

# *Perspectives on Baseline Study Needs in the Gulf of Mexico*

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# Overview

- ✓ What is a “baseline”?,
- ✓ Relationships of baselines to management targets (how established?),
- ✓ Attributes of an informative baseline / indicator of ecosystem health,
- ✓ How do managed ecosystems respond wrt established baseline targets?,
- ✓ What we [do, don't, need to] know....

# Definitions of “baseline”

- ✓ Imaginary straight line on which a line of type rests,
- ✓ In tennis, volleyball, etc., the line marking each end of the court,
- ✓ The line between bases which a runner must stay close to when running,
- ✓ Minimum or starting point used for comparisons. (So, is the baseline a good condition or a degraded one?)

# More potential baselines than we could possibly measure.....

- How do we select from the long list of candidate baselines?
- Not all baselines are relevant to management outcomes
- How do we correlate baselines (e.g., states & drivers)?

# Types of Baselines & Assessment Indicators

Drivers &  
Pressures



States &  
Impacts

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

# Need to Link High-Level Principles to Informative Performance Measures

- High-Level Principles

  - e.g., *healthy and productive ecosystems...*

- Operational Objectives

  - Indicators

  - Reference Points

  - Performance Measures

*Sainsbury & Sumaila 2003*

In many cases indicators, reference points and performance measures are not yet well specified for many ecosystem-level objectives

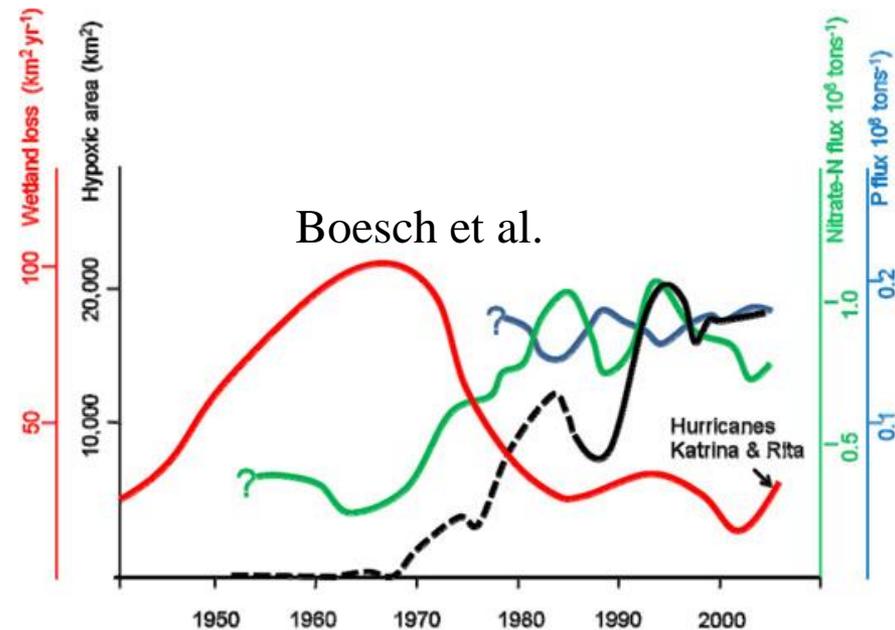
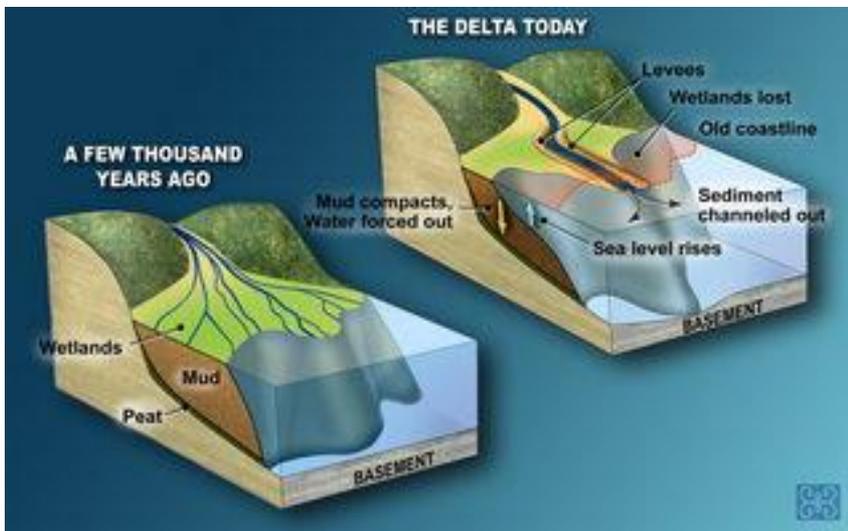
# How are Regulatory Baselines Established?

