

# Bottlenose Dolphins in the Gulf of Mexico



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# Bottlenose Dolphins in the Gulf of Mexico

- Introduction to stocks
- Risks
- Stock structure
- Abundance
- Next steps



C. Sinclair, NOAA

# Stock Definition

- U.S. Marine Mammal Protection Act (MMPA)
  - A group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature
- Functional
  - Groups delineated by a very low rate of genetic exchange
  - Groups that are essentially demographically separate (management groups experience differential risks)
  - Uniquely adapted to specific area/region they inhabit. Therefore, not easily replaced by individuals from adjacent areas.

# U.S. Marine Mammal Protection Act

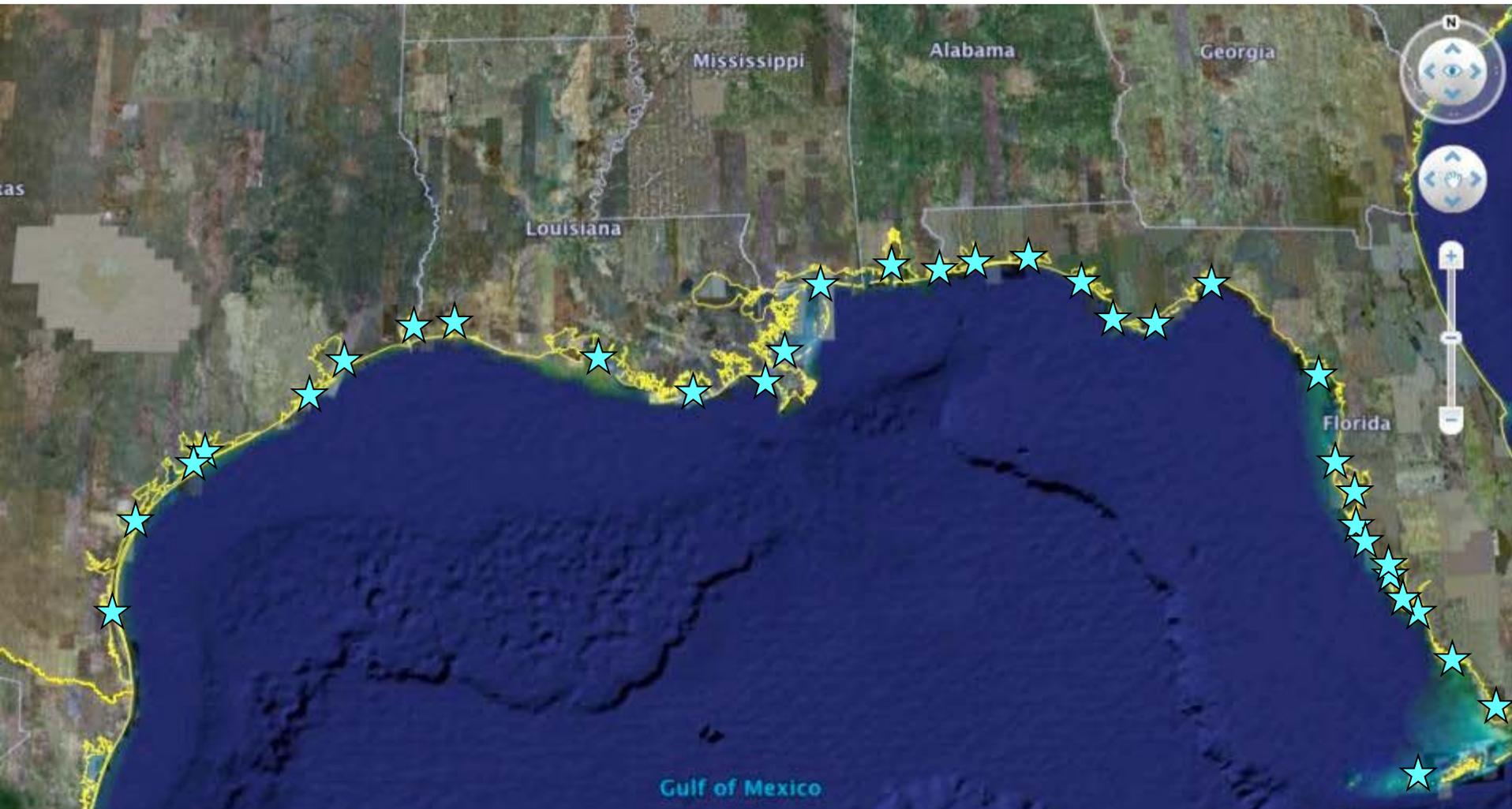
- Species or population stocks should remain a significant functioning element of the ecosystem they inhabit.
- Therefore, stocks should remain above their optimum sustainable population size (OSP).
- OSP – number of animals that results in the maximum productivity of the population keeping in mind carrying capacity (K) & the health of the ecosystem [OSP at least 50% of K]
- If a stock is already below OSP, then measures should be taken to replenish the stock ( $>OSP$ ).

