Gulf of Mexico Ecosystem-Based Fishery Management (EBFM) Road Map Implementation Plan

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Gulf States Marine Fisheries Commission
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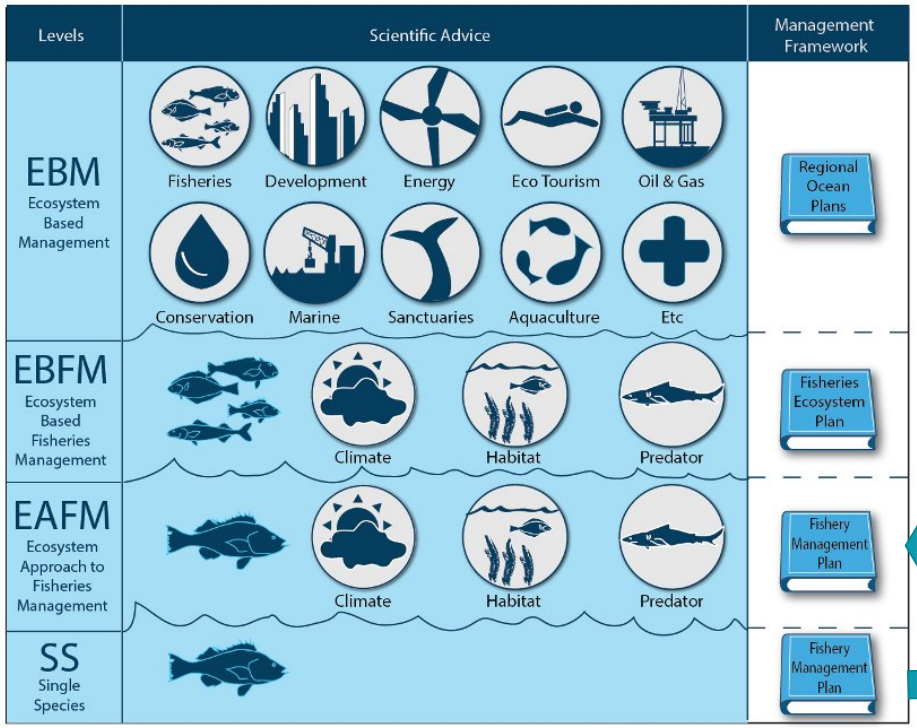
What is EBFM?

Q: What do all of these priority ecosystem management topics have in common?

What is EBFM?

Can be considered within a spectrum of approaches



NOAA FISHERIES

PLOS ONE

RESEARCH ARTICLE

Ecosystem-based fisheries management: Perception on definitions, implementations, and aspirations

John T. Trochta[1©], Maite Pons[1©*], Merrill B. Rudd[1©], Melissa Krigbaum[1©], Alexander Tanz[2©], Ray Hilborn[1]

"We highlight the lack of consensus in the interpretation of EBFM amongst professionals in marine science…**it is unnecessary for management to practice all the traits of EBFM, as some may be disparate from the ecosystem attributes or fishery goals.** Instead, incorporating some ecosystem-based considerations to fisheries management that are context-specific is a more realistic and useful way for EBFM to occur in practice."

Stock assessment

Improvement plan

What is EBFM?

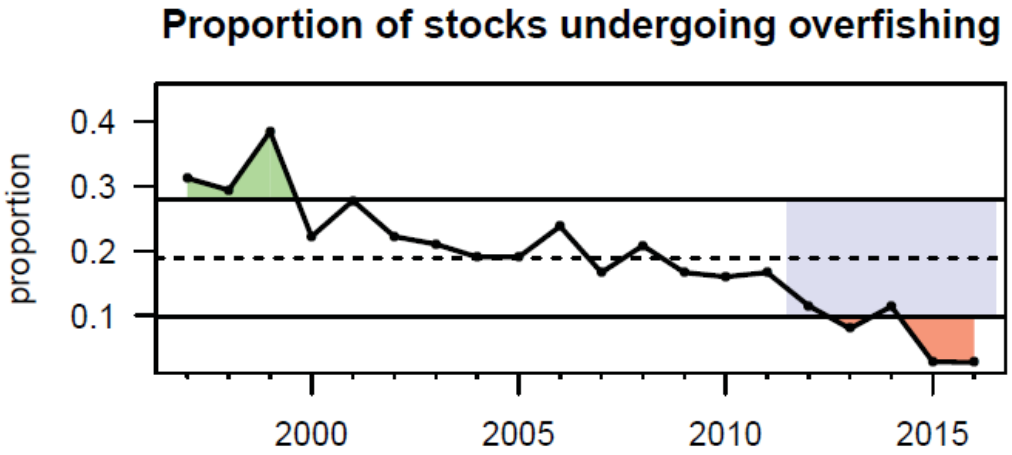
NOAA Integrated Ecosystem Assessment Program (IEA)

"The analytical engine to implement ecosystem approaches"

Gulf of Mexico IEA Mission Statement: Balancing the needs of nature and society through integrated science for current and future generations in the Gulf of Mexico

Why EBFM?

Single species stock assessments have been highly successful in ending overfishing

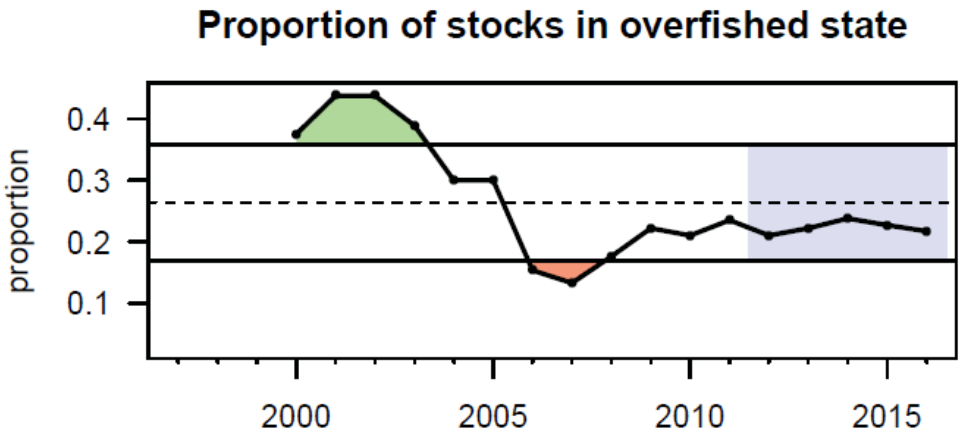


Now, the challenging part: what is **optimum yield**?

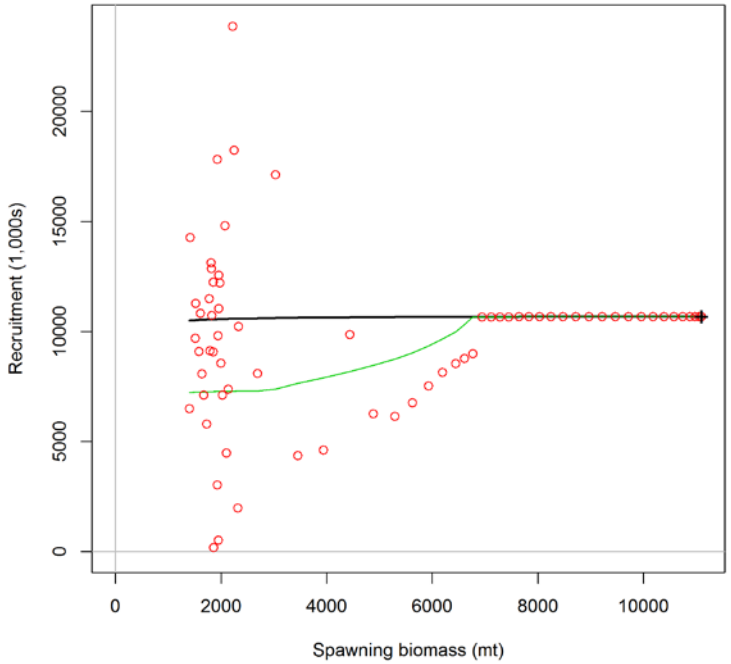
MSY → as reduced by economic, social, ecological factors → OY

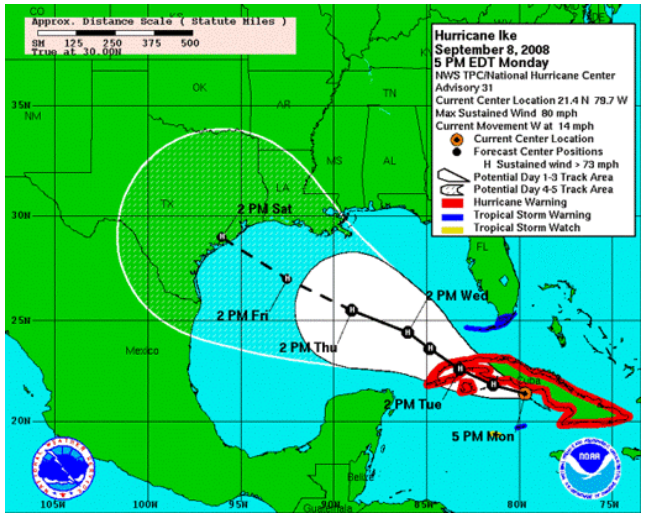
Why EBFM?

- We may be able to improve short-term projections
- Rebuilding plans are costly



- We have rights to productive fisheries





How EBFM?

