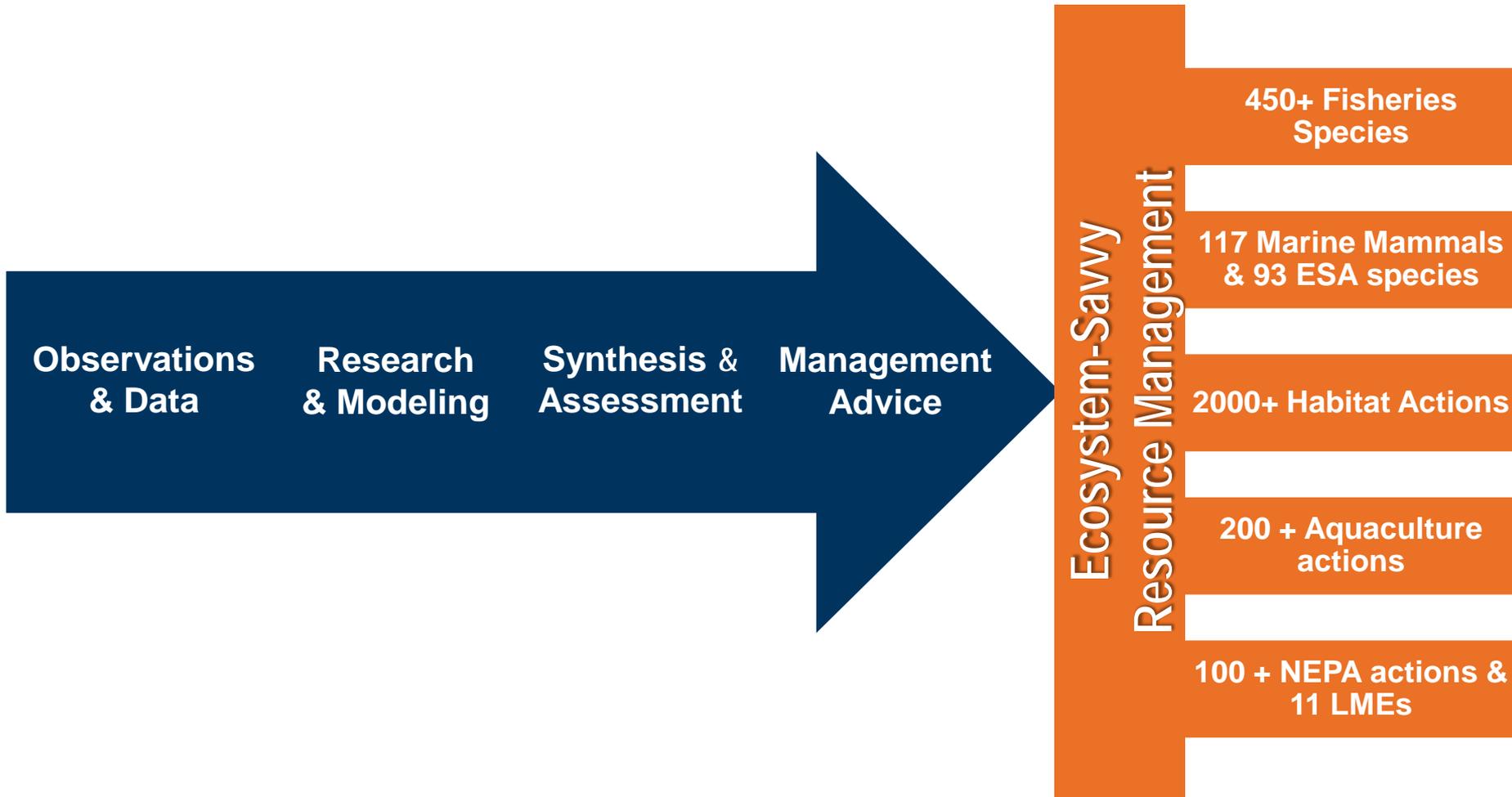
# Outline

- A bit of background
- 2 Stories
- What do we propose operational EBFM looks like?



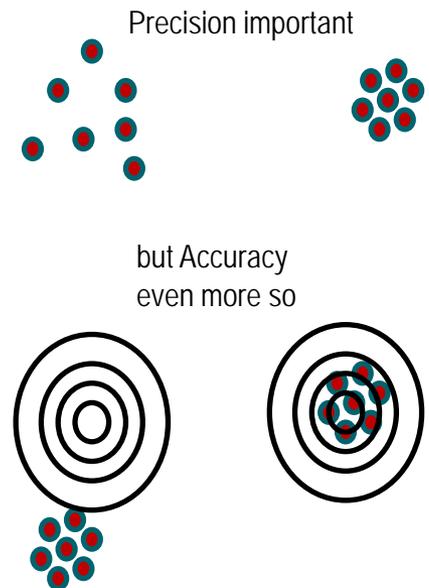


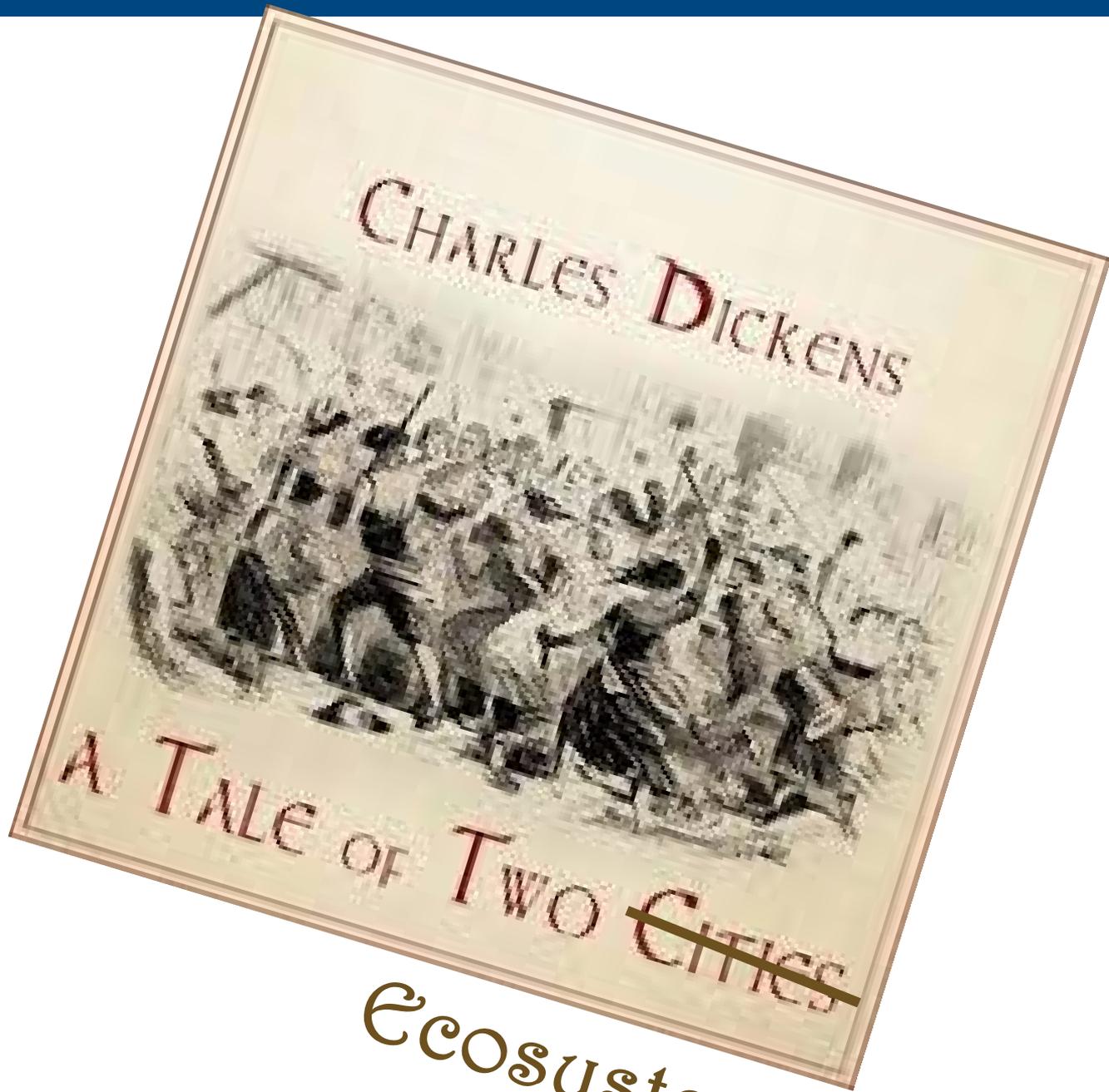
# Multiple Mandates, Multiple Opportunities



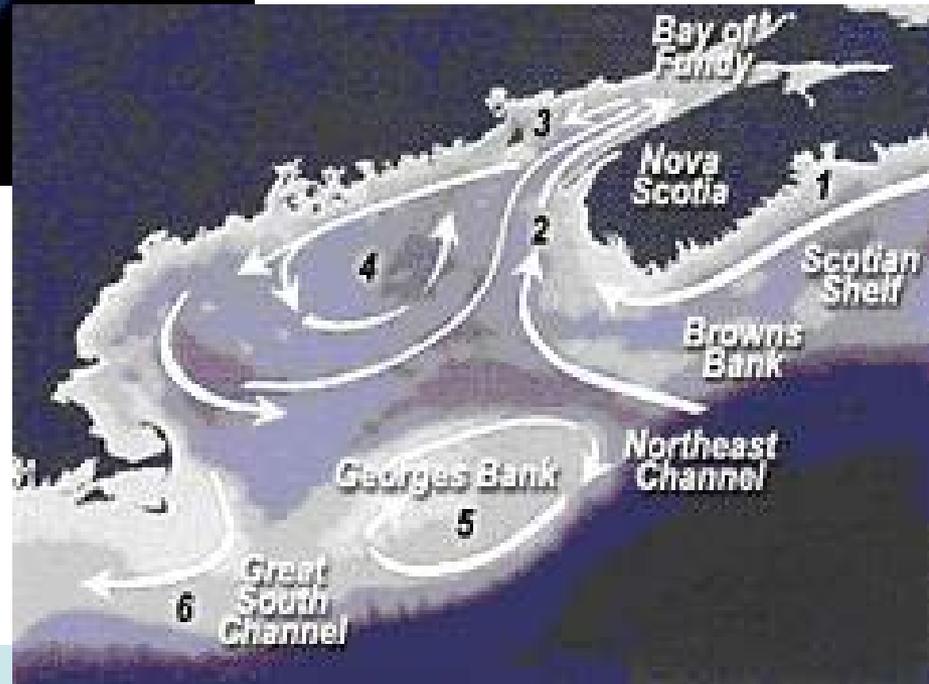
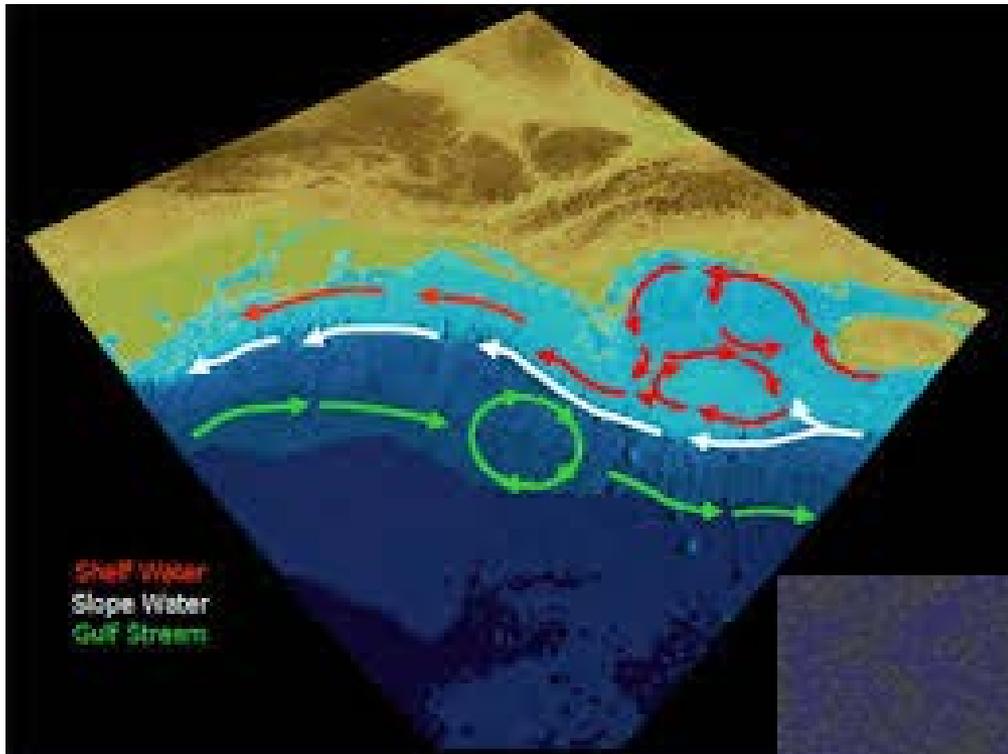
# Why EBFM?

