



# Developing a Harmful Algal Bloom Integrated Observing System for the Gulf of Mexico

Ann Jochens, Nancy Rabalais, Steven Wolfe

2010 National Monitoring Conference

Denver, Colorado

April 28, 2010

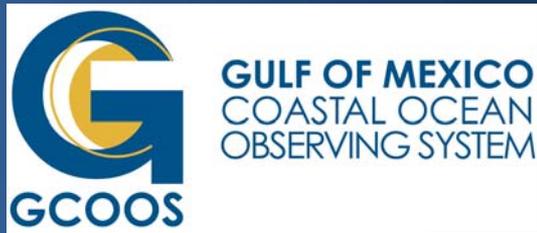
© 2010 Google  
© 2010 Europa Technologies  
US Dept of State Geographer  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

24°49'40.14" N 88°41'40.30" W elev -2300 m

Cayman Islands

©2005 Google

Eye alt 1750.95 km



- GCOOS is building a system that integrates coastal & ocean data from diverse sources and makes it available for many users and seeks to include needed HABs information as part of the Observing System



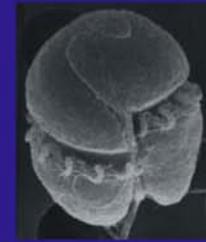
- GOMA seeks to provide coastal managers with improved information—about HABs & enhanced understanding of HABs ecology—as the basis for short- and long-term management decisions and to guide mitigation and control efforts.

## Increase in HABs - Reasons

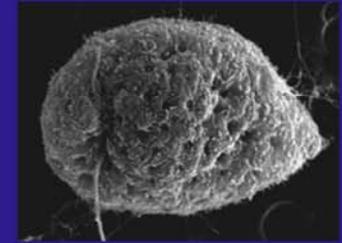
- Increasing coastal eutrophication
  - Increasing nutrient loads
  - Changing nutrient ratios
- Increasing shipping
  - Ballast water
  - Live fish and shellfish
- Increased aquaculture/mariculture
- Global change in climate

# HABs of the Gulf of Mexico

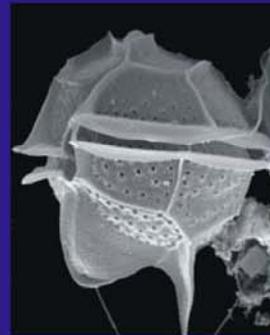
1. *Karenia* species
2. *Ciguatera* species
3. *Pyrodinium bahamense*
4. *Dinophysis* species
5. *Pseudo-nitzschia* species
6. *Karlodinium veneficum*
7. Raphidophytes
8. *Alexandrium monilatum*
9. *Takayama pulchella*



