

Fisheries Monitoring Workgroup (FMW) Report

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NOAA

*Cooperative Hypoxia Assessment and Monitoring Program (CHAMP)
Workshop*

Mississippi State University Science and Technology Center

January 9, 2018

FMW Goals

- Integrate fisheries surveys into CHAMP by leveraging and expanding upon current monitoring activities and compiling available data
- Serve as a management advisory group for NGOMEX projects to help ensure the effectiveness of project tools and outputs towards fisheries management applications

FMW Member	Affiliation
Chris Brown (temp co-chair)	NOAA/NESDIS/StAR
Kevin Craig (co-chair)	NOAA/NMFS/SEFSC
Doug Daigle	Lower Mississippi River Sub-basin Committee, Hypoxia Task Force Coordinating Committee
Chris Gledhill	NOAA/NMFS/Mississippi Labs
Rick Hart	NOAA/NMFS/Galveston Lab
David Hilmer	NOAA/NCCOS/CRP
Kirsten Lase	NOAA/NESDIS/NCEI
John Dehrter	Dauphin Island Sea Lab, University of South Alabama
Alan Lewitus	NOAA/NOS/NCCOS/CRP
Julie Anderson Lively	LSU, Louisiana Sea Grant
Shannon Martin	NOAA/NMFS/SER/SERO
Trevor Meckley	NOAA/NOS/NCCOS/CRP
Jeff Rester	Gulf States Marine Fisheries Commission

Modify Composition?

- Add

- Policy / manager?

- Fisher?

- Reduce

- NOAA personnel?

FMW CHAMP Objectives

- Identify monitoring programs for red snapper, menhaden, and brown shrimp within the hypoxic zone that collect dissolved oxygen for the purpose of incorporation into CHAMP
- Add dissolved oxygen to key operational monitoring programs to expand the number of relevant fisheries monitoring programs

Observations & Data Sets

NOAA Fishery-Independent Surveys on NOAA Ships*

In addition to the Southeast Area Monitoring and Assessment Program (SEAMAP) Groundfish Survey, the following surveys could be used by CHAMP:

- SEFSC Shark/Snapper/Grouper Bottom Longline
- SEAMAP Ichthyoplankton Survey for fall, spring, and winter
- Pelagic Acoustic Survey
- U.S. Gulf of Mexico Marine Mammal and Seabird Assessment for the summer and winter
- U.S. Atlantic Marine Mammal and Seabird Assessment for the summer and winter

* Compiled in May 2017 for the SEFSC Survey Assessment Workshop, Pascagoula, MS, 20-23 June 2017

SEAMAP Summer Trawl Survey

- Time series: 1982-2008; 2009-present
- Number of stations: ~400 / year
- Timeframe: May, June, July
- Area of focus: Florida to Texas
- Depth: 4-110 m
- Sampling design:
 - 1982 - 2008 – stratified random – area, depth zone, time of day - trawl across depth zone no matter how long (multiple tows)
 - 2009 - present – stratified random – prop. allocation SSZ and depth - trawl for 30 min
- Data: Catch composition, abundance, length, weight, sex, maturity



Environmental Data

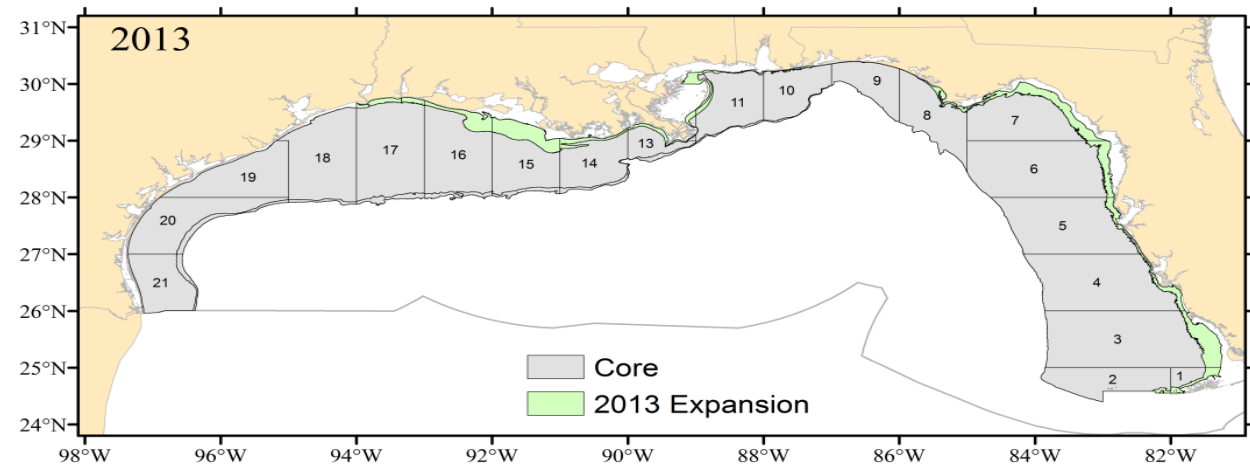
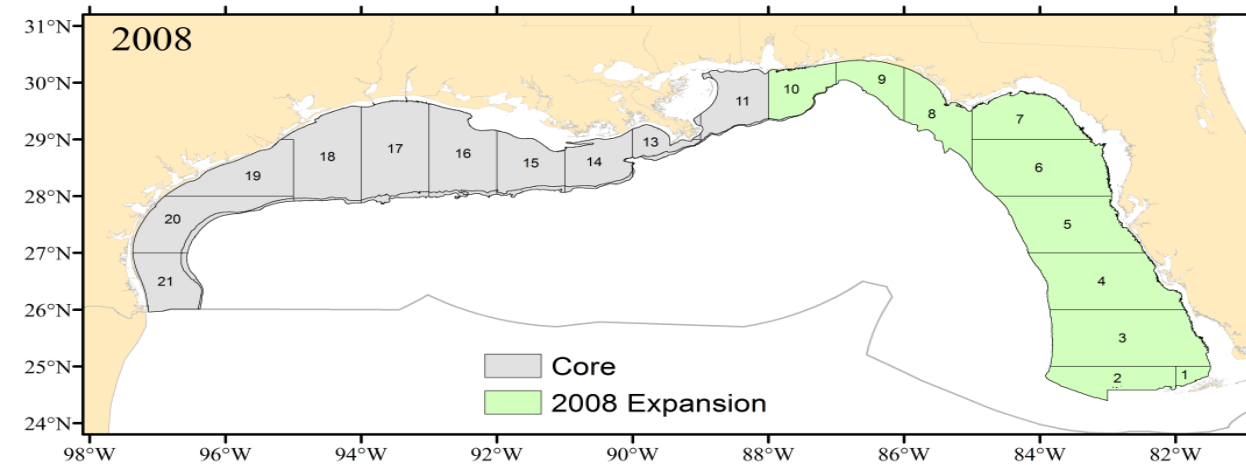
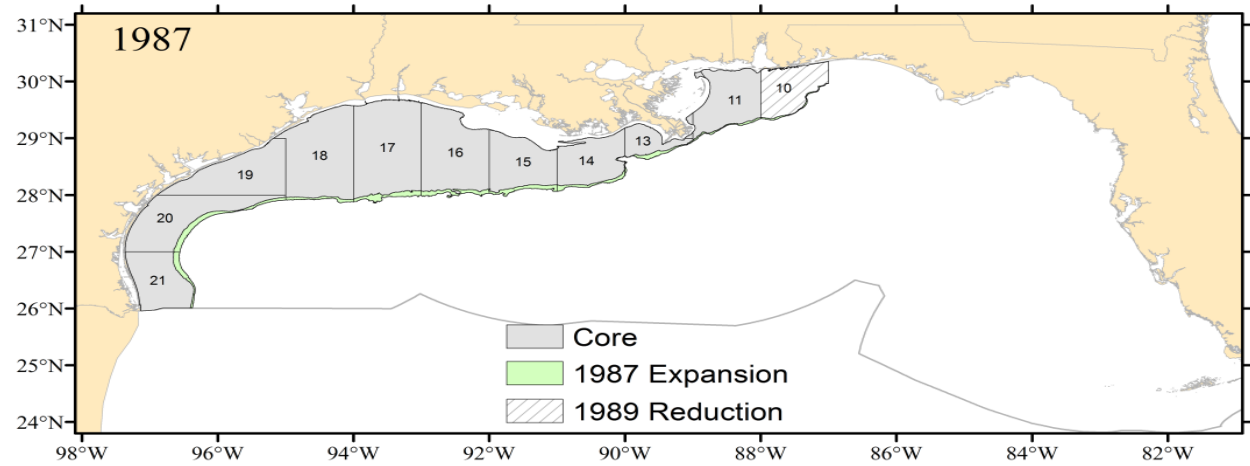
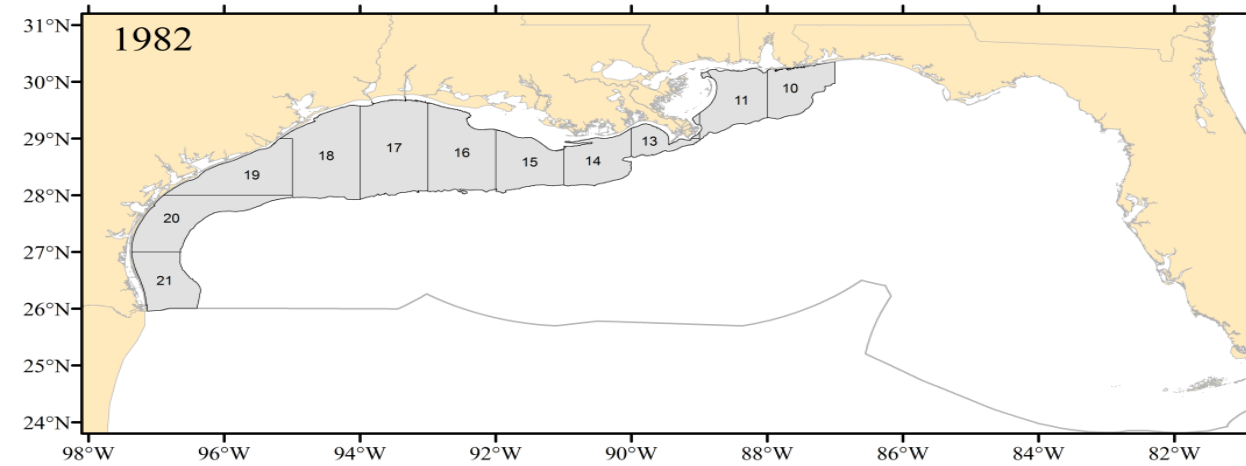
All surveys collect a suite of environmental data

