Managing in an Ecosystem Context: Progress and Opportunities (ESA, MSFCMA, NEPA and beyond)

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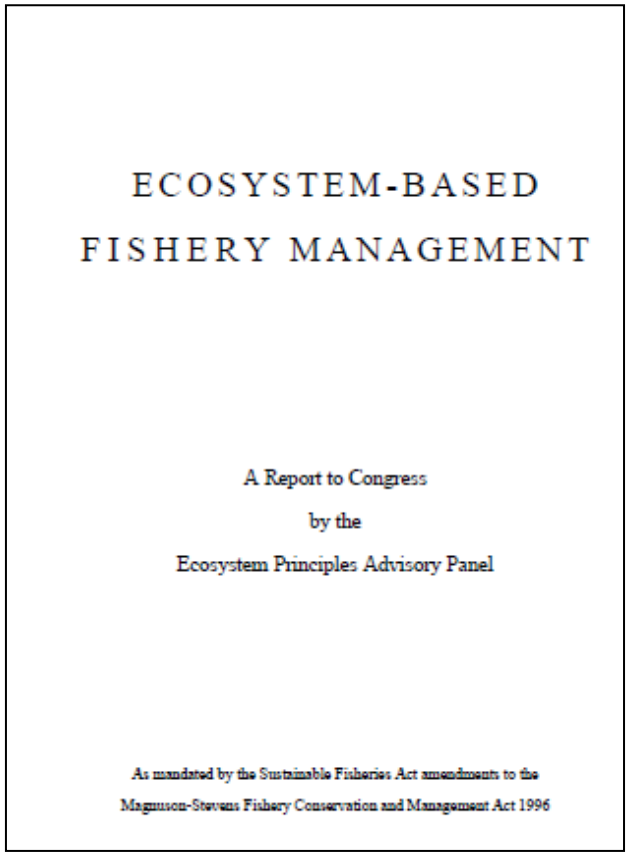
NOAA FISHERIES

ICES Journal of Marine Science, 57: 771–777. 2000
doi:10.1006/jmsc.2000.0719, available online at http://www.idealibrary.com on IDEAL®

An ecosystem-based approach for Alaska groundfish fisheries

David Witherell, Clarence Pautzke, and David Fluharty



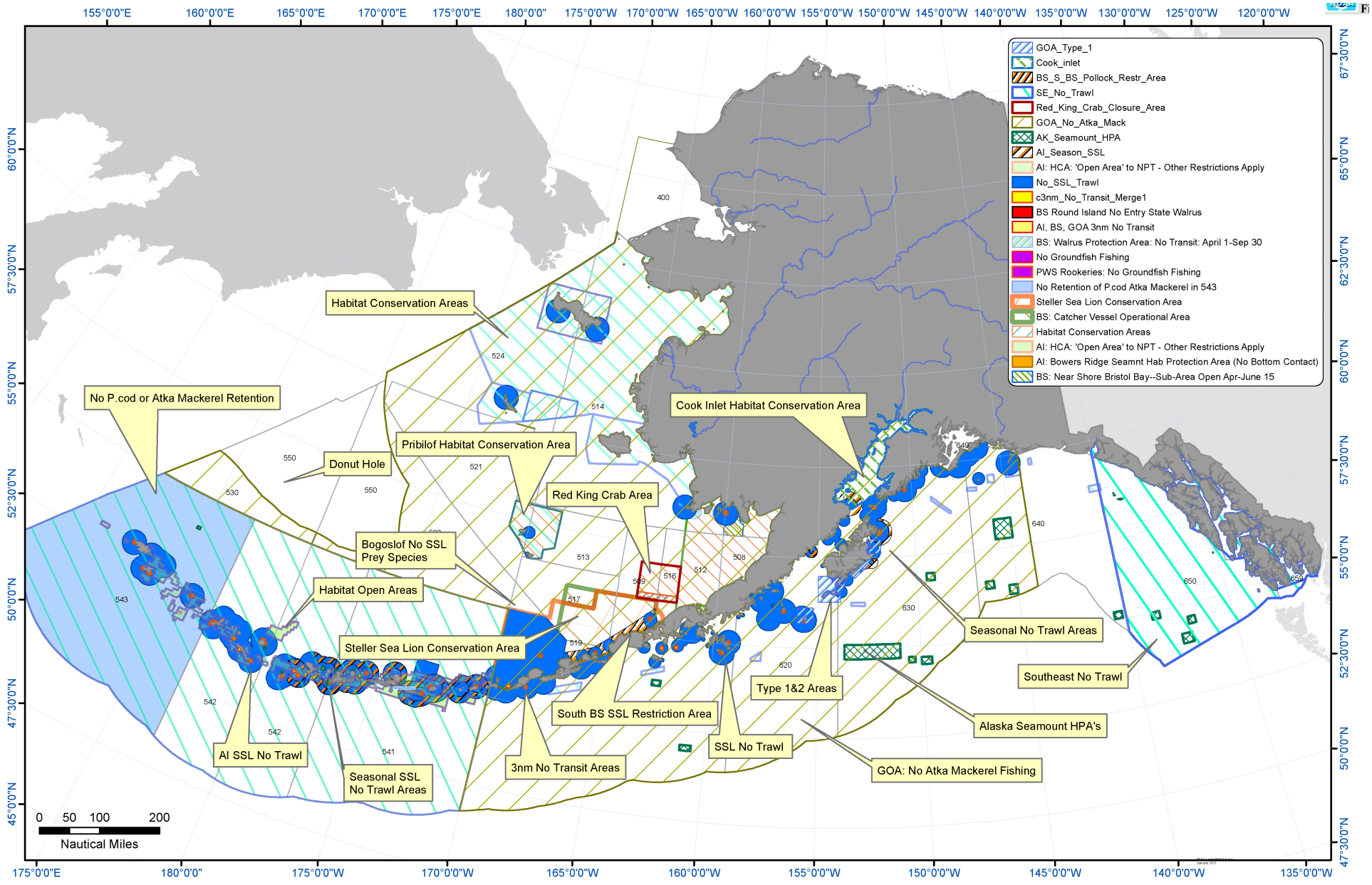
- ✓*Prevent Overfishing – Annual Catch Limits*
- ✓*Promote Sustainable Fisheries and Communities – science based guidelines*
- ✓*Preserve Food Web – Weak stock management*
- ✓*Manage Incidental Catch and Reduce Bycatch and Waste*
- ✓*Avoid Impacts to Seabirds and Marine Mammals*
- ✓*Reduce and Avoid Impacts to Habitat*
- ✓*Promote Equitable and Efficient Use of Fishery Resources*
- ✓*Increase Alaska Native Consultation*
- ✓*Improve Data Quality, Monitoring and Enforcement*