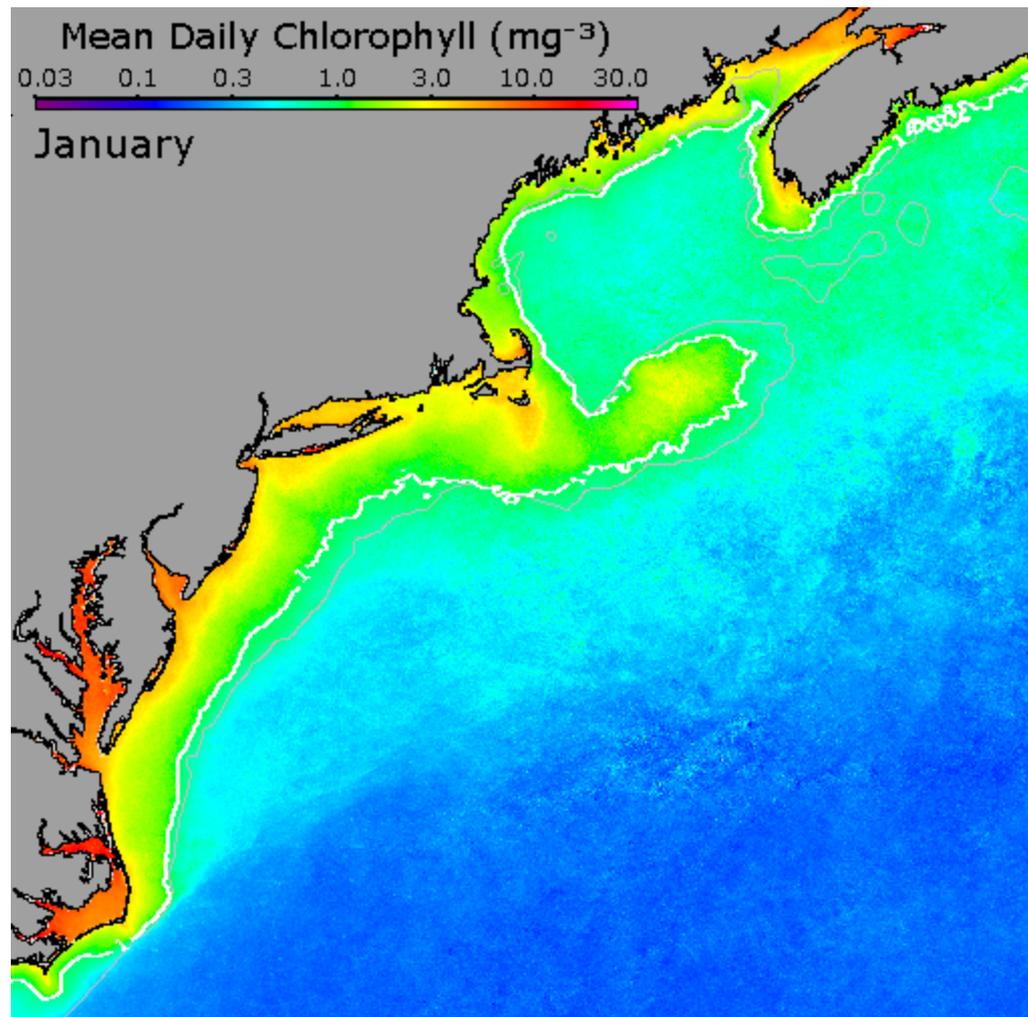
- Better Economics, \$\$\$
- Fewer Misses, Better advice
- Triage & Prioritization
- ↑ed Stability
- Address Tradeoffs



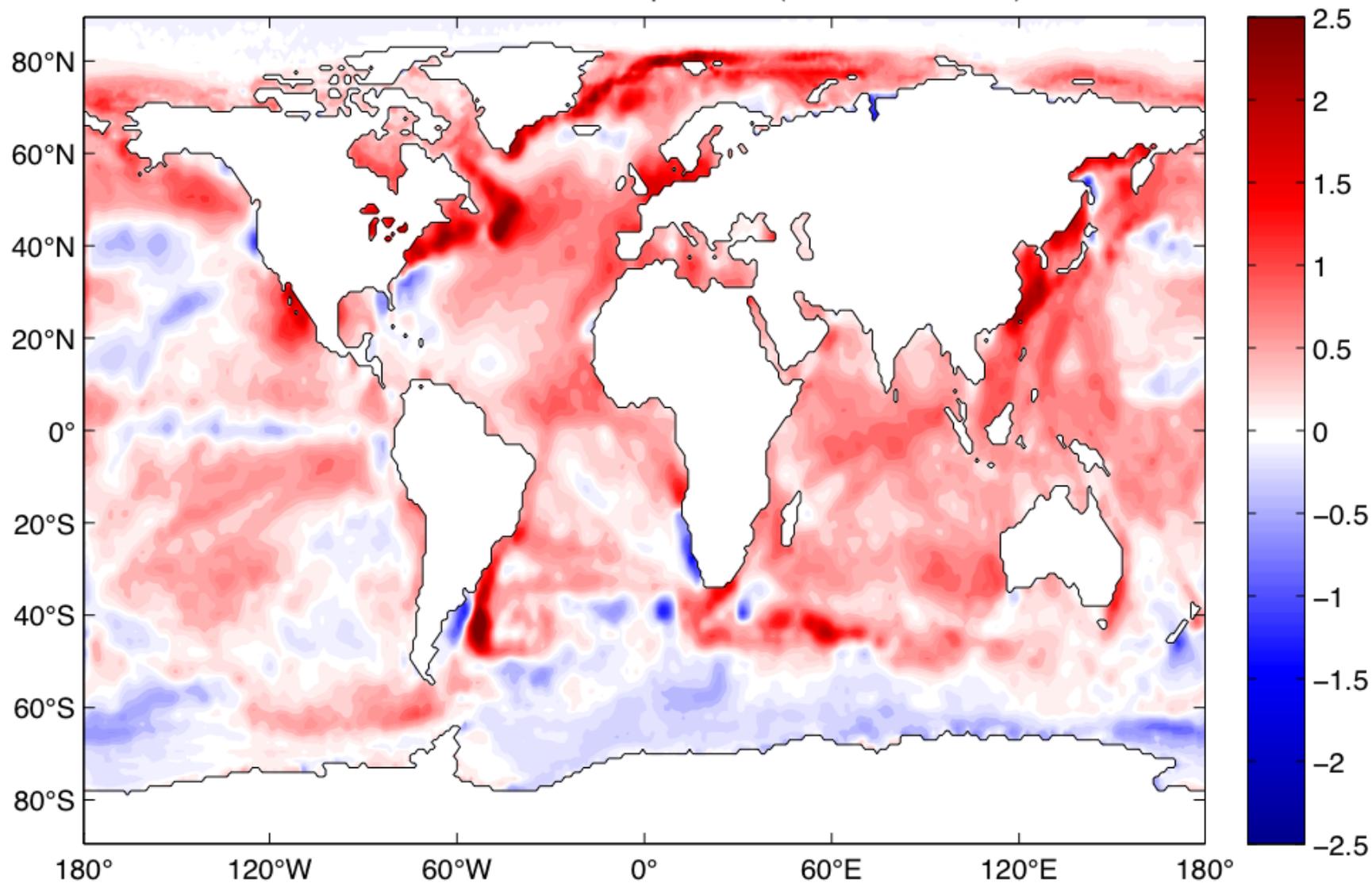


Ecosystems





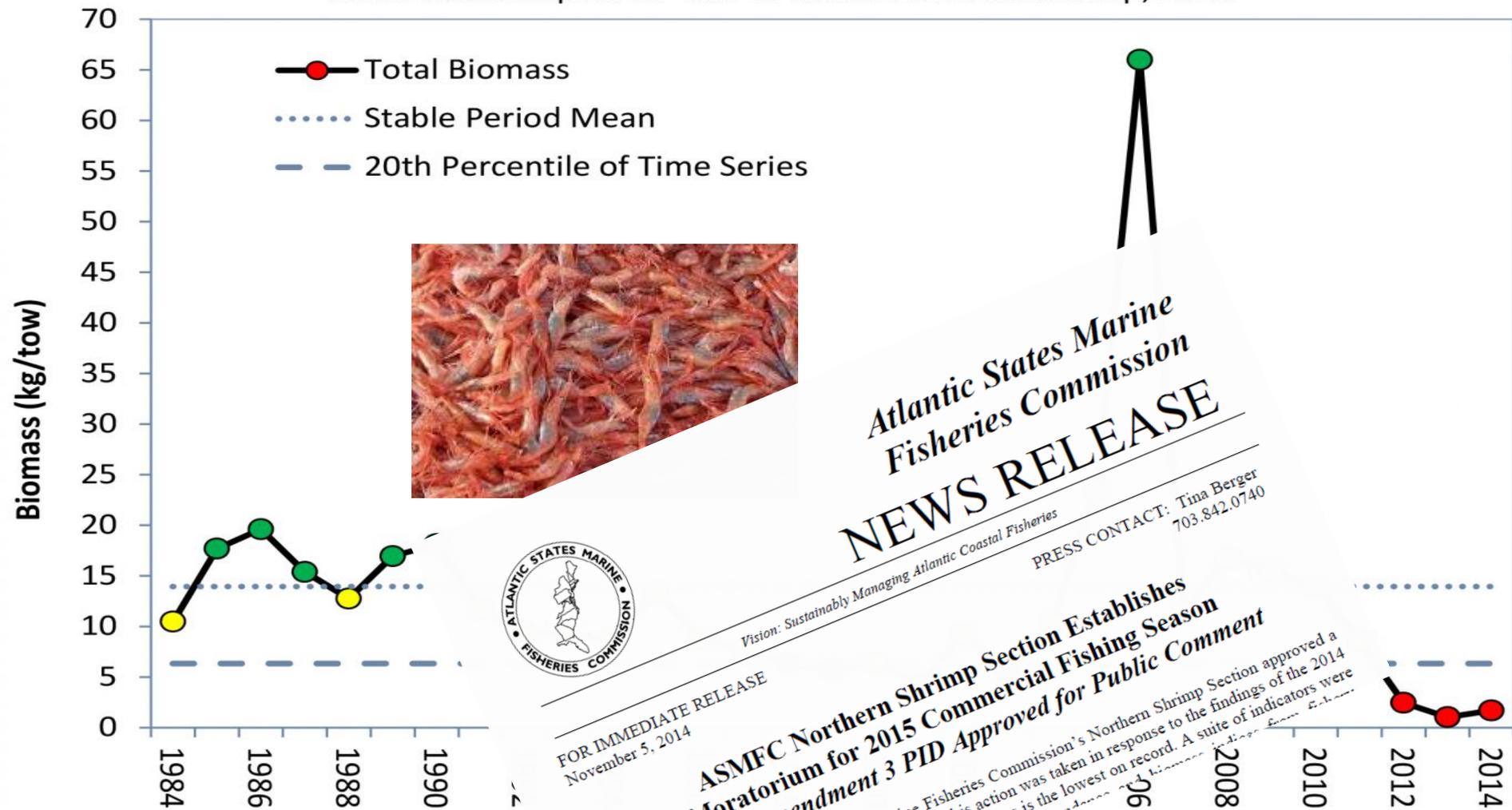
Trend in ocean surface temperature (°C, 1959 – 2008)





# Total Biomass of Northern Shrimp from the Gulf of Maine Summer Shrimp Survey

Stock Status Report for Gulf of Maine Northern Shrimp, 2014



**Atlantic States Marine Fisheries Commission**  
**NEWS RELEASE**

*Vision: Sustainably Managing Atlantic Coastal Fisheries*

PRESS CONTACT: Tina Berger  
 703.842.0740

FOR IMMEDIATE RELEASE  
 November 5, 2014

**ASMFC Northern Shrimp Section Establishes Moratorium for 2015 Commercial Fishing Season**  
**Draft Amendment 3 PID Approved for Public Comment**

Portland, ME – The Atlantic States Marine Fisheries Commission’s Northern Shrimp Section approved a moratorium for the 2015 commercial fishery. This action was taken in response to the findings of the 2014 Stock Status Report, indicating current fishable biomass is the lowest on record. A suite of indicators were used to assess the stock status of the fishery. These indicators include abundance and biomass. The 2014 findings and value. Green dots are values that are equal to or above the stable period mean (dotted line) and to the 20th percentile of the time series (dashed line); red dots are values that are equal to or below the 20th percentile of the time series; yellow dots are values between the SPM and the 20th percentile.