- Temperature
- Salinity
- Transmissivity
- Dissolved oxygen concentrations
- Fluorometry
- Weather conditions (air temperature, barometric pressure, wind speed and direction)



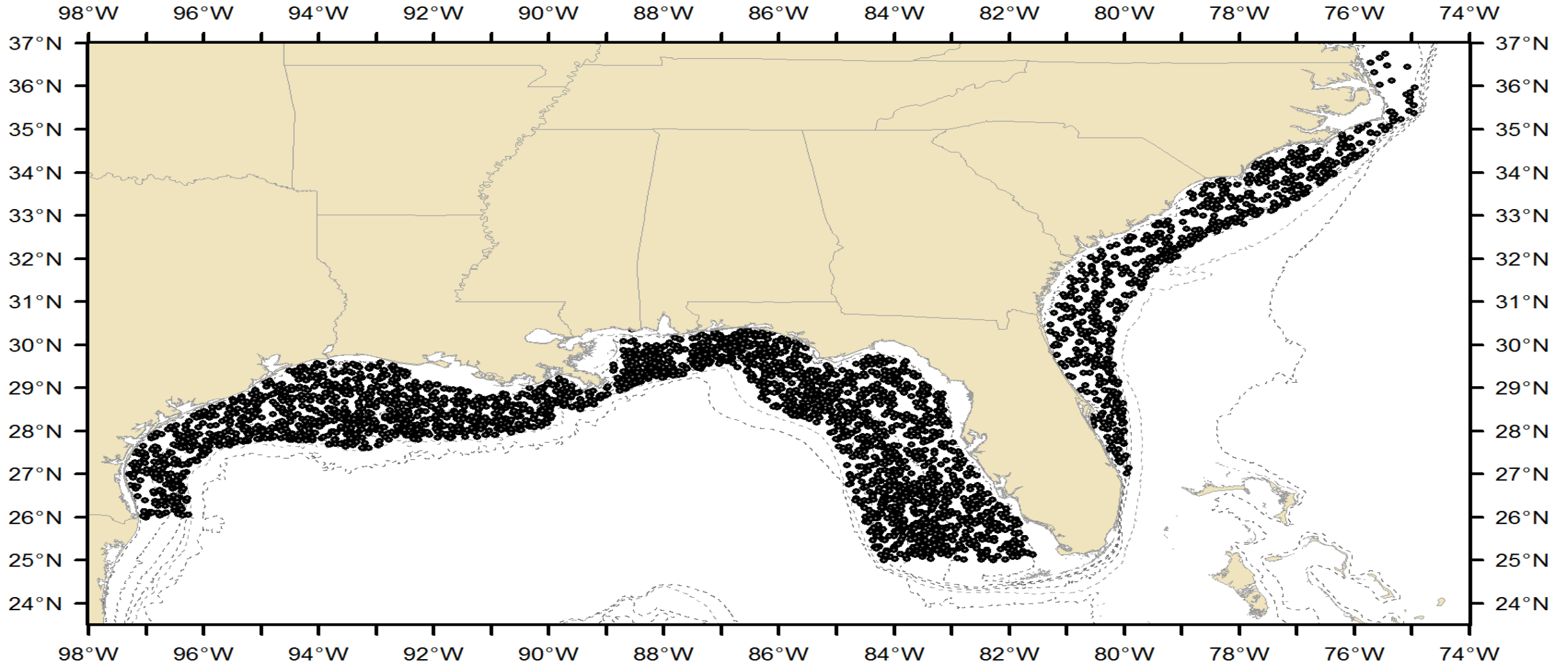
* Data collection methods and gear have changed over time, not all data available for all time series

SEAMAP Summer Trawl Survey



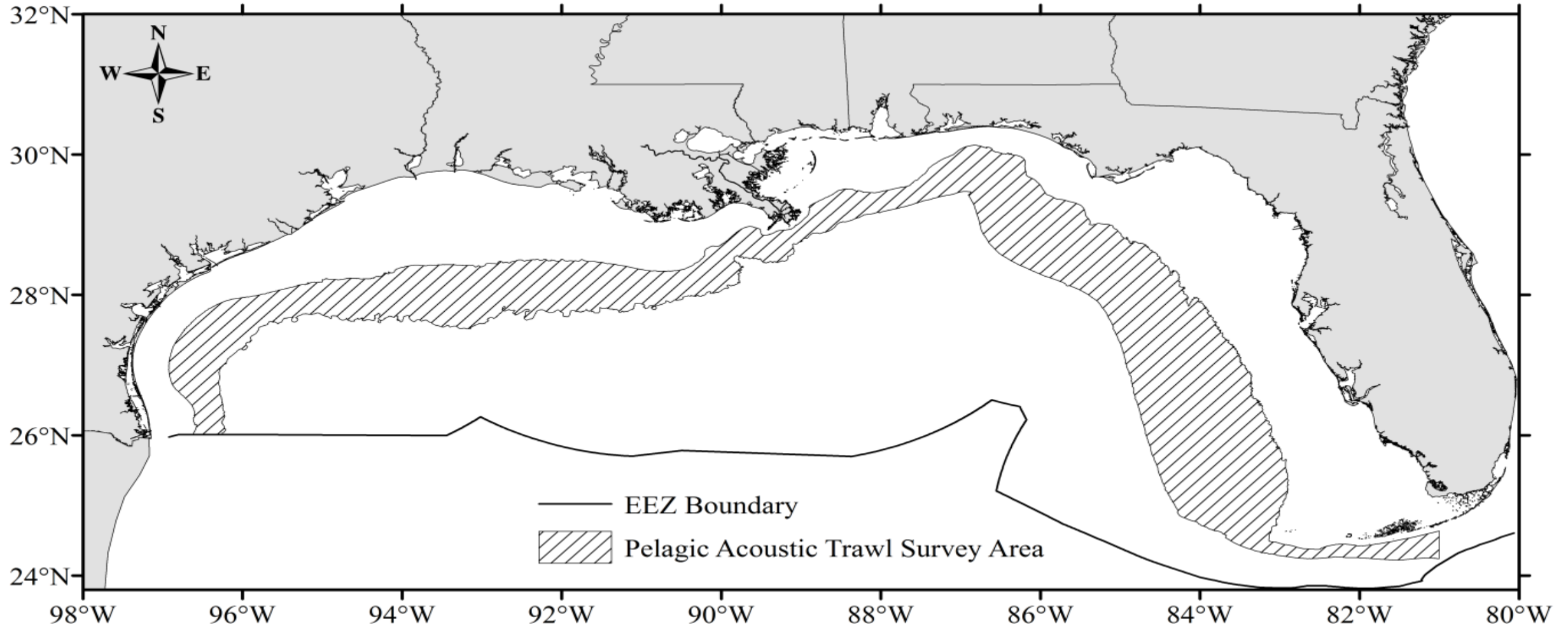
Length in years: 36 years; 1982-2008, 2009-present **Timeframe:** May, June and July
Depth Range: 2-60 fm from Dry Tortugas, FL to TX/LA border; from 5-60 fm off TX coast.