- ✓ Informative historical record (indexing some historical “desired” state),
- ✓ Minimum regulatory threshold (e.g., toxic substances, risk assessment, e.g., mercury consumption limits in seafood),
- ✓ Decision-theoretic (is the baseline that we are managing to from a degraded ecosystem?; a favorite of fishery scientists)

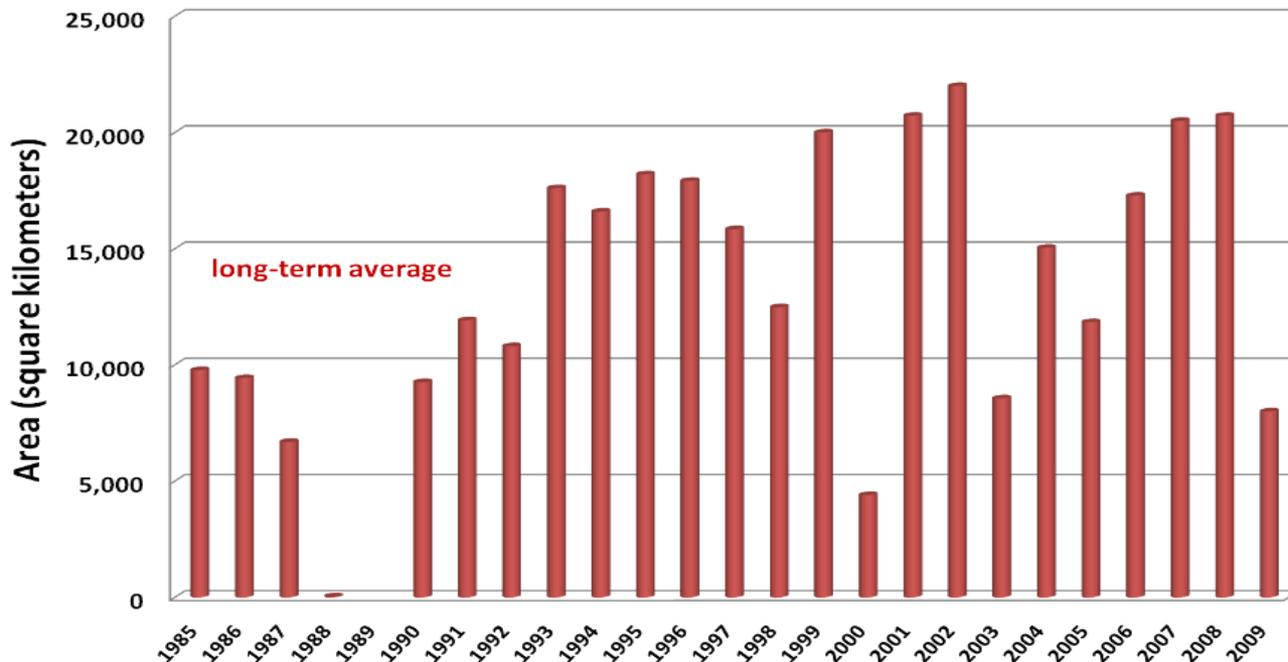


## What is the Baseline for Wetlands Restoration?

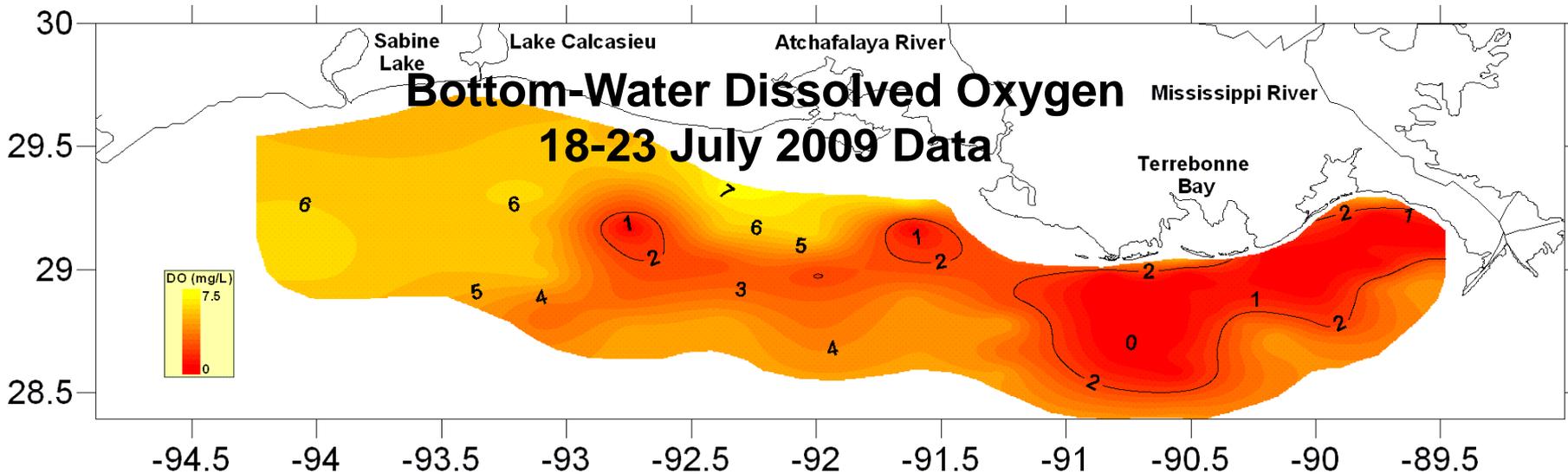
Long-term wetlands loss Northern Gulf of Mexico Related to:  
 Sediment starvation  
 Channelization (oil & gas)  
 Subsidence  
 SLR