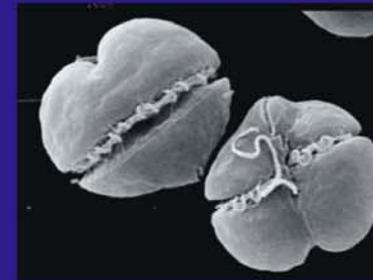
**Takayama pulchella**



**Chattonella subsalsa**



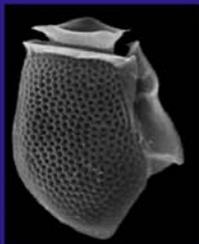
**Pyrodinium bahamense**



**Karenia brevis**



**Gambierdiscus toxicus**



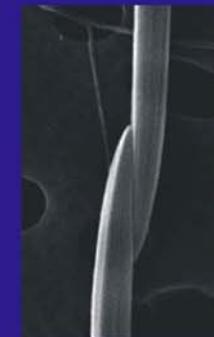
**Dinophysis acuta**



**Gambierdiscus toxicus**



**Karenia mikimotoi**

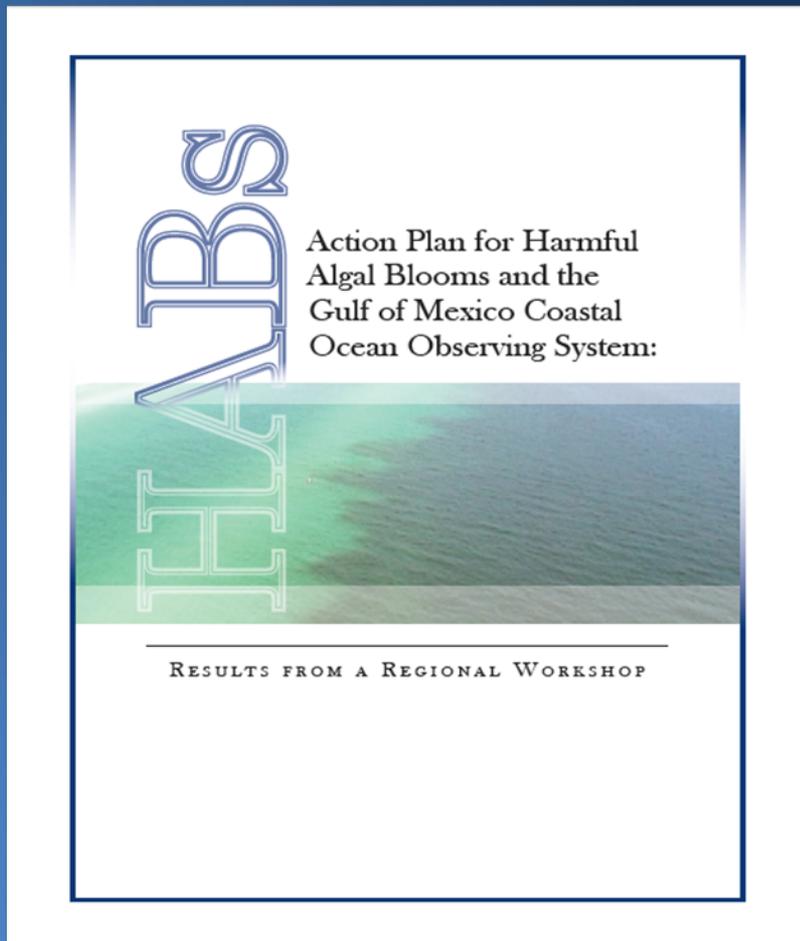


**Pseudo-nitzschia spp.**

# "Harmful"

- Human illness and mortality
  - Toxins consumed in food
  - Exposure to toxins in water or aerosol
- Fish, marine mammal, turtle, bird, invertebrate mortality
  - toxins in food or water
- Ecosystem effects, e.g., low oxygen
- Water discoloration, aesthetics
- Bad taste or smell to water or animals

# 2004 Regional Workshop



HABSOS-GCOOS  
Regional Workshop  
13-15 April 2004  
St. Petersburg, FL

# Joint GCOOS/GOMA HABs Workshop Series

- Workshop 1 – Nov 2007: Created conceptual design for HABs monitoring system and initial system design.
- Workshop 2 – Apr 2009: Identified user needs for HABs information and gaps in existing monitoring system and technology.
- Workshop 3 – 2010: Complete HABs monitoring system design. Create HABs system implementation plan with implementation priorities.

# Harmful Algal Bloom Integrated Observing System (HABSIOS)

Vision: Establish a sustained observing system to facilitate and enhance efforts to monitor, manage, and reduce detrimental effects of harmful algal blooms (HABs) on human health and living marine resources (non-human animals and plants) and to mitigate impacts of HABs on coastal communities.

# Workshop #2 Tasks

1. Identify user groups needing HAB information
2. Identify data and information needs for each user group in four focus areas:
  - a. prediction of bloom initiation,
  - b. detection of bloom existence,
  - c. tracking or monitoring of bloom, and
  - d. forecasting bloom movement and effects.
3. Identify gaps in existing capabilities

# User Groups

- Commercial – including fisheries
- Education – K-20 & informal (aquariums, museums)
- Marine Operations – offshore industries & workers
- Government/Elected Officials – resource managers, utilities, policy managers
- Local Economy – businesses (e.g., tourism)
- Public Health – policy managers, health care providers
- Recreation – public
- Scientists/Researchers
- Media

# Decision-Maker Information Needs

- Bloom Location, Scale, Species, Timing, Toxin, Counts, Historical Patterns by Species
- Impacts to Human Health, Seafood Safety, Economy, Animal Health, Ecosystem
- Model Results
- Data (3-D physical, biological, chemical)
- Technology
- Multi-lingual Information