The graph represents the annual biomass of northern shrimp from the Gulf of Maine Summer Shrimp Survey. The y-axis represents biomass in kg/tow, ranging from 0 to 70. The x-axis represents the year, from 1984 to 2014. The graph shows a general decline in biomass over time, with a significant low point in 2014. The 20th percentile of the time series is indicated by a dashed line at approximately 6 kg/tow, and the stable period mean is indicated by a dotted line at approximately 14 kg/tow. Green dots represent values equal to or above the stable period mean, while red dots represent values equal to or below the 20th percentile of the time series. Yellow dots represent values between the stable period mean and the 20th percentile. The 2014 data point is a red dot, indicating that the current fishable biomass is the lowest on record.

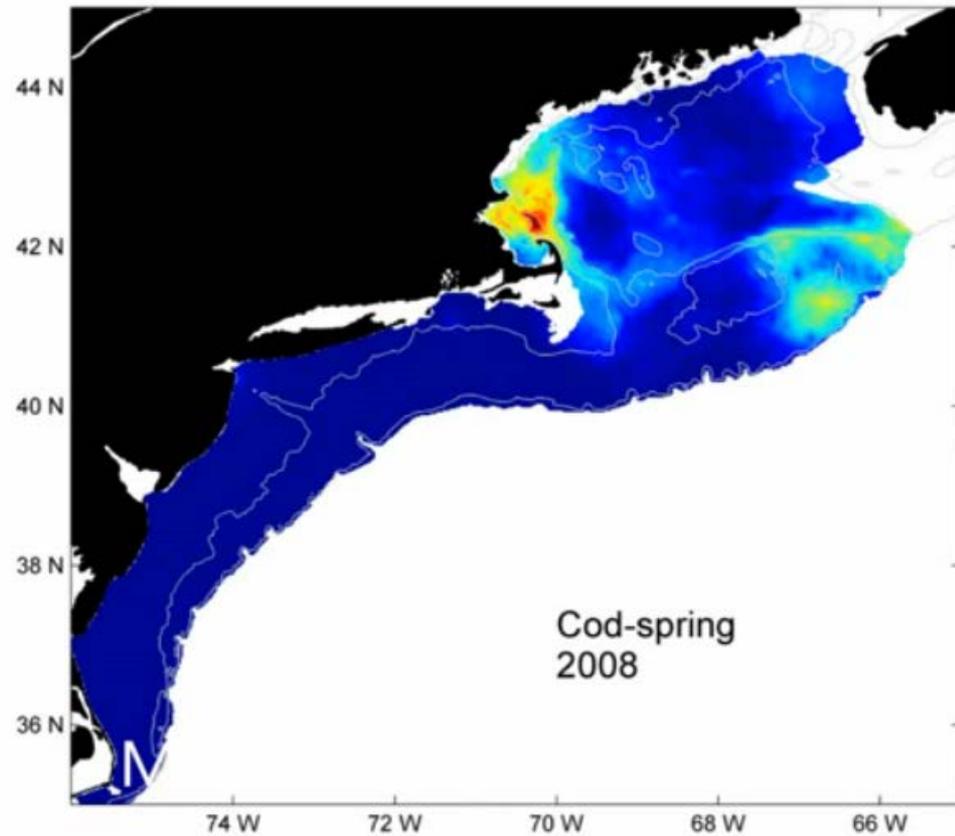
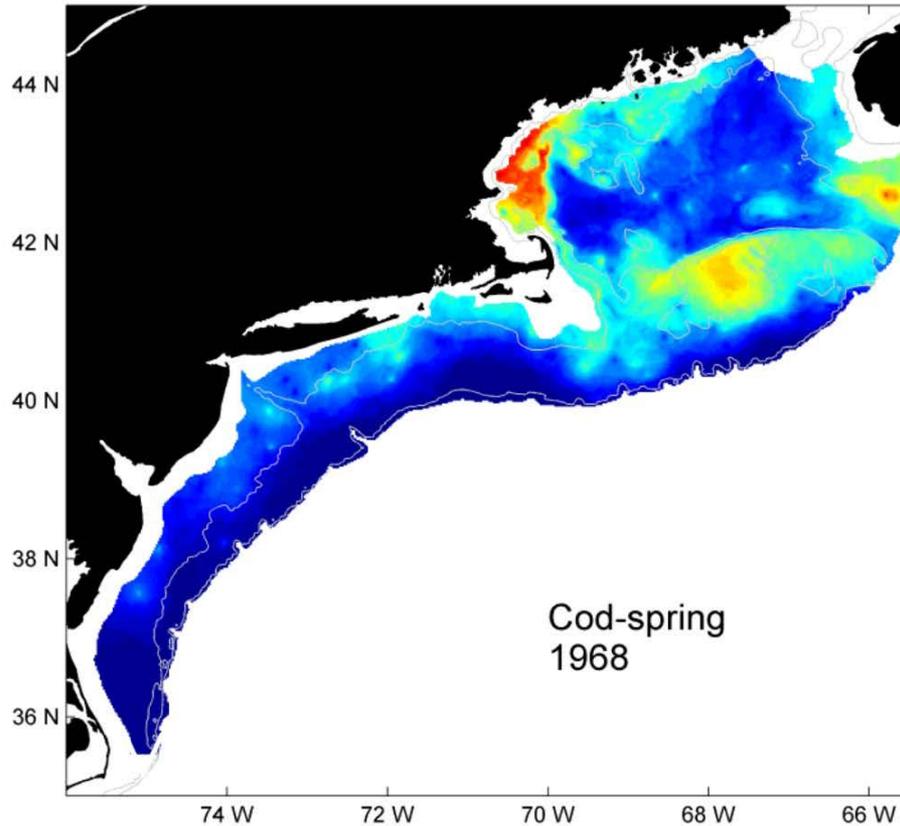
# *Pandalus borealis* fishery moratorium

We saw this coming. Was it addressed in:

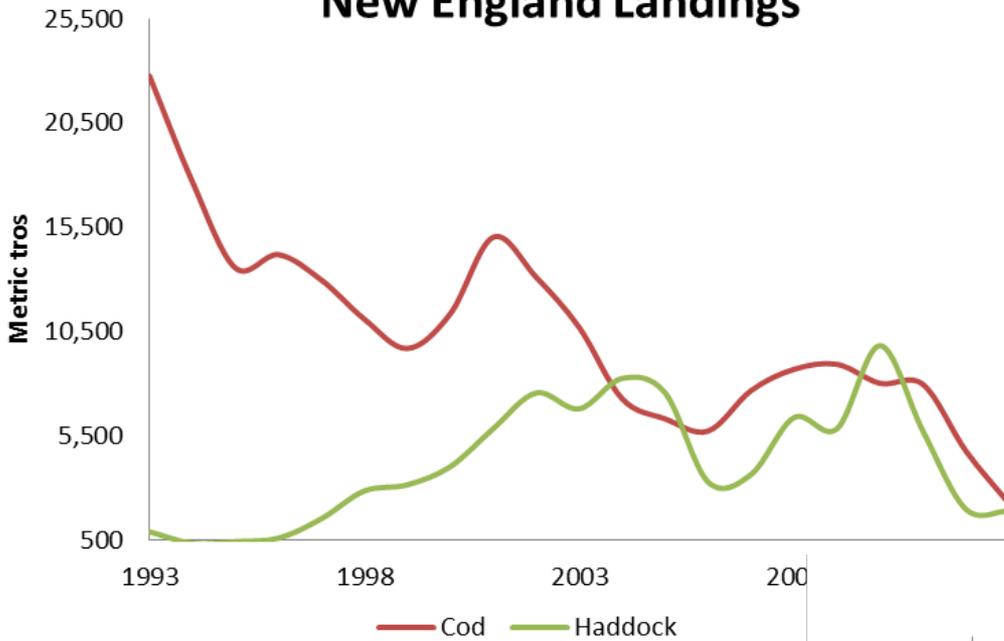
- Observations? • Yes
- Ecosystem covariates? • Yes
- Mechanistic understanding? • Partly
- Accommodated in Stock assessment? • No
- Buffer adjustments to BRP? • No
- Flexible HCRs? • No
- Risk evaluation for FMP? • No



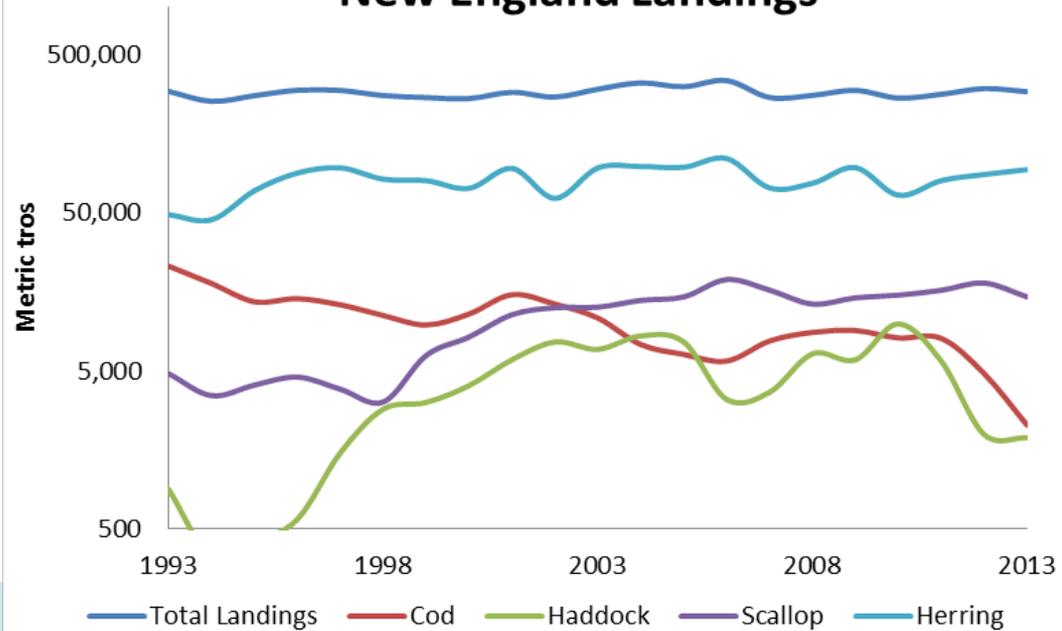
# Coming attractions



# New England Landings

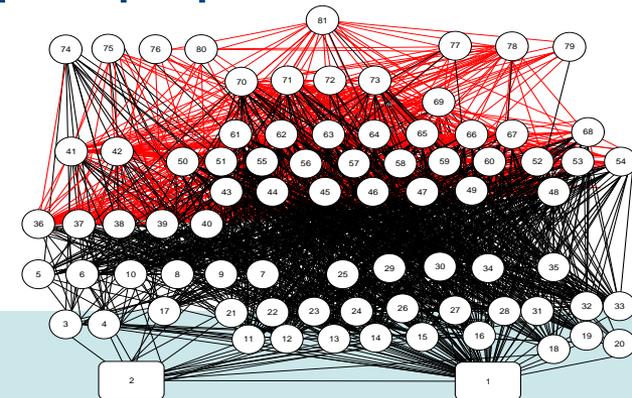


# New England Landings



# Governance complexity & interactions

- Other Jurisdictions
- Int'l Considerations & Joint Mgt?
- # Stakeholders
- Stakeholder engagement
- ASMFC, NASCO, NAFO, ICCAT
- Yes, DFO
- High
- Decent per populace



# Interacting Species: Multiple Management Plans

Sea Herring

Cod  
Haddock  
White Hake  
Pollock  
Yellowtail  
Flounder  
Winter Flounder  
Witch Flounder  
Windowpane  
American Plaice  
Halibut  
Redfish  
Ocean Pout

Spiny Dogfish

Seals

Silver Hake  
Red Hake  
Offshore Hake

Winter Skate  
Little Skate  
Smooth Skate  
Thorny Skate  
Barndoor Skate  
Clearnose Skate  
Rosette Skate