# Area of Mid-Summer Bottom Water Hypoxia (Dissolved Oxygen < 2.0 mg/L)



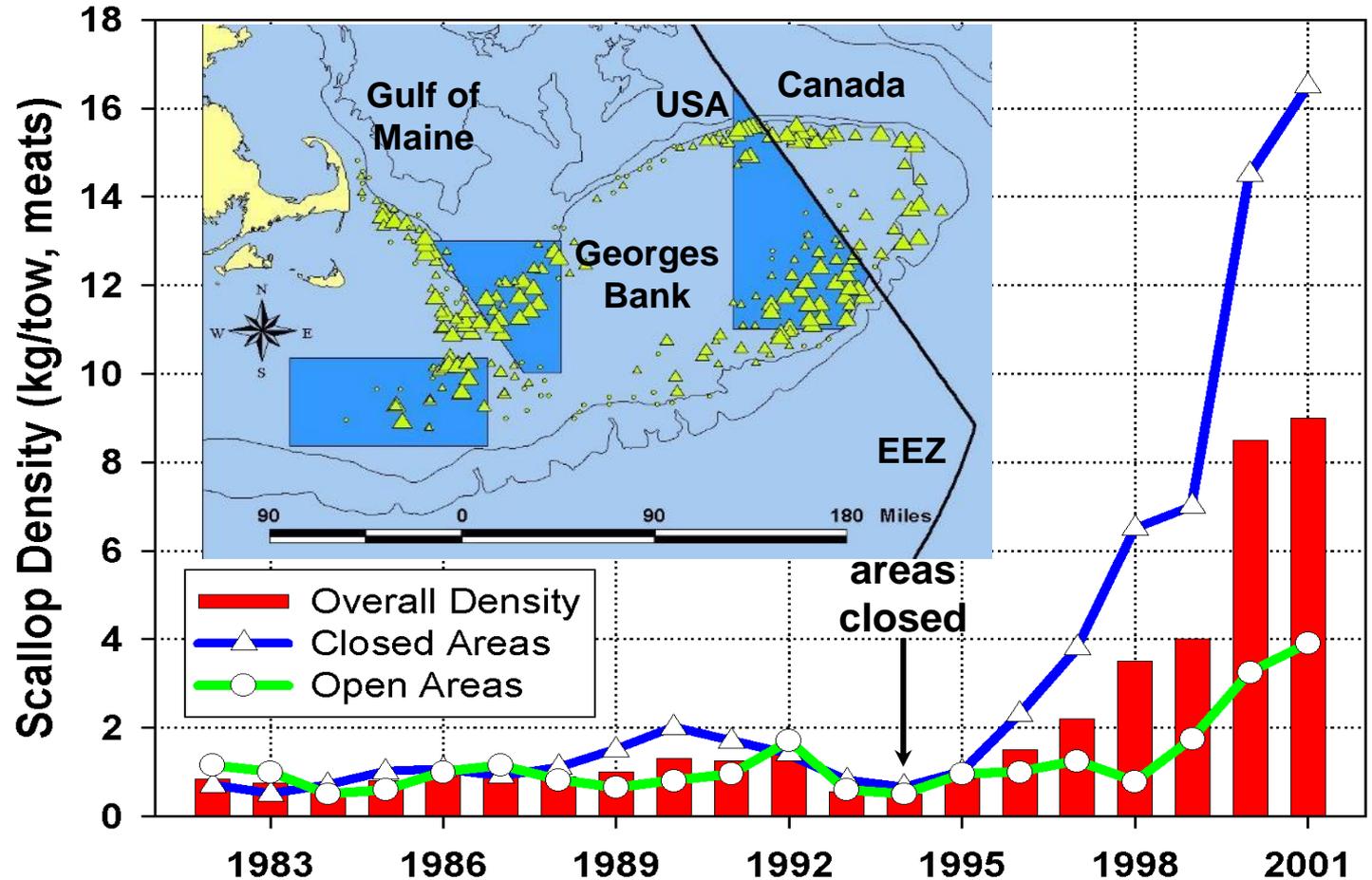