SEFSC Bottom Longline Survey 2001-2016



Length in years: 27 years **Timeframe:** Late July through end of September **Depth Range:** 9-366 m.

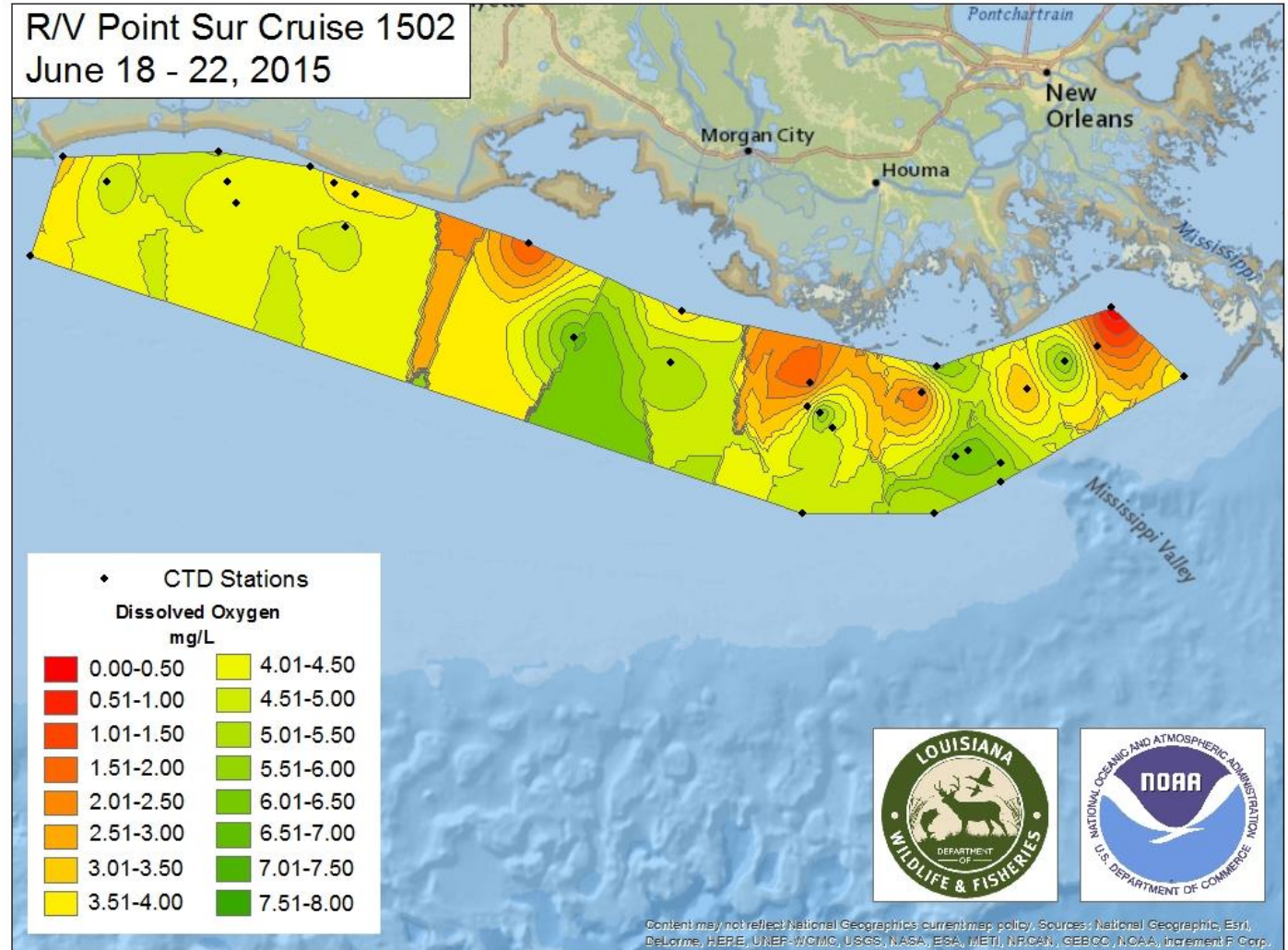
SEFSC Pelagic Acoustic Trawl Survey



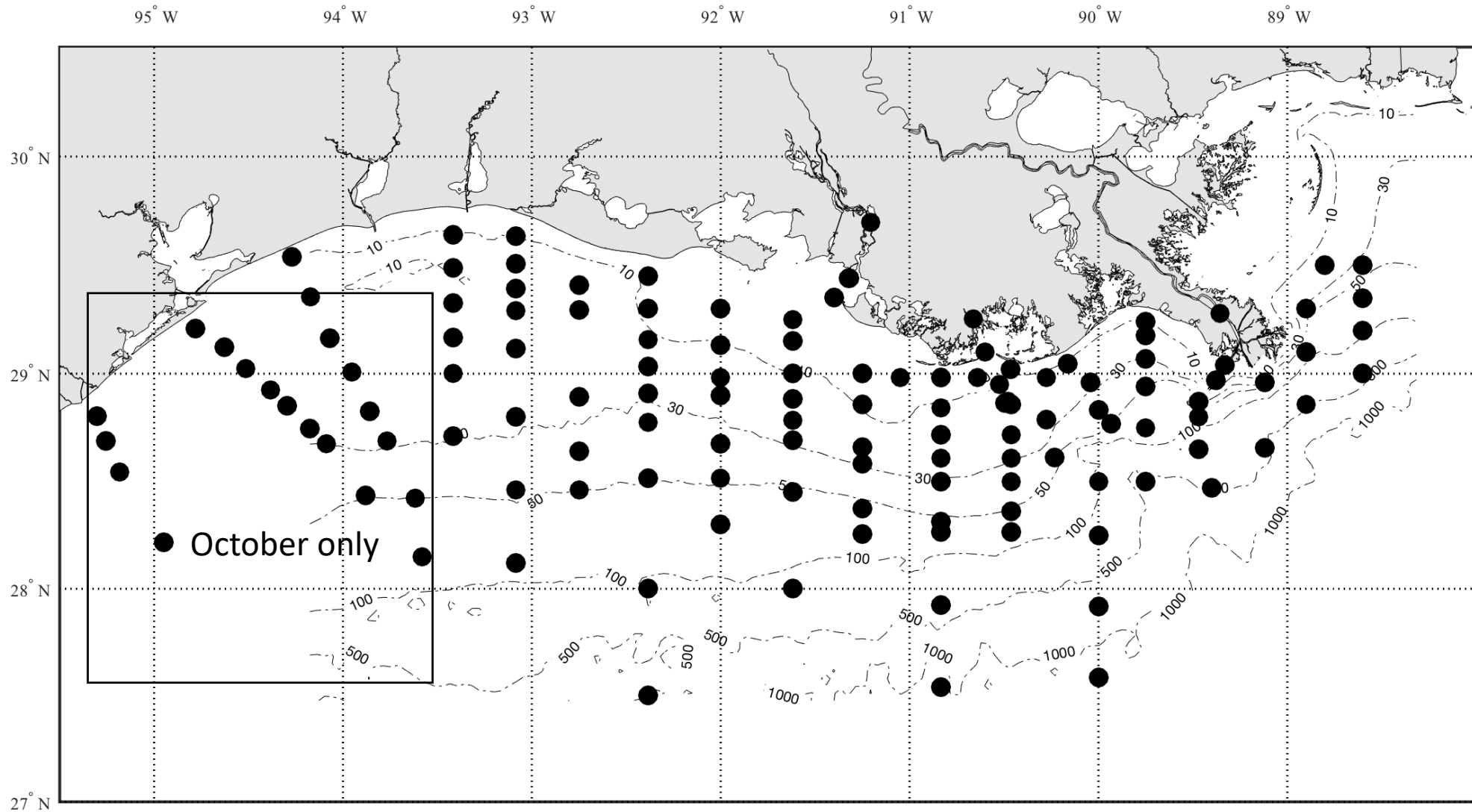
Other Observations & Data Sets

State fisheries surveys whose outputs could be integrated into CHAMP:

LDWF nearshore monitoring component of the SEAMAP Groundfish Survey, and DO data and maps from their surveys in 2013 and 2015 available from Hypoxia Watch



Study Area of Carbon and Oxygen Cycling Cruises 2017-2018 of Cai et al.