Bluefish

Whales

Monkfish

Scup  
Black Sea Bass  
Summer Flounder

Squid  
Mackerel  
Butterfish

NERO

Sturgeon

NEFMC

MAFMC

Salmon

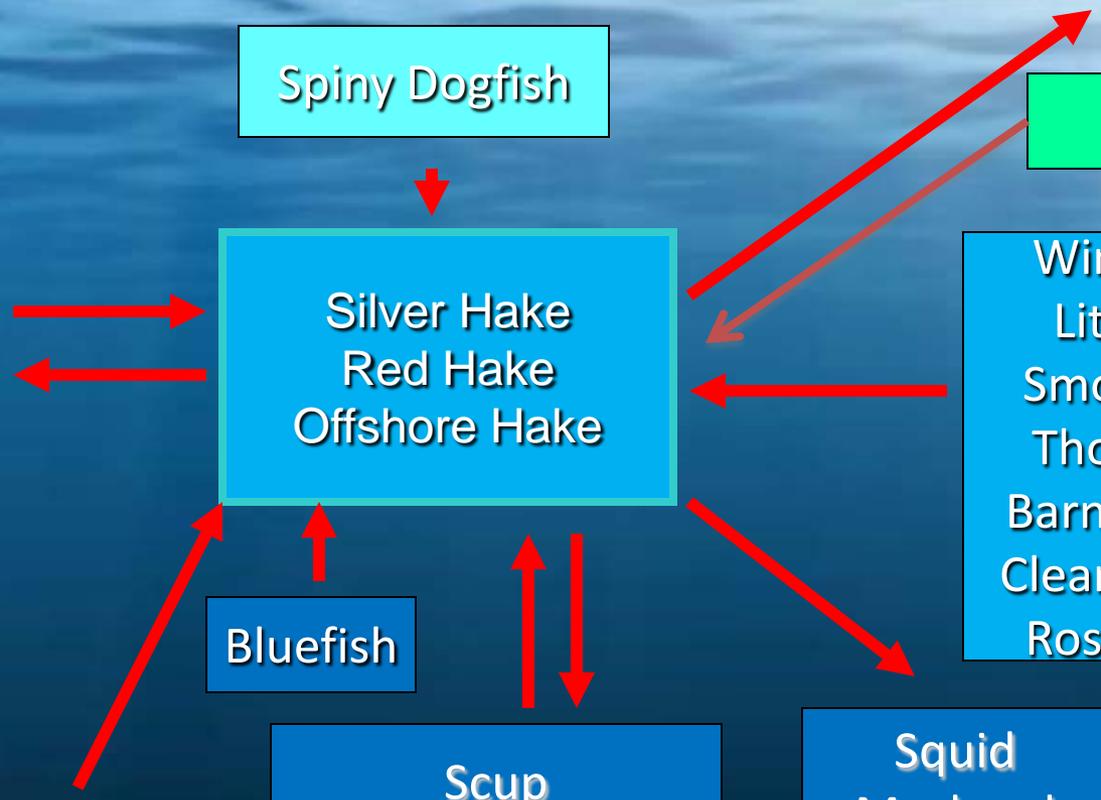
Red Crab

Tilefish

Surf Clam  
Ocean Quahog

Sea Scallops

Shared

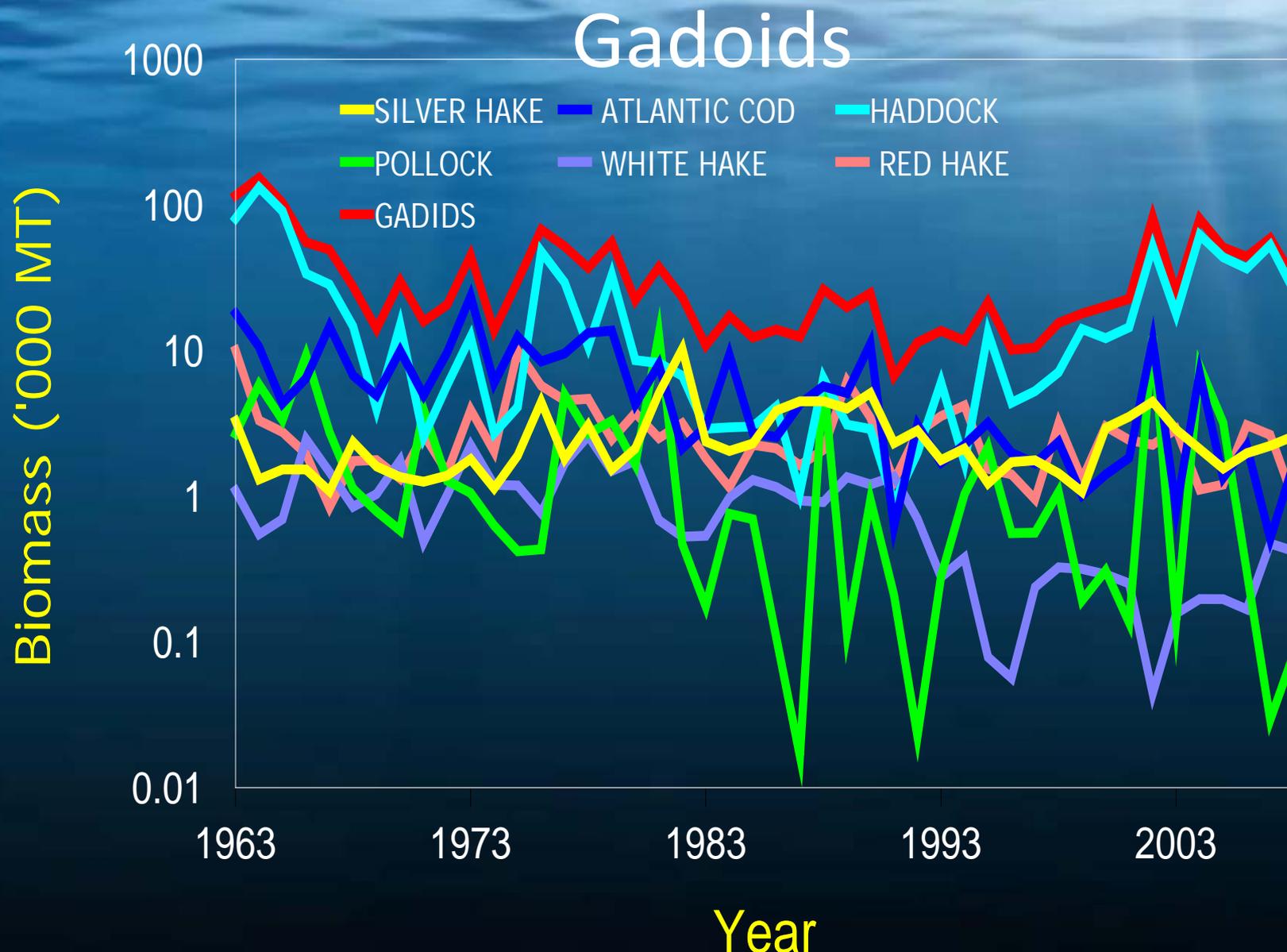


# Reductionism is the solution?

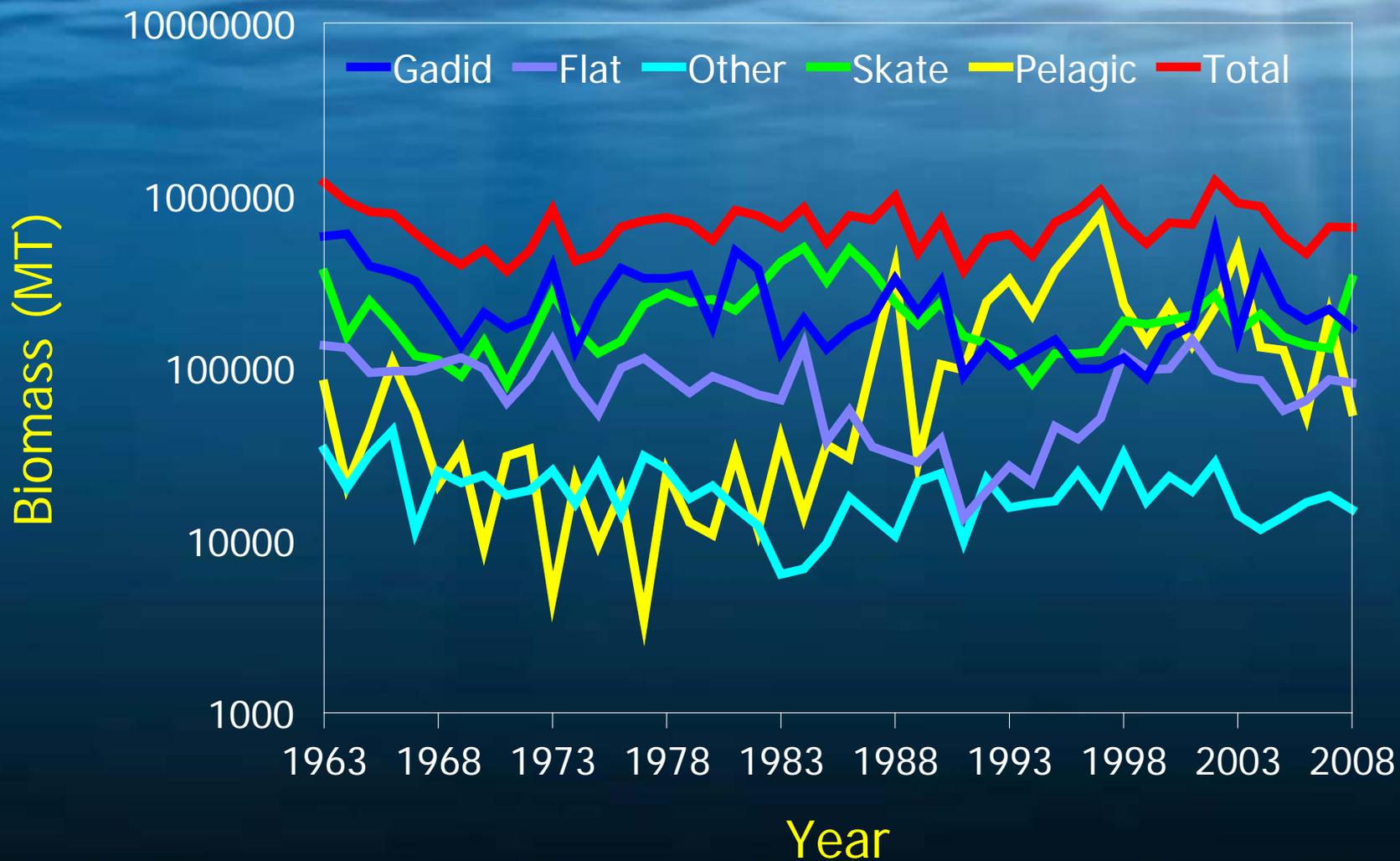
- # of managed spp
  - # of managed fishery spp
  - # of FMPs
  - FEP?
  - Leading Indicators?
  - Ecosys Status Report or Ecosys Chapter?
  - Ecosys information informs mgt process?
- >70
  - ~39 in FMP (not stocks, not other Jurisdictions)
  - 7 NE, 5 MA, 2 joint (c.f. 24 in ASMFC)
  - No
  - Yes
  - Yes
  - No



# Emergent Properties: Is the Whole More Stable than the Parts?



# Emergent Properties: Overall Fish Community



# Systems thinking

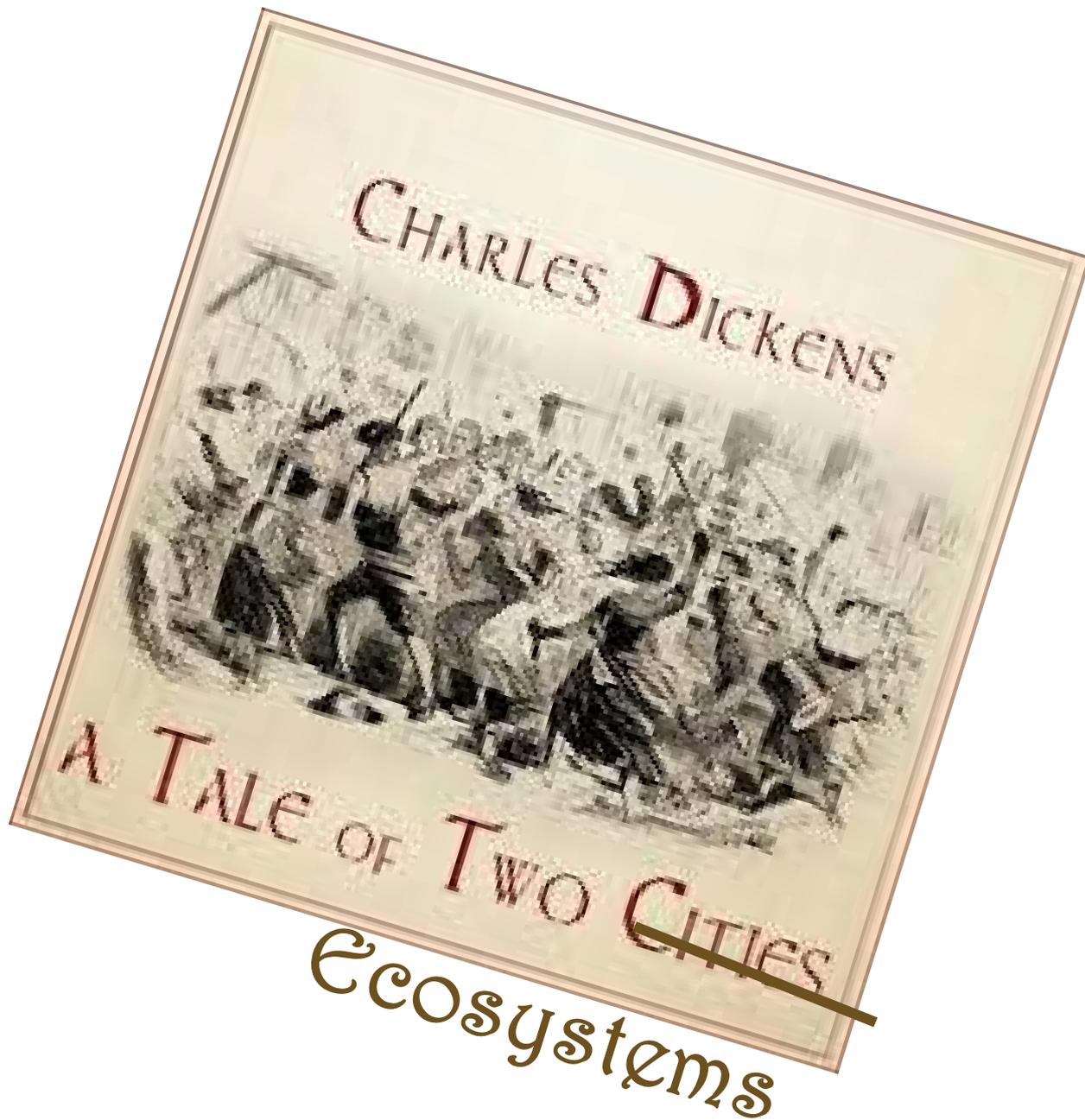
- Are there evaluations of systemic risk? • Partially
- Are there estimates of Ecosystem Level RPs (e.g. ACLs)? • Yes
- Are there overarching MSEs in place to evaluate tradeoffs • Partially
- Are there economic analyses showing net, overall benefits of EL RPs? • Yes
- Are EL RPs used? • No