NOAA Fisheries EBFM Road Map Policy

May 2016
National EBFM Policy released

June 2017
Regional Road Map development initiated

September 2018
Regional drafts released; public comment period

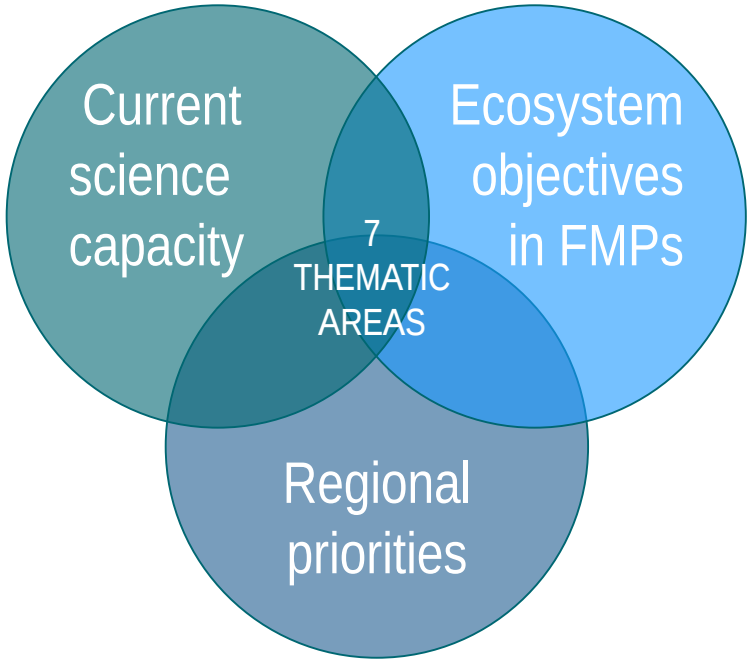
Summer 2019
Final Road Maps to be released

Purpose of the Gulf EBFM Road Map

1) Document the efforts that the SEFSC its partners have completed,
2) guide the organization of ecosystem science within the SE region,
3) clarify regional priorities in order to facilitate collaboration, and
4) assist the Gulf Council with ecosystem-level planning.

Intended audience: Gulf Council, public, the NOAA Fisheries Southeast region and its collaborating partners

Overall objective: to motivate a dialogue on how EBFM can be effectively applied in the Gulf of Mexico



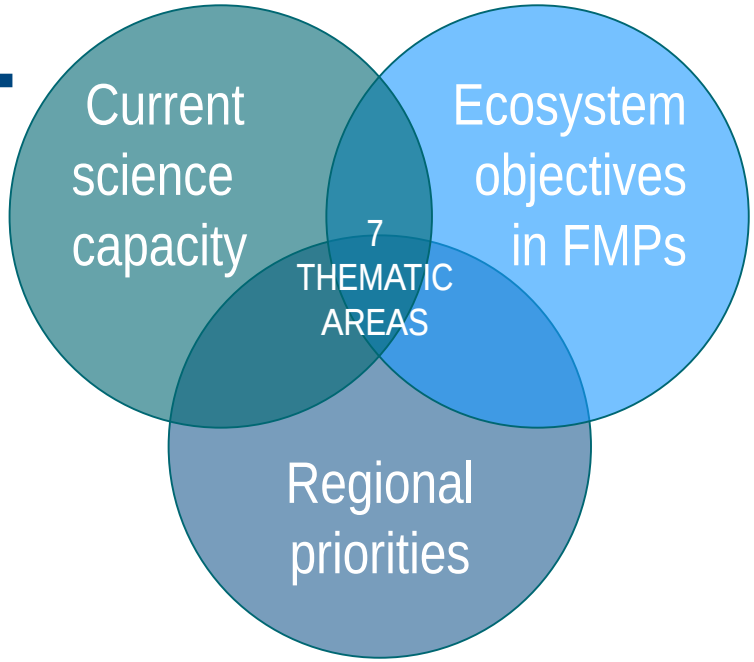
Gulf EBFM Road Map Outline

Regional context

- Stock assessment
- Baseline monitoring
- Climate change
- Habitat considerations
- Multi-species interactions
- Connectivity
- Human dimensions

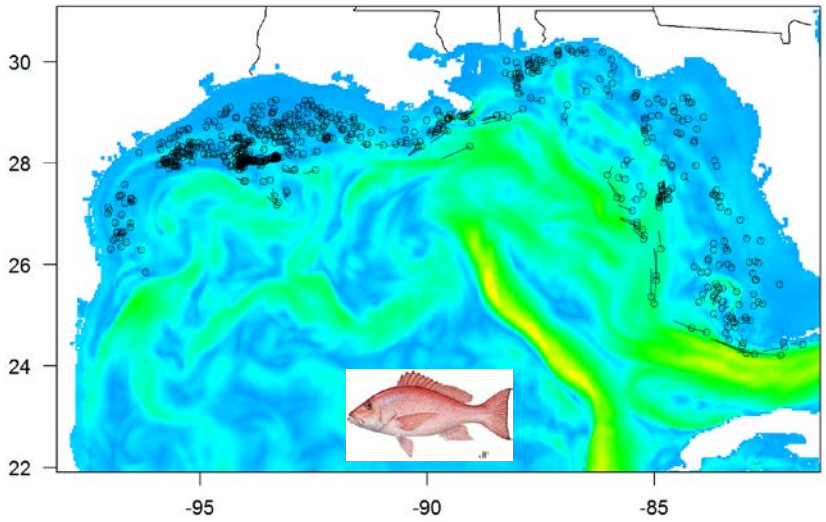
Expected outcomes and benefits

Engagement strategy



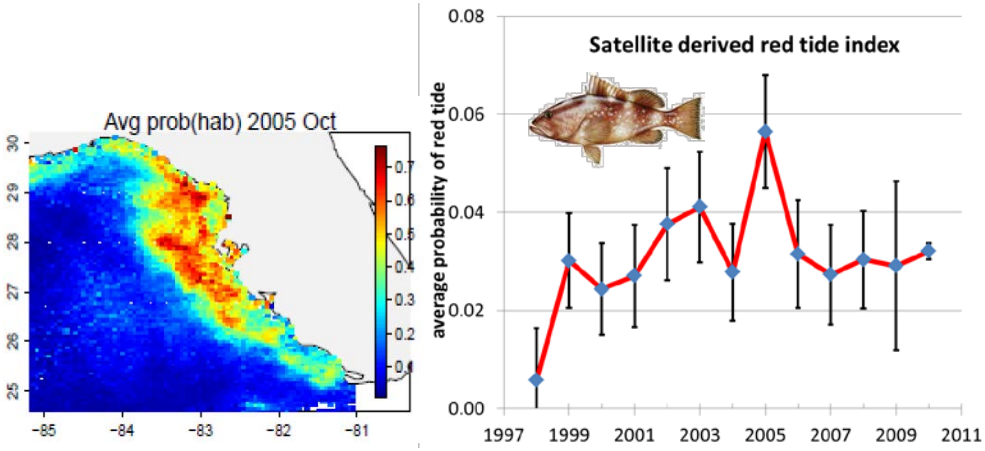
Advancing stock assessments (a.k.a. SAIP)

- Larval transport of red snapper
- Red tide and groupers
- Shrimp production



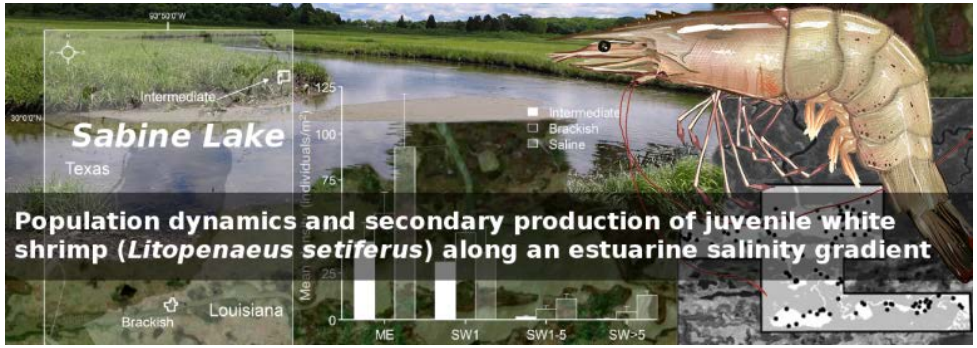
Larval transport modeling to predict recruitment strength

(M. Karnauskas, J. Walter, SEFSC; C. Paris, Univ. of Miami)



Estimating mortality due to red tide events

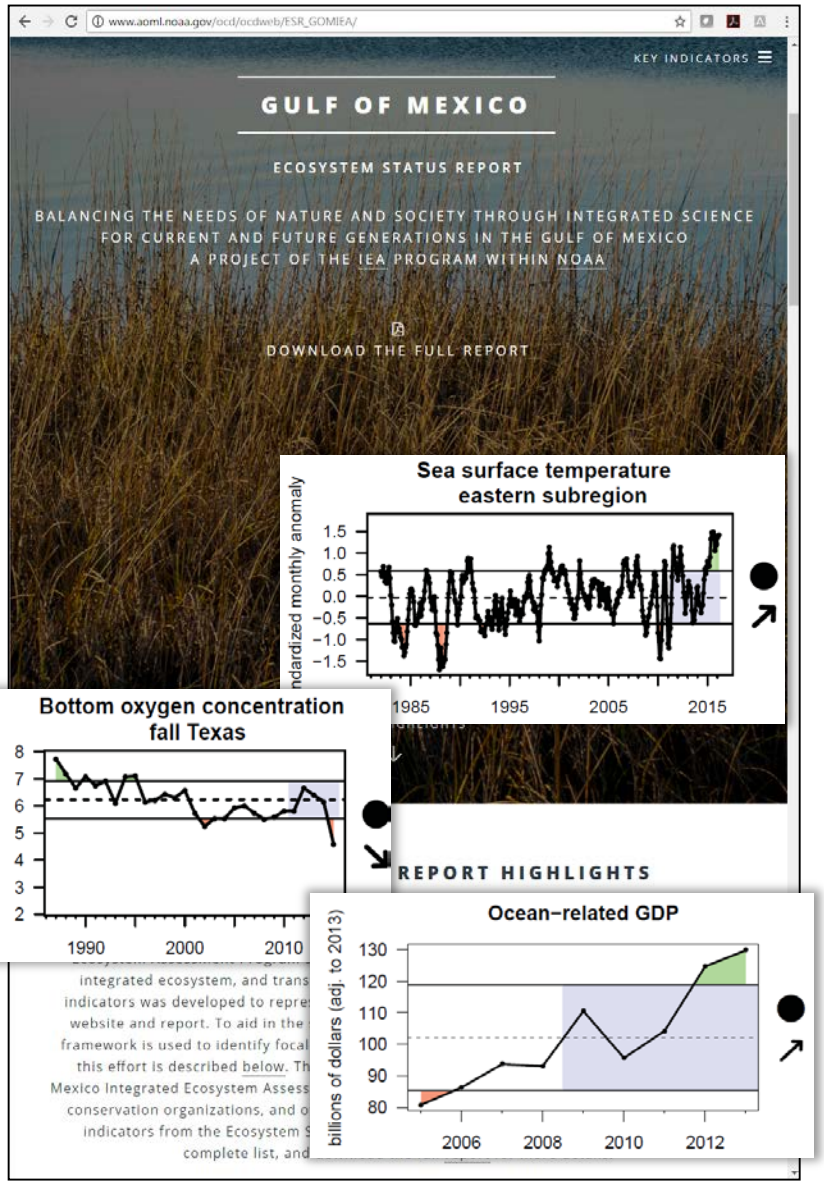
(Walter et al. 2013, SEDAR33-DW08)