Future Activities

- Explore the possibility of adding DO to key fisheries surveys – assess what it would take and who to contact
- Probing SEDAR or other fisheries data or assessment workshops targeting menhaden, red snapper, or brown shrimp
- Identify and resolve gaps in collection of essential environmental variables and sampling resolution
- Examine non-traditional platforms for retrieving environmental data coincident with fisheries surveys

Satellites Derived Variables as Source of Synoptic Observations

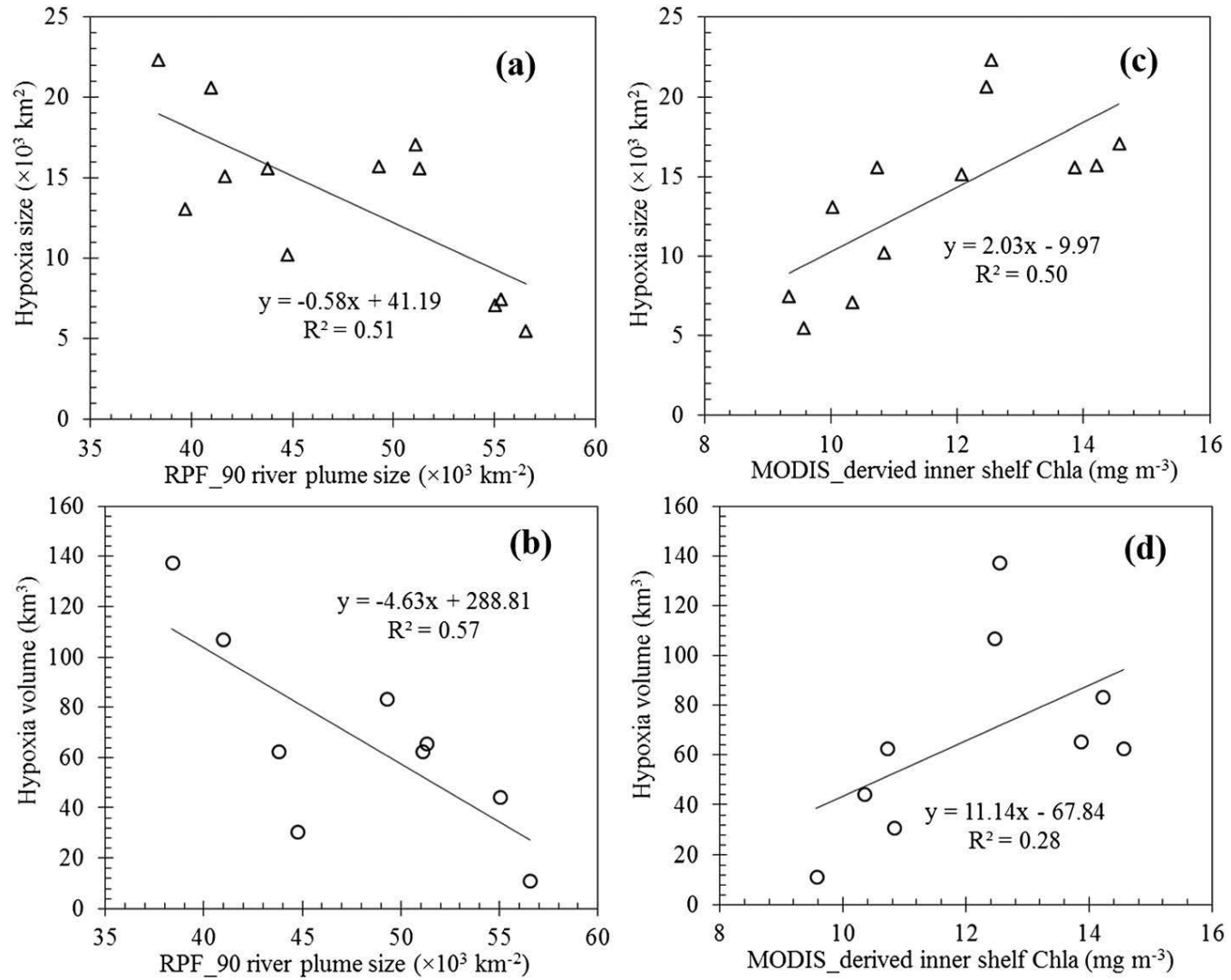
Derived Variables

- Temperature
- Salinity
- Bio-optical: Chlorophyll concentration, Particulate Organic Carbon, Particulate Inorganic Carbon, Primary Productivity, Particle Size Distribution

Limitation: Surface

Purpose: model initialization, validation, hypoxia prediction





The relationship between June RPF_90 (river plume frequency > 90%) area and (a) hypoxic area and (b) hypoxic volume, and the relationship between July, inner shelf (depth < 10 m) Chl a, and (c) hypoxic area and (d) volume. From Le et al., 2016, GRL 43: 2693-2699.

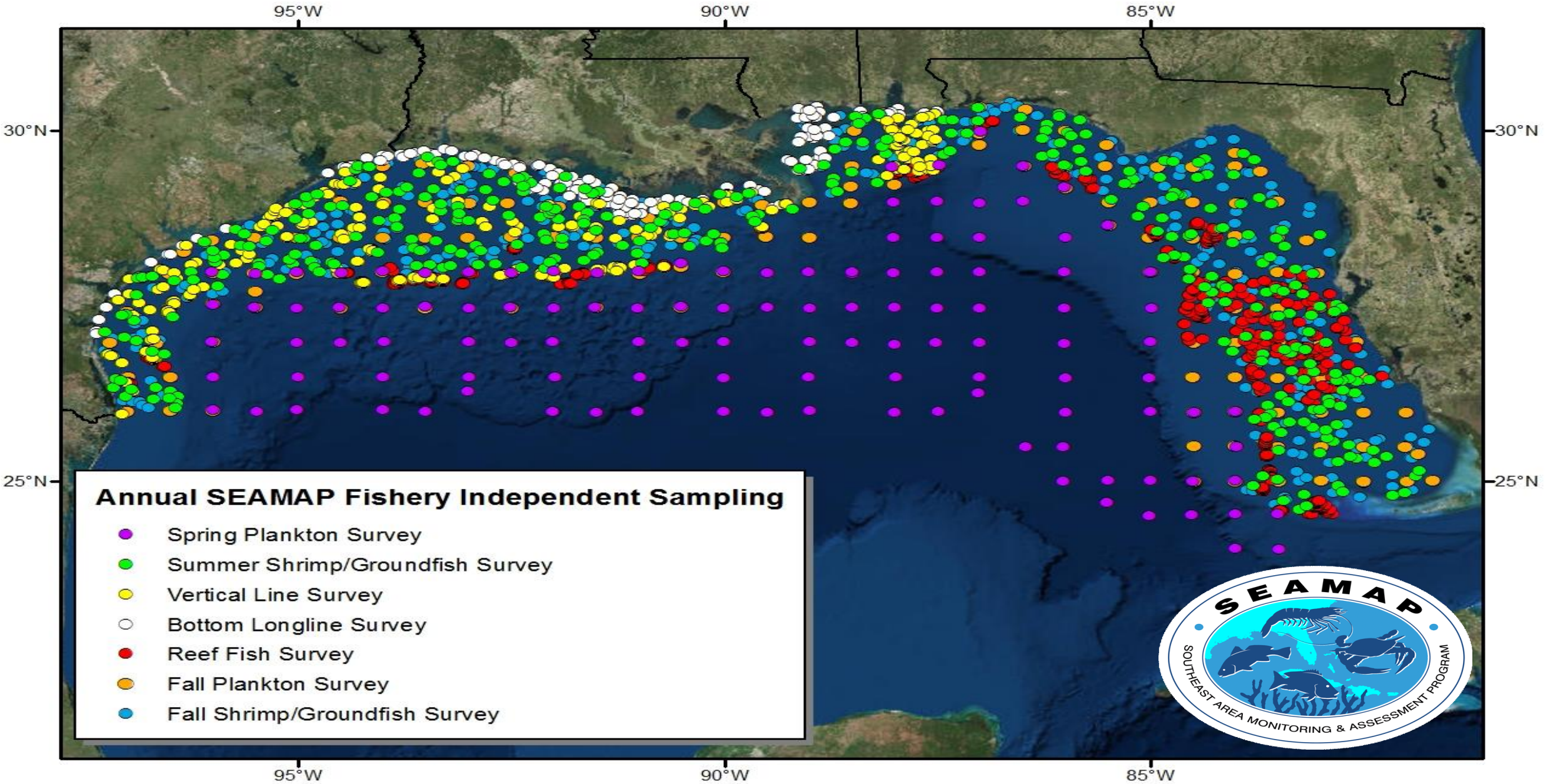
Fisheries Monitoring Workgroup (FMW) Workshop