# Unranked Highest Priority Needs: Observations

Aesthetically detectable

Animal stranding data

Area of effect (aerosols); HAB toxin abundance

Bloom location; Bloom spatial and temporal extent

Bloom species and cell counts, benthic and water column

Calls into poison control on respiratory, food poisoning incidents, skin rashes

*In situ* real-time data on physical, chemical, biological parameters

Epidemiology and surveillance

Meteorology; climatological data

Nutrient conditions of freshwater and groundwater and atmosphere

River runoff and precipitation and groundwater data

# Existing Resources

- Gulf coast states have monitoring and management programs
  - “red tide” focus
  - shellfish safety
  - information for public health and recreation
- NOAA Harmful Algal Bloom Operational Forecast System
- EPA/NOAA Harmful Algal Blooms Observing System
- CDC Harmful Algal Bloom-related Illness Surveillance System
- NASA satellite imagery
- Marine Mammal Stranding Networks – federal/state
- Phytoplankton Monitoring Network – volunteer
- Oceanographic observations (e.g., currents, salinity, fluorescence, winds, etc.)
- Research programs: e.g., causation, new technologies

# State Systems

- Monitoring conditions
- Adequate communication of risk and consequences without provoking undue alarm.
- Availability of good data that is easily accessible
- Data appropriate for the audience



FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION  
FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION  
FISH AND WILDLIFE RESEARCH INSTITUTE

Home About FWRI Contact FAQs Locations Search Site Map

Search:  GO Explore:  Select Topic

Home : Features : Harmful Algal Bloom Events—Current Status : Florida Red Tide Current Status

## FEATURES

**Florida Red Tide Current Status**  
Red tide status reports contain information about current red tide conditions and include sample results, a map, and information links. The photo gallery has maps for the current year; at the end of each year, maps are transferred to the photo gallery in Historical Florida Red Tide Monitoring Maps.

**PHOTO GALLERY**  
Click To View

### ARTICLES:

**Latest Red Tide Status Report Now Available by Phone**  
Callers Can Hear Updates on Statewide Conditions

**Red Tide Current Status Statewide Information**  
This summary report of current red tide conditions around Florida includes a map of sampling results and regional status reports. Reports are generally updated on Friday afternoon. Additional information, if available, is provided on Tuesday afternoon.

**Red Tide Current Status for East Florida**  
Current red tide conditions around northwest Florida are reported on Friday. Additional information, if available, is provided on Tuesday on the Statewide Information page.

**Red Tide Current Status for Northwest Florida**  
Current red tide conditions around northwest Florida are reported on Friday. Additional information, if available, is provided on Tuesday on the Statewide Information page.

**Red Tide Current Status for Southwest Florida**  
Current red tide conditions around southwest Florida are reported on Friday. Additional information, if available, is provided on Tuesday on the Statewide Information page.

**Inside FWRI:**

- Careers
- Event Calendar
- Outreach
- Partners in Science
- Press Room
- Resources and Publications

**Research:**

- Florida Manatee
- Florida Panther
- Freshwater
- GIS and Mapping
- Habitat
- Red Tide
- Saltwater
- Wildlife

**Featured Articles:**

- > [Red Tide Current Status Statewide Information](#)
- > [New FWRI Publications for February](#)
- > [Press Release Experience science firsthand at MarineQuest 2010](#)
- > [Horseshoe Crab Survey Response](#)
- > [A Review of the Biology and Management of Horseshoe Crabs, with Emphasis on Florida Populations](#)

[See More Articles...](#)

# State Systems

## Harmful Algal Blooms (HABs)

[Red Tide Status](#) (Updated March 22, 2010)

[Golden Alga Status](#) (Updated April 20, 2010)

### ***Dinophysis* Bloom Closes Texas Shellfishery**

In recent weeks, Texas A&M University's Imaging Flow CytoBot has detected increasing concentrations of *Dinophysis ovum* and *D. caudata* coming through the pass at Port Aransas. Dr. Lisa Campbell and her staff have been in contact with the Texas Department of State Health Services keeping them informed of the cell concentrations. Phytoplankton Monitoring Network volunteers also report high concentrations of *D. ovum* and *D. caudata* at Matagorda Bay Nature Park. TDSHS has been closely monitoring bays all along the Texas coast for the toxic alga, which causes a type of seafood poisoning known as [Diarrhetic Shellfish Poisoning](#) or DSP.