# Bottlenose Dolphins in the Gulf of Mexico

- Oceanic waters (>200m; 1 stock)
- Continental shelf (20–200m; 1 stock)
- Coastal waters (0–20m; 3 stocks)
- Bay, sound & estuary (32 stocks)



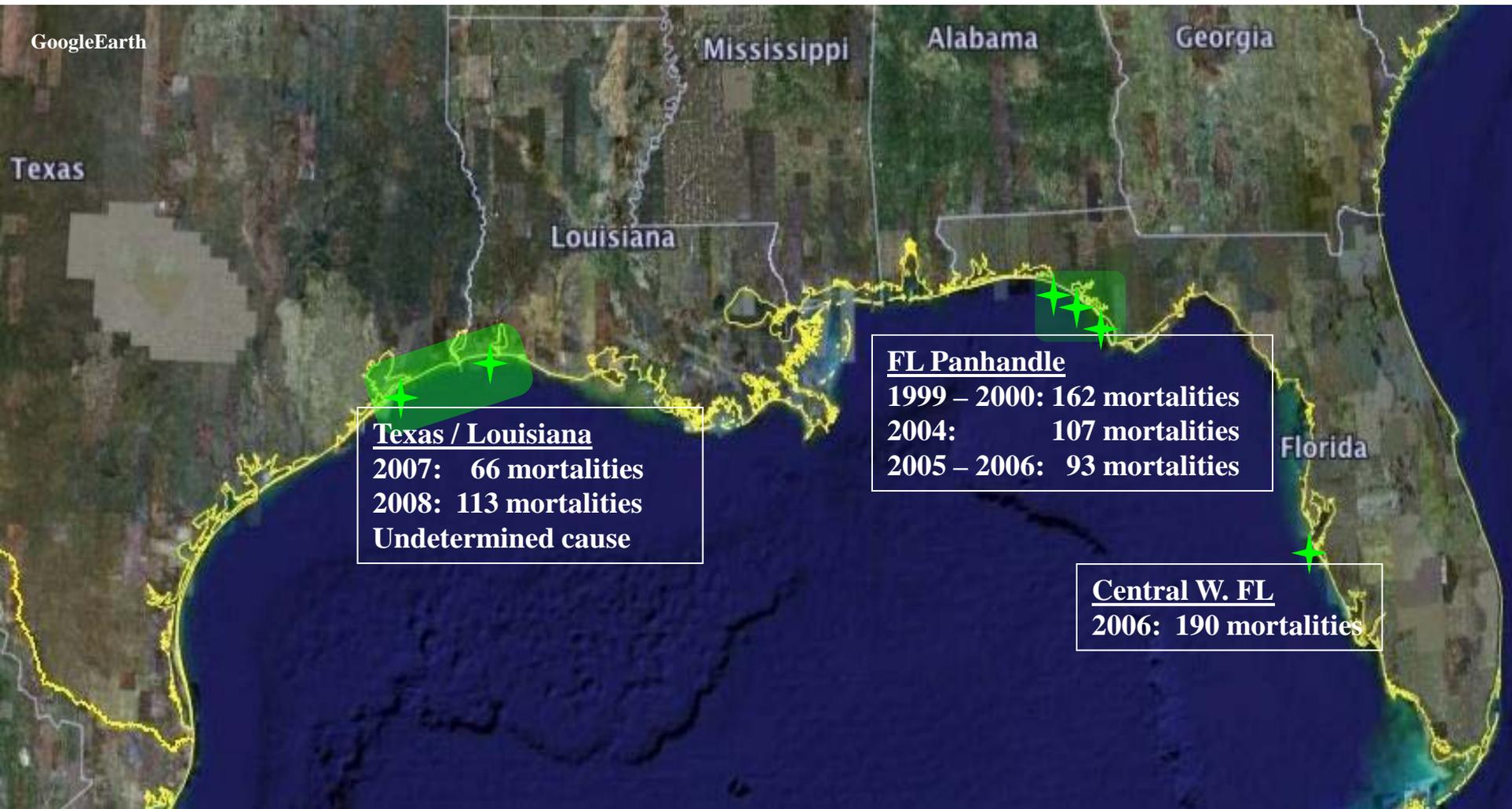
**Bay, Sound & Estuary Stocks** – The 32 BSE stocks are of special concern because in many cases individual dolphins are resident to small areas (i.e., occur there at least 50% of the time).



