# EXPLORATION OF ECOSYSTEM-BASED FISHERY MANAGEMENT IN THE UNITED STATES

Issues at the Fore in the Land of MSA

Bevan Symposium - Reauthorization of the MSA

David Fluharty, SMEA, COE, UW

April 24,2014

# ORIGIN

**Report by the Ecosystem Sciences and Management Working (ESMWG)**

**to the NOAA Science Advisory Board**

**April 15, 2014**

**Full Report and Appendices Available on NOAA SAB Website – In Final Edits**

# Task

**Goal: To explore the progress in implementation of Ecosystem-Based Fishery Management (EBFM) in US fisheries 1999-2012**

**Principal Lines of Inquiry**

1. **To assess fishery management Council region taking actions to implement EBFM**
2. **To determine the availability and adequacy of ecosystem science in management of marine fisheries in the US**
3. **To examine the use of ecosystem science in support of regional fishery management council actions**

# Is There a Federal Mandate for EBFM?

**YES AND NO**

**To what extent is there a mandate to use ecosystem-based management in US fishery management?**

# EBFM Mandates in SFA

- **Stock Assessments – Total Allowable Catch/Annual Catch Limit**
- **Essential Fish Habitat**
- **Bycatch Reduction**
- **Best Available Science and Information**
- **Report on Ecosystem Principles**

# 1999 Report to Congress by Ecosystem Principles Advisory Panel [required by 1996 SFA]

# ECOSYSTEM PRINCIPLES ADVISORY PANEL [EPAP]

| | |
|---|---|
| Chair, David Fluharty | University of Washington /NPFMC |
| Pete Aparicio | Texas Shrimpers Association /GOMFMC |
| Chris Blackburn | Alaska Groundfish Data Bank |
| George Boehlert | NMFS/Pacific Fisheries Environmental Laboratory |
| Felicia Coleman | Florida State University /GOMFMC |
| Philip Conkling | Island Institute |
| Robert Costanza | University of Maryland |
| Paul Dayton | University of California San Diego |
| Robert Francis | University of Washington |
| Doyle Hanan | California Department of Fish and Game |
| Ken Hinman | National Coalition for Fisheries Conservation |
| Ed Houde | University of Maryland |
| James Kitchell | University of Wisconsin |
| Rich Langton | Maine Department of Natural Resources |
| Jane Lubchenco | Oregon State University |
| Marc Mangel | University of California Santa Cruz |
| Russell Nelson | FMFC/ GOMFMC/ SAFMC |
| Victoria O'Connell | Alaska Department of Fish and Game |
| Michael Orbach | Duke University |
| Michael Sissenwine | NMFS, Northeast Fisheries Science Center |

# History -- EBFM in the US – MSFCMA 1996

- Defined the principles on which EBFM is based; outlined the policies required to institute EBFM and recommended development a Fishery Ecosystem Plan as an overarching umbrella document for each region
- Approach is incremental as opposed to revolutionary
- Action can commence immediately through use of existing knowledge and processes
- Ecosystem Principles Advisory Panel anticipated that there would be many ways this advice could be implemented -- thus, voluntary guidelines encourage adaptive management

