Sargassum in the northern Gulf of Mexico

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Dauphin Island Sea Lab · Alabama ·

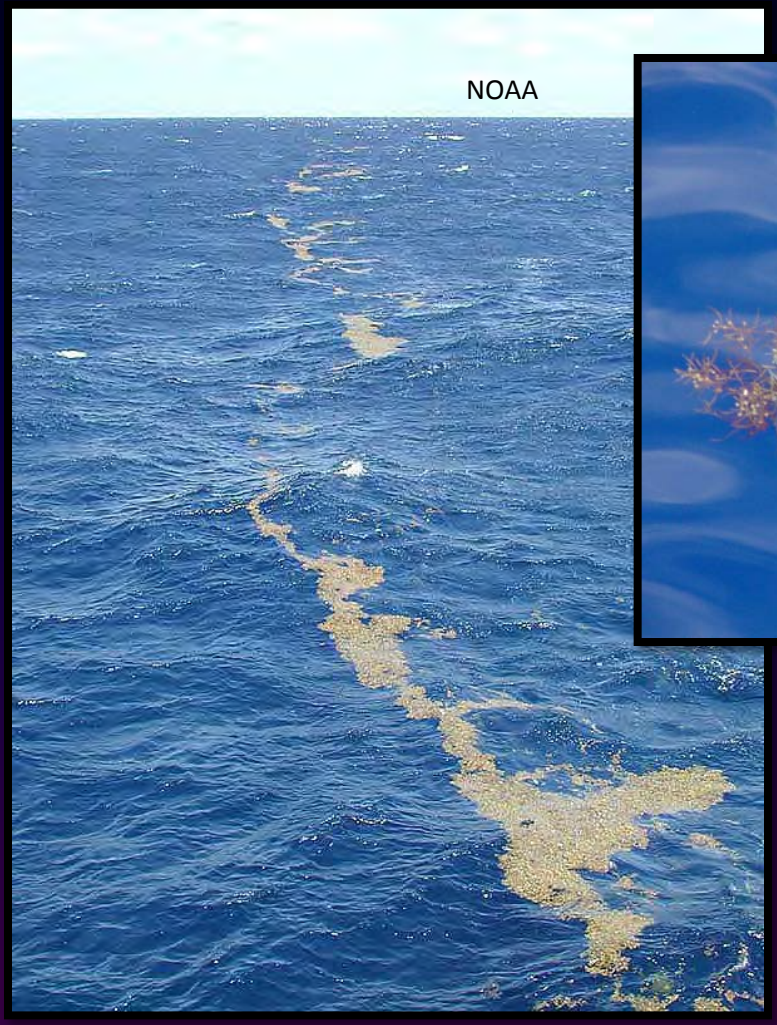
FISHERIES OCEANOGRAPHY OF COASTAL ALABAMA

FOCAL

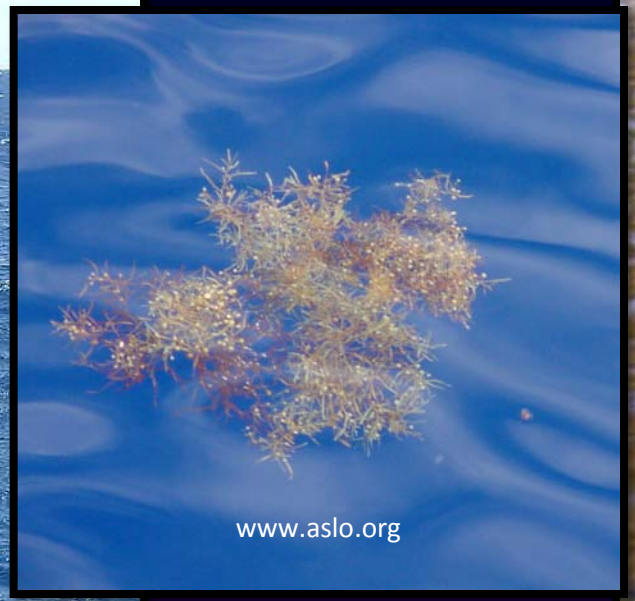
What is *Sargassum* ?