http://alaskafisheries.noaa.gov/npfmc/PDFdocuments/meetings/Management_FMP.pdf

Management Approaches (Fulton et al. 2014, Plos One)

- ✓ Property rights (Sablefish and halibut ITQ 1995; American Fisheries Act 1998 (pollock); Amendment 80 (non-pollock trawl))
- ✓Community-based management (CDQ 1992)
- ✓ Time/Area and quota regulation
  - Time – Area
  - Gear (optional)
  - ❖Effort (no)
  - Catch limits
- ✓ Incentive-based approaches
- ✓ Spatial management?

Spatial Management



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From Steve Lewis - AKR

Managing Incidental Catch of Prohibited Species

- Catch Limits
- Gear/Area closures
- Bristol Bay Red King Crab Conservation Area
- Chinook and Other salmon (primarily chum):
  - Hard cap + Incentive Program Agreements (IPAs)

Pacific herring. Photo: JJ Vollenweider, NOAA Fisheries

OPEN ACCESS Freely available online

PLoS BIOLOGY

Perspective

Integrated Ecosystem Assessments: Developing the Scientific Basis for Ecosystem-Based Management of the Ocean

Phillip S. Levin*, Michael J. Fogarty, Steven A. Murawski, David Fluharty

Core Elements IEA

- Scoping
- Develop indicators
- Risk analysis
- Assessment
- MSE

Fully Coupled End to End Ecosystem Model

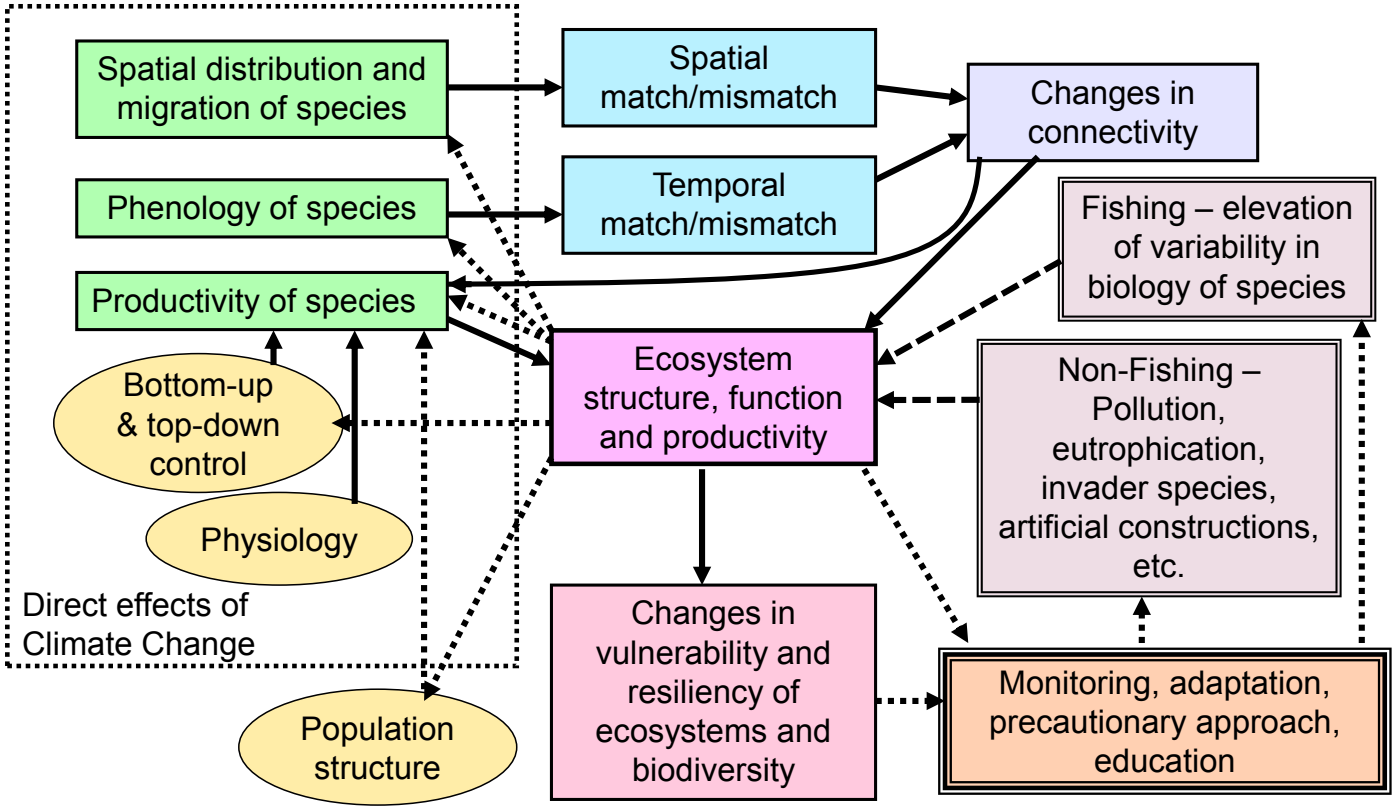
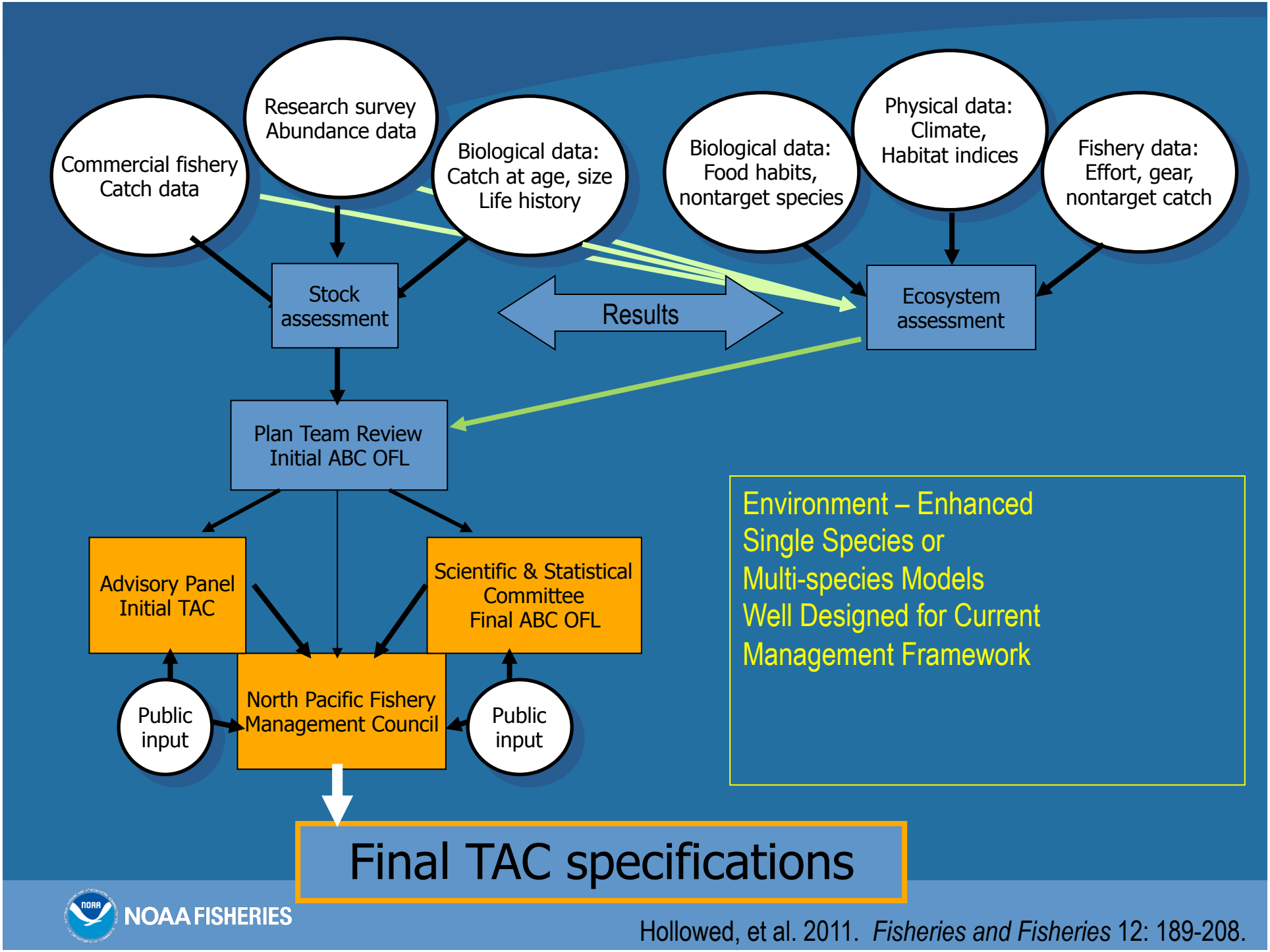