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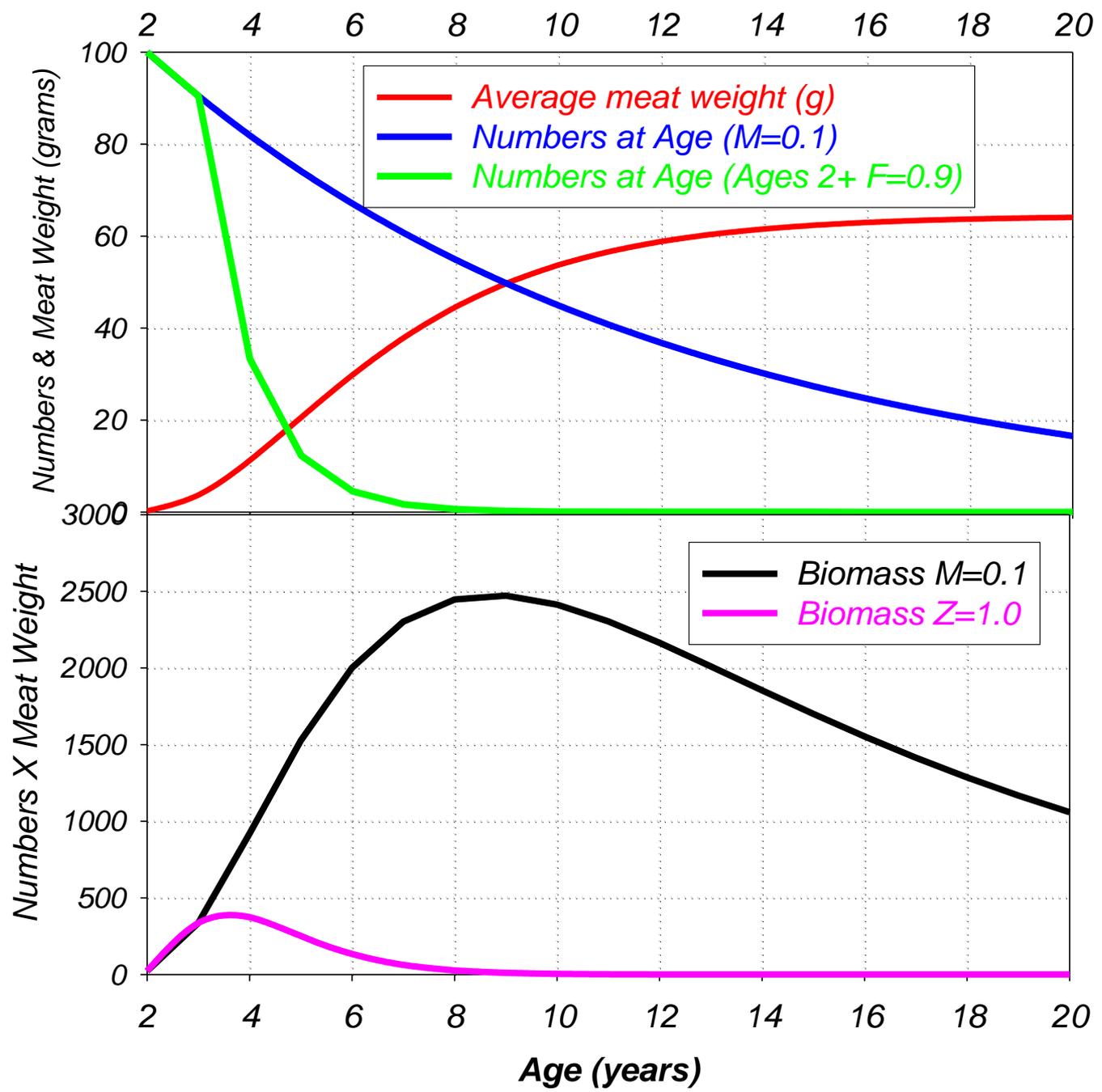