- "Gulf Weed"
- Brown algae (seaweed)
- Only two species that are entirely pelagic
  - *Sargassum natans* (90%)
  - *Sargassum fluitans* (10%)
- Air bladders

Sargassum "forms"



Weed Lines



Clumps

Mats

It’s not just seaweed

Bryozoans

Barnacles

Hydroids

Rooker et al. (2006)

Largest fraction of organic matter used by *Sargassum*-associated fauna was derived from POM

Contribution of organic matter from *Sargassum* > 50% for juvenile grey triggerfish, blackfin tuna and yellowfin tuna

Sargassum may enhance overall food web productivity by serving as a substrate for epiphytic algae

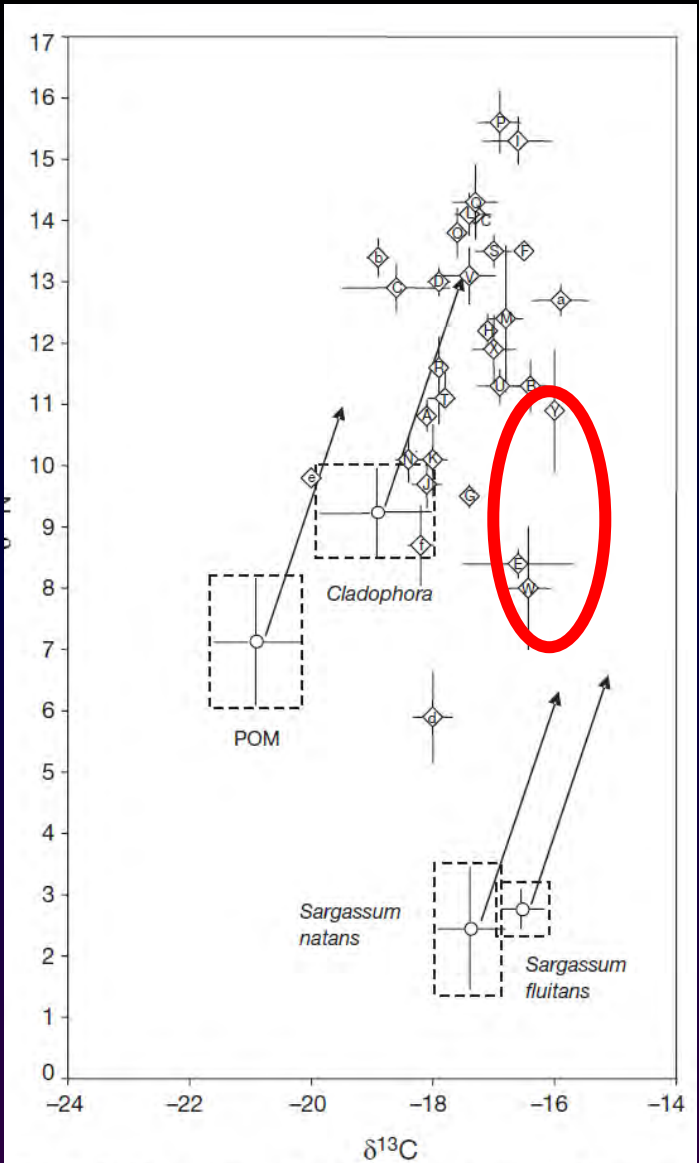


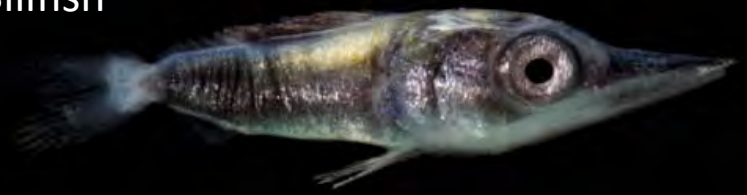
Fig. 1. Stable carbon and nitrogen isotope ratios (‰, mean ±1 SE) of producers and consumers associated with the *Sargassum* complex in the NW Gulf of Mexico in 2000 and 2001. Dashed-line boxes represent stable isotope ratios of producers; arrows denote expected trajectory of enrichment with increasing trophic position. Lower- and upper-case letters denote invertebrates and fishes, respectively (codes in Table 1)