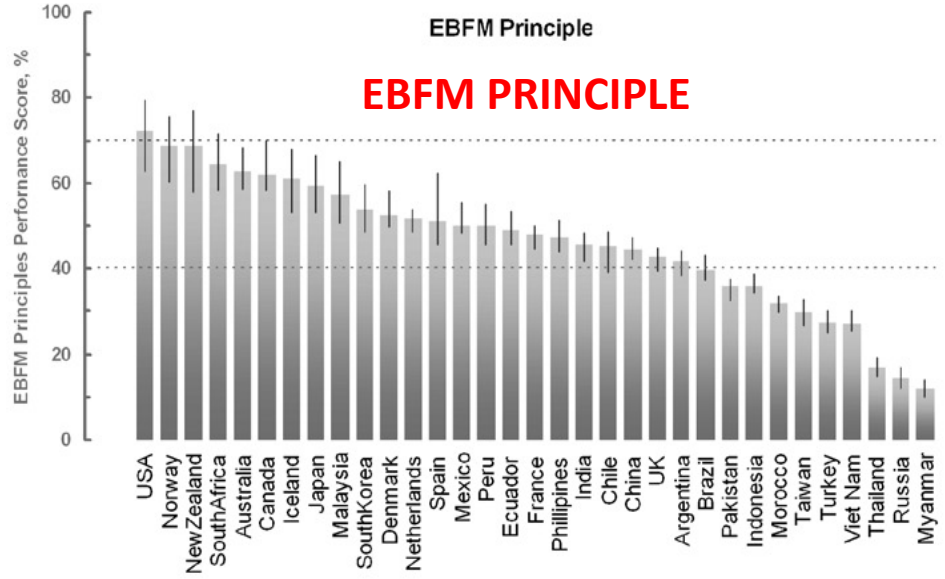
# EBFM in the US – MSA 2007

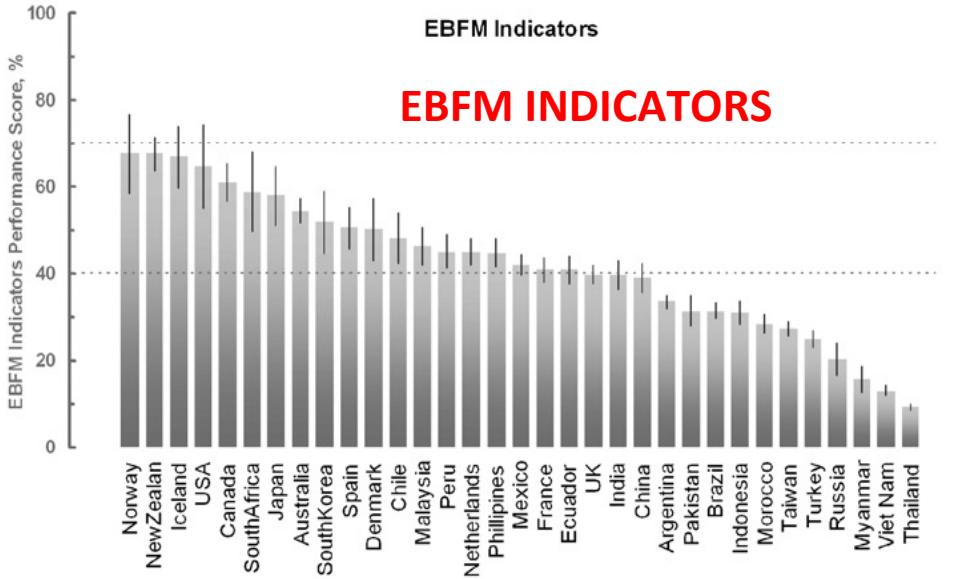
- **HR 5051 Proposed NOAA Fisheries to prepare Guidelines for Council consideration of EBFM through Fishery Ecosystem Plans [FEP].**
- **Final MSFCMA as Enacted 2007 required a report by NOAA Fisheries on the state of science for advancing the concepts and integration of ecosystem considerations in regional fishery management [Report submitted 2009].**

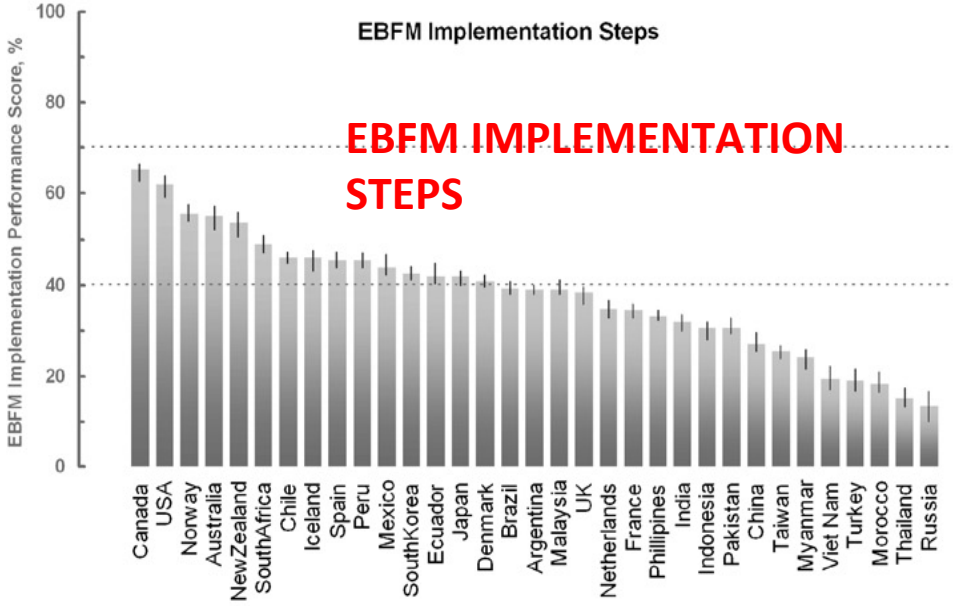
# EBFM Related Mandates

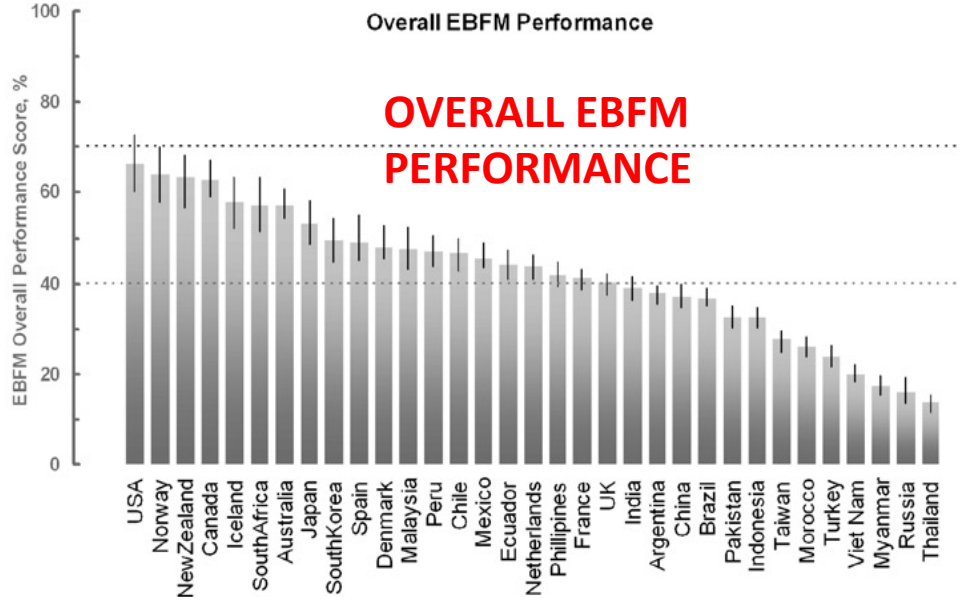
- **National Environmental Policy Act**
  **Environmental Impact Assessment**
  **Cumulative Effects**
- **Endangered Species Act**
- **Marine Mammal Protection Act**
- **Others**