Can Bmsy be greater than Previously Observed?

*Biomass Reference Point OFD Committee :  
Average Recruitment \* Biomass/recruit*







## Some Desirable Characteristics of Ecosystem Indicators/Baselines

- Easy to Understand
- Responsive to Manageable Human Activities
- Responses Linked in Time to Management Action
- Easily and Accurately Measured
- Low Responsiveness to Other Factors (e.g., multiple factors)
- Measurable Over Large Portion of Area
- Existing Data to Provide Historic Perspectives to inform the selection of Targets and Thresholds

Source: ICES Working Group on Ecosystem Effects of Fishing

# Indicators & Decision Criteria

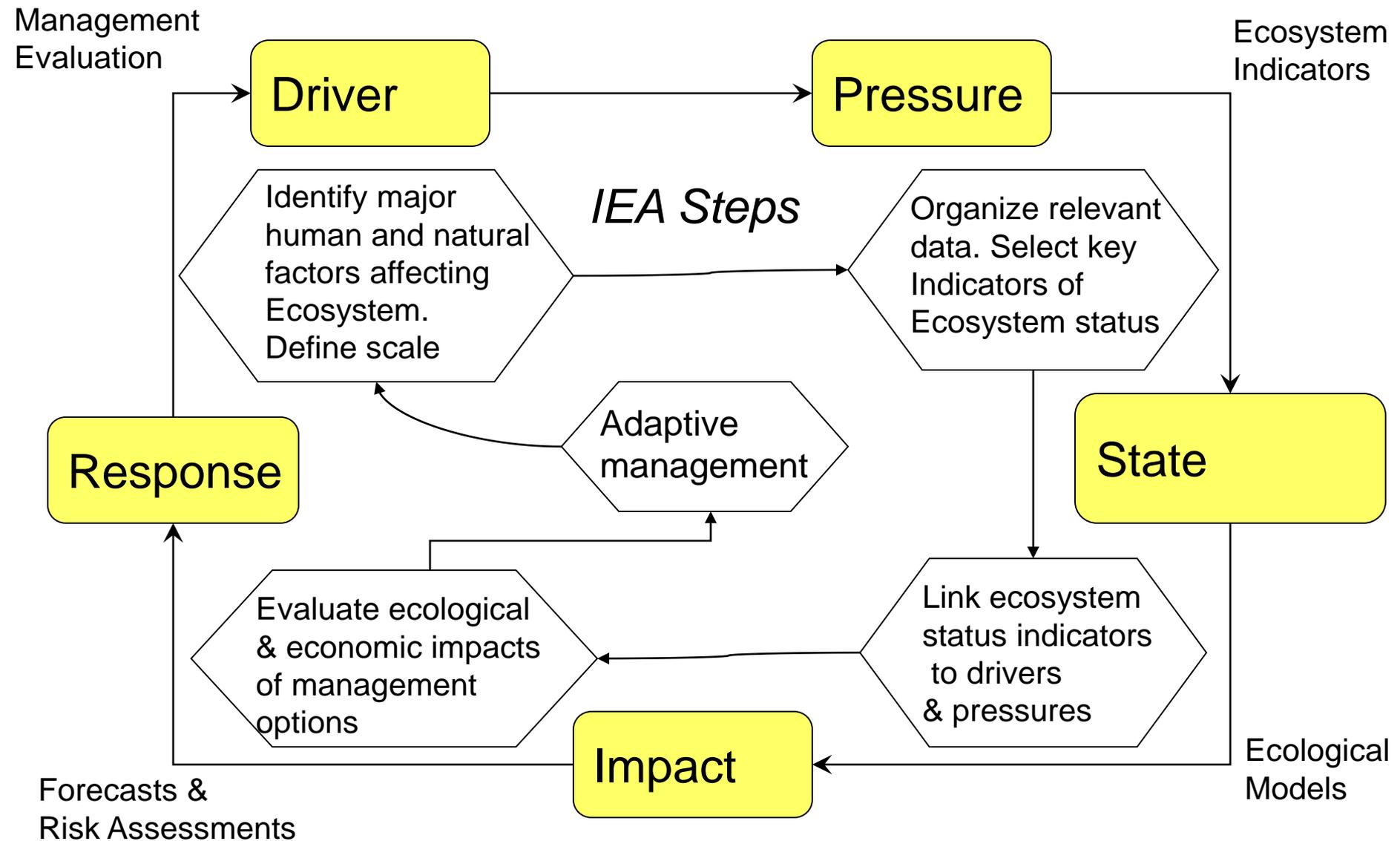
- Most indicators are not yet usable as reference points.
- Empirical use of state indicators (e.g. biomass) as a function (or partial function) of pressure indicators (e.g. fishing rate) can help establish specified thresholds or Limit Reference Points.
- Development of empirically based indicator thresholds needs further development, but can be used *NOW* to establish some intermediate decision criteria.