Nursery area for larvae and juveniles

Sailfish

Flyingfish

Billfish



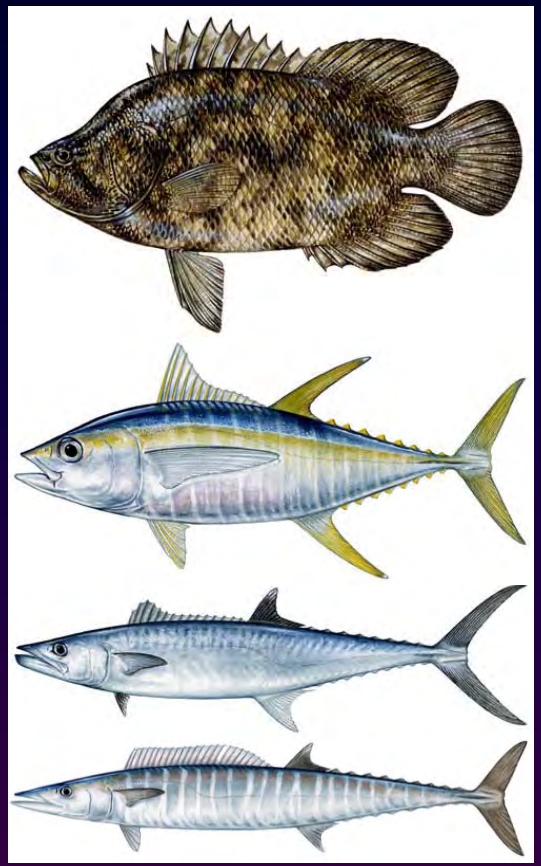
Halfbeak

Eel

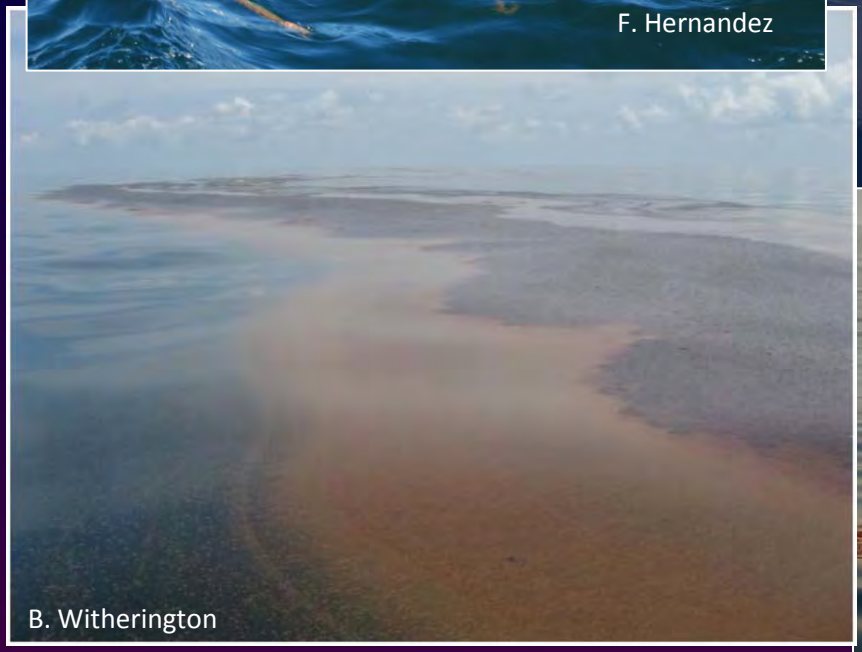
Mahi Mahi

http://anotheca.com

Feeding grounds for adult fish



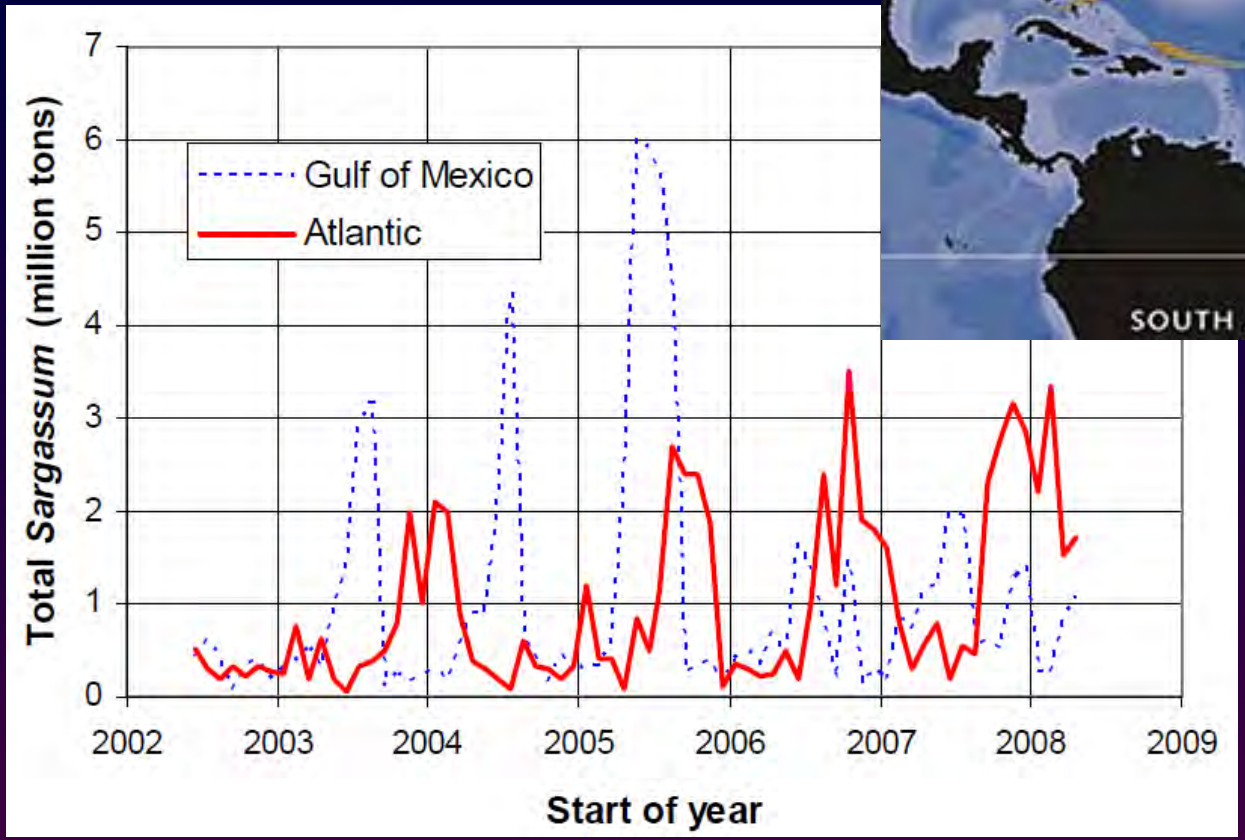
Deepwater Horizon oil spill



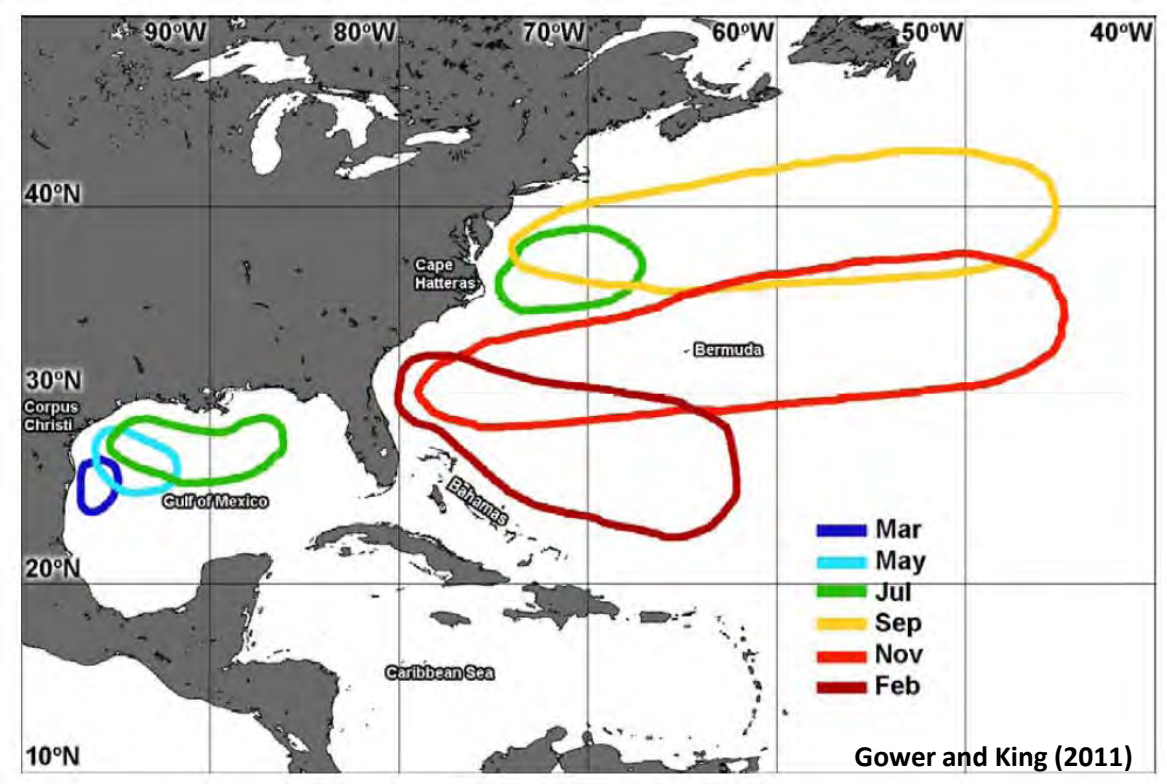
Sargassum distribution

Gower and King (2011)

MERIS
Medium Resolution Imaging Spectrometer



Sargassum seasonality



Life History Circuit

MERIS - Medium Resolution Imaging Spectrometer

Average flow of about one million tons of *Sargassum* out of the Gulf of Mexico each

Sargassum projects at DISL

- NSF RAPID -- 2010
  - S. Powers, F. Hernandez, M. Drymon
    - Trophic interactions in floating *Sargassum* communities of the Gulf of Mexico: potential consequences of habitat degradation related to the Deepwater Horizon oil spill

- GRI (RFP III) -- 2011
  - F. Hernandez, S. Powers, M. Drymon
    - Floating *Sargassum* communities of the Gulf of Mexico: a continued assessment of associated faunal assemblages, trophic interactions and habitat function in the wake of the Deepwater Horizon oil spill

- NRDA -- 2011
  - In collaboration with GCRL (USM), NOAA

Our questions?