To Be Held January 24 & 25, 2018

Mississippi State University Science and Technology Center

Meeting between FMW & NGOMEX PIs

Additional Slides



In Summary

- At least 40 assessment species/species groups are currently covered by the surveys.
- Over 500 DAS are expended annually by SEFSC in support of assessment and management.
- Every survey collects some type of detailed hydrographic and environmental data.
- Most of the species on the FMP short list are collected in at least one of our surveys.
- Support of several inter-agency and university projects.

Assessment Species

Almaco Jack

Atlantic Bluefin Tuna

Atlantic Sharpnose Shark

Blacknose Shark

Blacktip Shark

Black Grouper

Bonnethead

Brown Shrimp

Bullet/Frigate Tuna

Cobia

Dolphin

Dusky Shark

Gag Grouper

Gray Snapper

Gray Triggerfish

Greater Amberjack

Hogfish

King Mackerel

Large coastal sharks

Lane Snapper

Lesser Amberjack

Little Tunny

Menhaden

Mutton Snapper

Pink Shrimp

Red Grouper

Sandbar Shark

Skipjack Tuna

Small coastal sharks

Smoothhound sharks

Snowy Grouper

Spanish Mackerel

Speckled Hind

Swordfish

Tilefish

Vermilion Snapper

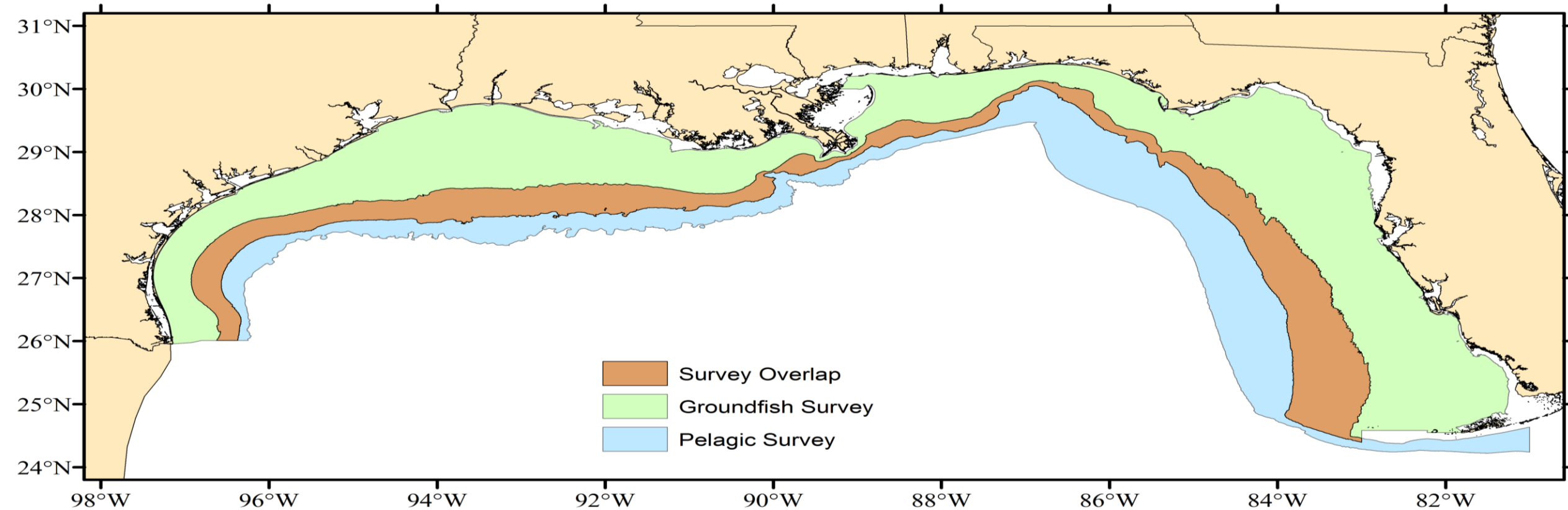
Wenchman

White Shrimp

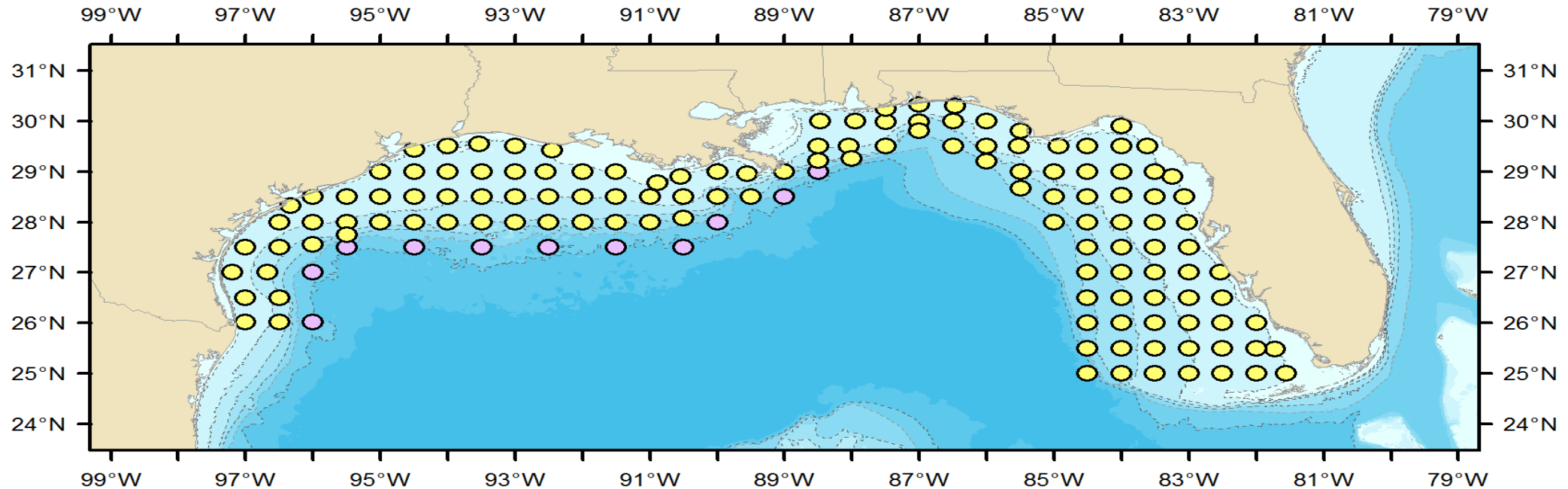
Yellowedge Grouper

Yellowmouth Grouper

Trawl Surveys Overlap

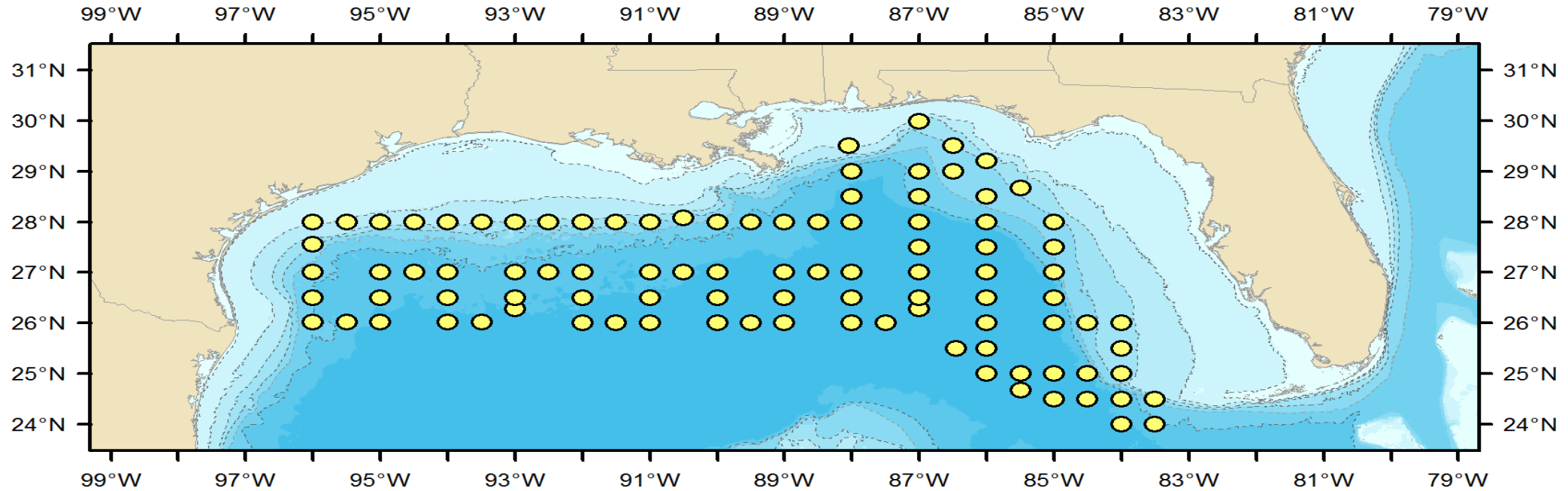


SEAMAP Fall Plankton Survey



- **Time Series:** 1986 - present (August - September)
- **Number of Stations:** 143 / year
- **Days at Sea:** 36
- **Survey Design:** Fixed Grid
- **Area:** Gulf of Mexico Continental Shelf Waters – Texas to South Florida
- **Gear:** Bongos, Neuston, MOCNESS, CUFES, CTD, EK60
- **Data:** Abundance, Lengths, Displacement Volume, Chl-a, Zooplankton Abundance, Acoustic Backscatter

SEAMAP Spring Plankton Survey



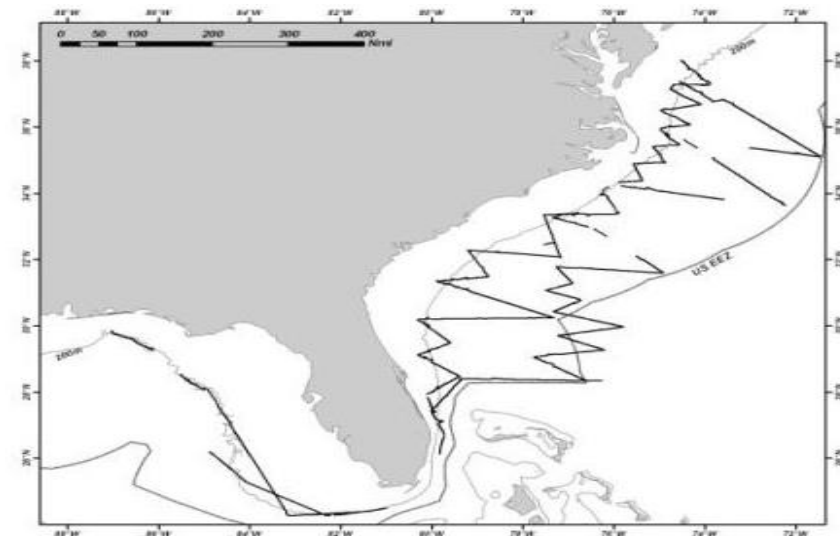
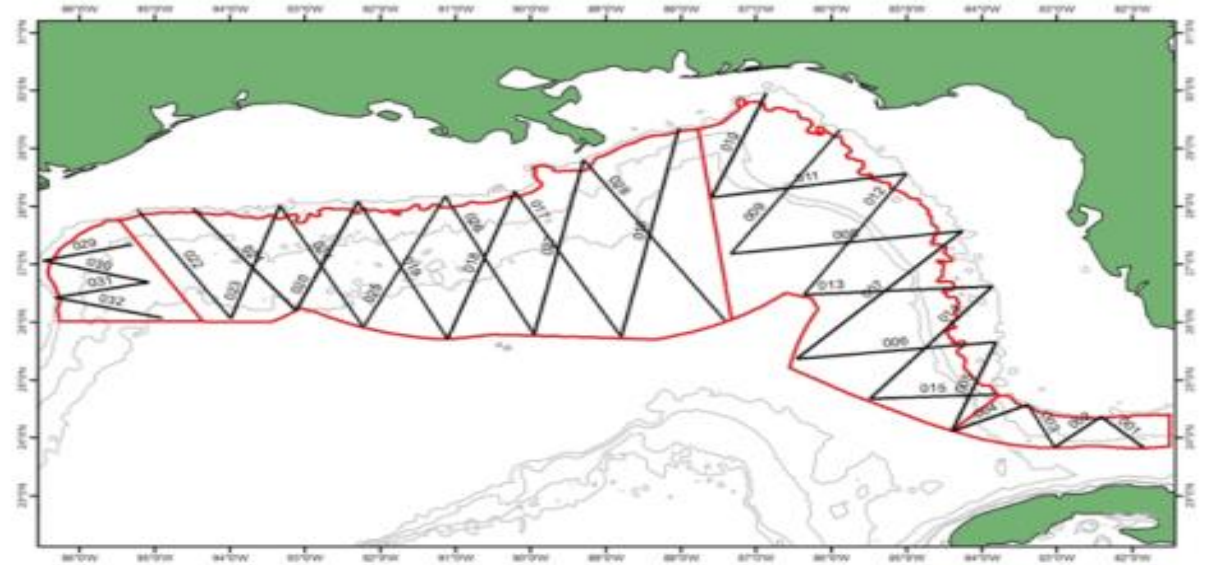
- **Time Series:** 1982 - present (April – May)
- **Number of Stations:** 97 / year
- **Days at Sea:** 30
- **Survey Design:** Fixed Grid
- **Area:** Gulf of Mexico Offshore Waters out to U.S. EEZ
- **Gear:** Bongos (Deep and Shallow), Neuston, MOCNESS, CTD, EK60
- **Data:** Abundance, Lengths, Displacement Volume, Chl-a, Zooplankton Abundance, Acoustic Backscatter