Figure from Hollowed et al, 2013, ICES J. Mar. Sci



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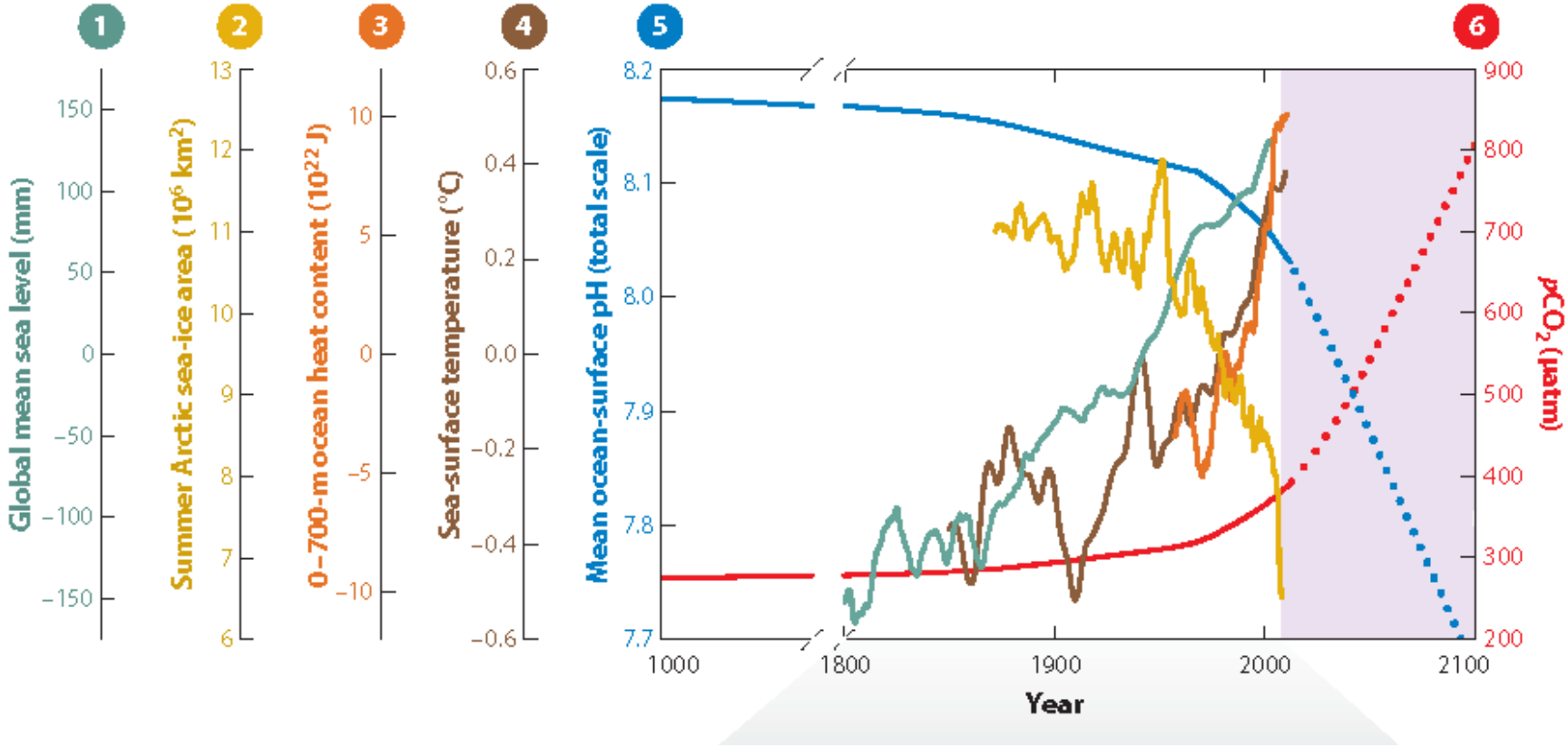
Hollowed, et al. 2011. *Fisheries and Fisheries* 12: 189-208.

Emerging Issues

- Climate change
- Population Growth (Food Security, Market Demand)
- Increased shipping
  - Effects of sound in the marine environment
  - Invasive species
  - Ship strikes on whales

- Impacts of offshore energy development (oil and other)
- International Science Advice:
  - FAO - Sustainable Development Goals
  - Convention on Biodiversity (CBD) global vulnerability assessments
  - Intergovernmental Panel on Climate Change

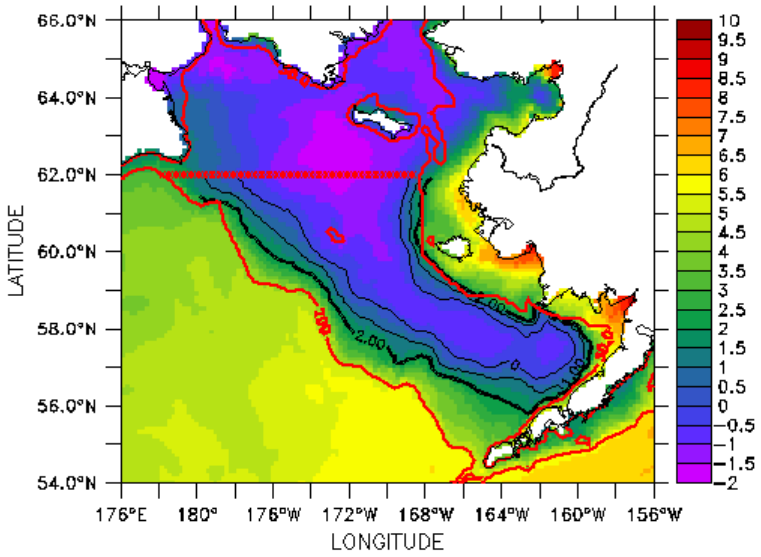
Physical Changes: Observations and projections



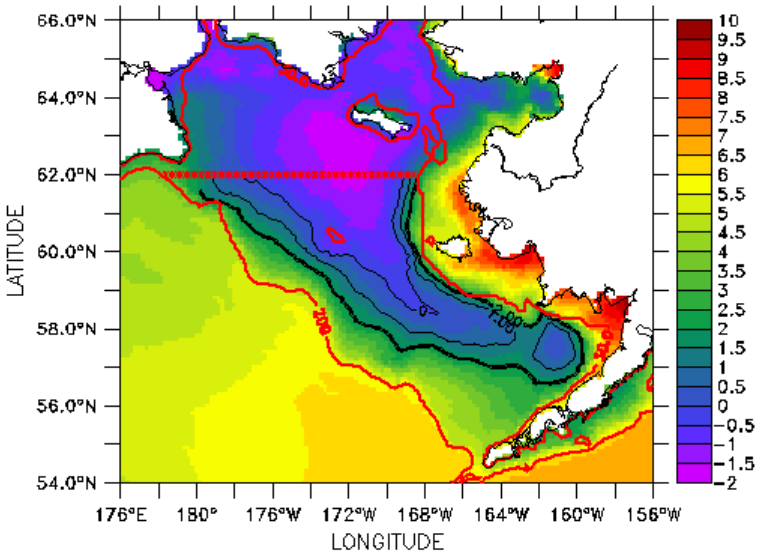
(*a) Changes in global mean sea level (teal line; Jevrejeva et al. 2008),summer Arctic sea-ice area (yellow line;Walsh & Chapman* 2001),0–700-m ocean heat content (*orange line; Levitus et al. 2009),sea-surface temperature (brown line; Rayner et al. 2006),* mean ocean-surface pH (*blue line; Natl. Res. Counc. 2010), andpCO2 (red line; Petit et al. 1999). Light purple shaded region* denotes projected changes in pH and *pCO2 consistent with the Intergovernmental Panel on Climate Change's twenty-first-century A2* emissions scenario with rapid population growth.