(J. Leo, T. Minello, L. Rozas, SEFSC; many other collaborators)

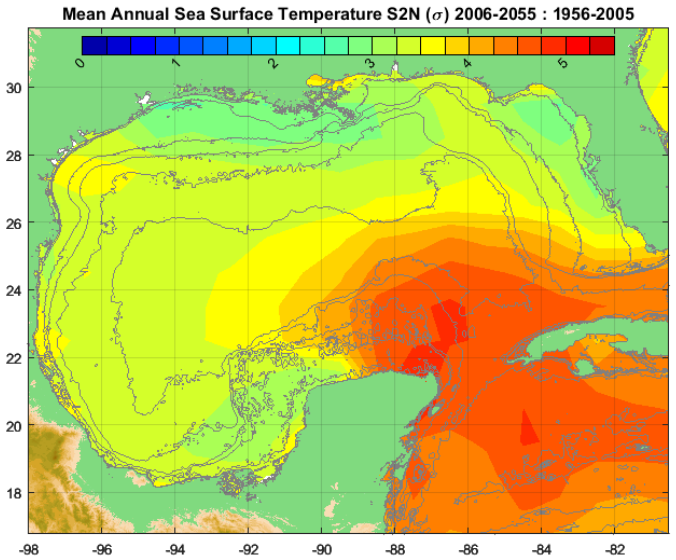
Baseline monitoring

- Existing long-term monitoring activities
- Ecosystem Status Reports
- Gulf of Mexico Marine Assessment Program for Protected Species
- Pilot “ecosystem survey” (eDNA, diet data)

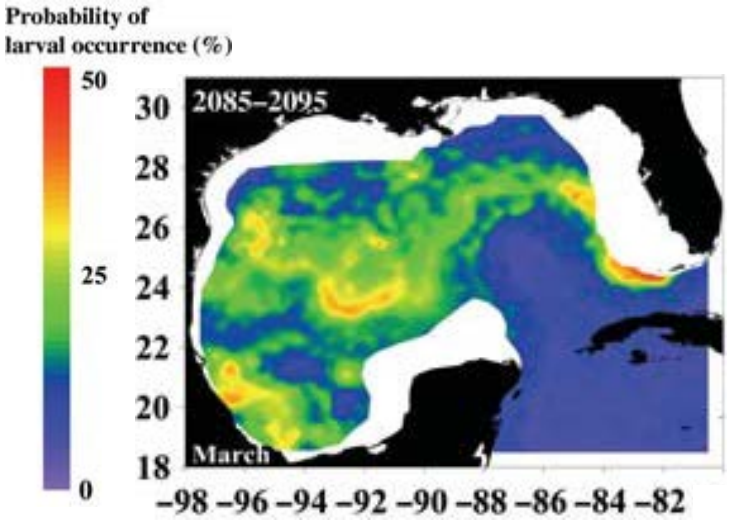


Climate

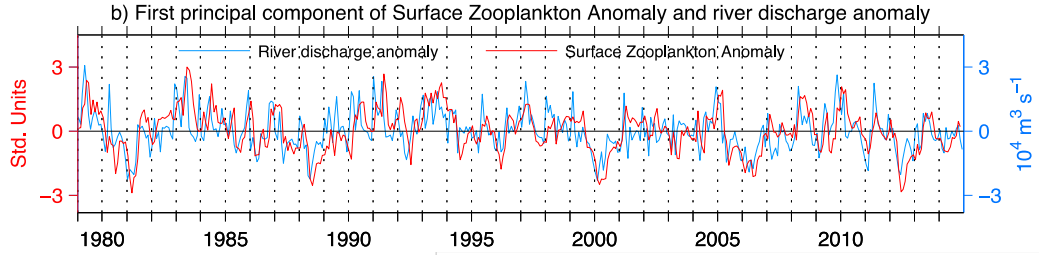
Climate Vulnerability Analysis
(J. Quinlan, SEFSC)



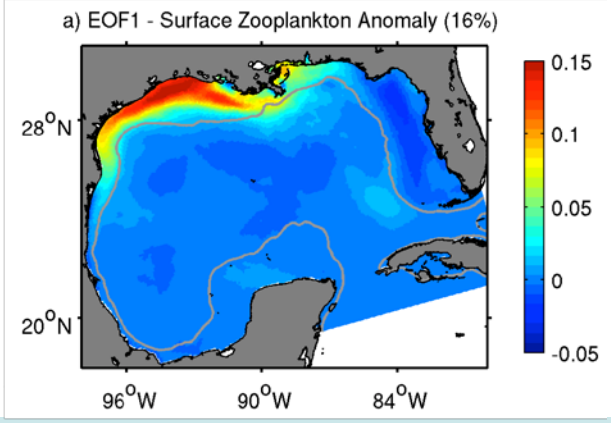
- Climate vulnerability analyses
- Bluefin tuna spawning predictions
- Biogeochemical modeling



Predicting effects of climate change on bluefin tuna spawning habitat
(B. Muhling et al. 2011, ICES 68(6) 1051–1062)

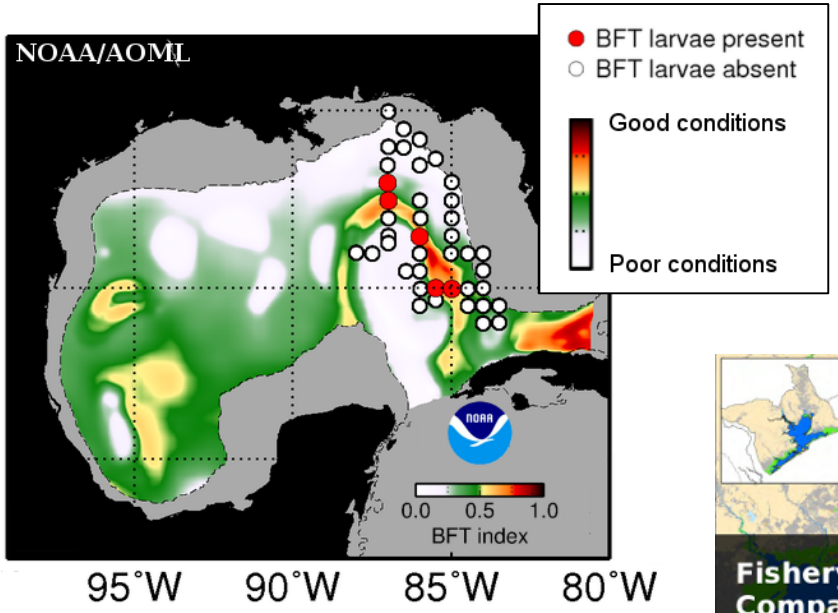


Impacts of El Niño on plankton biomass
(Gomez et al. in review, Geophysical Research Letters)



Habitat considerations

- Estuarine habitat
- Pelagic habitat

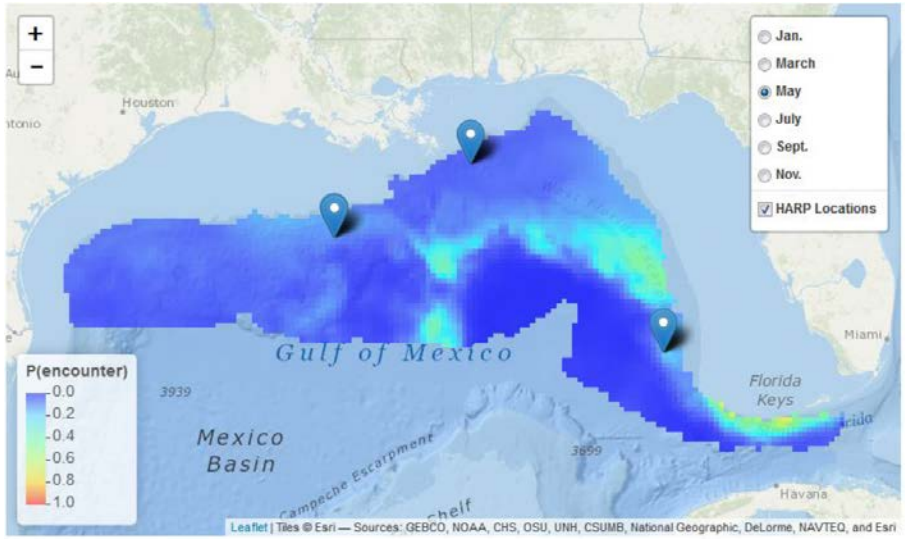


Predicting preferred conditions for Bluefin tuna larvae

(Domingues et al. 2016 Fisheries Oceanography)

Predictions of mammal distributions from visual survey and acoustic data

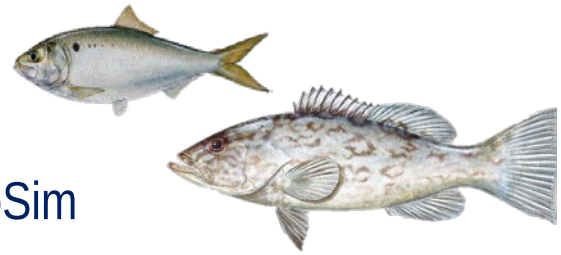
(M. Soldevilla, L. Garrison, SEFSC; J. Hildebrand, K. Frasier, Scripps Institution of Oceanography)



Understanding estuarine productivity

(T. Minello, P. Caldwell, L. Rozas, SEFSC)