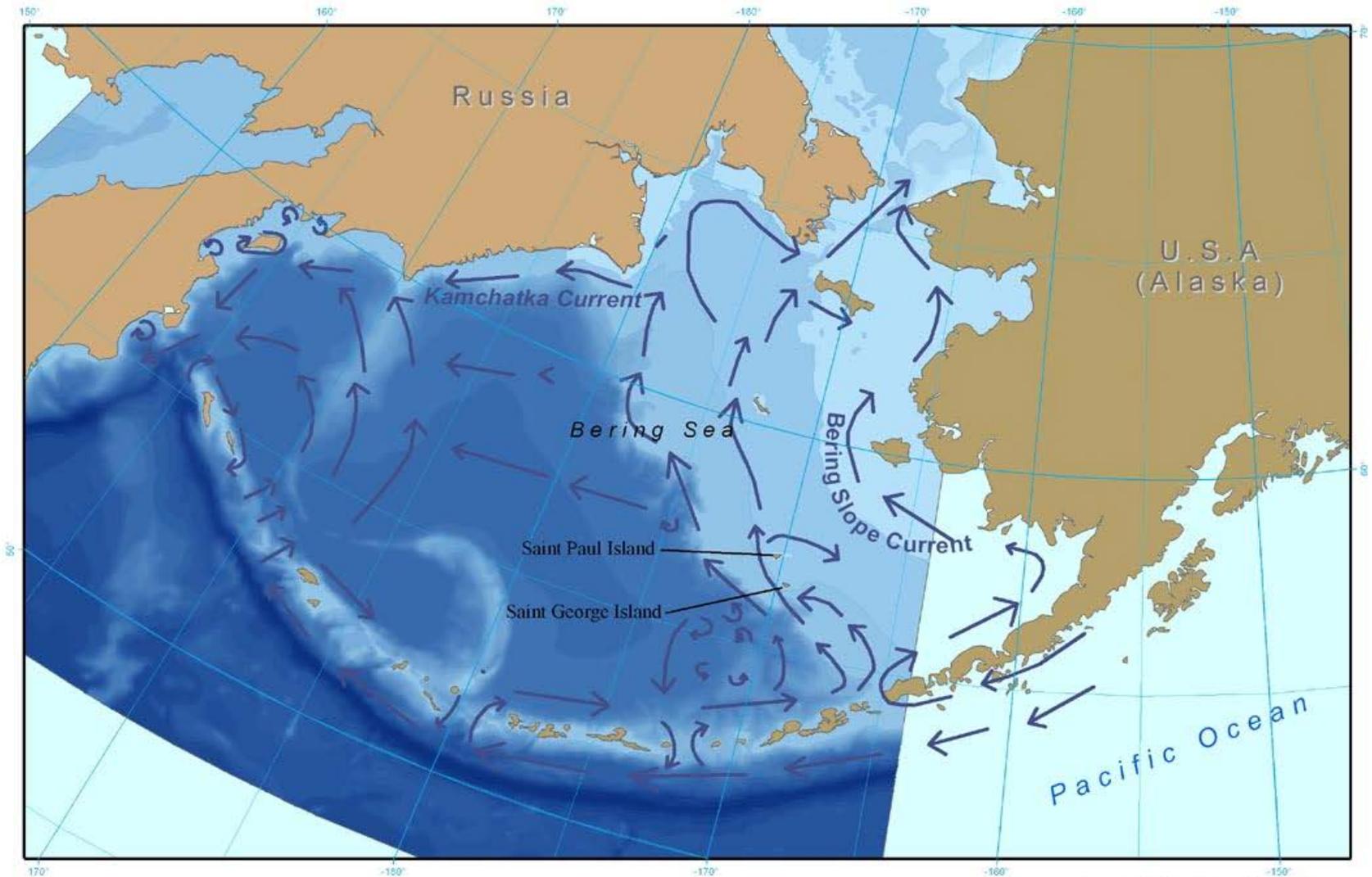


# Inadequate Kudos for other stuff?

- Are (deep water) corals protected? • Yes
- Is habitat actively managed (e.g. closures, restoration, etc.)? • Yes
- Are cryptic or non-target keystone spp (e.g. jellyfish, benthic engineers, etc.) monitored? • Partly
- Are cryptic spp accounted for in LMR mgt? • No
- Is offshore development (e.g. wind farms, cables, etc.) managed around fisheries? • Yes
- Are other ocean-use sectors coordinated with & supported by fisheries mgt (e.g. tourism, whale-watching, etc.)? • Yes







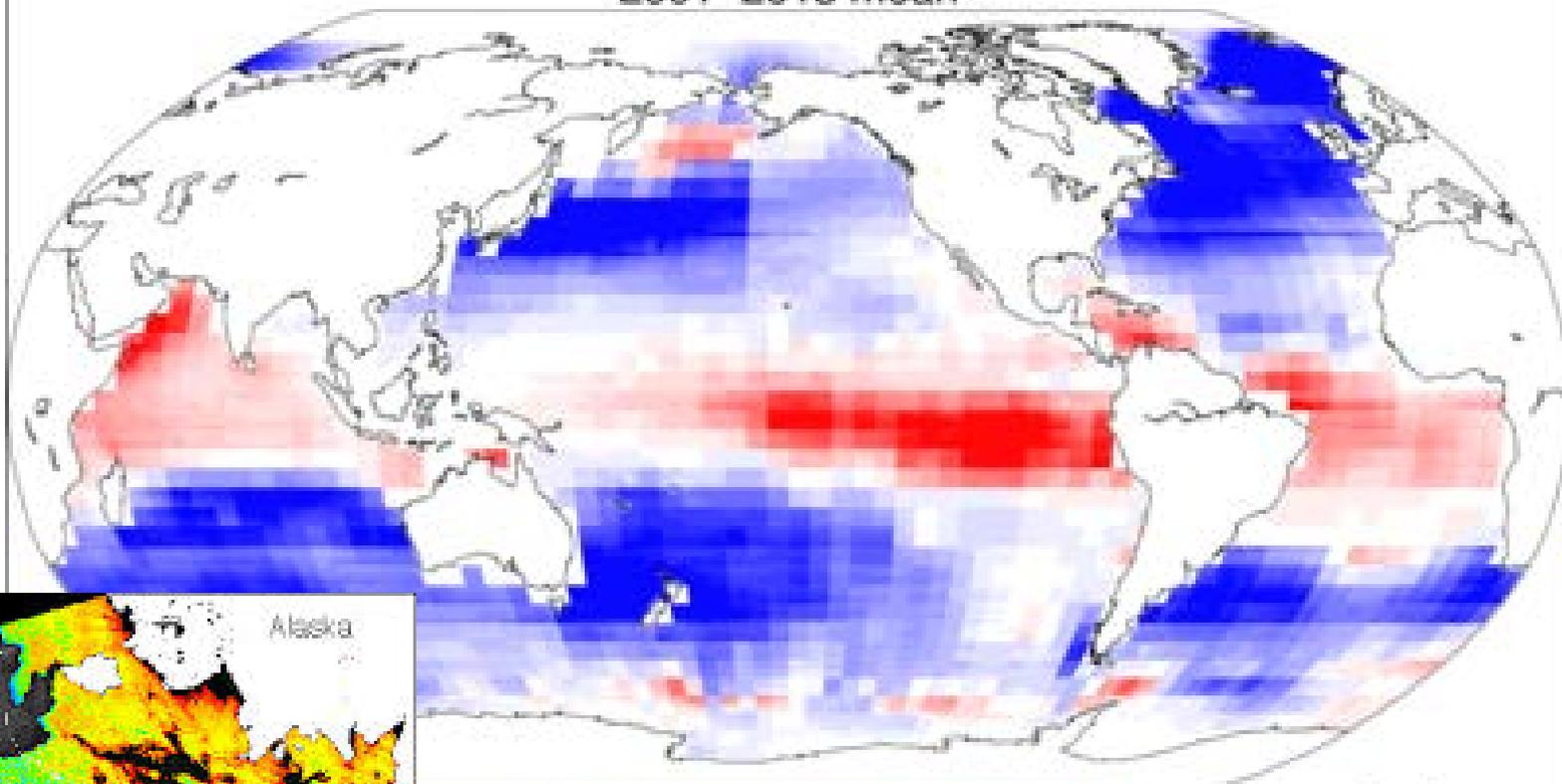
# Bering Sea Circulation

Source: ESRI Data & Maps (Countries),  
 U.S. Geologic Survey (Bathymetry),  
 World Wildlife Fund (WWF) (Circulation Data)