# 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 one element of an IEA

# Integrated Ecosystem Assessments: Implementing an adaptive system



# How do Indicators Respond to Management Intervention?

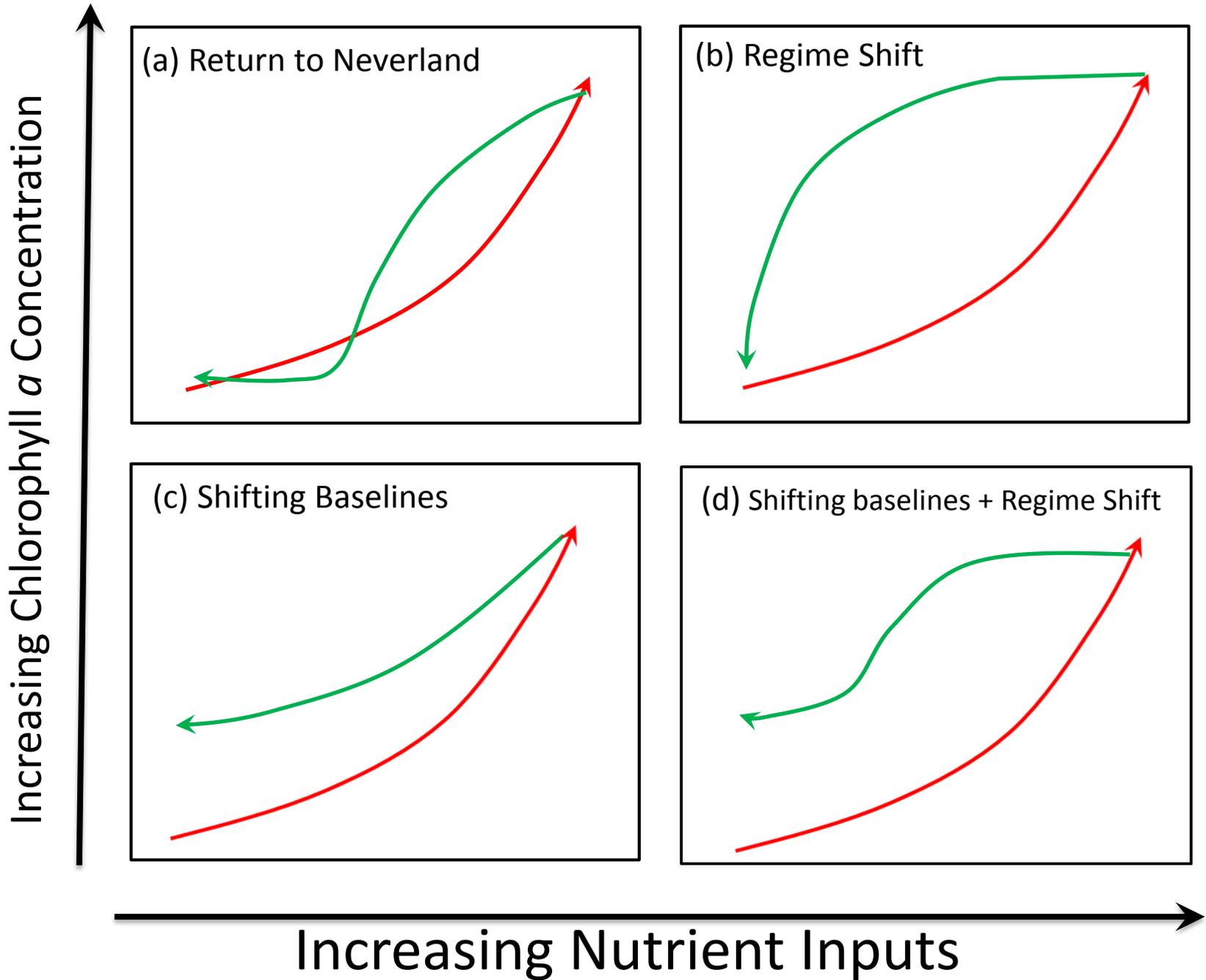
Carlos M. Duarte, Daniel J. Conley, Jacob Carstensen & María Sánchez-Camacho.

**Return to Neverland: Shifting Baselines Affect Eutrophication Restoration Targets.** Estuaries and Coasts (2009) 32:29–36.



Daniel Pauly. **Anecdotes and the Shifting Baseline Syndrome of Fisheries.** Trends in Ecology and Evolution 10(10:430, 1995).





# Do's, Don'ts, & Needs

- ✓ **Do know:** status of some major species populations, some physical characteristics, some indices of ecosystem change,
- ✓ **Don't Know:** Comprehensive, multi-scale relationships between human use, natural drivers of variability, and resource outcomes,
- ✓ **Need to Know:** Degree of connectivity among physical properties, natural resources and social/economic systems of the Gulf as a whole (is the whole more resilient than the parts?).

There is a big difference  
between international science  
coordination & International  
science collaboration