Doney et al. 2012. Annu. Rev. Mar. Sci. 2012. 4:4.1–4.27

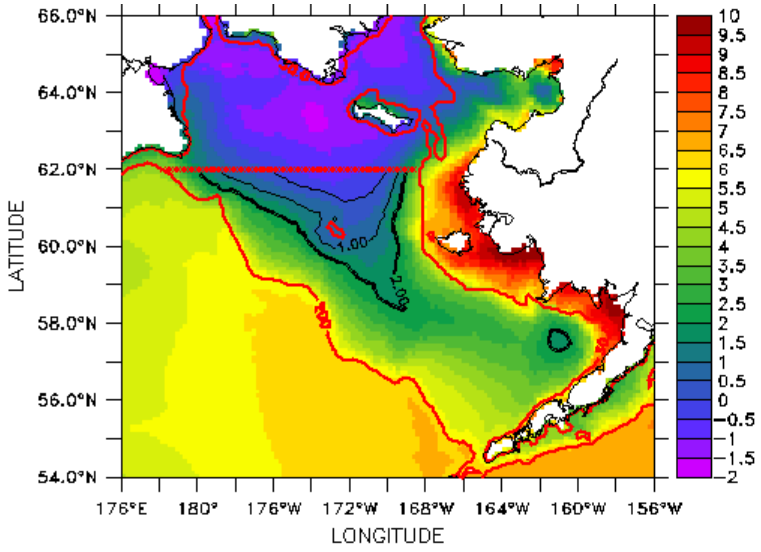
Projected EBS July bottom temperatures in SE Bering Sea (Al Hermann JISAO)



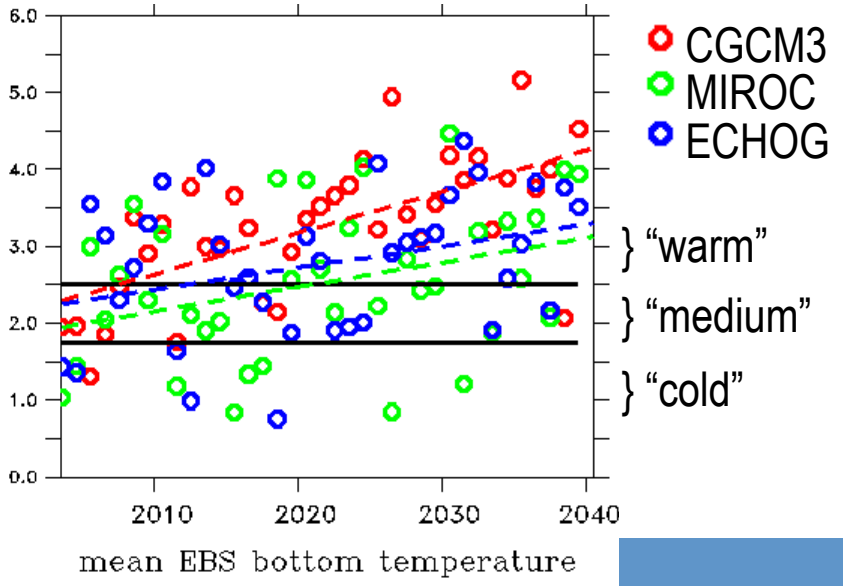
ensemble ave cold year



ensemble ave medium year



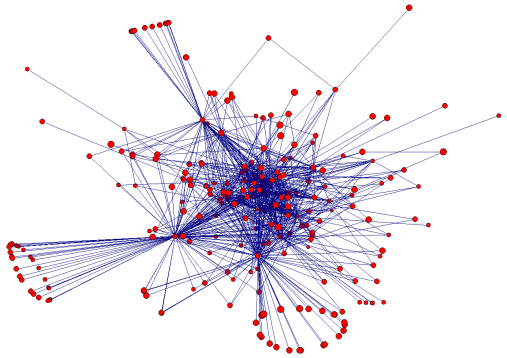
ensemble ave warm year



mean EBS bottom temperature

Tracking Climate Impacts Through Life History Gauntlet

Recruitment Processes Alliance
GOA IERP



GOA food web network:
Prioritize process studies on nodal species
Gaichas & Francis (2008) CJFAS 65:1965-1982