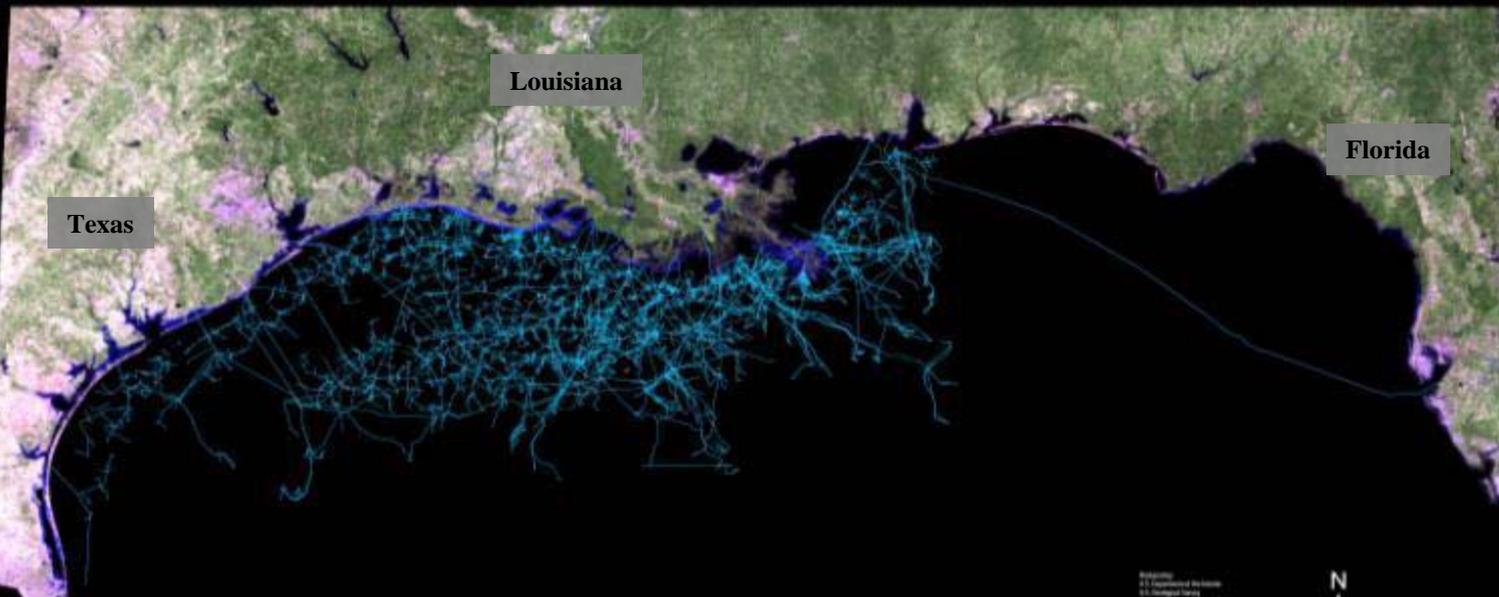
# Risk Factors

- Oil & gas development
- Fishery interactions
- Habitat degradation (vessel traffic, noise, pollution)
- Wetland loss
- Large-scale Unusual Mortality Events (UMEs) often associated with harmful algal blooms (HAB)
- Unknown impacts of climate change on habitat & food availability, disease vectors & susceptibility
- There are areas where bottlenose dolphins that have experienced repeated mortality events

# Gulf of Mexico Bottlenose Dolphin Unusual Mortality Events (UME) 1999 – 2008



## Offshore Oil and Gas Pipelines in the Gulf of Mexico



## Oil & Gas Pipelines in the Gulf of Mexico

## Oil Platforms in the western and northern Gulf of Mexico



## **To understand the impacts of these risk factors, we need some very basic biological information:**

1. WHO is being impacted, i.e. which stock?
2. HOW MANY animals are in the stock, i.e. abundance, and how stock abundance changes (or not) over time?