# US in Global Reviews

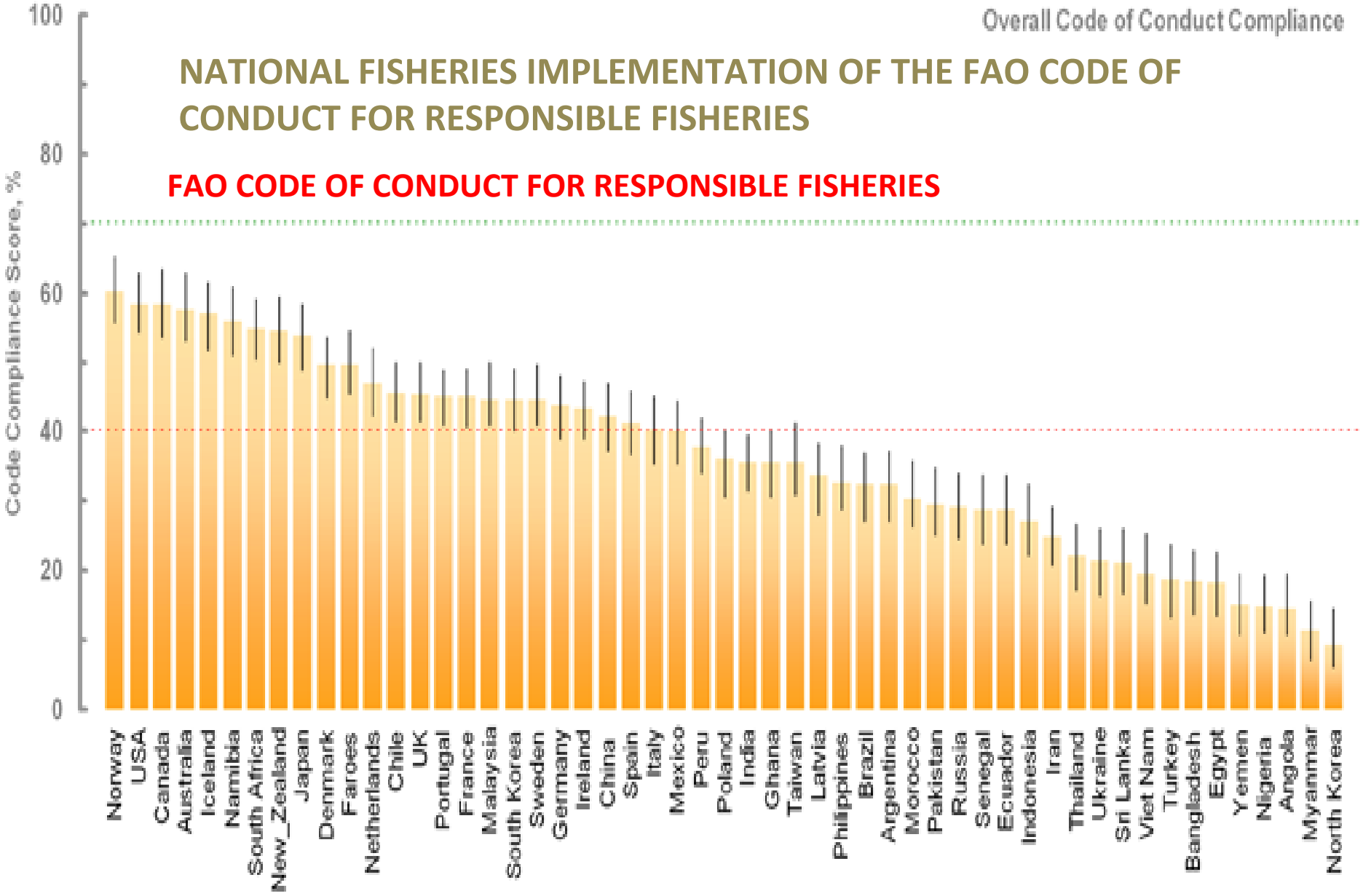



Source: Pitcher et al. 2009;




**Alder et al. 2009 – 95% of Global Catvh**

# Framework for Exploration: Seek Evidence for the Following Actions

1. Cease overfishing and develop rebuilding plans for overfished species.
2. Delineate extent of ecosystem/interactions.
3. Develop a conceptual model of the foodweb
4. Describe habitat needs of different live history stages of animals and plants in the "significant foodweb" and develop conservation measures

# Framework for Exploration: Seek Evidence for the Following Actions

5. Calculate total removals – including incidental mortality and relate them to standing biomass, production, optimum yields, natural mortality and trophic structure

6. Council assessment of how uncertainty is characterized and definition of buffers against uncertainty included in management actions

# Framework for Exploration: Seek Evidence for the Following Actions

**7. Council A) setting of ecosystem goal[s] and B) developing indices of ecosystem health as targets for management?**

**8. Description of long term monitoring data and how they are used.**

**9. Assessment of the ecological, human and institutional elements of the ecosystem which most significantly affect fisheries, and are outside Council/NMFS jurisdiction and define a strategy to address those influences.**

# Framework for Exploration: Seek Evidence for the Following Actions

**10. Development of a Fishery Ecosystem Plan/ Fishery Management Plan employing EBFM**

**11. Designation of a lead entity to advance EBFM in the Council process?**

**12. Are ecosystem models developed and available for use in the Council process?**

# Framework for Exploration: Seek Evidence for the Following Actions

**13. Are decision support tools for EBFM / trade-off analysis employed [e.g., management strategy evaluation, risk assessments, ecosystem indicators, scenarios]?**