Multi-species interactions

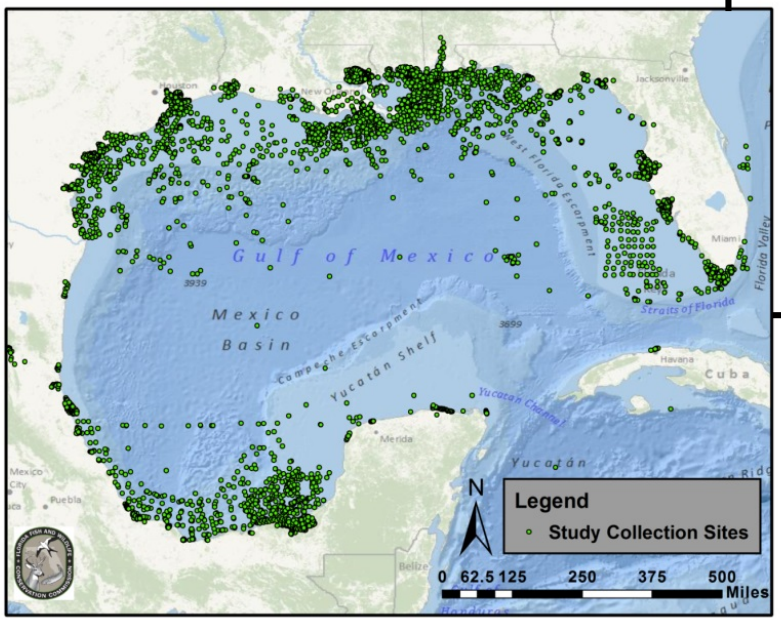


- Bycatch issues
- Diet studies
- Ecosystem modeling

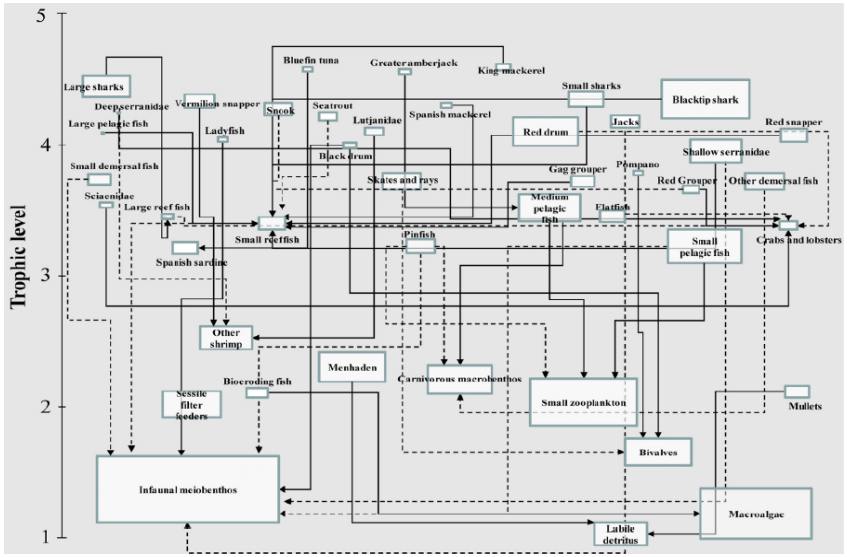
EcoPath with EcoSim

RESTORE project: Integrate ecosystem stressors and predator-prey interactions into stock assessment and management

(S. Sagarese, M. Lauretta, SEFSC; D. Chagaris, R. Ahrens, University of Florida; K. de Mutsert, George Mason University)



GoMexSI diet database (J. Simons, Texas A&M)

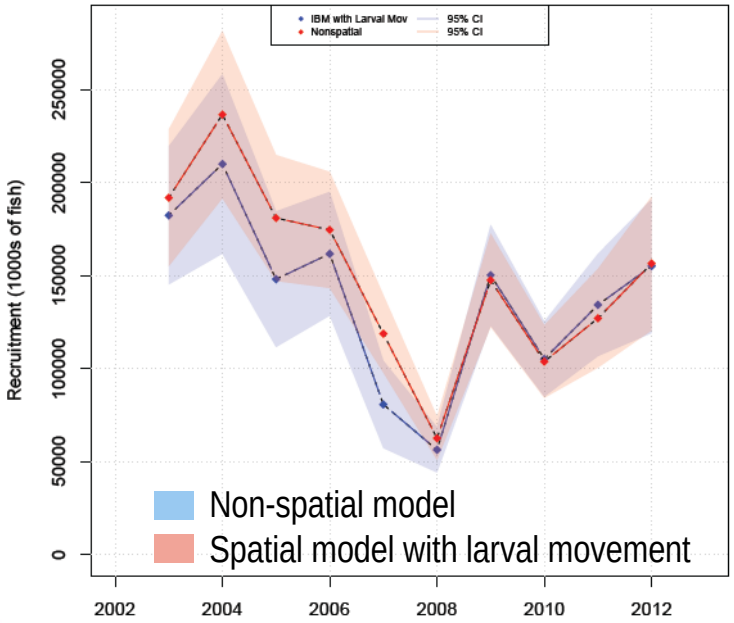


ATLANTIS end-to-end ecosystem model

(C. Ainsworth, USF; M. Masi, M. Schirripa, SEFSC)

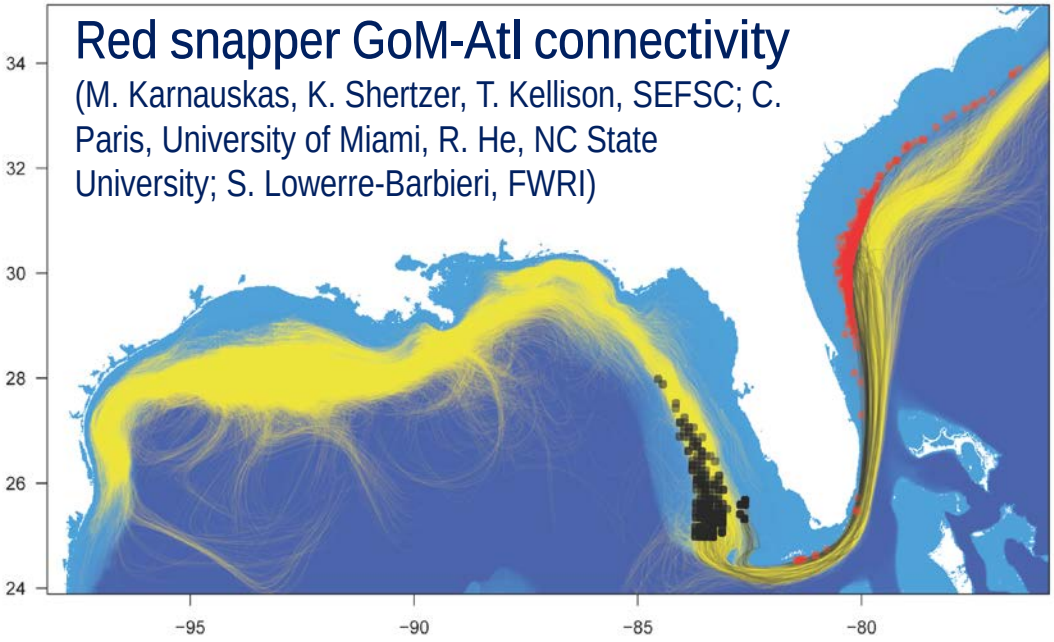
Connectivity: regional

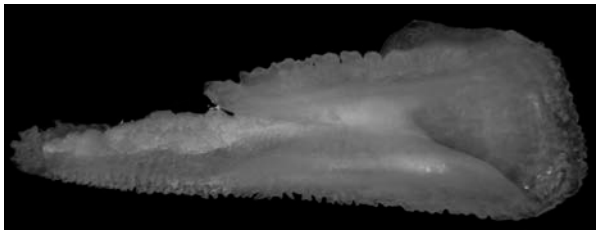
- Estimating larval transport between regions
- Spatially explicit assessments
- Otolith studies

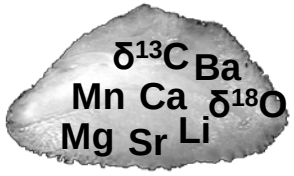


Advanced stock assessments

(D. Goethel, SEFSC)







Otolith microchemistry and shape analysis

(B. Barnett, G. Fitzhugh, SEFSC)

Connectivity: watersheds

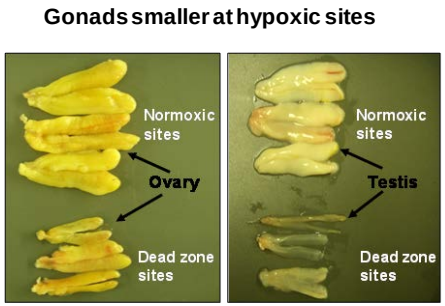
Understanding hypoxia affects on:

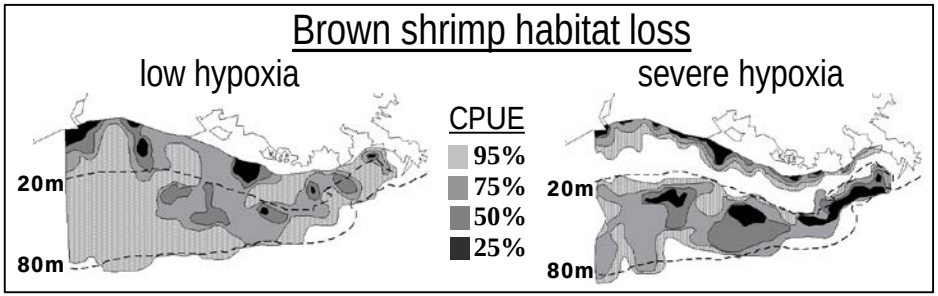
-habitat

-vital rates

-fisher behavior

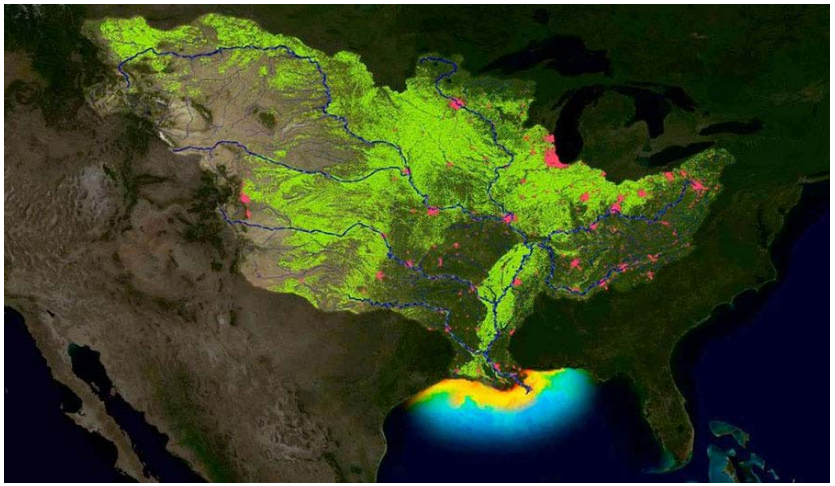
-shrimp prices

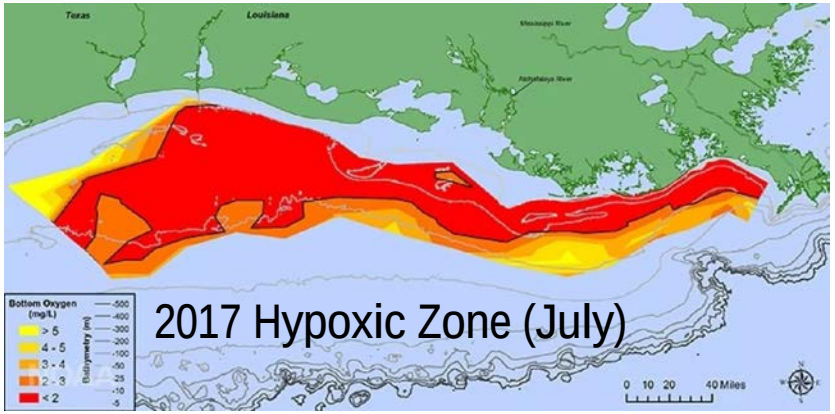




- How do effects on vital rates translate to the population?

- Does hypoxia bias management advice from stock assessments?

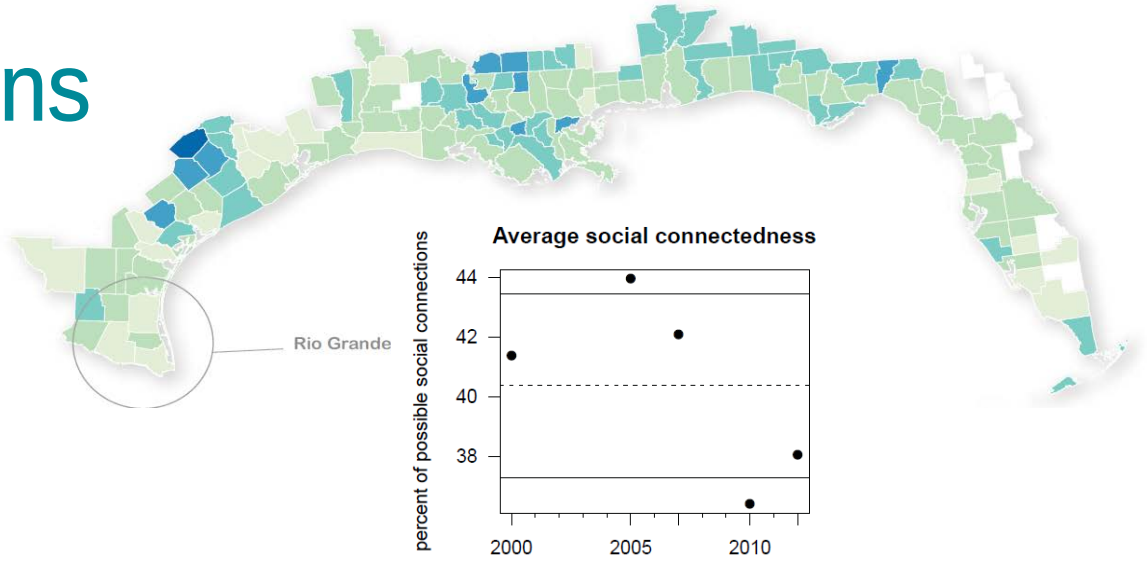


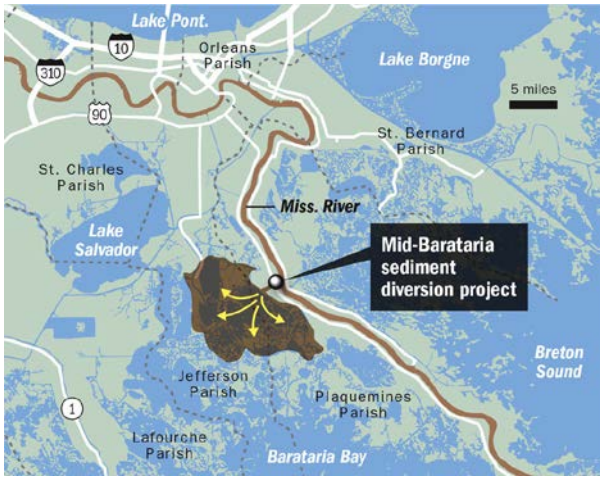


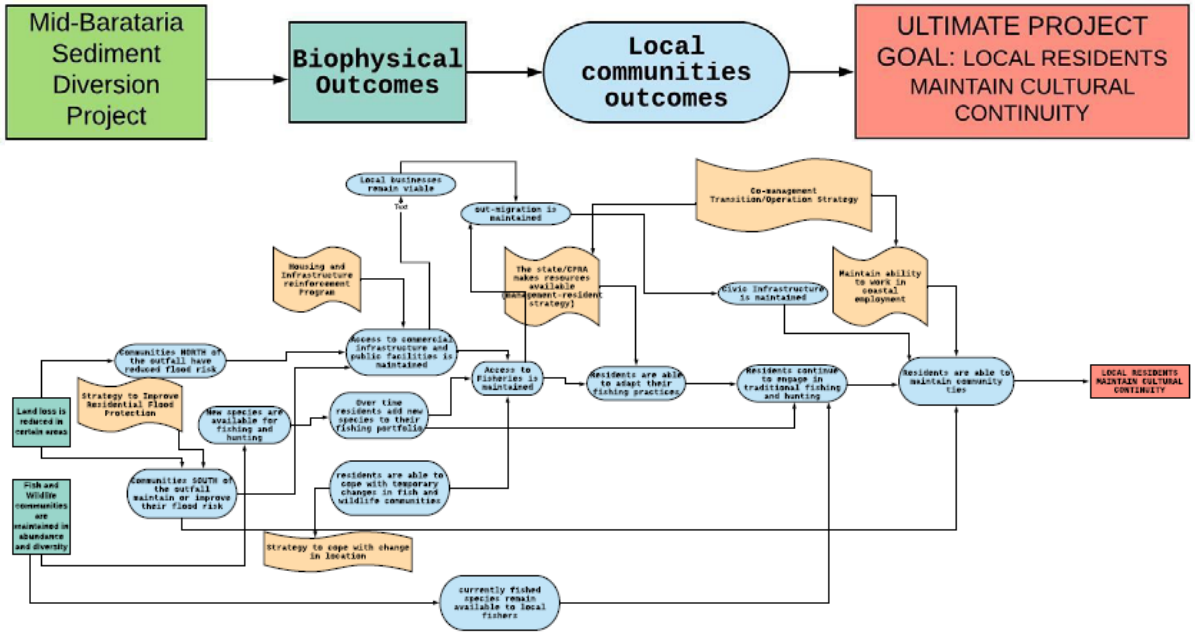
(K. Craig, R. Hart, J. Nance, B. Langseth, SEFSC; M. Smith, Duke University; D. Obenour, NC State University)

Human dimensions

Understand and track how different management actions affect human well-being

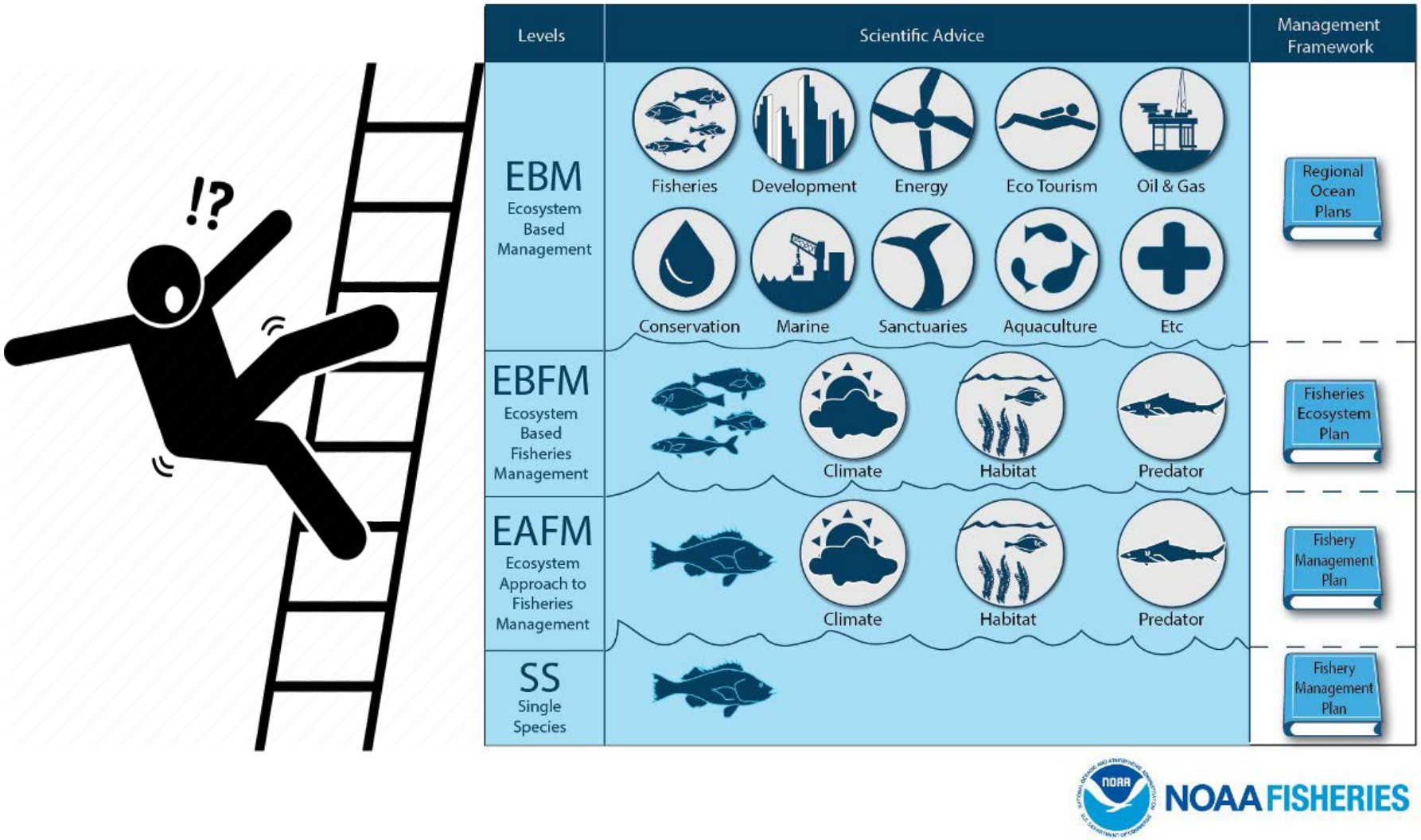






Results Chain and Bayesian network modeling approaches
(M. McPherson, S. Blake, SEFSC; M. Jepson, SERO)