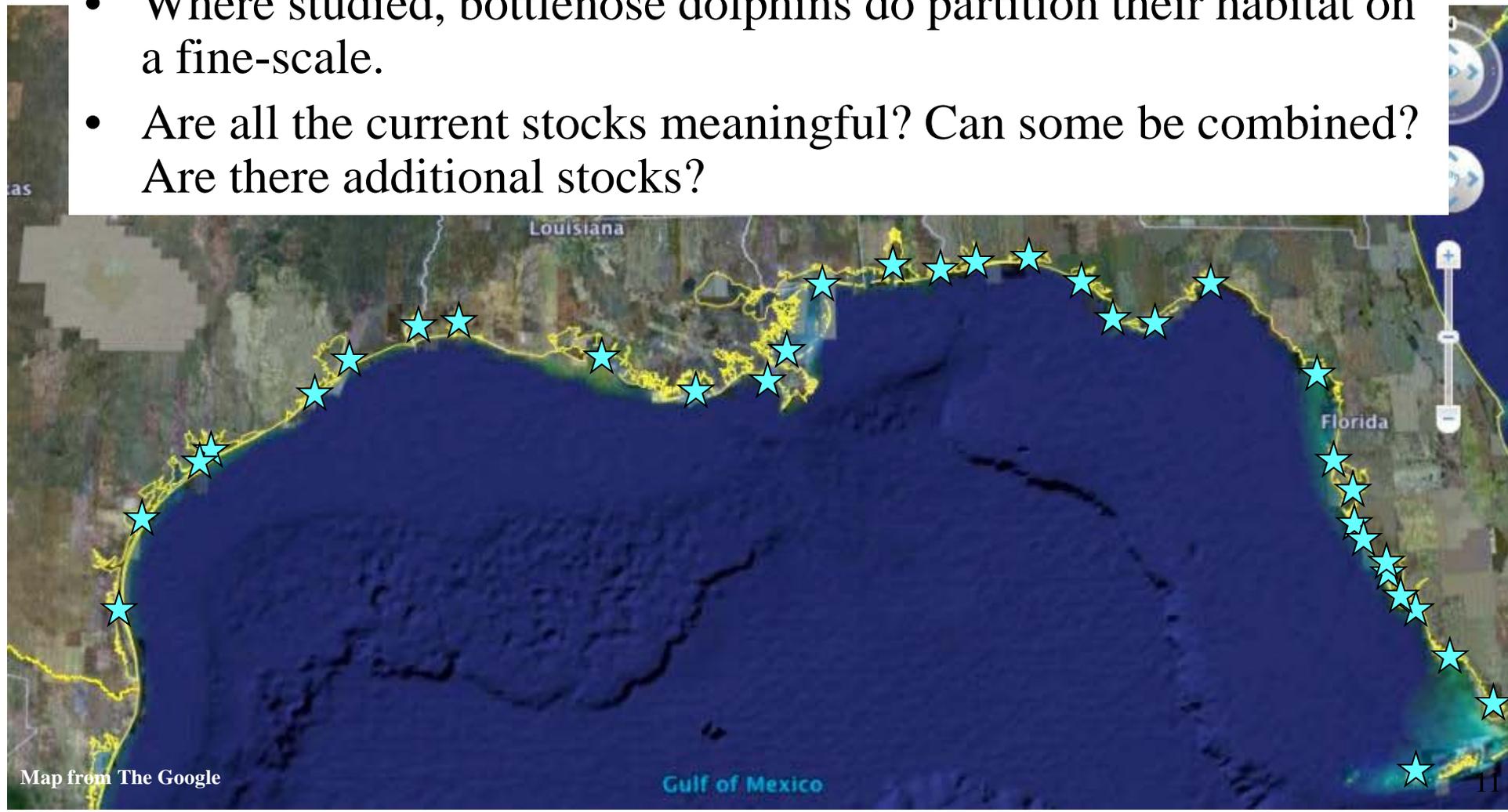
## **Only then are we able to**

1. assess the impacts of mortalities
2. determine the long-term effect(s) on sustainability of the stock
3. assess the health of the stock & quantify the risks
4. understand trends in health parameters & disease

# Bottlenose Dolphin Stock Structure

## What Is Known?

- Most of the designated stock boundaries have yet to be tested.
- Where studied, bottlenose dolphins do partition their habitat on a fine-scale.
- Are all the current stocks meaningful? Can some be combined? Are there additional stocks?