**14. To what extent are spatial management tools applied [besides EFH measures above] to accomplish EBFM?**

**15. Other indicators of EBFM implementation**


LOUISIANA
25 square miles of coastal wetlands lost per year
Lower Mississippi River Basin
Heavy Industry
Nursery Habitat
Coastal Communities
Hypoxia Zone
Gulf Estuaries
Harmful Algal Blooms
Loop Current Eddy
Sustainable Fisheries
Coral Reefs
Oil & Gas Platforms
Oil & LNG Tankers
LOOP CURRENT
Ocean Observations
GULF OF MEXICO
HURRICANES
Sea Turtles
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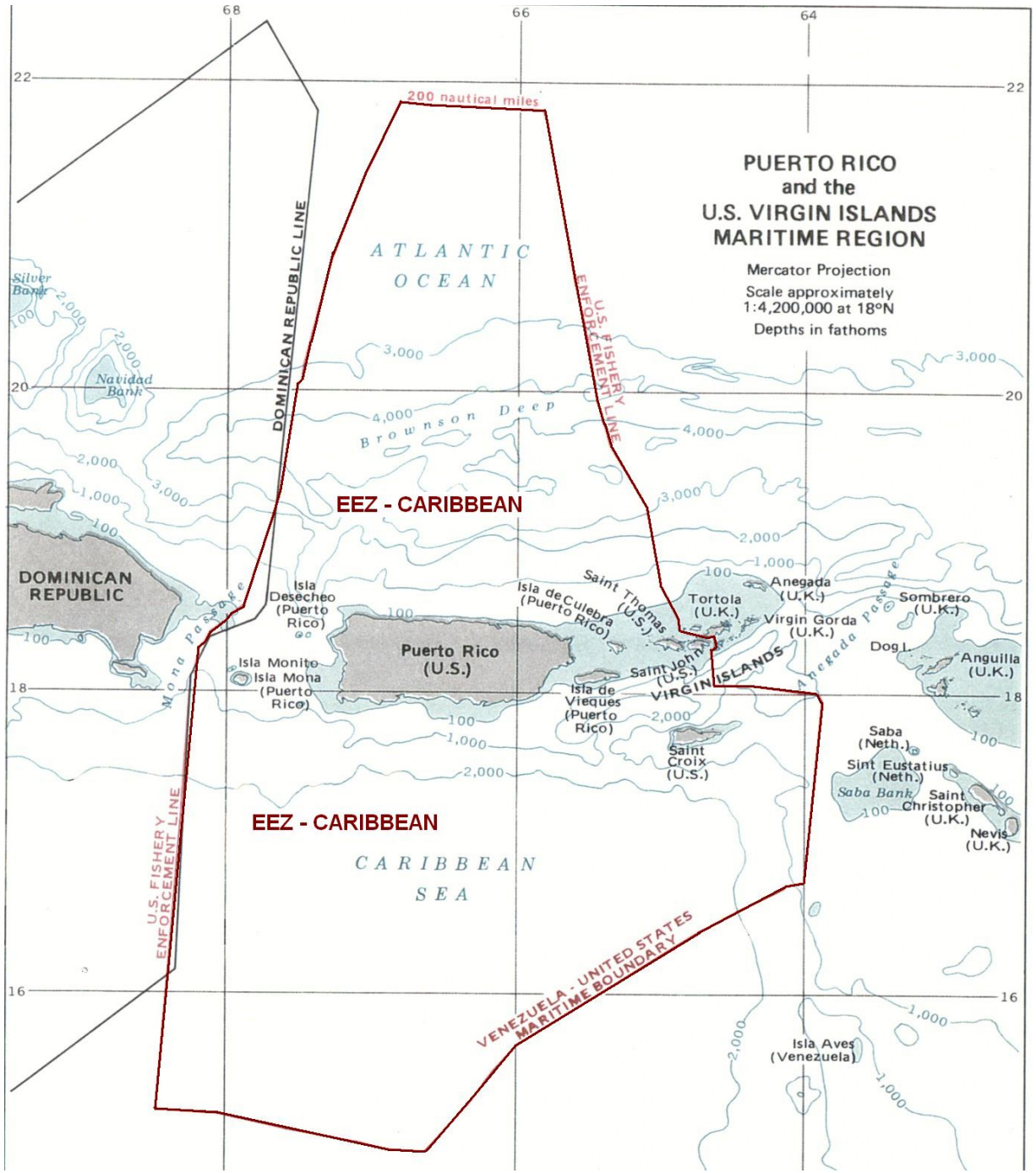
PUERTO RICO
and the
U.S. VIRGIN ISLANDS
MARITIME REGION
Mercator Projection
Scale approximately
1:4,200,000 at 18°N
Depths in fathoms
200 nautical miles
DOMINICAN REPUBLIC LINE
U.S. FISHERY ENFORCEMENT LINE
EEZ - CARIBBEAN
EEZ - CARIBBEAN
U.S. FISHERY ENFORCEMENT LINE
VENEZUELA - UNITED STATES MARITIME BOUNDARY
ATLANTIC OCEAN
CARIBBEAN SEA
Brownson Deep
Silver Bank
Navidad Bank
DOMINICAN REPUBLIC
Mona Passage
Isla Desecheo (Puerto Rico)
Isla Monito
Isla Mona (Puerto Rico)
Puerto Rico (U.S.)
Isla de Culebra (Puerto Rico)
Isla de Vieques (Puerto Rico)
Saint Thomas (U.S.)
Saint John (U.S.)
VIRGIN ISLANDS
Saint Croix (U.S.)
Tortola (U.K.)
Anegada (U.K.)
Virgin Gorda (U.K.)
Anegada Passage
Sombrero (U.K.)
Dog I.
Anguilla (U.K.)
Saba (Neth.)
Sint Eustatius (Neth.)
Saba Bank
Saint Christopher (U.K.)
Nevis (U.K.)
Isla Aves (Venezuela)
68
66
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16

# When is EBFM –EBFM?

- First, this list of actions is obviously not an exhaustive list and it is not a "perfect" list.
- Second, such a list invites one to think that there is some "magic" list of actions that constitute EBFM. EBFM, however, can take on many forms and processes
- Third, EBFM is a moving target with actions being taken over time. This review presents a snapshot as of March 2014

# When is EBFM – EBFM?

- **Fourth, given the dynamics of marine ecosystems, EBFM must accommodate a constantly changing context in which management occurs.**
- **Fifth, not all of these actions are equally important.**

# What Would Ray Hilborn Do?

**"The most important elements of EBFM are keeping fishing mortality rates low enough to prevent ecosystem-wide overfishing, reducing or eliminating by-catch and avoiding habitat-destroying fishing methods"–Core issues.**

**Are we are prepared scientifically and administratively to implement these approaches because they are high cost and involve trade-offs among goals and objectives that are not clearly defined.**