Effective Friday, April 23, the following bays have been closed due to levels of *D. caudata* and *D. ovum*: Galveston, West Galveston, Bastrop, Christmas, East Matagorda, Matagorda, Tres Palacios, Carancahua, Lavaca, Powderhorn Lake, Espiritu Santo, San Antonio, Mesquite, and Copano. St. Charles, Aransas and Corpus Christi bays all remain closed due to red tide. The Lower Laguna Madre and South Bay remain open.

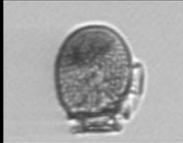
[TDSHS Press Release](#)

<http://www.tpwd.state.tx.us/landwater/water/environconcerns/hab/>

Welcome [Daily Picture](#) [Image Archives](#) [Study Site](#)

### Daily Picture - What are we seeing today?

from Apr. 16 to Apr. 22, 2010.



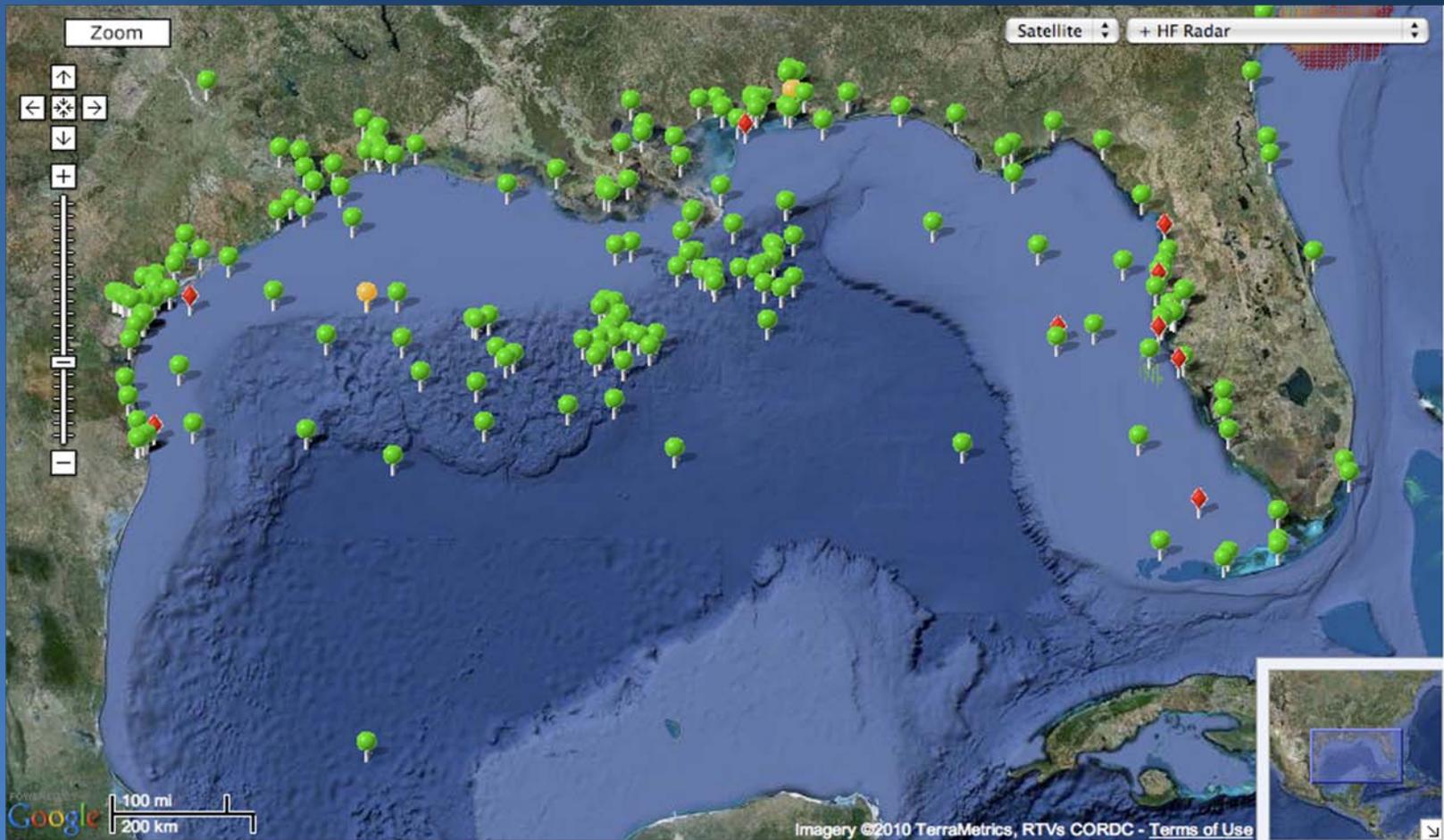
**Dinoflagellate - *Dinophysis***

Dinophysis at the ship channel at Port Aransas, Texas on 16 Apr 2010 at 13:11 PM (Local time)

[http://gcoos.tamu.edu/products/phytoplankton/Daily\\_Picture.html](http://gcoos.tamu.edu/products/phytoplankton/Daily_Picture.html)