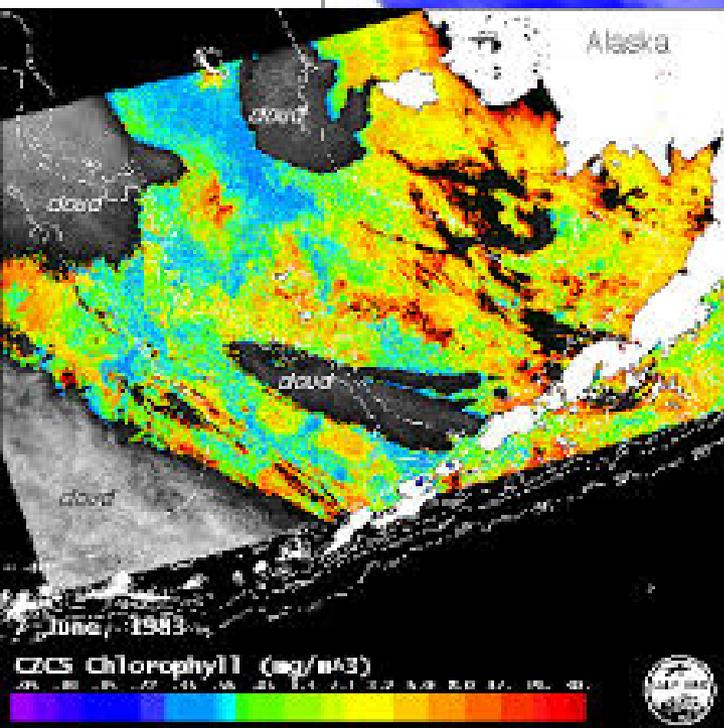


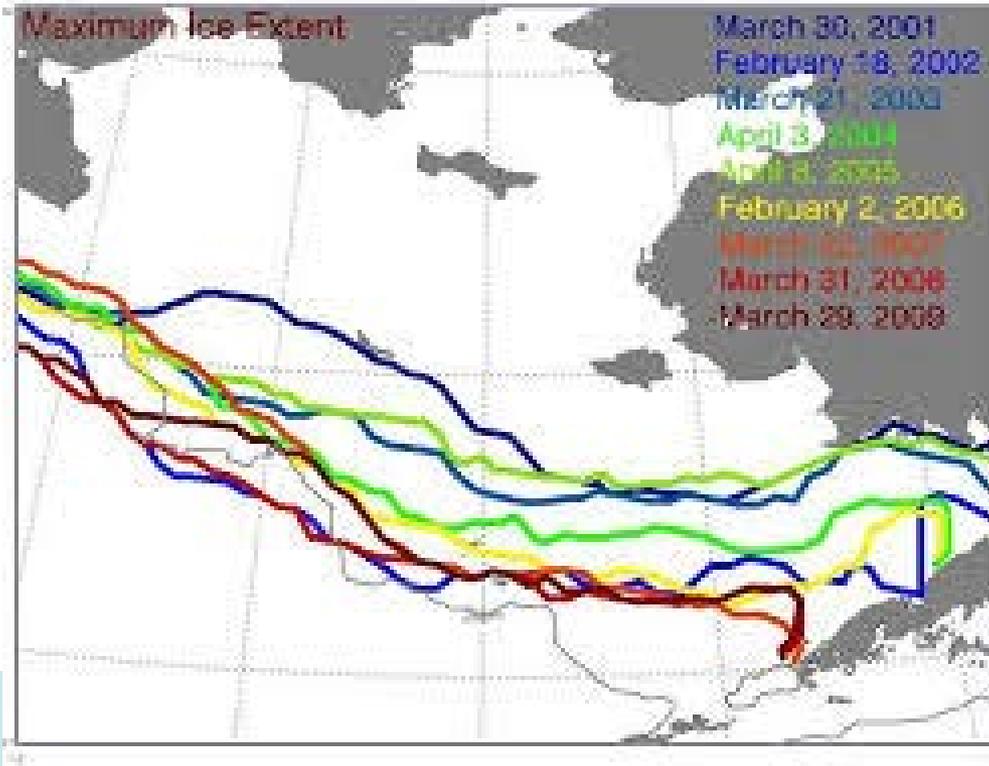
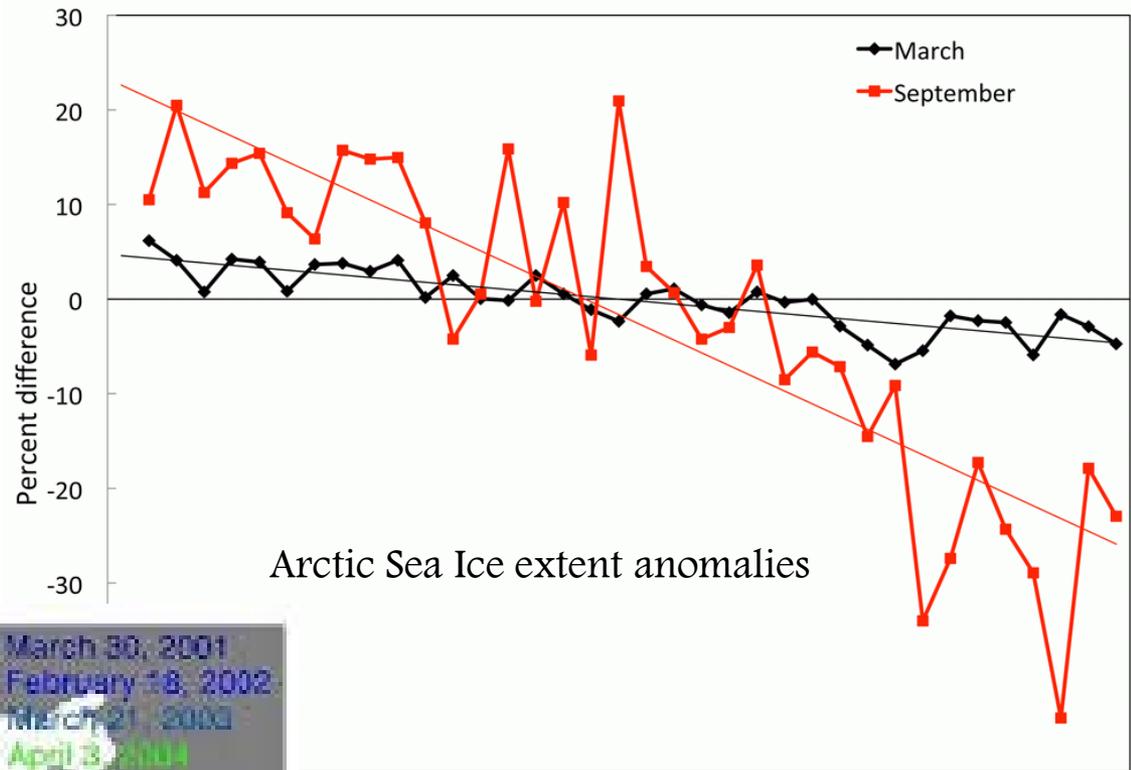
# 1°x1° ocean fluxes