**(Hilborn 2011, p.235).**

# EBFM Exploration - Approach

- **ESMWG invited presentations and had discussions with scientists from NMFS regional science centers and international experts**
- **Invited presentations and discussion with lead staff on EBFM from regional Councils**
- **Review of peer review literature**
- **Review of Fishery Science Center and Council region reports and websites**

# Invited Presentations

- Mike Fogarty, New England Fisheries Science Center*
- Roger Pugliese, South Atlantic Fisheries Science Center*
- Kerim Aydin, Alaska Fisheries Science Center
- John Boreman, Mid-Atlantic Fishery Management Council*
- Diana Evans, North Pacific Fisheries Management Council
- Yvonne deReynier, Pacific Fisheries Management Council*
- Jake Rice, Chief Scientist, Department of Fisheries and Oceans, Canada*
- Eric Kingma, [for Paul Dalzell], West Pacific Fisheries Management Council*

| Extent of Implementation of EBFM – Qualitative Assessment | Caribbean FMC | Gulf of Mexico FMC | Mid-Atlantic FMC | New England FMC | North Pacific FMC | Pacific FMC | South Atlantic FMC | Western Pacific FMC |
|---|---|---|---|---|---|---|---|---|
| Cease overfishing (OF) and develop rebuilding plans for overfished species. | OF stopped; rebuilding plans in place [stocks may not be rebuilt] | OF for some species still occurring; rebuilding plans in place | OF stopped; rebuilding plans in place [stocks may not be rebuilt] | OF for some species still occurring; rebuilding plans in place | OF stopped; rebuilding plans in place [stocks may not be rebuilt] | OF stopped; rebuilding plans in place [stocks may not be rebuilt] | OF and rebuilding plans not in place | OF and rebuilding plans not in place |
| Delineate extent of ecosystem/ interactions. | Under discussion | Under discussion | Consideration given but not formal | Formal recognition by Regional Action | Formal recognition by Regional Action | Formal recognition by Regional Action | Formal recognition by Regional Action | Formal recognition by Regional Action |
| Develop a conceptual model of the foodweb. | Under discussion | Model(s) available and evaluated in stock assessments, management decisions | Consideration given but incomplete and/or ad-hoc | Model(s) available and evaluated in stock assessments, management decisions | Model(s) available and evaluated in stock assessments, management decisions | Model(s) available and evaluated in stock assessments, management decisions | Model(s) available and evaluated in stock assessments, management decisions | Model(s) available and evaluated in stock assessments, management decisions |
| Describe habitat needs of different life history stages of animals and plants in the "significant foodweb" and develop conservation measures. | Not used because MSA requirements constitute baseline | EFH fully implemented | Not used because MSA requirements constitute baseline | EFH fully implemented | EFH fully implemented | EFH fully implemented | EFH fully implemented | Not used because MSA requirements constitute baseline |
| Calculate total removals-including incidental mortality and relate to standing biomass, production, optimum yields, natural mortality and trophic structure. | MSA requirements implemented but incidental mortality insufficiently accounted for | Compliance with MSA required | Compliance with MSA required | MSA requirements implemented but incidental mortality insufficiently accounted for | MSA requirements fully implemented with good estimates of incidental mortality, etc. | MSA requirements implemented but incidental mortality insufficiently accounted for | MSA requirements implemented but incidental mortality insufficiently accounted for | Compliance with MSA required |
| Does council assess how uncertainty is characterized and define what buffers against uncertainty are included in management actions? | Partial accounting of uncertainty / use of risk based assessments | Partial accounting of uncertainty / use of risk based assessments | Partial accounting of uncertainty / use of risk based assessments | Partial accounting of uncertainty / use of risk based assessments | Partial accounting of uncertainty / use of risk based assessments | Partial accounting of uncertainty / use of risk based assessments | Partial accounting of uncertainty / use of risk based assessment | Partial accounting of uncertainty / use of risk based assessments |
| Has council set an ecosystem goal (s) and developed indices of ecosystem health as targets for management? | Ecosystem goals and indices under discussion | Ecosystem goals and indices under discussion | Goals articulated but indices not defined as targets | Goals articulated but indices not defined as targets | Goals articulated but indices not defined as targets | Goals articulated but indices not defined as targets | Goals articulated but indices not defined as targets | Goals articulated but indices not defined as targets |
| Describe long-term monitoring data and how they are used. | Regional monitoring plan under discussion | Regional monitoring plan for fisheries but not necessarily ecosystem based fishery | Regional monitoring plan for fisheries but not necessarily ecosystem based fishery | Region developed monitoring plan relative to EBFM can be identified | Region developed monitoring plan relative to EBFM can be identified | Regional monitoring plan for fisheries but not necessarily ecosystem based fishery | Region developed monitoring plan relative to EBFM can be identified | Regional monitoring plan for fisheries but not necessarily ecosystem based fishery |
| Assess the ecological, human and institutional elements of the ecosystem which most significantly affect the fisheries, and are outside Council/NMFS jurisdiction and define a strategy to address those influences. | Limited or no response to external influences | Region discusses but has limited engagement with outside influences | Region discusses but has limited engagement with outside influences | Fully proactive plan with respect to outside impacts | Fully proactive plan with respect to outside impacts | No plan but region is responsive to threats as they arise | Fully proactive plan with respect to outside impacts | Fully proactive plan with respect to outside impacts (C) |
| Is there a Fishery Ecosystem Plan/Fishery Management Plan employing EBFM? | Discussion of FEP or FMP for relevant ecosystem | FEP or FMP covering significant portions of the relevant ecosystem | Discussion of FEP or FMP for relevant ecosystem | FEP or FMP covering significant portions of the relevant ecosystem | *FEP or thorough FMP using EBFM for the relevant ecosystem | FEP or thorough FMP using EBFM for the relevant ecosystem | FEP or thorough FMP using EBFM for the relevant ecosystem | FEP or thorough FMP using EBFM for the relevant ecosystem |