# Bottlenose Dolphin Stock Structure

- Delineating stocks
  - Genetics
    - Permanence across life span of individual
    - Unaffected by environmental differences or changes
    - Provides history of population connectivity and degree of interbreeding
  - Telemetry, photo-ID, contaminants, stable isotopes

# Bottlenose Dolphin Stock Structure

- Genetic Data to Date

- Tampa Bay / Sarasota Bay / Charlotte Harbor / coastal area alongshore. And versus Matagorda Bay, TX. Sellas et al. 2005
- Mississippi Sound vs Perdido Bay, AL – ongoing
- St. Joseph Bay, FL – ongoing
- Choctawhatchee Bay, FL – ongoing



# Stock Structure Needs & Strategy

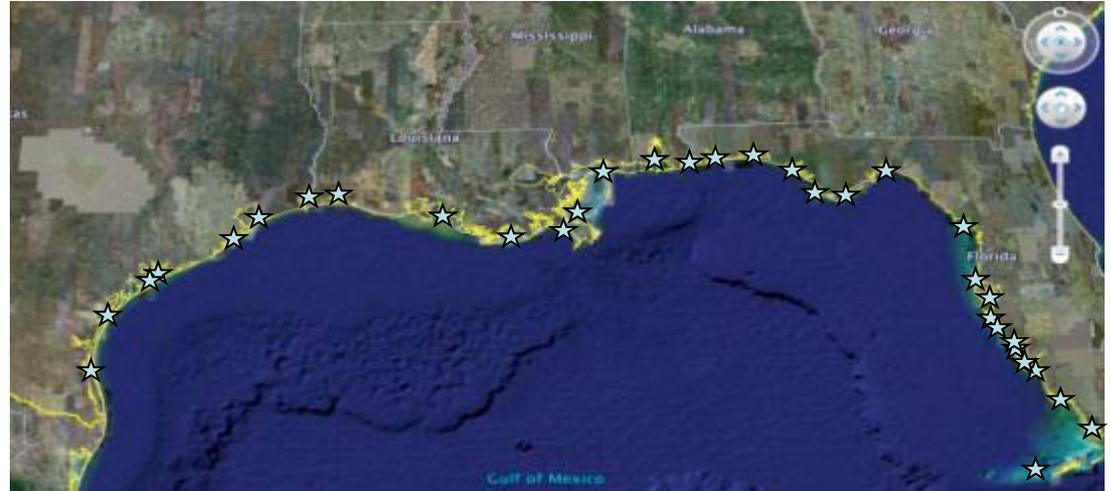
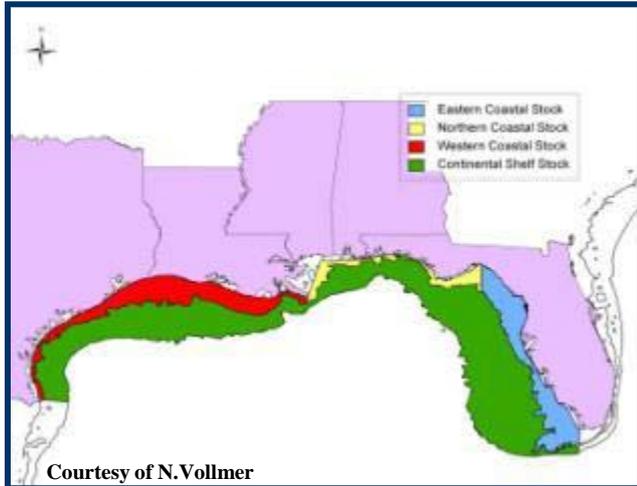
- Population structure is complex
- Fine-scale differentiation is the norm
- Requires
  - Dedicated biopsy sampling in each bay, sound & estuary stock area paired with sampling in adjacent coastal waters
  - Seasonal biopsy effort to ensure residency patterns