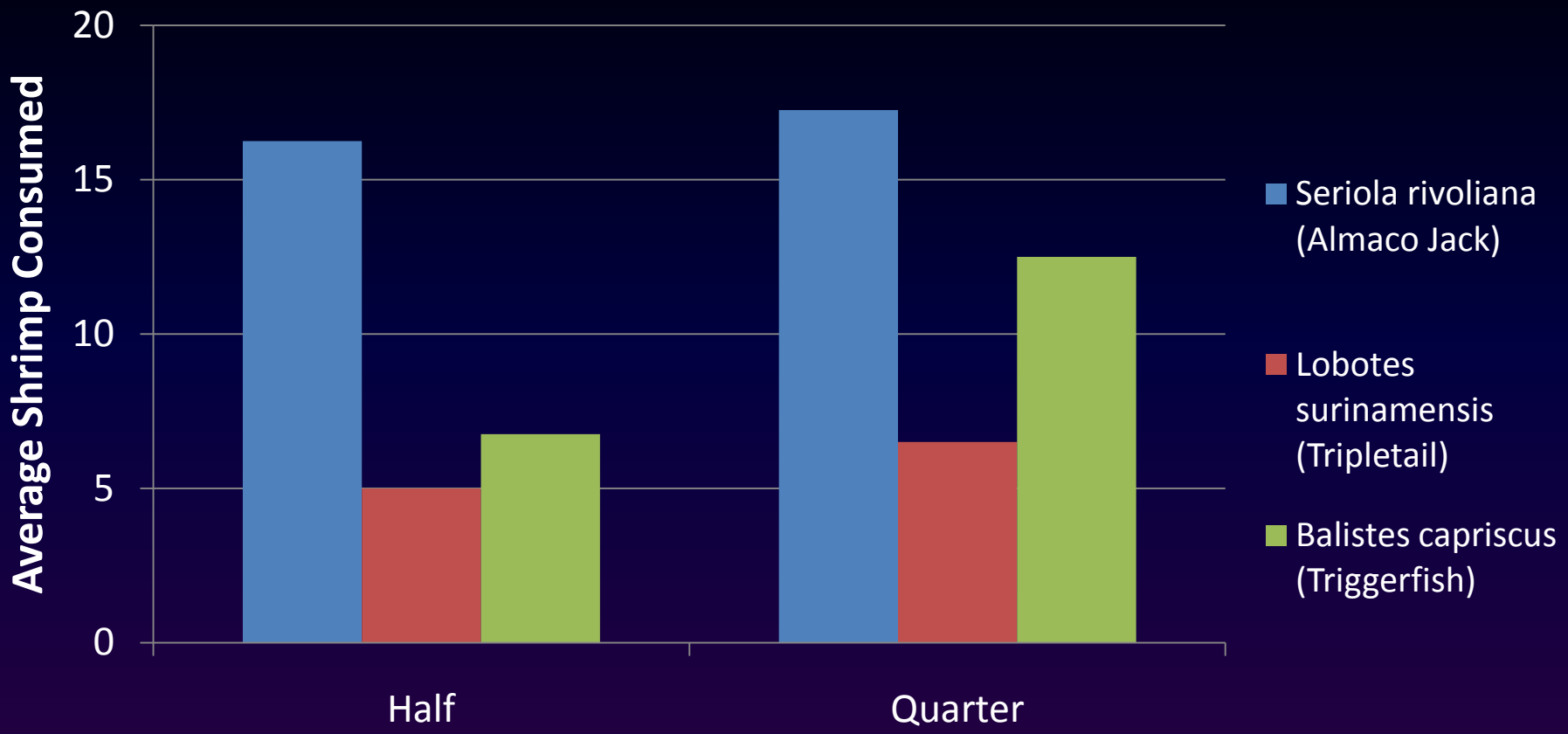
- How much *Sargassum* is off Alabama?
  - Aerial surveys
- Which adult fishes are there?
  - Longline fishing survey
- Which larval and juvenile fishes are there?
  - Plankton purse seine, neuston net
- What are the food web dynamics?
  - Stomach contents, large tank experiments, Stable isotope analyses