# Summary EBFM Implementation

| Extent of Implementation of EBFM – Qualitative Assessment | **Caribbean FMC** | **Gulf of Mexico FMC** | **Mid-Atlantic FMC** | **New England FMC** | **North Pacific FMC** | **Pacific FMC** | **South Atlantic FMC** | **Western Pacific FMC** |
|---|---|---|---|---|---|---|---|---|
| Does the Council have a lead entity designated to advance EBFM in the Council process? | No lead entity and limited or no discussion | Being developed | Yes, proactive lead in developing EBFM actions for Council | Yes, proactive lead in developing EBFM actions for Council | Yes, proactive lead in developing EBFM actions for Council | Yes, proactive lead in developing EBFM actions for Council | Yes, proactive lead in developing EBFM actions for Council | Yes, proactive lead in developing EBFM actions for Council |
| Are ecosystem models developed and available for use in the Council process? | No discussion or use of models | Use of models is under discussion / development | Yes, models available but not in use | Yes, models available and in use | Yes, models available and in use | Yes, models available and in use | Yes, models available and in use | Use of models is under discussion / development |
| Are decision support tools for EBFM/ trade-off analysis employed (e.g., management strategy evaluation, risk assessments, ecosystem indicators and scenarios)? | No discussion and no use of formal tools | Yes to some of the elements | Yes to some of the elements | Yes to some of the elements | Yes to some of the elements | Yes to some of the elements | Yes to some of the elements | Some or all elements under discussion |
| To what extent are spatial management tools applied (besides EFH measures above) to accomplish EBFM? | Some spatial management tools applied as well to EFH | Some spatial management tools applied as well to EFH | Some spatial management tools applied as well to EFH | Significant spatial management tools applied as well to EFH | Significant spatial management tools applied as well to EFH | Significant spatial management tools applied as well to EFH | Significant spatial management tools applied as well to EFH | Some spatial management tools applied as well to EFH |
| Other | | | | | ACL-Cap on Total Removals BS/ GOA | EBFM Initiative Agenda for Council | | Archipelagic FMPs |

# NOAA Headquarters Roles

**Marine Fisheries Advisory Committee (MAFAC) – Guidelines 2001**

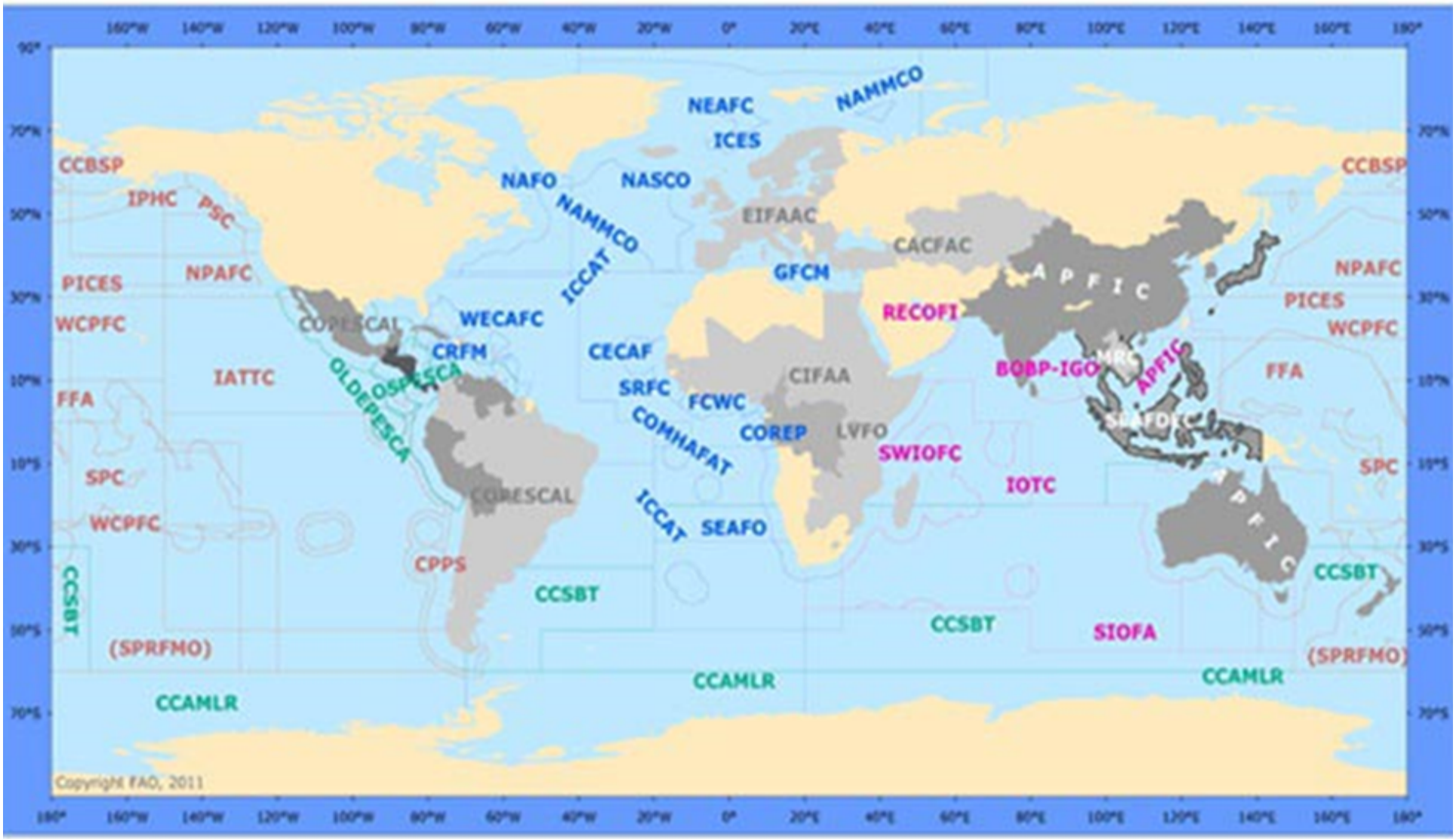
**Four Councils 250k$ 2004**

**Guidance for EBFM (Holliday 2005)**

**NOAA Ecosystem Goal Team**

**NOAA SAB – Integrated Ecosystem Assessments**

Regional Fishery Management Organizations --



# NOAA Ecosystem Science
# Observations

- **Science enterprise is strong – large amount of effort goes to stock assessments, EFH and other mandates; moderate amounts of effort go into evaluating modeling interactions among species and their environments—much less effort for spatial aspects of linking exploitation to community dependencies and harvest strategies**
- **A considerable amount of ecosystem research is being performed and made available to Councils, (likely more than can be used in terms of food web models and environmental drivers of productivity)**