2001-2013 mean



NOAA Earth System Research Laboratory  
CarbonTracker CT2013 release

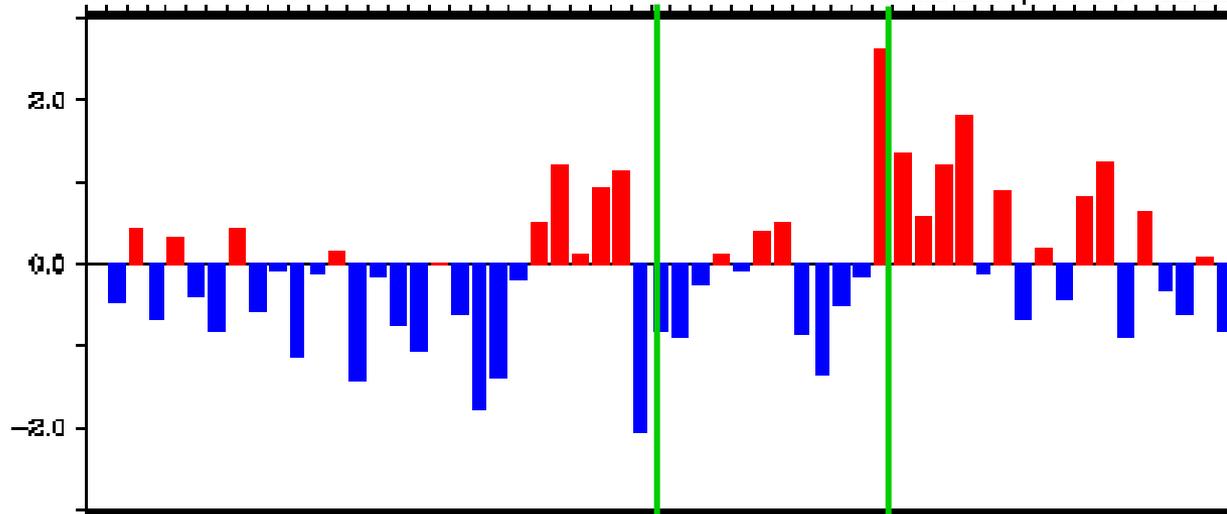




1986 1990 1994 1998 2002 2006 2010 2014

### Arctic Oscillation index (DJF)

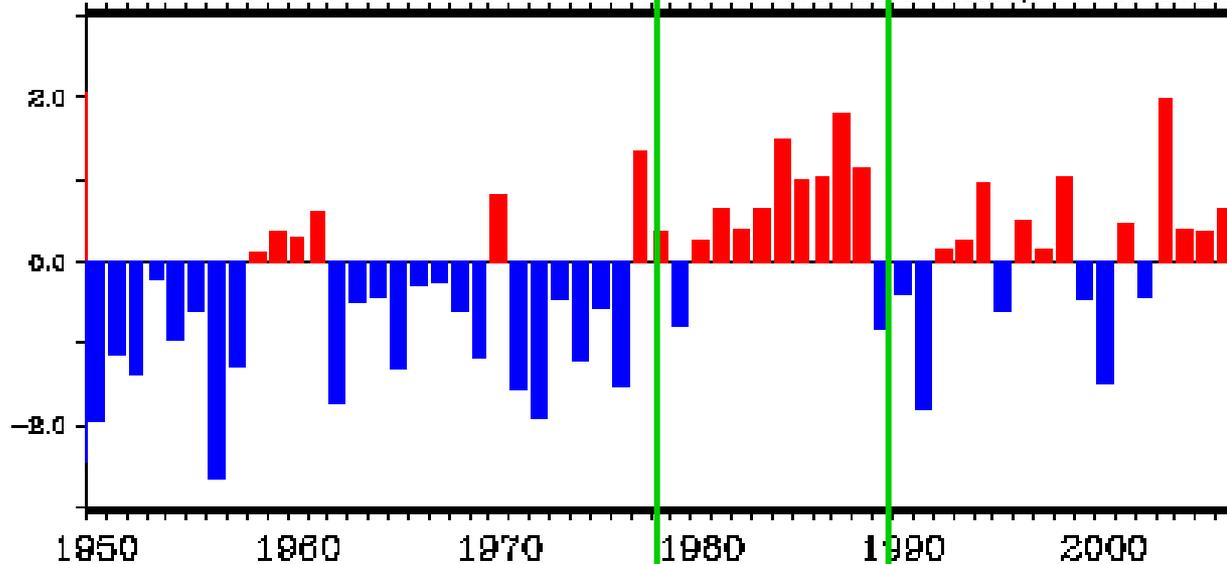
Arctic, 1951-2008



Arctic  
Oscillation

### Winter PDO index (DJF)

North Pacific, 1901-2008



Pacific  
Decadal  
Oscillation

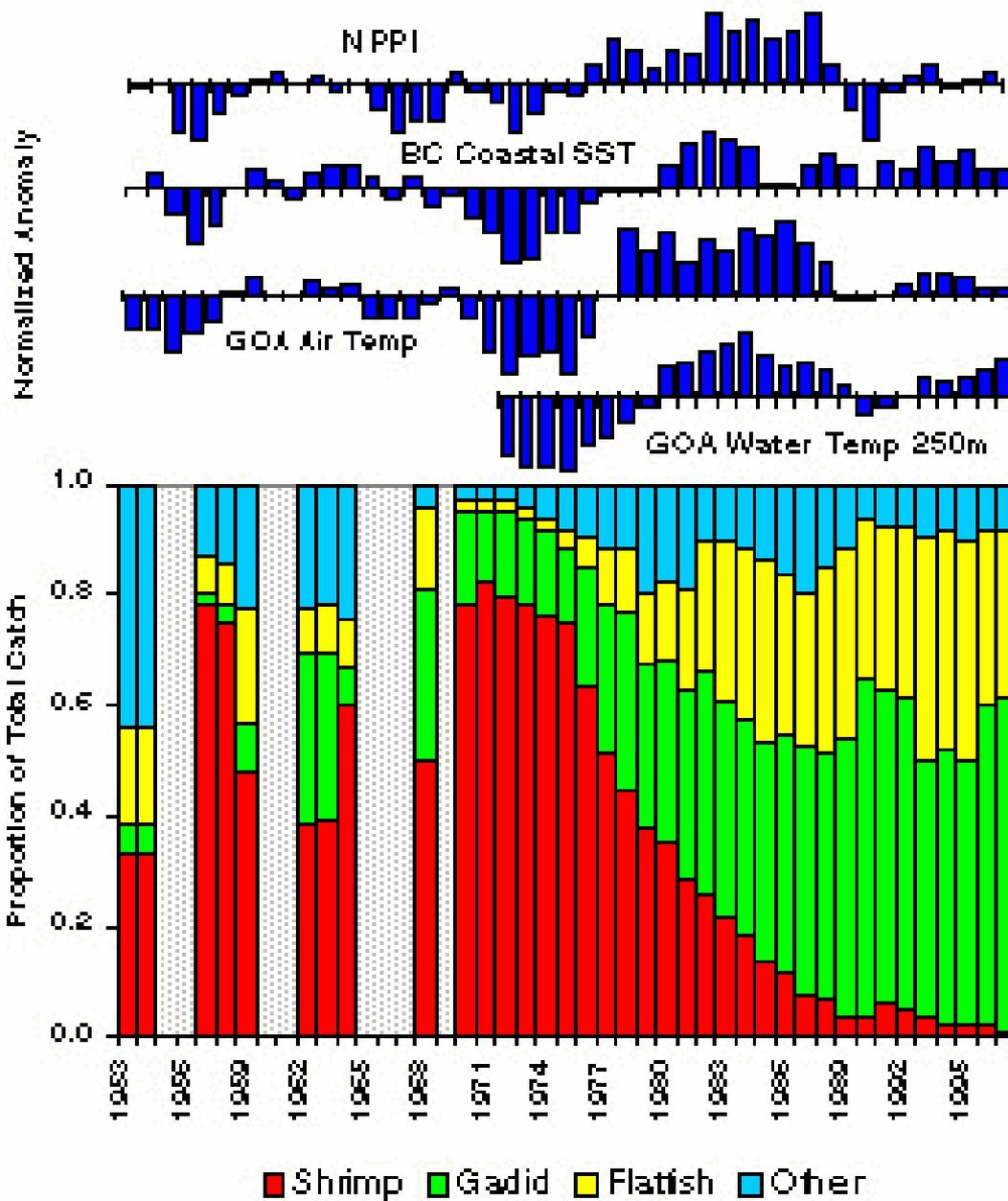


## Long-Term Changes in the Gulf of Alaska Marine Ecosystem



**Photographs from  
small net trawl  
surveys** NMFS, Kodiak Alaska  
(Paul Anderson)





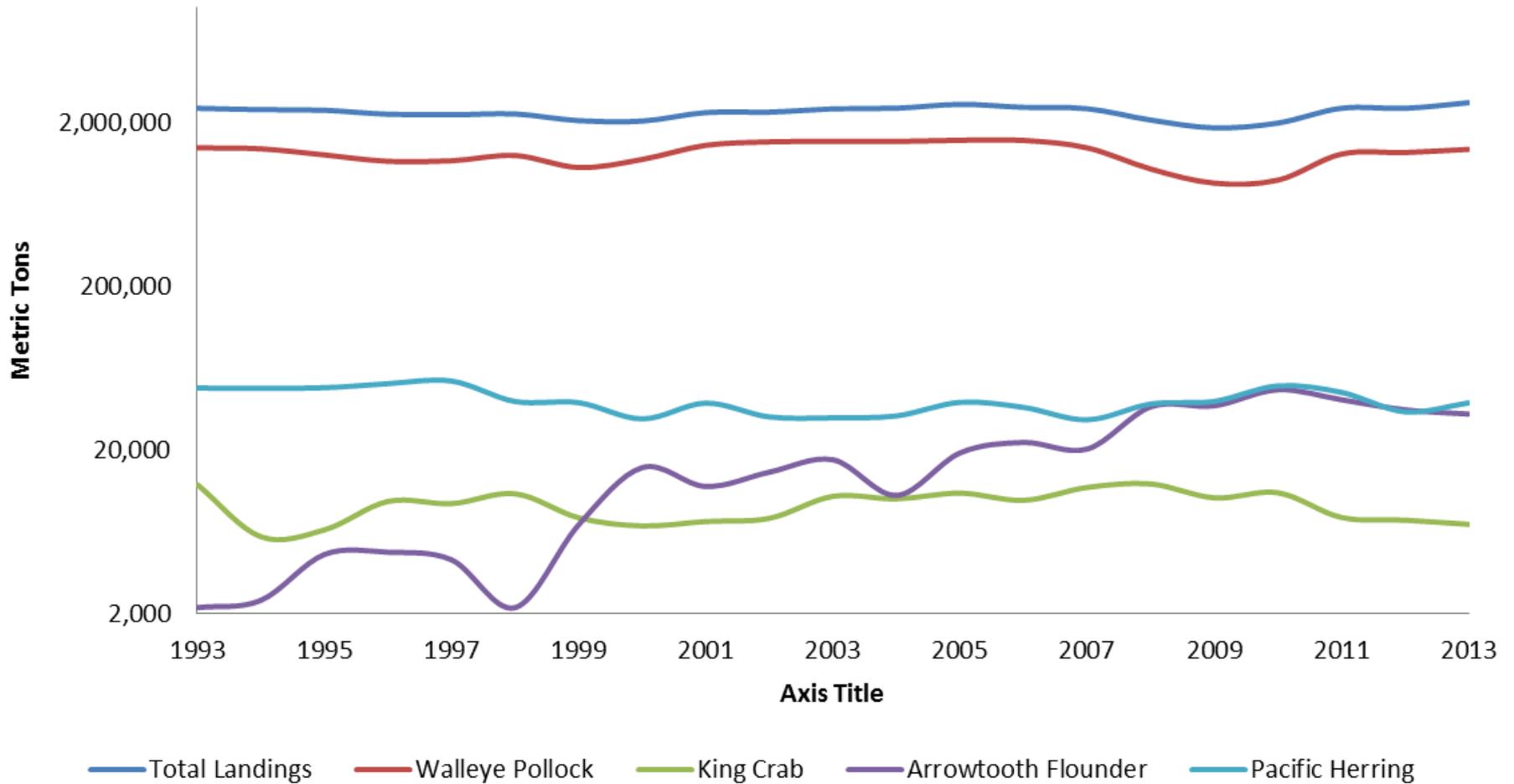
# Major regime shift & fished spp

We did not see this coming. Was it addressed in:

- Observations? • Yes
- Ecosystem covariates? • Yes
- Mechanistic understanding? • No
- Accommodated in Stock assessment? • No
- Buffer adjustments to BRP? • Partly
- Flexible HCRs? • Yes
- Risk evaluation for FMP? • No

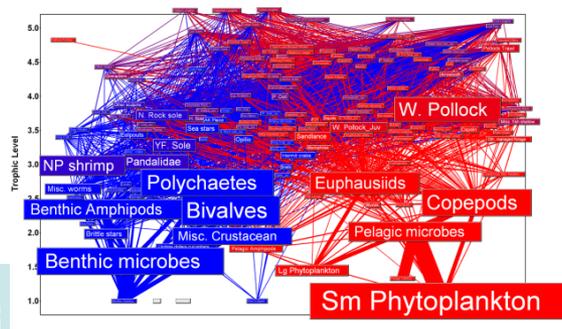


# Alaska Landings



# Governance complexity & interactions

- Other Jurisdictions
- Int'l Considerations & Joint Mgt?
- # Stakeholders
- Stakeholder engagement
- IPHC, Arctic Council, State
- Yes
- Low to Moderate
- Decent per remoteness



# Reductionism is still not the solution

- # of managed spp
- # of managed fishery spp
- # of FMPs
- FEP?
- Leading Indicators?
- Ecosys Status Report or Ecosys Chapter?
- Ecosys information informs mgt process?
- >70
- ~32
- 7
- 1 of 3 Ecosystems
- Yes
- Yes
- Partly

# How ecosystem knowledge is used in setting fishery quota

an example

From Council minutes, December 2006:

"The [eastern Bering Sea walleye pollock] stock remains above the MSY level, having declined ... at a rate of about 19% per year....

**Result from stock assessment**

Other issues raised ... suggest a need for further caution.

- a northward shift ... with some portion of the population into Russian waters.

**Assessment + ecosystem indicators**

- a large decline in zooplankton, which is important in providing forage for juvenile pollock.

**Ecosystem indicators**

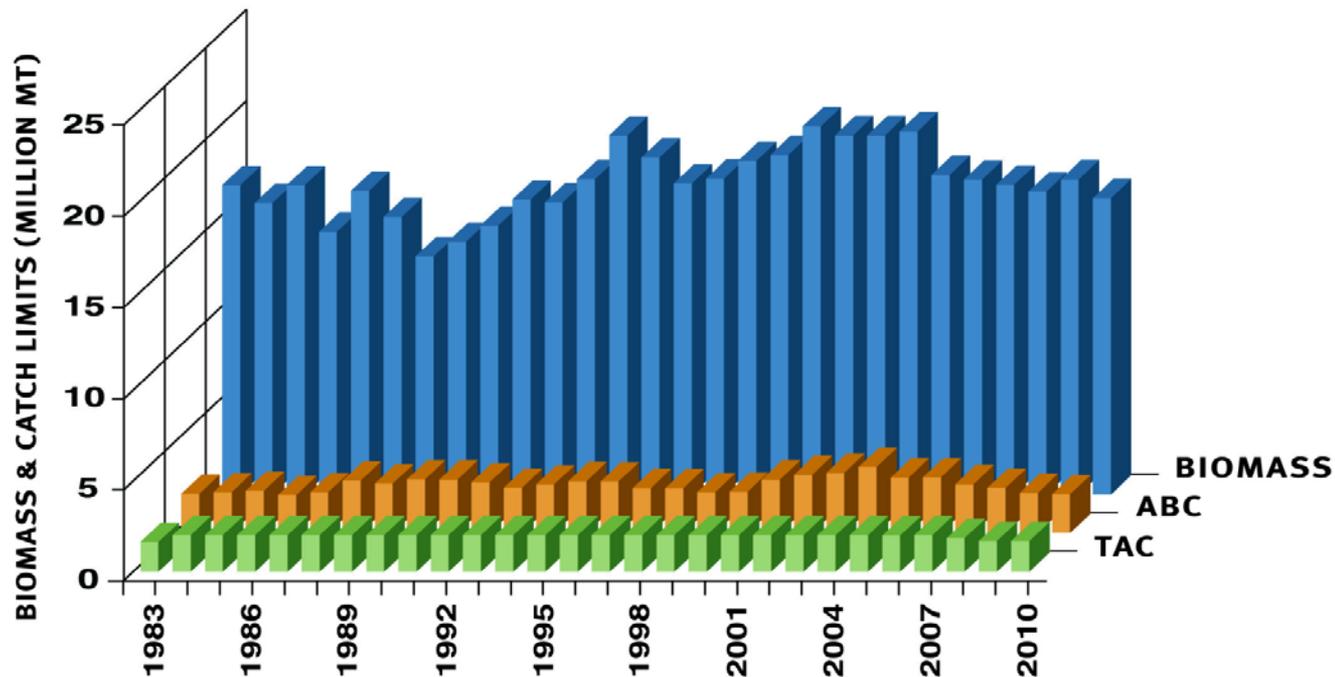
- increasing predation by arrowtooth flounder on juvenile pollock.

**Multispecies model**

Consequently, ... a reduction in ... catch ... is justified."

# Systemic Thresholds and Caps

**BERING SEA/ALEUTIAN ISLANDS (BSAI) GROUND FISH  
CATCH LIMITS 1983-2010**



SOURCE: North Pacific Fishery Management Council

- Biomass: total amount of fish in the BSAI
- Acceptable Biological Catch: maximum fraction of the biomass that may be sustainably harvested; always a VERY small fraction of the total biomass
- Total Allowable Catch: maximum fraction of the ABC that may be legally harvested; almost always less than the ABC, NEVER greater

# Systems thinking

- Are there evaluations of systemic risk? • Partially
- Are there estimates of Ecosystem Level RPs (e.g. ACLs)? • Yes
- Are there overarching MSEs in place to evaluate tradeoffs • Partially
- Are there economic analyses showing net, overall benefits of EL RPs? • Yes
- Are EL RPs used? • Yes



# Inadequate Kudos for other stuff?

- Are (deep water) corals protected?
  - Is habitat actively managed (e.g. closures, restoration, etc.)?
  - Are cryptic or non-target keystone spp (e.g. jellyfish, benthic engineers, etc.) monitored?
  - Are cryptic spp accounted for in LMR mgt?
  - Is offshore development (e.g. wind farms, cables, etc.) managed around fisheries?
  - Are other ocean-use sectors coordinated with & supported by fisheries mgt (e.g. tourism, whale-watching, etc.)?
- Partly
  - Yes
  - Partly
  - No
  - Partly
  - Partly





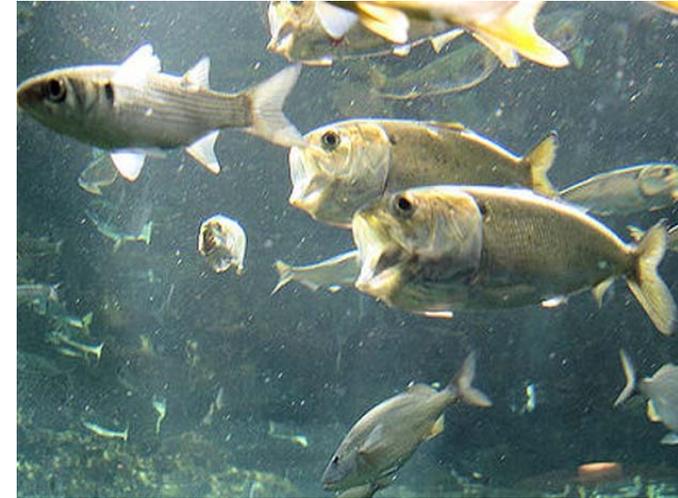
# Policy and Road Map

**NOAA**  
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Headquarters

# Policy Components

- Policy Statement
- Background
- Purpose of and Need for Policy
- Definition of EBFM
- Context of EBFM
- Benefits
- Guiding Principles
- Legal Authorities and Mandates
- NOAA Fisheries Responsibilities