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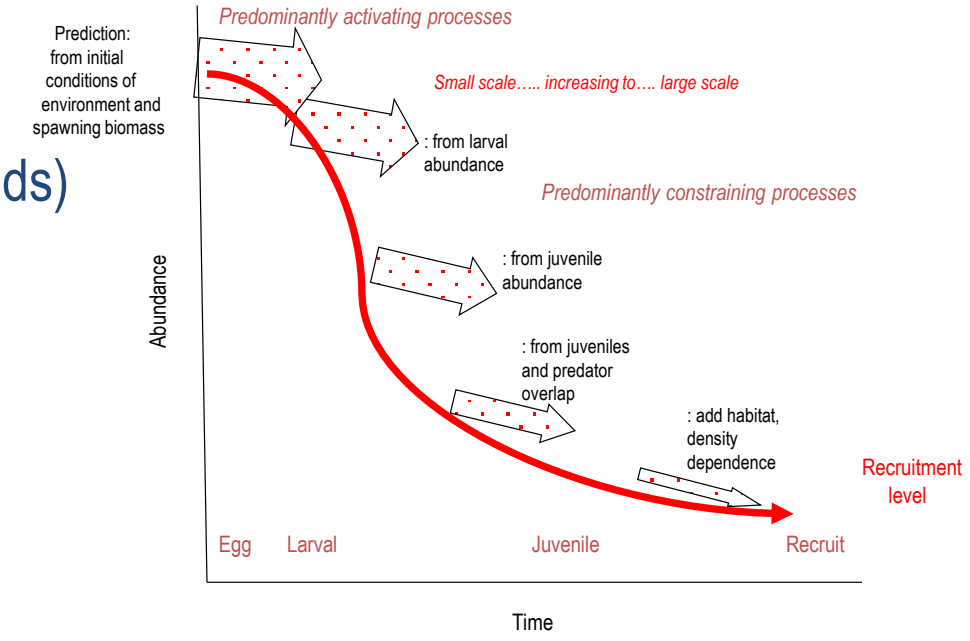
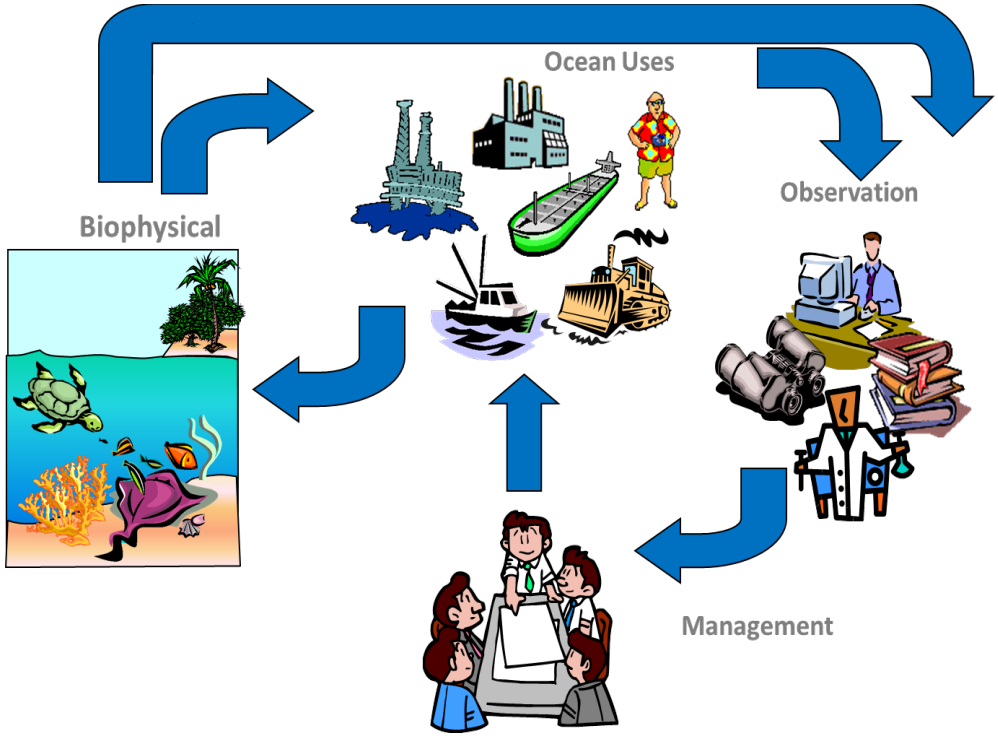
- ✓ Growth – bio-energetics
- ✓ Recruitment
- ✓ Catchability (non-trawlable grounds)
- ✓ Selectivity/availability
- ✓ Phenology
- ✓ Natural mortality
- ✓ Bio-economic (fishers choice)
- ✓ Stock structure

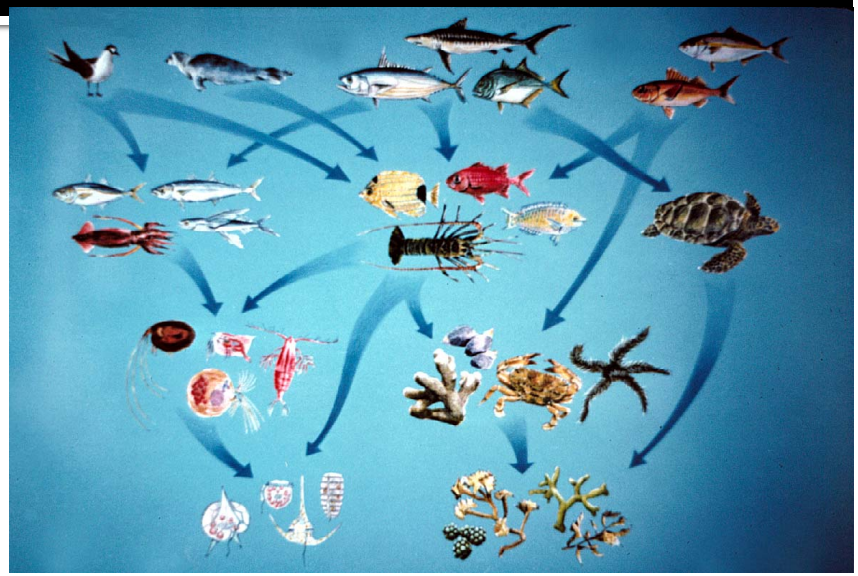
Scheme of Continuous Refinement of Recruitment Forecast