Summer 2010

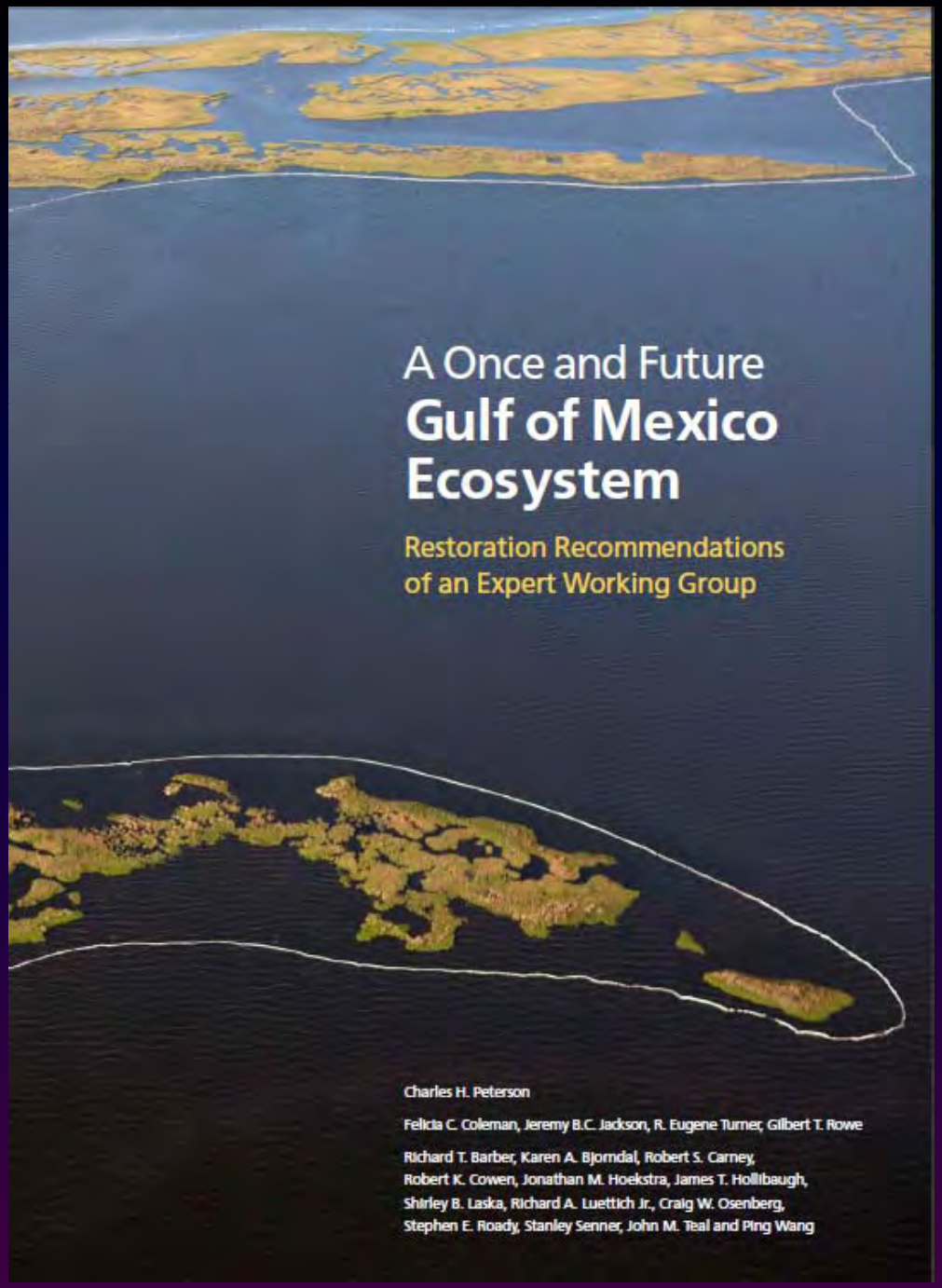
“Clean” patch

“Usual Suspects”

Mesocosm experiment example



***Sargassum* Cover**



Moving forward

Conduct

Realistic mesocosm experiments to complement field observations made during the spill to assess acute and chronic mortality of *Sargassum* and its animal associates by floating oil and dispersants.