This all seems a little bit overwhelming…



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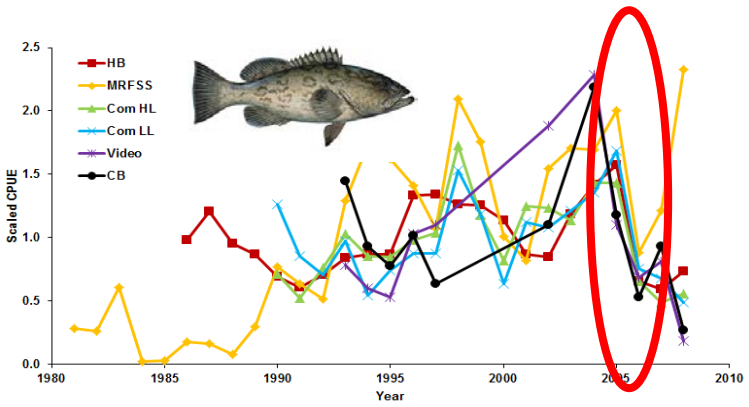
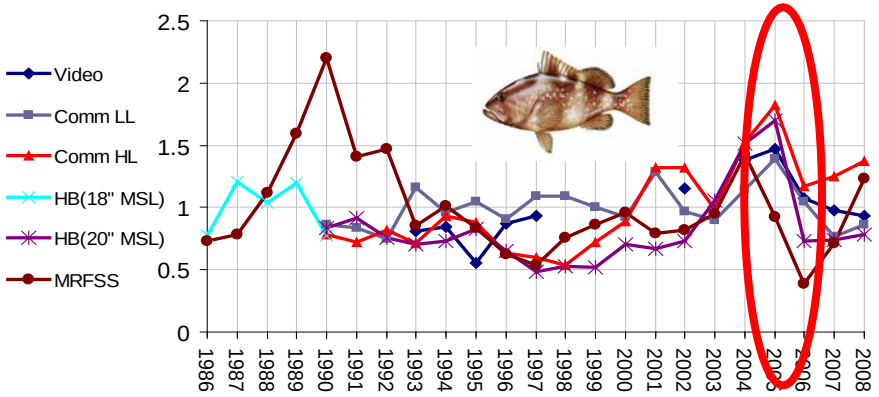
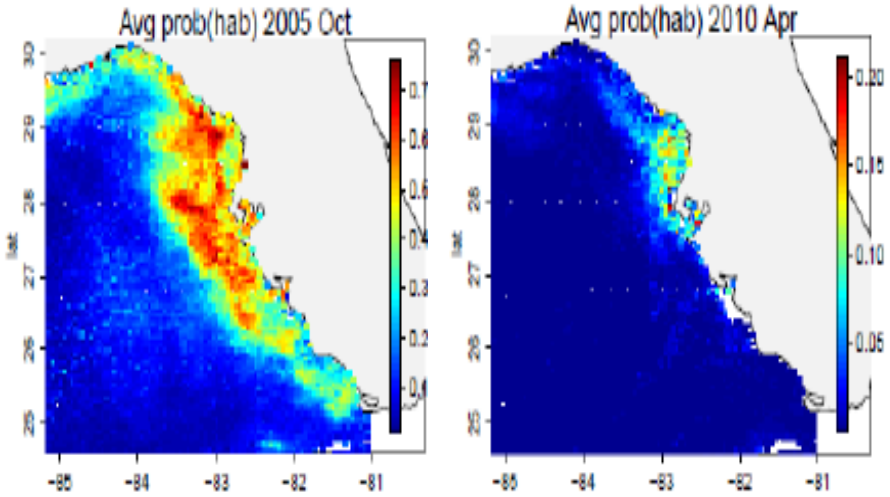
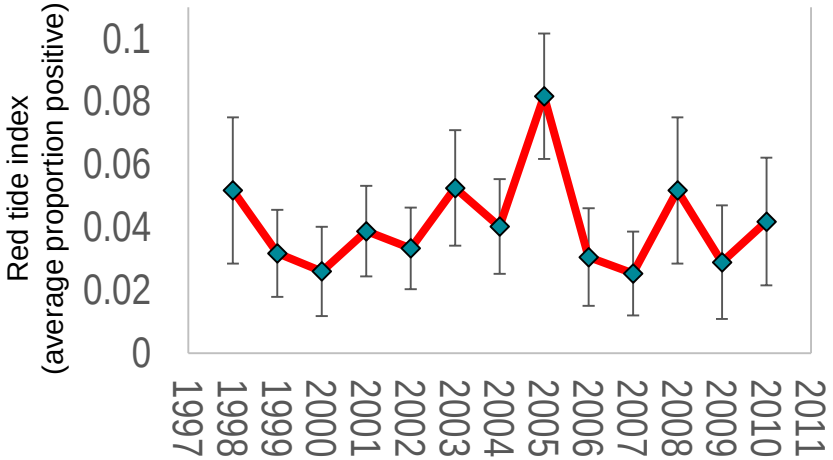
Red tide case study