Technical Options- Scenario Testing

- System MSEs



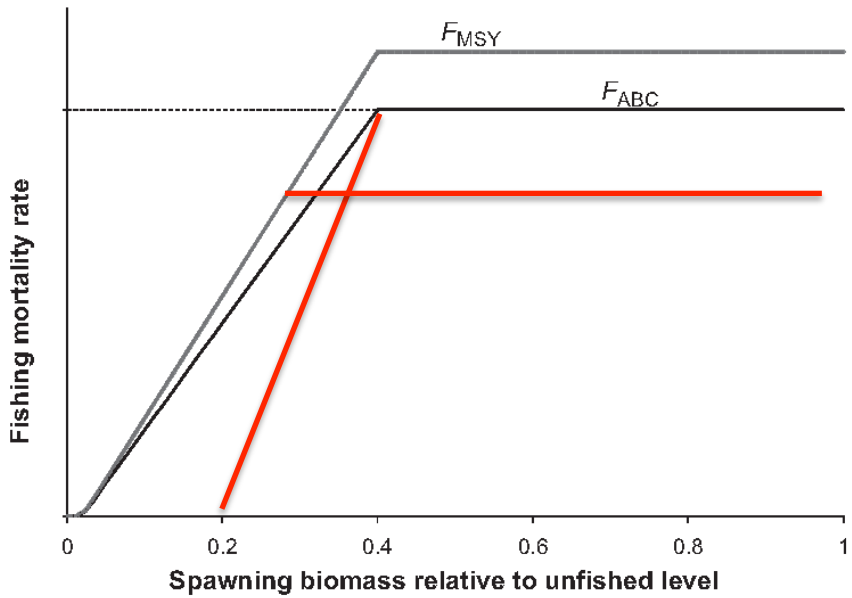


A'mar et al. 2009 GOA pollock
Mueter et al 2011 BS pollock
Ianelli et al. 2011 BS pollock
Wilderbuer et al 2013 rock sole
Holsman et al. submitted BS MSM

Change Fishing Strategy?

"modifying management strategies to include environmental factors seldom improves the ability to achieve management goals unless the system is well known." Punt et al. 2013