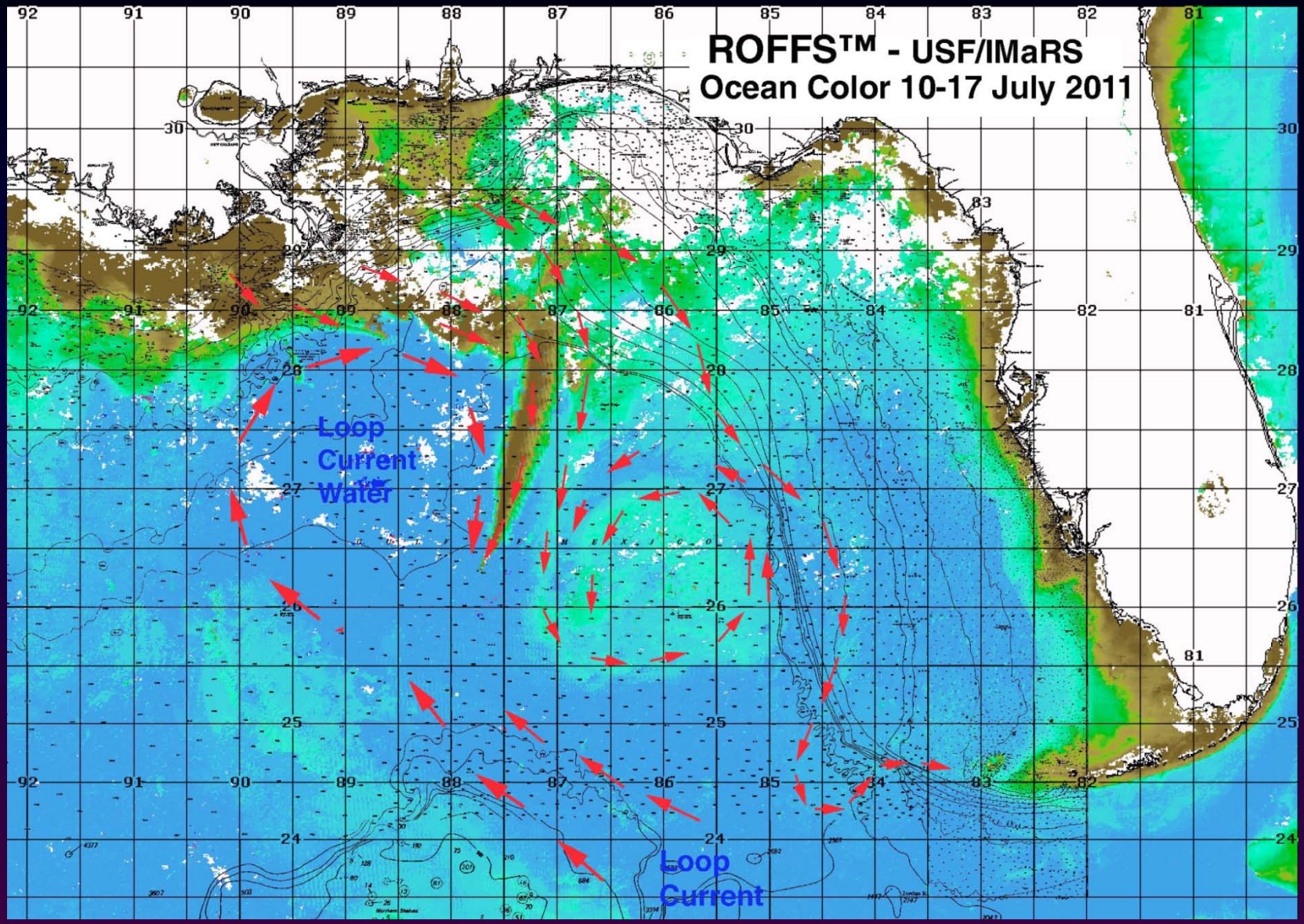
Restore

Sargassum by prohibiting commercial harvest, and by culturing it in lab settings to test whether *Sargassum* augmentation increases survival or production of its animal associates and, if it does, scaling up augmentation to match expected benefits with estimated damages.

What we don't know

- How much *Sargassum* is in the Gulf of Mexico?
  - What drives *Sargassum* productivity?
  - What is the seasonal and interannual variability of *Sargassum* abundance and distribution?
- How much *Sargassum* was directly oiled?
- Is there a predictable 'life history circuit' for *Sargassum*?
- Is there seasonality in faunal use of *Sargassum* habitat?
- To what extent is *Sargassum* 'essential' for marine fishes and invertebrates?

2011 Freshwater Discharge



Summer 2011

Summary

- *Sargassum* was oiled in 2010
  - To what extent?
  - Chronic effects on fauna?
- Monitoring needs to extend beyond 2011
  - Flood event, abundance in Caribbean
- When *Sargassum* was encountered
  - Taxonomic assemblages were as expected
- Restoration?
  - Wait and see approach may be prudent