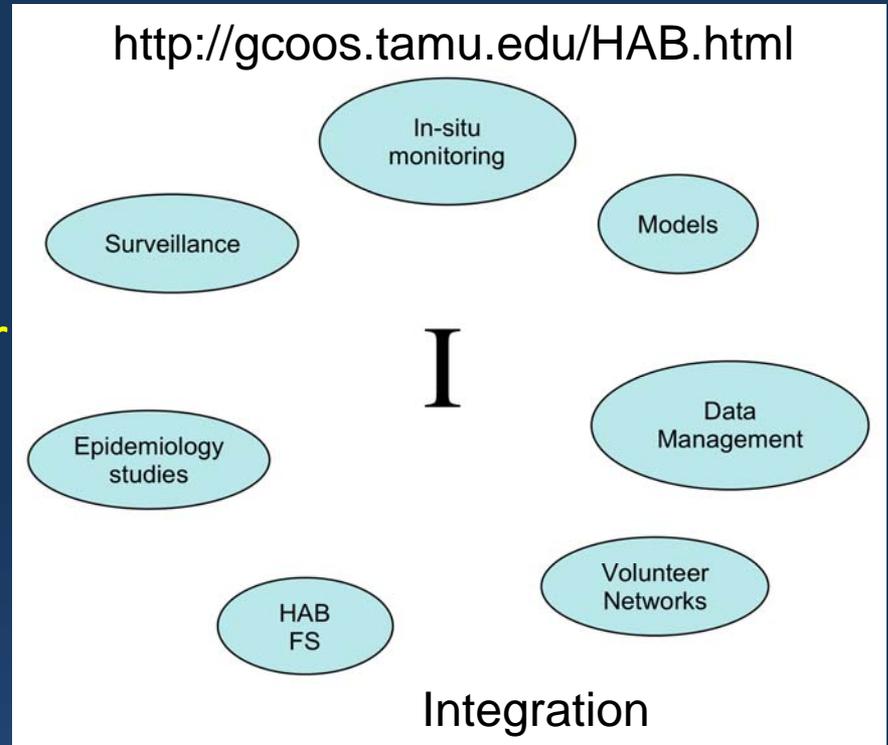
# Real-Time Ocean Observations



<http://gcoos.rsmas.miami.edu/>

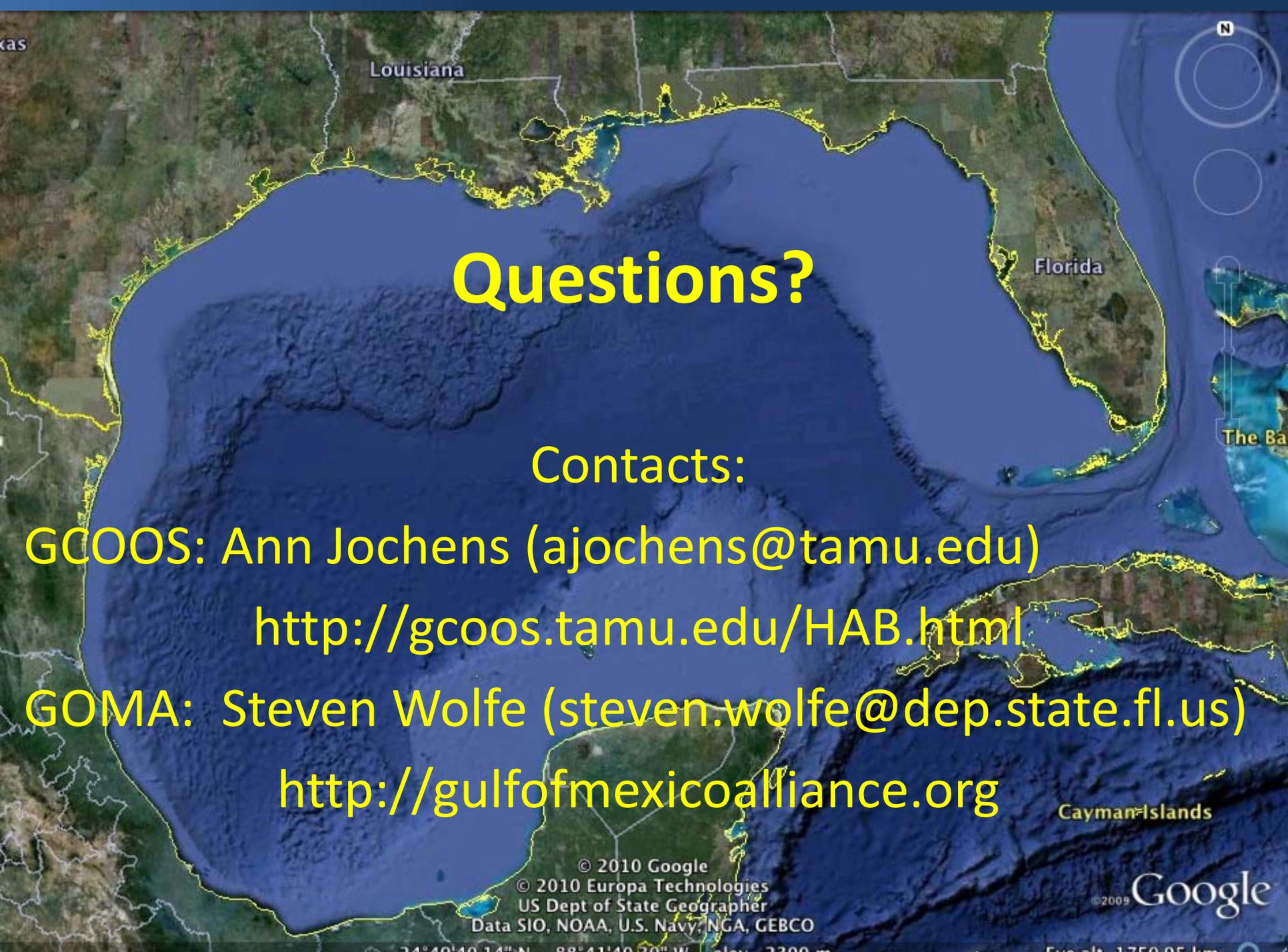
# Implementation Plan Elements

- Observations
  - Environmental conditions
  - In situ HAB monitoring
  - Remote sensing HAB monitoring
  - Adaptive sampling
- Models
- Data Man., Communications
- Performance Metrics
- Links of Public Health and Living Marine Resources to Ocean Observations
- Improve Operational Capabilities through Research
- Information Delivery for Specific Audiences



# Future Actions

- GCOOS/GOMA Workshop #3 – 2010
- Complete Implementation Plan with priorities
- Maintain existing capabilities (presently diminishing in today's fiscal environment)
- Integrate existing capabilities
- Enhance capabilities through completion of GOMA action steps and GCOOS data acquisition plans

A satellite-style map of the Gulf of Mexico region, showing the Gulf of Mexico, Florida, Louisiana, and parts of Texas and the Caribbean. The text is overlaid in yellow. A north arrow and zoom controls are visible in the top right corner. The map shows the coastline of the Gulf of Mexico, with Florida on the right and Louisiana on the left. The Gulf of Mexico is the central feature, with the Caribbean Sea to the south and the Atlantic Ocean to the east. The text is centered over the Gulf of Mexico.

# Questions?

## Contacts:

GCOOS: Ann Jochens (ajochens@tamu.edu)

<http://gcoos.tamu.edu/HAB.html>

GOMA: Steven Wolfe (steven.wolfe@dep.state.fl.us)

<http://gulfofmexicoalliance.org>