Havana

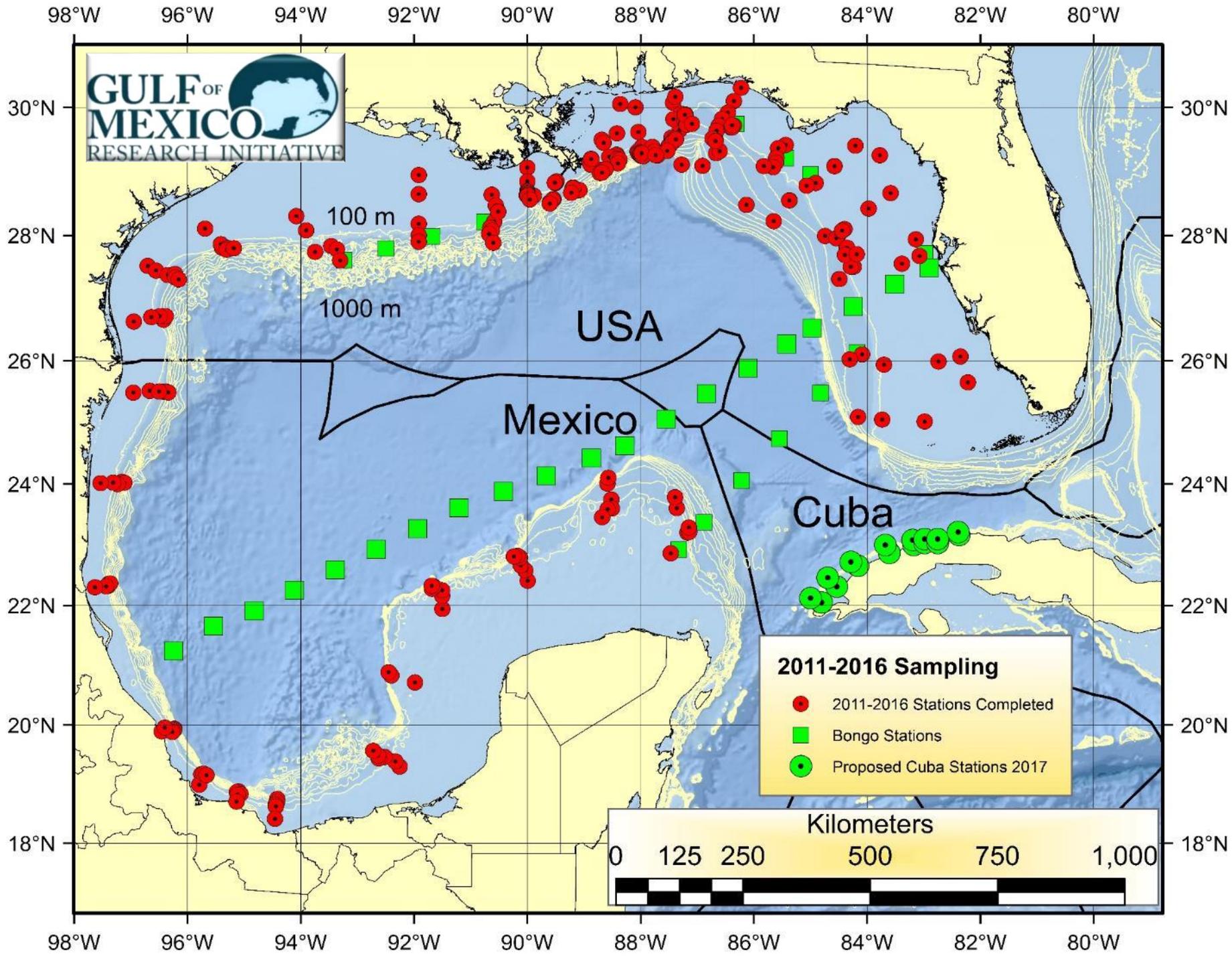


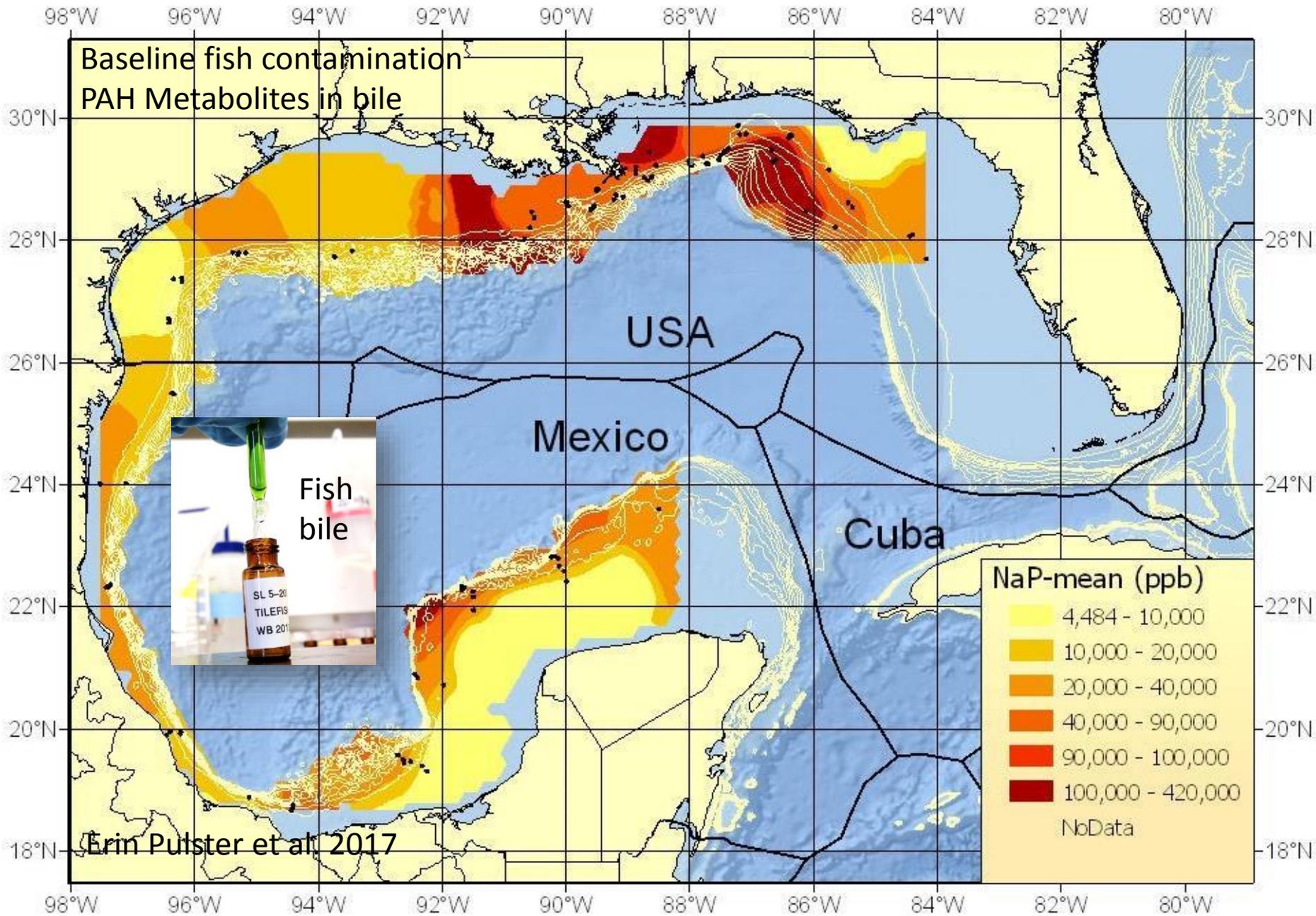
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