Satellite-informed model of red tide → index for stock assessment

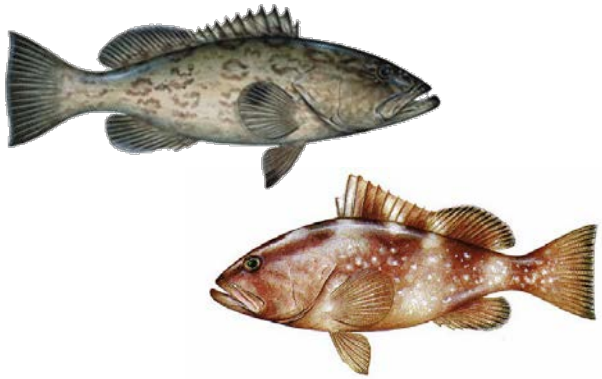


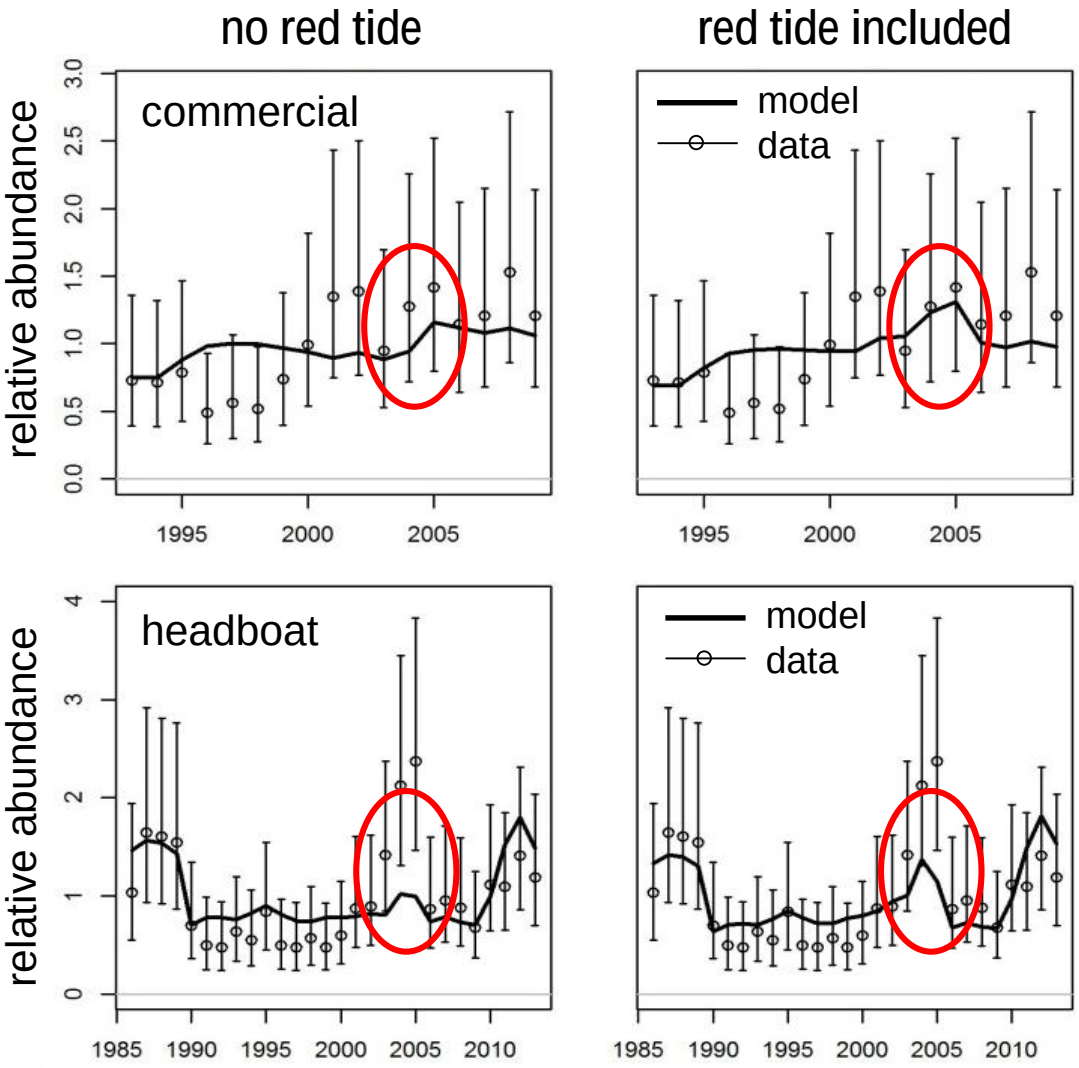


Walter et al. 2013

Incorporating red tide into stock assessment

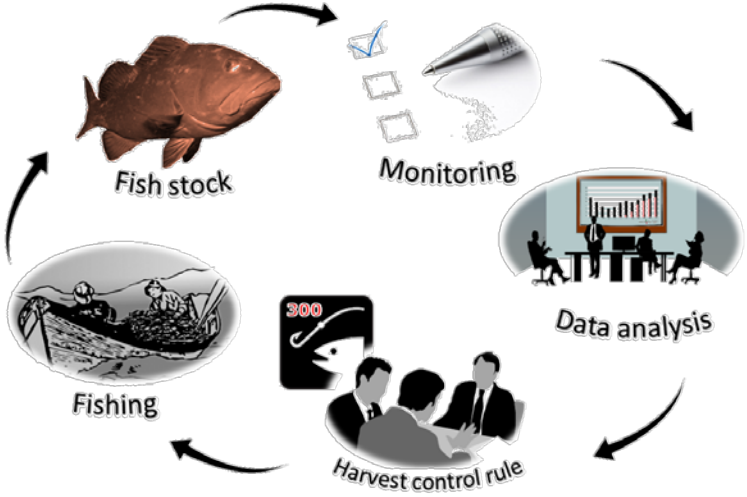
- Including index improves stock assessment fit
- Red tide explains declines of ~8 **million grouper** (gag and red combined) in 2005



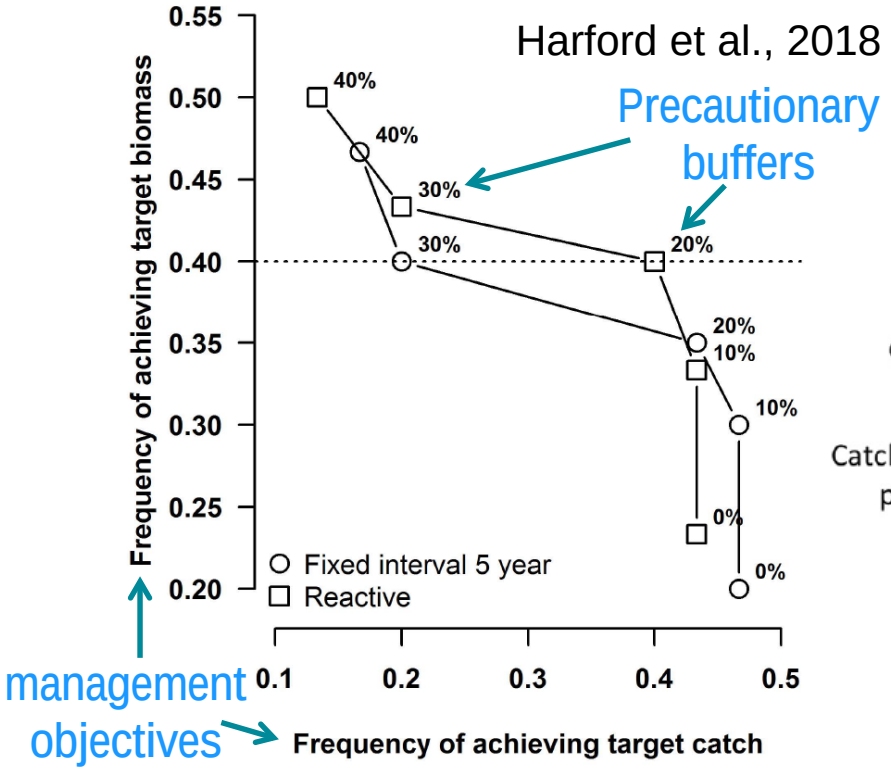


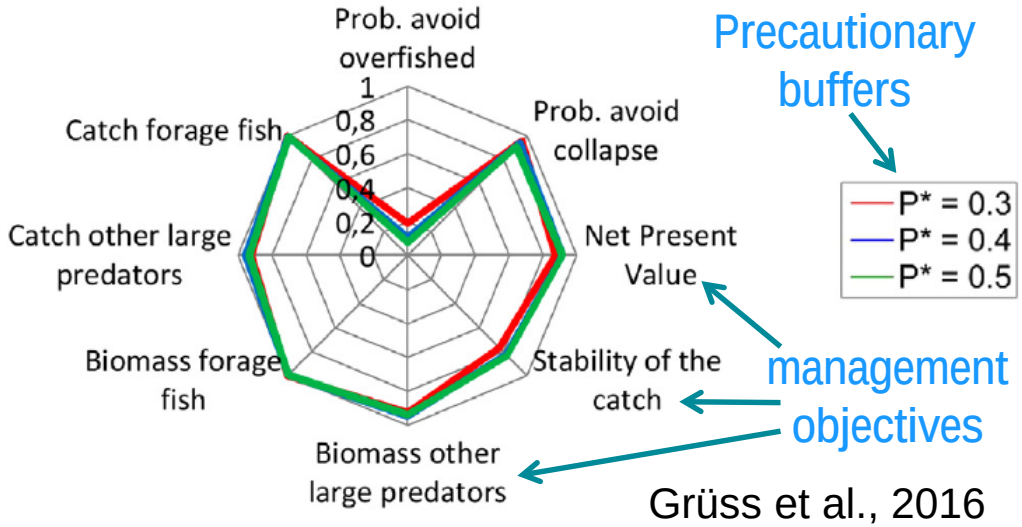
Management Strategy Evaluation

Are current harvest policies robust to possible future changes in frequency of red tides?



Harford et al., 2018





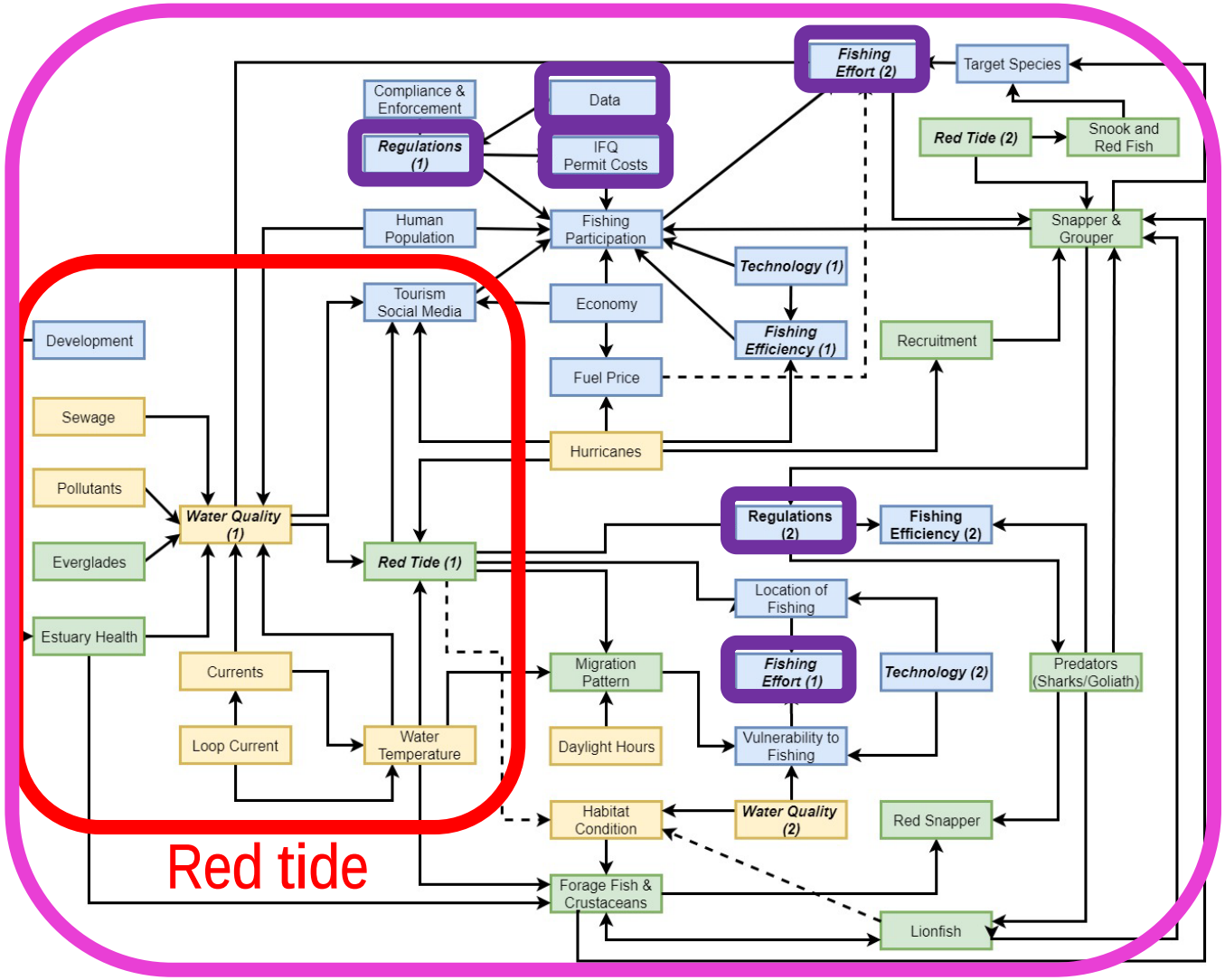
Grüss et al., 2016

What is the “system” we are managing?

Participatory system dynamics modeling EBFM scoping workshops

Goal: To increase information flow between scientists, managers, and stakeholders, in support of improved stock assessment and ecosystem assessment in the Gulf of Mexico.