Observational Gaps – Additional Variables

- Depth
- Salinity
- Temperature
- pH / carbonate system

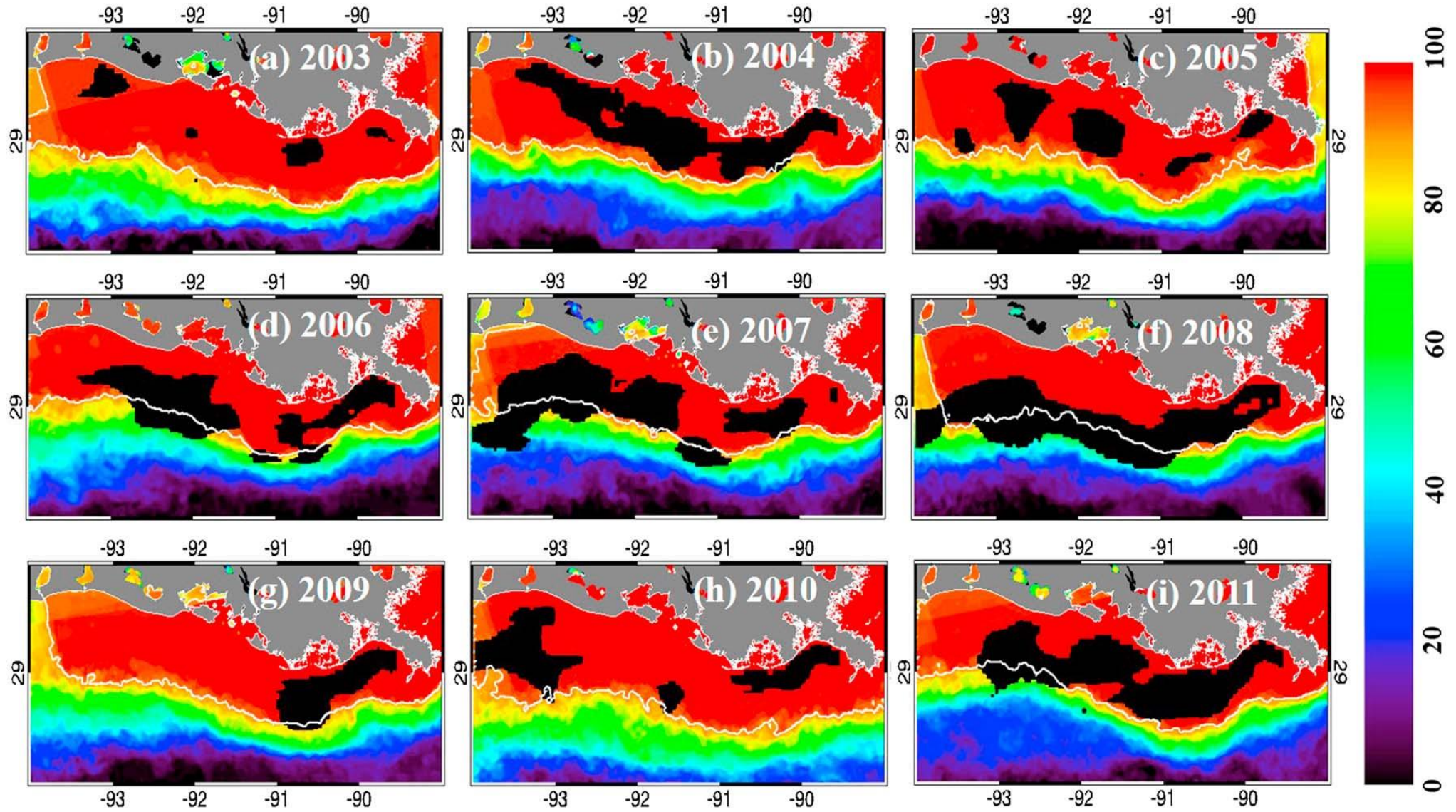
U.S. Gulf of Mexico Marine Mammal and Seabird Assessment (Summer)

- Length in years: last 27 years
- Days at sea: 60
- Timeframe: June through August
- Area and depth:
 - U.S. Gulf of Mexico waters >100m,
 - U.S. Atlantic waters >20m to Delaware Bay
 - Rotates annually between GOM and Atl.
- Sampling design: Uniformly spaced transect lines from a random start to estimate the abundance and spatial distribution of cetaceans.
- Gear: 25 x 150mm binoculars, 7-m chase boat, acoustic array, sonobuoys and receivers, biopsy sampling equipment, -80 degree C freezer, cameras and video, plankton sampling gear (bongo nets)



Carbon and Oxygen Cycling Cruises 2017-2018

- Focus is on understanding the linkage between carbon and oxygen cycling and the related processes of respiration induced acidification and hypoxia development
- Four shelf-wide cruises in 2017, one upcoming (Jan 17-26, 2018)
 - Cruises in 2017
 - April
 - July, right after Tropical Storm Cindy
 - Observed widespread hypoxia and anoxia both east and west of the birdsfoot delta
 - This cruise directly preceded the mid-summer hypoxia survey by Rabalais et al.
 - September, a short cruise to capture after effects of Hurricane Harvey
 - October, Hurricane Nate occurred in the middle of the cruise allowing sampling before and after conditions
 - Will produce the first set of observations over an annual cycle for CO₂ system variables, O₂, nutrients, organic matter, primary production, respiration, and sediment processes
 - Will examine effects of hurricanes
- Research team: Wei-Jun Cai (U Delaware), Nancy Rabalais (LSU/LUMCON), John Lehrter (U South Alabama and Dauphin Island Sea Lab), Brian Roberts (LUMCON), Kanchan Maiti (LSU), Steven Lohrenz (UMASS Dartmouth)
- Funding: NSF



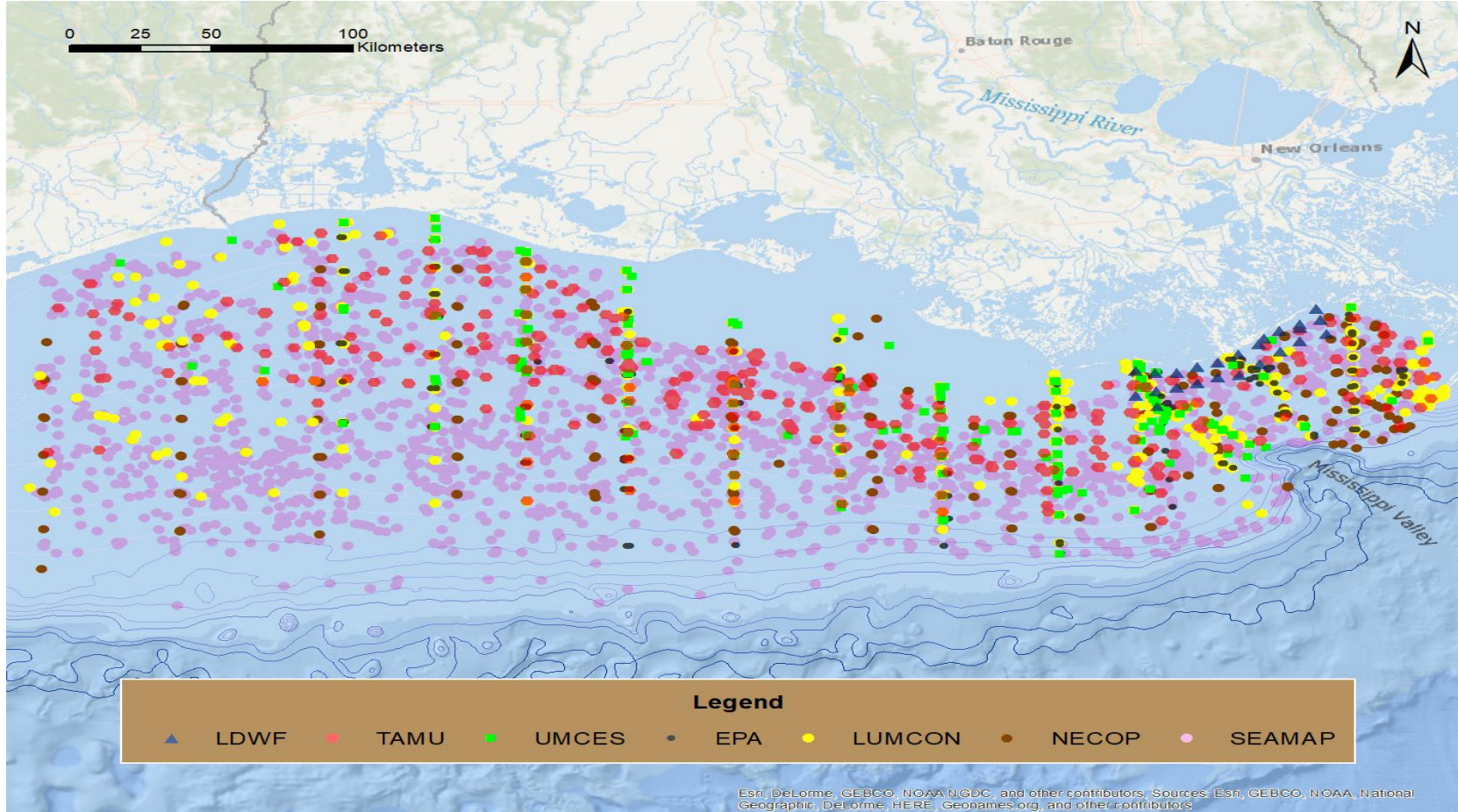
The location of hypoxia (black) from (a–i) 2003 to 2011 overlaid on river plume frequency images composited from January to July. The white line delineates the RPF_90 on the shelf. From Le et al., 2016, GRL 43: 2693-2699.