# NOAA Ecosystem Science
# Observations

- **Social sciences for EBFM (in sensu coupled social-ecological systems) research is quite limited**
- **Increasing emphasis on more and more sophisticated fisheries ecosystem models**
- **A question is raised about approaches being applied in ecosystem science and habitat science across NOAA and whether these tracks can be more mutually supportive**

# Council Use of Ecosystem Science
## Observations

- **Demand for and Use of EBFM Scientific Information is Highly Variable by Council Region**
- **As Councils Develop Fishery Ecosystem Plans or Fishery Management Plans or FMP Approaches the Use of EBFM Science Increases**
- **The Nature of EBFM Science Demanded and Used Is [no surprise] Place-based and Specific to Actions Taken – Sum of actions = EBFM**

# Council Use of Ecosystem Science

## Observations

- **Steep Learning Curve on Use of Modeling in Management Decision-Making**
- **Need More Assistance in Developing Capacity for Analyzing Trade-offs in Management Scenarios in Ecosystem and Socio-Economic Contexts**

# PRINCIPAL RECOMMENDATION

**NOAA Fisheries should perform a prioritized needs assessment of what ecosystem inputs will contribute to improving the performance of Councils.**

**As preparation for the needs assessment a useful first step would be a major workshop for which Councils and Science Centers prepare a list of needs.**

**Compare these lists nationally and regionally at the workshop [with invited independent ecosystem scientists and others]**

**Prioritize lists of science needs regionally and nationally**

# Recommendations on Ecosystem Science NOAA SAB

**1. Continue and Expand Support to Council Processes for Ecosystem Science**

**2. Invest More in Development of Science to Understand Fishery Management as a Coupled Socio-Ecological System**

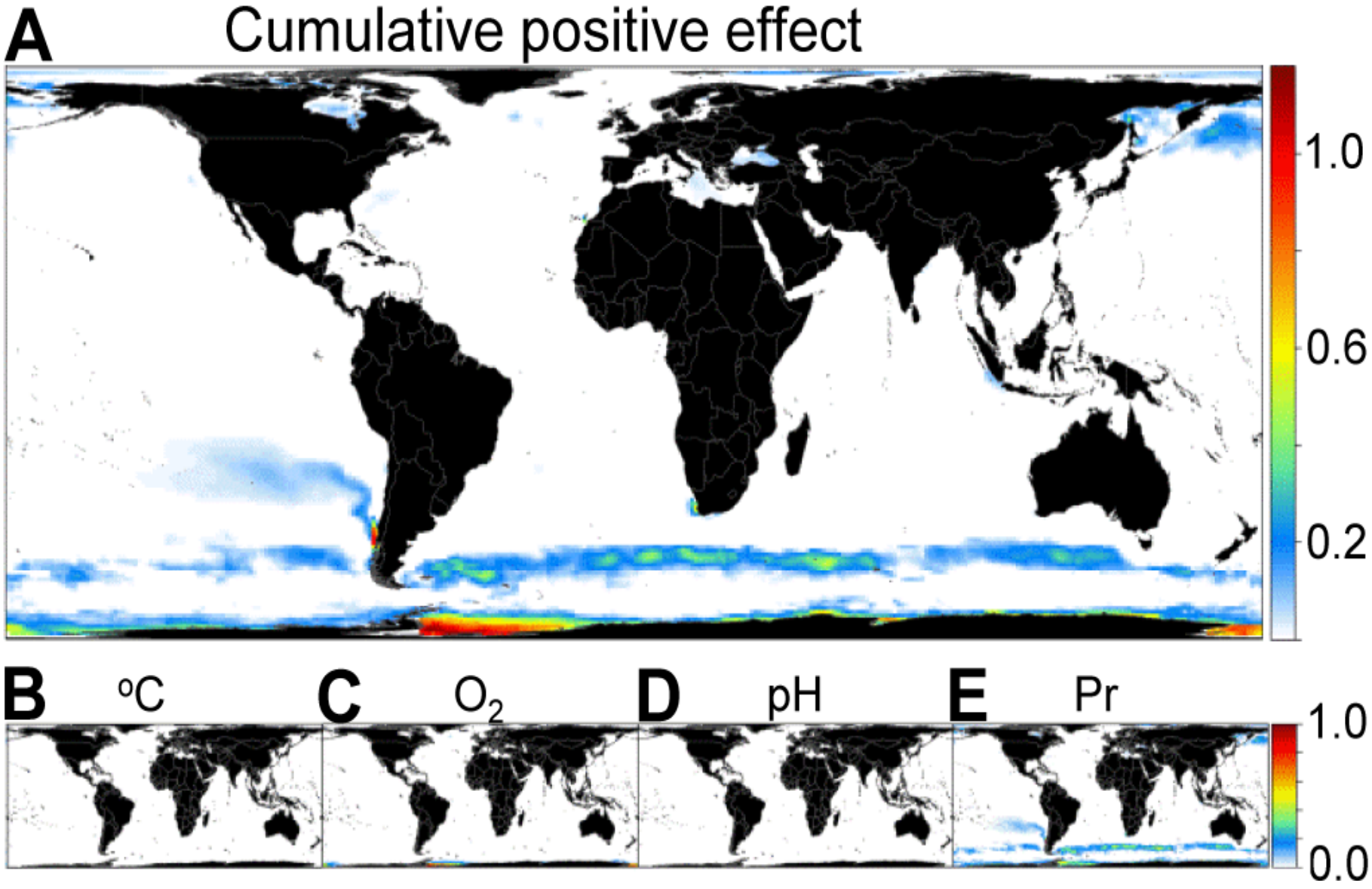
**3. Headquarters Can Facilitate Cross-Region and Council Interactions on EBFM Science and Management**