Schematic of Harvest Control Rule

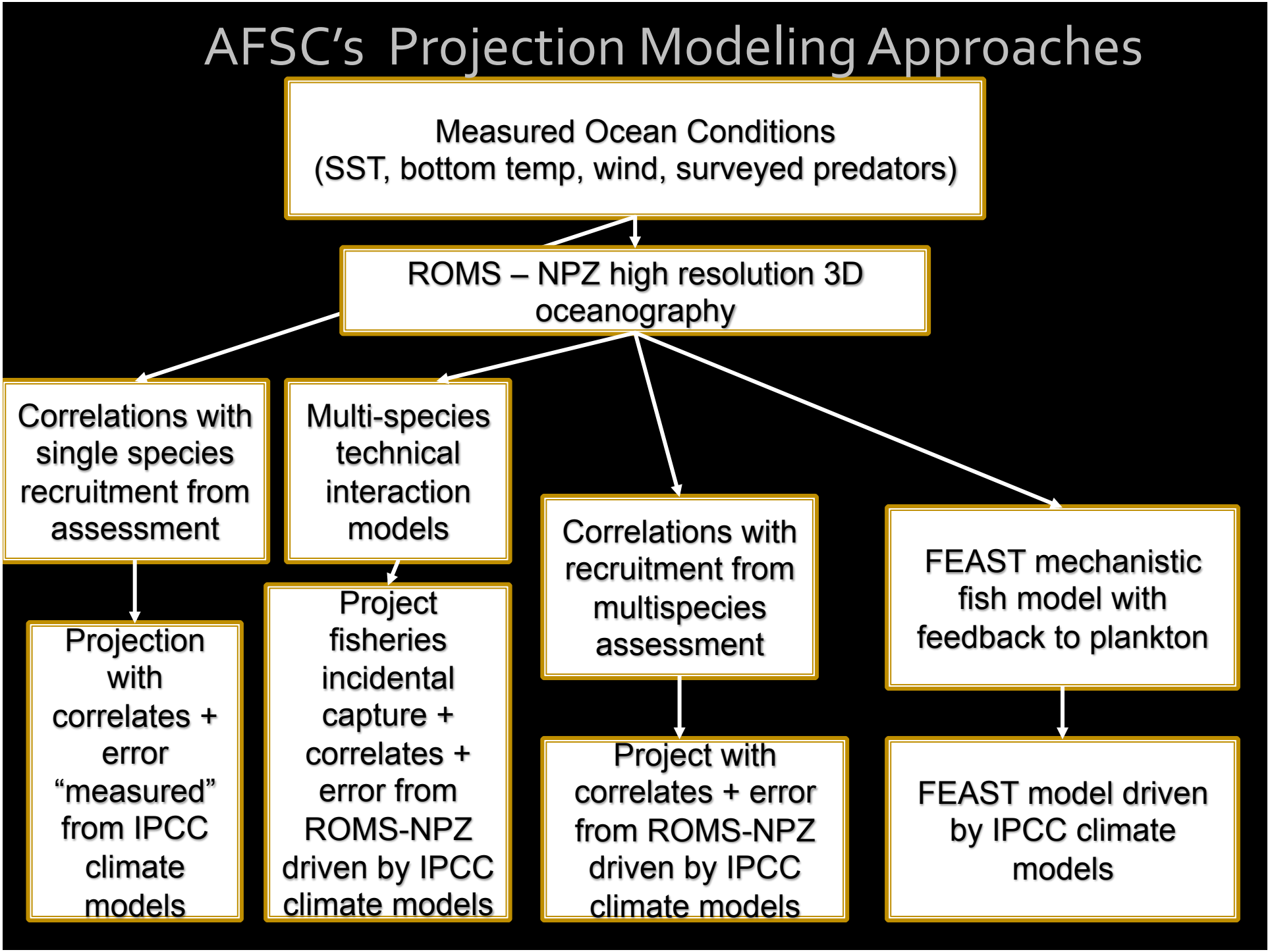


- Alt. 1: (no action) Adjust quota to maintain historical Bmsy
- Alt 2: Adopt steeper control rule to create a larger no fishing buffer.
- Alt 3: Adopt larger buffer between OFL and ABC to account for increased uncertainty due to climate change
- Alt 4: Account for climate impact on growth, maturation schedule, M, fishery selectivity . Then reset biological reference points

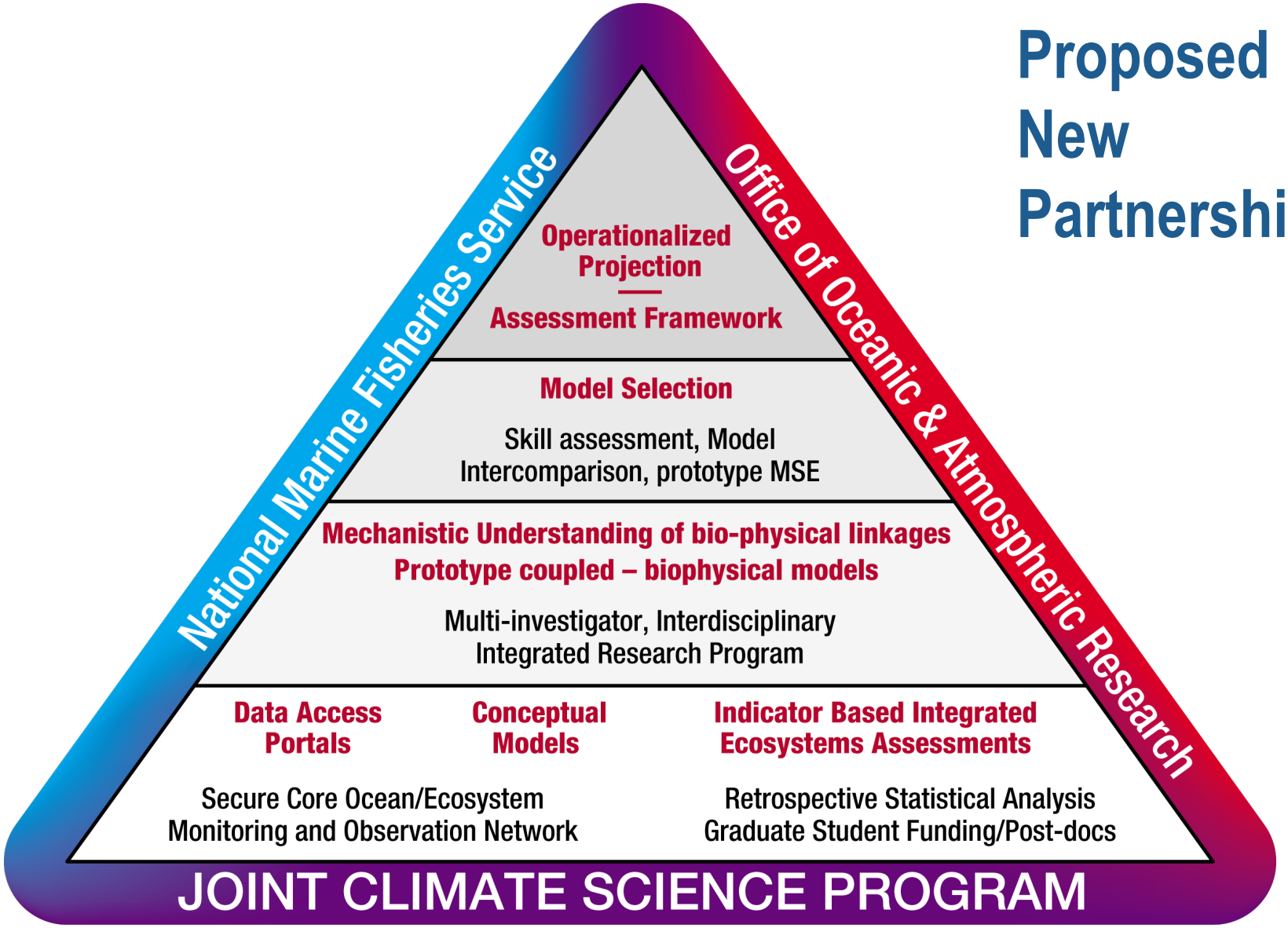
Catch " TAC " ABC/ACL < OFL

Total Allowable Catch | Acceptable Biological Catch | Overfishing Level

AFSC's Projection Modeling Approaches



Proposed New Partnership



Deliverables listed in RED

*Funding request listed in **BLACK***

Summary:

- Maintain and enhance monitoring.
- Prioritize process field work to inform functional form of biological response of key species
- Defining biological reference points may be challenging.
- Select precautionary harvest strategies that are robust to changing environment.
- Management strategy evaluations will help to identify sustainable harvest strategies and to evaluate trade-offs of changes in harvest strategies.
- Engagement with stakeholders to discuss landscape of future management systems needed.
    - Management System will continue to evolve.
- Multi-model portfolio of projection modeling approaches needed