Contributions to Gulf of Mexico Integrated Ecosystem Assessment Program

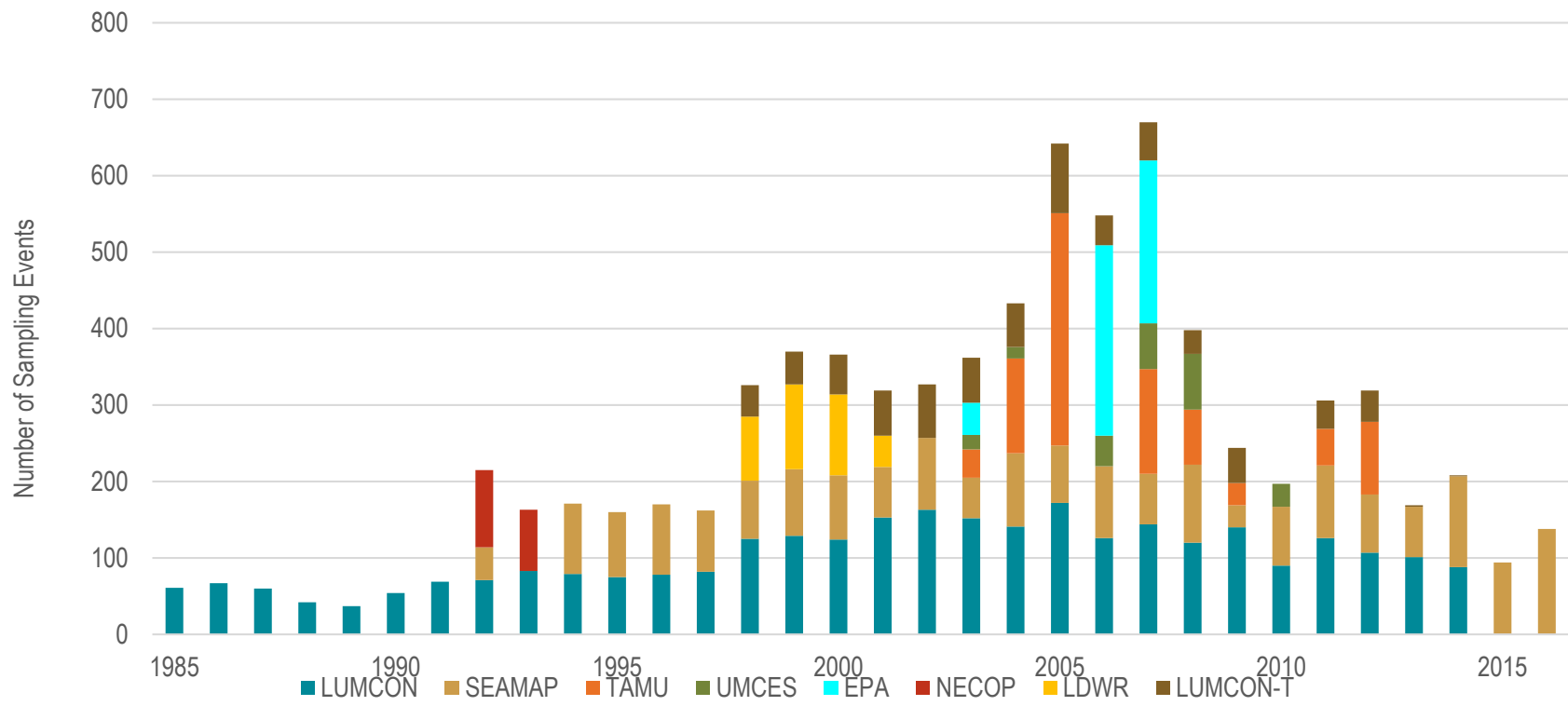
- One component of the Gulf of Mexico Integrated Ecosystem Assessment Program is the development and updating of Ecosystem Status Reports (ESRs)
- ESRs are intended to provide a broad level overview of the current and historical state of the Gulf ecosystem to managers in the region
- Indicators of contemporary and historical patterns in shrimping effort, hypoxia severity, and fish community structure developed with the support of the NCCOS Gulf Hypoxia Research program are now incorporated in the Gulf of Mexico ESR and are available to managers

For more information see the Gulf Ecosystem Status report:

http://www.aoml.noaa.gov/ocd/ocdweb/ESR_GOMIEA/

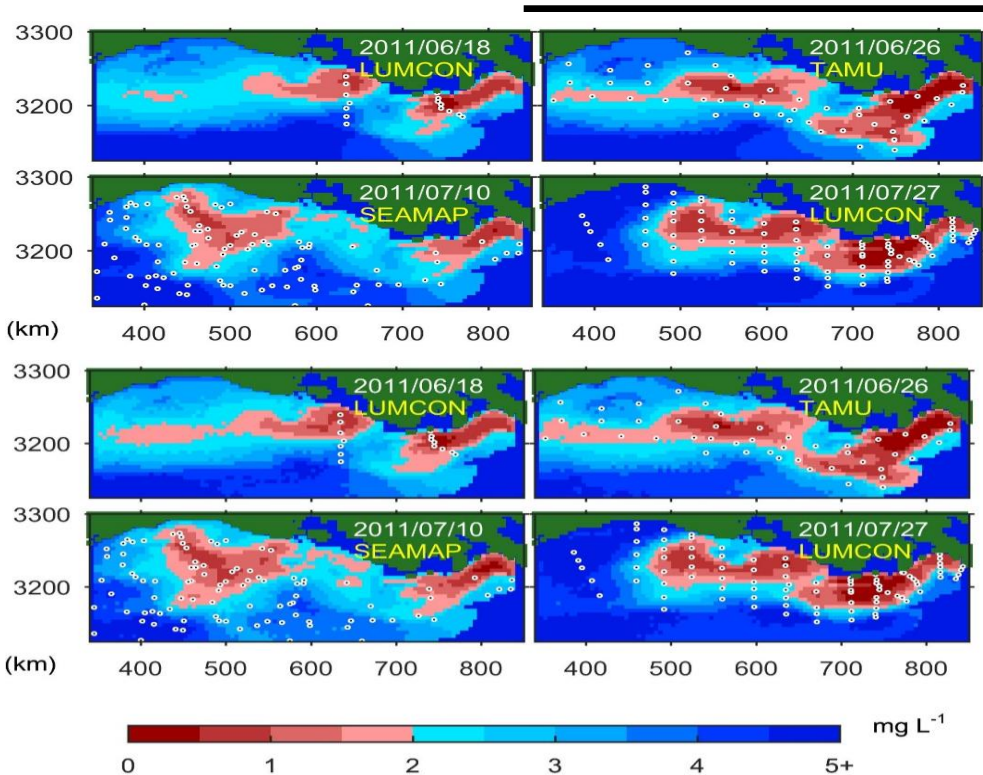


Locations of data collected from 1985-2016, color-coded by monitoring program



Number of sampling events available for each year of this study, color-coded by monitoring program

Estimating BWDO at estimation locations



$$\begin{bmatrix} \mathbf{Q}_{oo} & \mathbf{X}_o \\ \mathbf{X}_o^T & \mathbf{0} \end{bmatrix} \begin{bmatrix} \boldsymbol{\Lambda}_d \\ -\mathbf{G}_d \end{bmatrix} = \begin{bmatrix} \mathbf{Q}_{oe,d} \\ \mathbf{X}_{e,d}^T \end{bmatrix} \quad \text{Equation - 4}$$

$$\begin{bmatrix} \mathbf{z}_{e,d}^u \\ \mathbf{z}_{o,d}^u \end{bmatrix} = \mathbf{C} \left(\begin{bmatrix} \mathbf{Q}_{ee} & \mathbf{Q}_{oe,d}^T \\ \mathbf{Q}_{oe,d} & \mathbf{Q}_{oo} \end{bmatrix} \right)^T \mathbf{u} \quad \text{Equation - 5}$$

$$\mathbf{z}_{e,d}^c = \boldsymbol{\Lambda}_d^T (\mathbf{z}_o - \mathbf{z}_{o,d}^u) + \mathbf{z}_{e,d}^u \quad \text{Equation - 6}$$