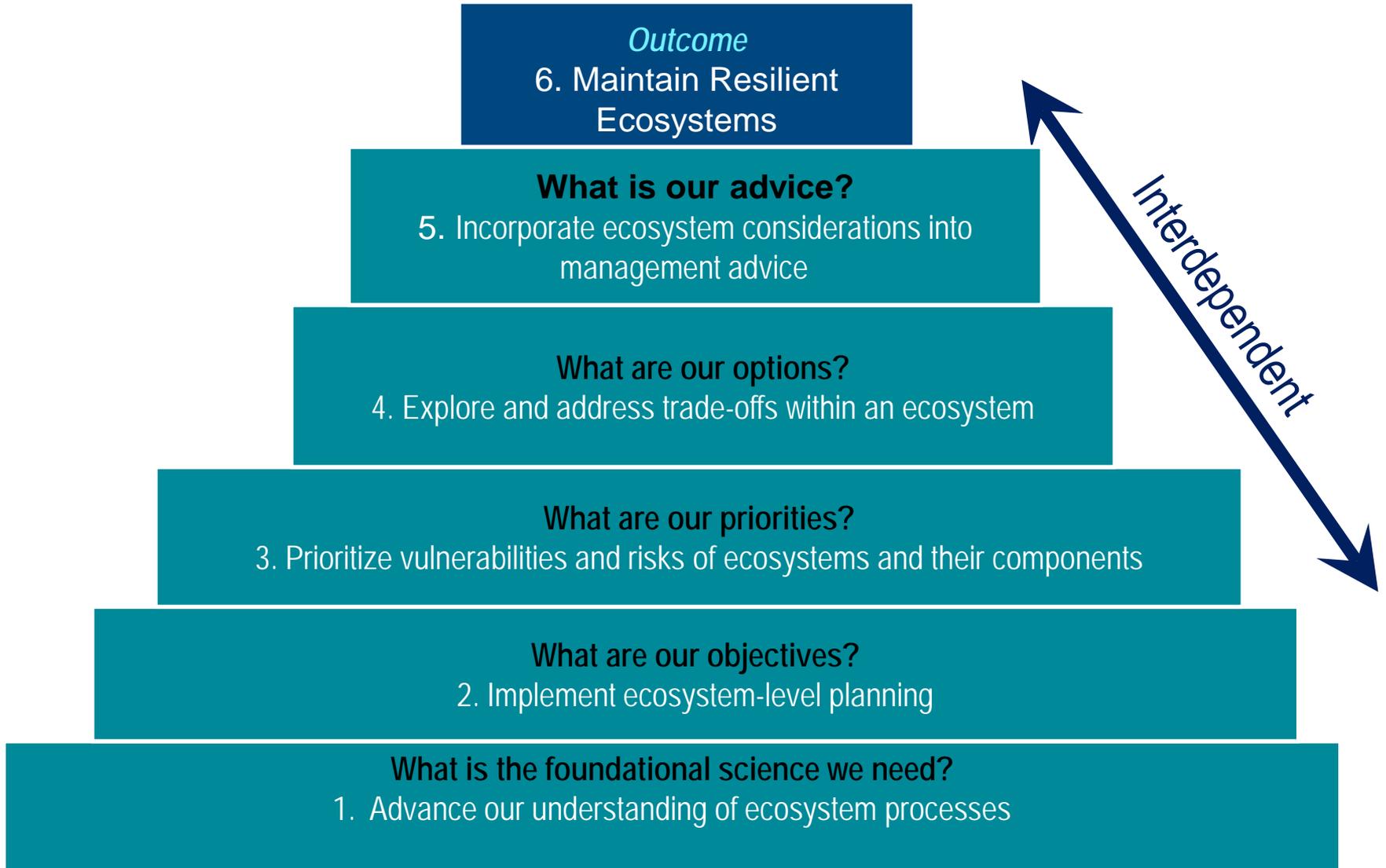
# Policy Statement

NOAA Fisheries strongly supports the implementation of Ecosystem-Based Fisheries Management (EBFM), to better inform decisions and help achieve and optimize the benefits from marine fisheries by evaluating trade-offs among and between fisheries (commercial, recreational, and subsistence), aquaculture, protected species, biodiversity, and habitats, while maintaining resilient and productive ecosystems.

# Policy Defines EBFM as:

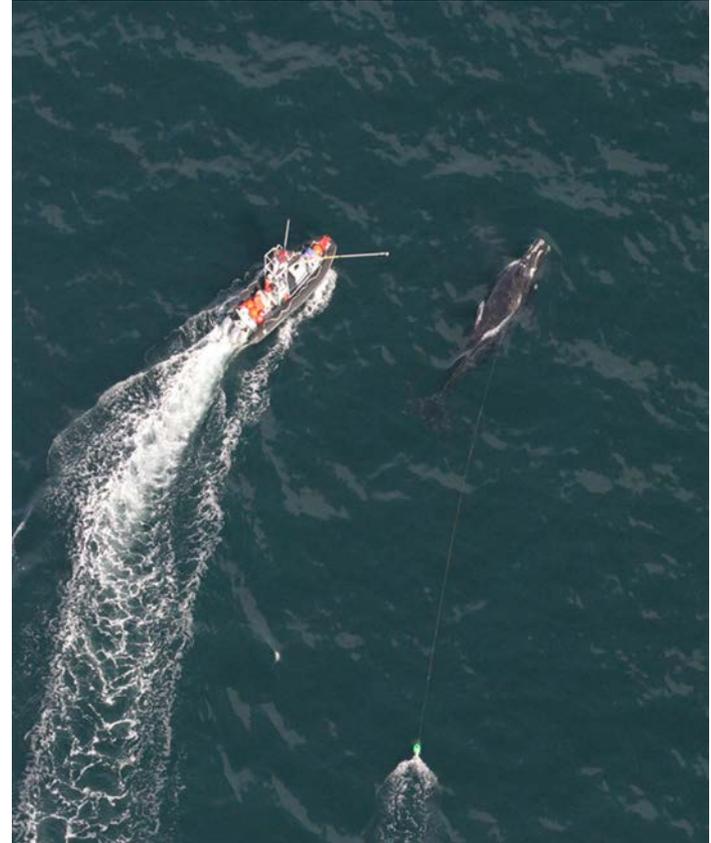
a systematic approach to fisheries management in a geographically specified area that ensures the resilience and sustainability of the ecosystem ; recognizes the physical, biological, economic, and social interactions among the affected components of the ecosystem, including humans; and seeks to optimize benefits among a diverse set of societal goals.

# EBFM Guiding Principles



# Next Steps for Policy

- Will be open for comment in early Sept.
- NOAA Fisheries Staff will be traveling to brief the Fishery Management Council Meetings throughout the fall
- Hope to finalize in January 2016

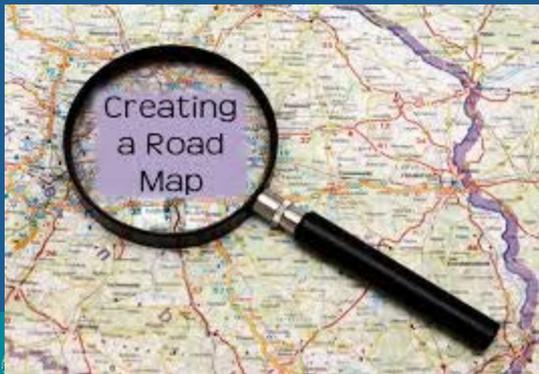


# Key EBFM Questions

What is EBFM and Why Would we want to do it? (c.f. Policy)

What does successful EBFM look like?

How do we determine when EBFM has been done, and evaluate whether it has been done well?



# EBFM Road Map Core Components

## Outreach and Policy

1. Engagement Strategy
2. Ecosystem Status Reports
3. Fishery Ecosystem Plans



# EBFM Road Map Core Components

## Ecosystem-level Advice/Research

4. Ecosystem-level Risk/Vulnerability/Prioritization Analysis
5. Ecosystem-level Management Strategy Evaluations
6. Ecosystem-level decision criteria (including ecosystem ACLs)



# EBFM Road Map Core Components

Ecosystem Considerations into Trust Species Advice

7. All Trust species have a Risk Analysis

8. Appropriate Trust species have ecosystem considerations in their assessments



# Proposed Road Map Structure

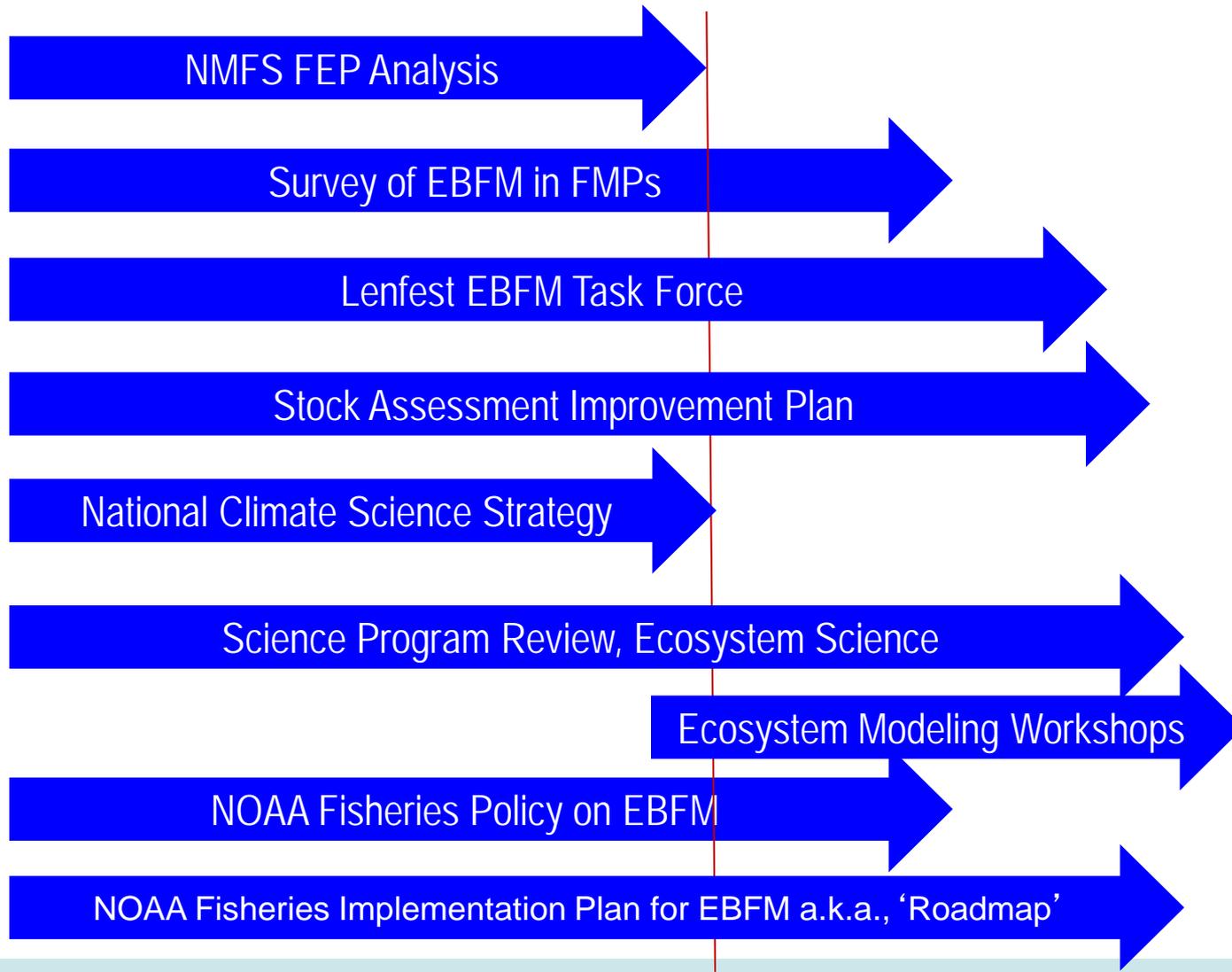
- Background of EBFM
- Relation to EBFM Policy
- Core Components
  - What & Why
  - What we need
  - Recommendations
- Other Considerations
  - Jurisdictions, Scales and Partners
  - Mandates again
  - Relation to other programs
- Summary of Recommendations, Timeline and Milestones



# How does Road Map Fit with Policy?

EBFM Policy Statement	EBFM Road Map	NCSS
<i>Guiding Principles</i>	<i>Core Components</i>	<i>Objectives</i>
6 Maintain Resilient Ecosystems		
5 Incorporate Ecosystem Considerations into Mgt Advice	6 Ecosystem-level decision criteria (including ecosystem ACLs)	1 Climate-Informed Reference Points
	8 Appropriate Trust species have ecosystem considerations in their assessments	
4 Explore and address trade-offs within an ecosystem	5 Ecosystem-level Management Strategy Evaluations	2 Robust Management Strategies
		3 Adaptive Management Processes
3 Prioritize vulnerabilities and risks	4 Ecosystem-level Risk/Vulnerability/Prioritization Analysis	<i>embedded</i>
	7 All Trust species have a rapid Risk Analysis	
2 Implement Ecosystem Level planning	3 Fishery Ecosystem Plans	<i>embedded</i>
	1 Engagement Strategy	4 Robust Projections of Future Conditions
<i>c.f. GP #1</i>	2 Ecosystem Status Reports	6 Status, Trends and Early Warnings
1 Advance our understanding of ecosystem processes	<i>embedded</i>	5 Information on Mechanisms of Change
		7 Science Infrastructure

# A Lot of Ecosystem Stuff Ongoing

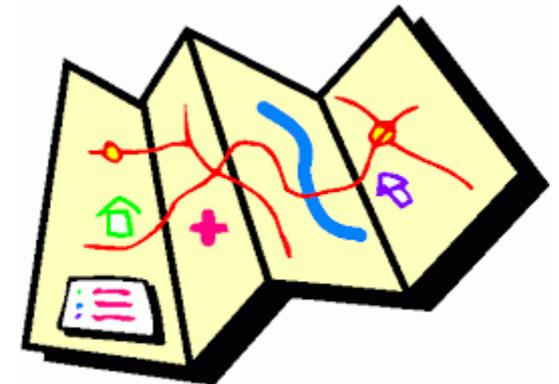


2015

2016

# Summary

- This is a start to codify what operational EBFM looks like, and serves as an implementation plan
- We're already doing ~20-30% of these in the main jurisdictions
- Comments welcome



# Contributors

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Lipton, Long, Methot, Osgood, Patrick,  
Shuford, Tromble

# Questions?