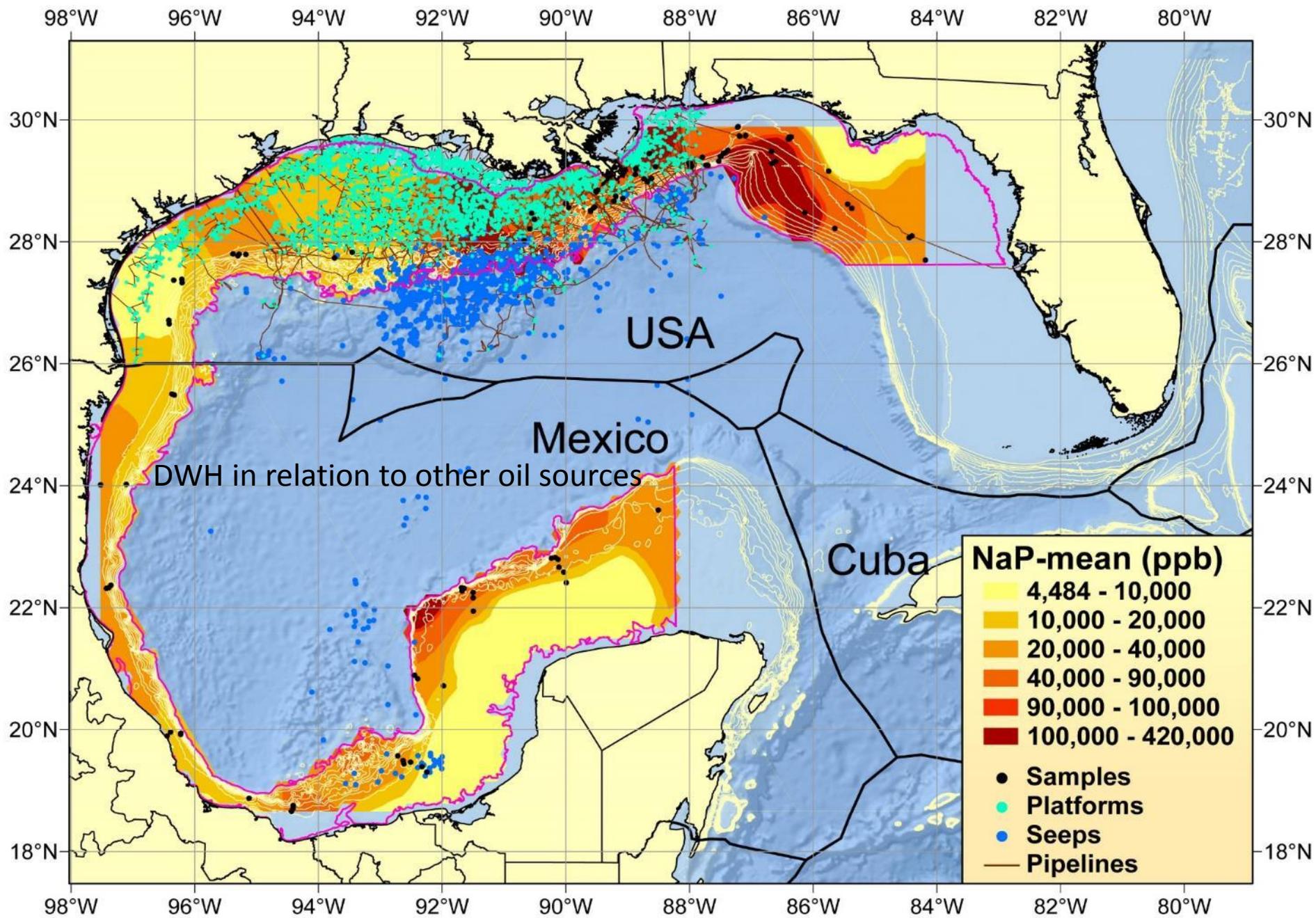


Tuxpan

Example.....









Questions?

**GULF**

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