**4. Invest in Tools for Assessing Trade-Offs [Spatial and Temporal] of Alternative Management Decisions**

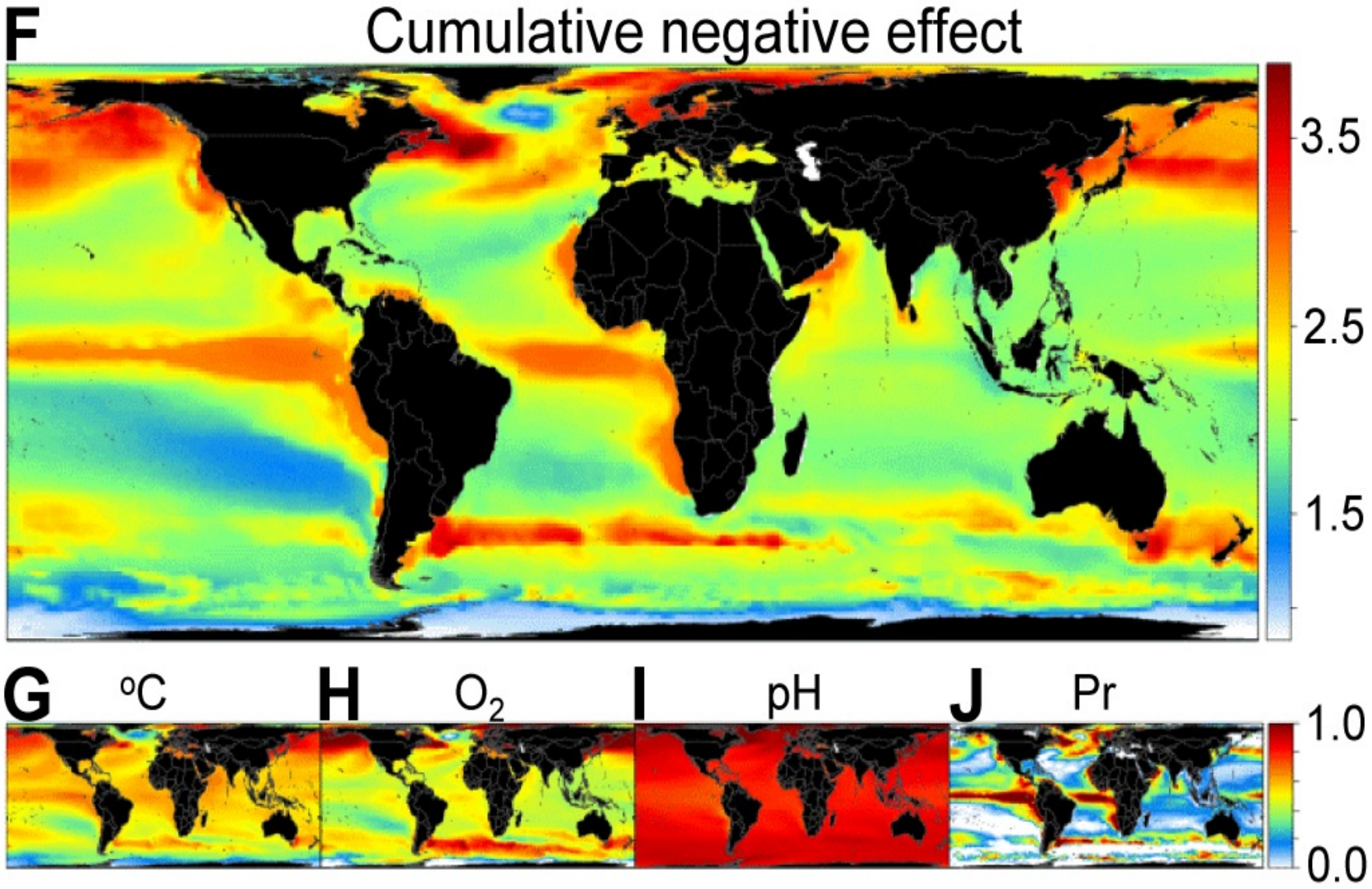
**5 Assess and Implement Best Practices for Integrating Ecosystem Science across NOAA and with Partners**

# EBFM Grand Challenge Questions

- **How can we demonstrate the results of EBFM are making a difference in fisheries and protection of marine diversity? Can these be compared across ecosystems?**
- **Can/should we actively manage for different ecosystem states and maximum economic yield as opposed to maximum sustainable yield?**
- **To what extent is climate change/ocean acidification an ecosystem game changer for fisheries?**
- **How can historic ecosystem state be used to inform fishery management by Council regions?**




Mora et al. 2013. PloS Biology Oct. 15




Mora et al. 2013. PLoS Biology Oct. 15

# Summary

**There is strong support for fishery management from NOAA science.**

**Regional fishery management Councils receive and utilize this advice**

**EBFM in the US fisheries is being implemented through diverse actions that are regionally appropriate**

**EBFM science can benefit from regional review and prioritization**

**There are major ecosystem science and management issues that require long term assessment**

# MSA Reauthorization 2014

- **US House of Representatives**

  **Hearings Statement by Ellen Pikitch**

- **US Senate**

  **Section 103 Fishery Ecosystem Planning Authority**

**However, "Rule of Construction. – Nothing in this section shall be construed as requiring a Council or the Secretary to exercise the discretionary planning authority provided in this section**

# THANK YOU
# FOR YOUR KIND ATTENTION