Participatory fisheries system modeling



COLOR LEGEND
Human Related
Physical Components
Biological Components

Forces controlled by fishery management

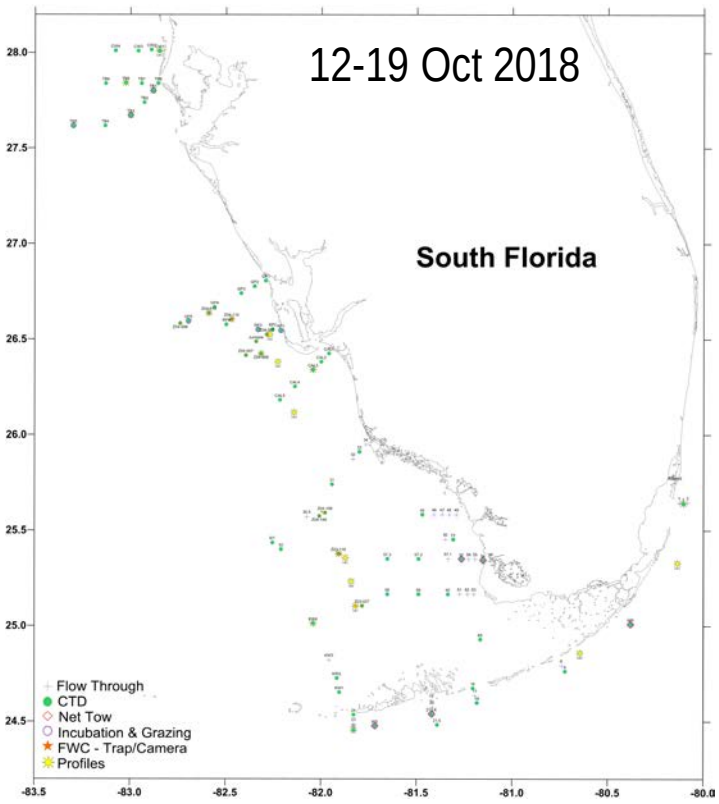
Forces that affect the fisheries

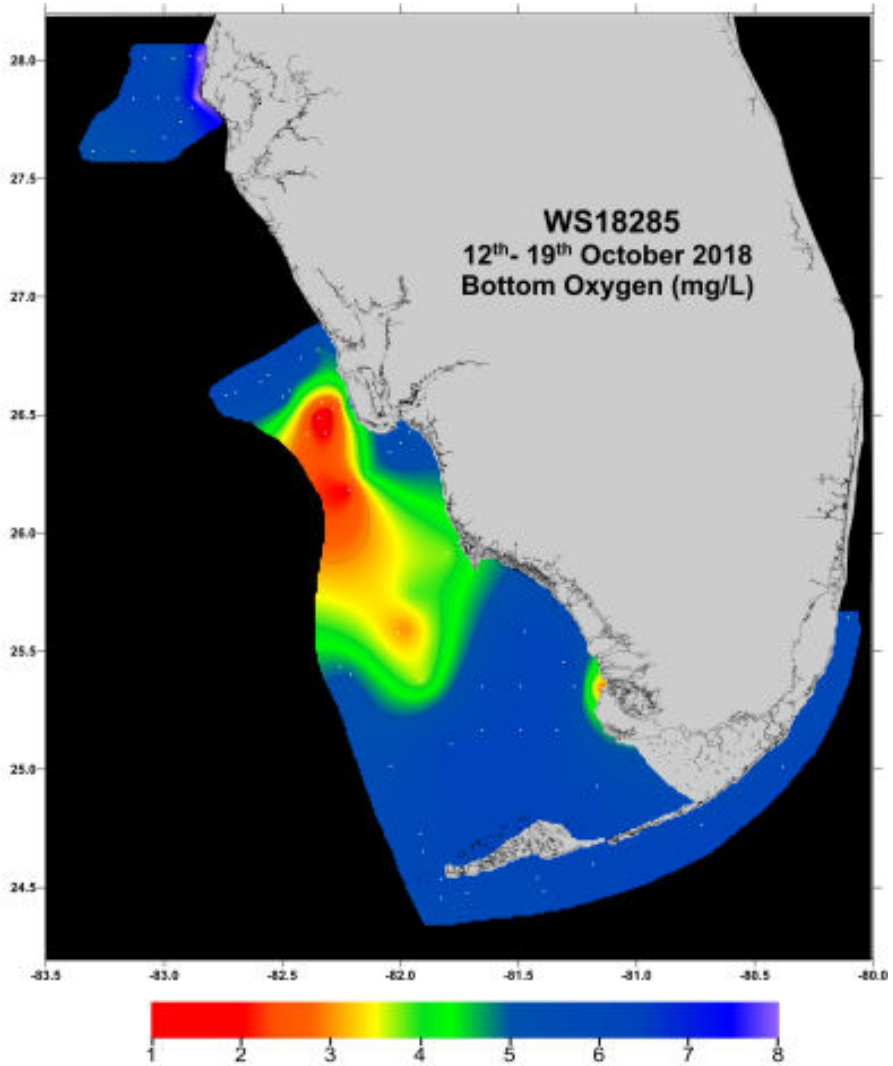
Accounting for fish kills is just the beginning…

Red tide also perceived to negatively affect:

- Prey base
- Habitat
- Tourism
- Aquaculture
- Demand for recreational sector
- Demand for local seafood
- Restaurant industry
- Real estate
- Human health
  - bacterial infections
  - mental health

Red tide response cruise – October 2018



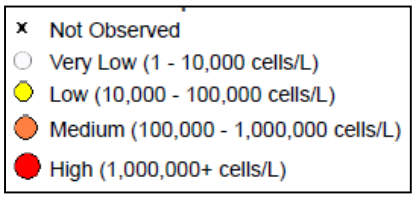


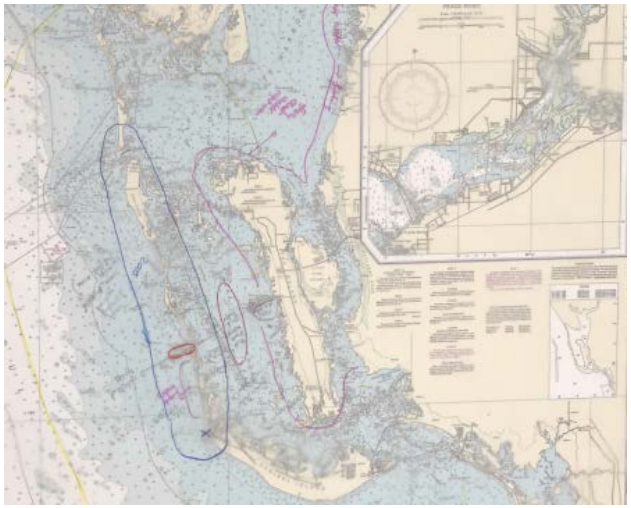
Chris Kelble (NOAA-AOML) in collaboration with NOAA-SEFSC, NOAA-NESDIS, CIMAS, FWC-Fish and Wildlife Research Institute, Mote Marine Lab, University of South Florida, NCCOS

Local ecological knowledge (LEK) assessment

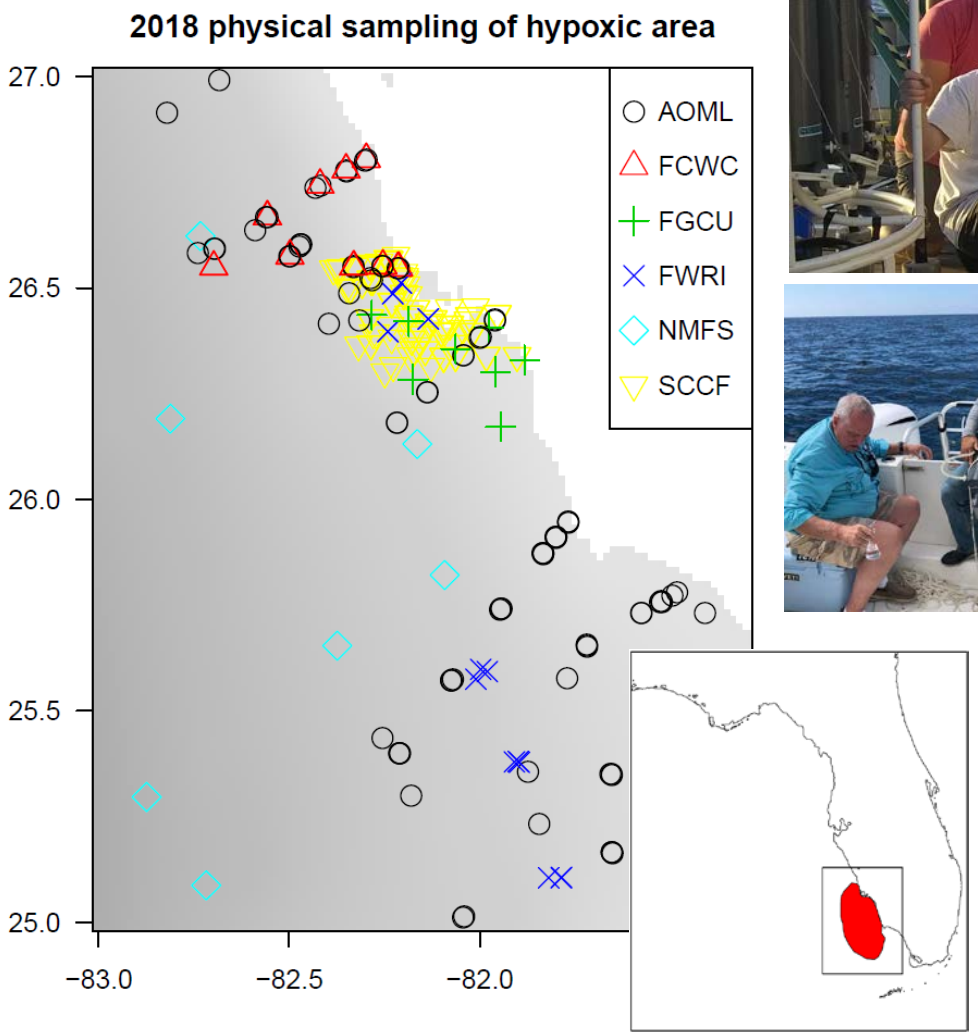
- Document red tide locations, frequency and severity over time and space
- Document impacts on ecosystem
- Identify stakeholder-driven hypotheses on bloom ecology
- Document adaptation strategies

FWRI HAB database





What is EBFM?


2018 physical sampling of hypoxic area
27.0
26.5
26.0
25.5
25.0
−83.0
−82.5
−82.0
AOML
FCWC
FGCU
FWRI
NMFS
SCCF

Acknowledgments

Thank you to all the SEFSC and SERO staff and other NOAA scientists who contributed to the Gulf EBFM Road Map.

Red tide work:

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