# Gulf of Mexico Bottlenose Dolphins

## Abundance & Distribution

- Current knowledge of abundance & distribution for coastal stocks and bay, sound & estuary stocks
- Future research needs



# Aerial Surveys

Line-transect methods

- Coastal stock abundances
- Bay, sound & estuary 1992 – 1994



# Capture – Recapture

Photo-ID sampling

- Bay, sound & estuary abundances (all since 1994)



# Coastal Stock Bottlenose Dolphin Abundances

Eastern Coastal Stock: 3,500 dolphins (2007 aerial survey)

Northern Coastal Stock: 7,500 dolphins (2007 aerial survey)

Western Coastal Stock: 3,500 dolphins (1992 aerial survey)

(Continental shelf stock: 17,500 dolphins) (Ocean stock: 3,500 dolphins)



Courtesy of N.Vollmer

# Gulf of Mexico Bay, Sound & Estuary Stocks

## Abundances – TX, LA, MS, AL to Central FL Panhandle

### 1992 – 1993, Aerial Surveys; 2001 – 2007, Mark-Recapture

	Gulf of Mexico Estuary	N <sub>BEST</sub>	N <sub>MIN</sub>	PBR	Year
1	Laguna Madre	80	UNK	UNK	1992
2	Nueces Bay, Corpus Christi Bay	58	UNK	UNK	1992
3	Compano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay	55	UNK	UNK	1992
4	Matagorda Bay, Tres Palacios Bay, Lavaca Bay	61	UNK	UNK	1992
5	West Bay	32	UNK	UNK	2000
6	Galveston Bay, East Bay, Trinity Bay	152	UNK	UNK	1992
7	Sabine Lake	0		UNK	1992
8	Calcasieu Lake	0		UNK	1992
9	Vermillion Bay, West Cote Blanche Bay, Atchafalaya Bay	0		UNK	1992
10	Terrebonne Bay, Timbalier Bay	100	UNK	UNK	1993
11	Barataria Bay	138	129	1.3	2001
12	Mississippi River Delta	0		UNK	1993
13	Mississippi Sound, Lake Borgne, Bay Boudreau	1,401	UNK	UNK	1993
14	Mobile Bay, Bonsecour Bay	122	UNK	UNK	1993
15	Perdido Bay	0		UNK	1993
16	Pensacola Bay, East Bay	33	UNK	UNK	1993
17	Choctawhatchee Bay	179	73	1.7	2007
18	St. Andrew Bay	124	UNK	UNK	1993
19	St. Joseph Bay	146	126	1.3	2005 – 07

# Gulf of Mexico Bay, Sound & Estuary Stocks Abundances – Central FL Panhandle to Key West 1992 to 1994, Aerial Surveys; 2007 – 08, Mark-Recapture

Gulf of Mexico Estuary		$N_{REST}$	$N_{MIN}$	PBR	Year
20	St. Vincent Sound, Apalachicola Bay, St. Georges Sound	537	498	5	2008
21	Apalachee Bay	491	UNK	UNK	1993
22	Waccasassa Bay, Withlacoochee Bay, Crystal Bay	100	UNK	UNK	1994
23	St. Joseph Sound, Clearwater Harbor	37	UNK	UNK	1994
24	Tampa Bay	559	UNK	UNK	1994
25	Sarasota Bay, Little Sarasota Bay	160	160	1.6	2007
26	Lemon Bay	0		UNK	1994
27	Pine Island Sound, Charlotte Harbor, Gasparilla Sound	209	UNK	UNK	1994
28	Caloosahatchee River	0		UNK	1985
29	Estero Bay	104	UNK	UNK	1994
30	Chokoloskee Bay, Ten Thousand Islands, Gullivan Bay	208	UNK	UNK	1994
31	Whitewater Bay	242	UNK	UNK	1994
32	Florida Keys (Bahia Honda to Key West)	29	UNK	UNK	1994

# Gulf of Mexico Bay, Sound and Estuary Stocks with a Current/Pending Abundance



# Abundance Summary

- Abundance estimates for most (28/35) coastal and bay, sound & estuary stocks are >15 years old & are invalid for management.
- Abundance estimate for western coastal stock is needed.
- Updating abundances for estuarine stocks is time-intensive & needs to be initiated on a broad scale.
- Assessing the impacts to stocks is not possible without abundance & distribution information that is updated on a routine basis (e.g., at least every 5 – 8 years).

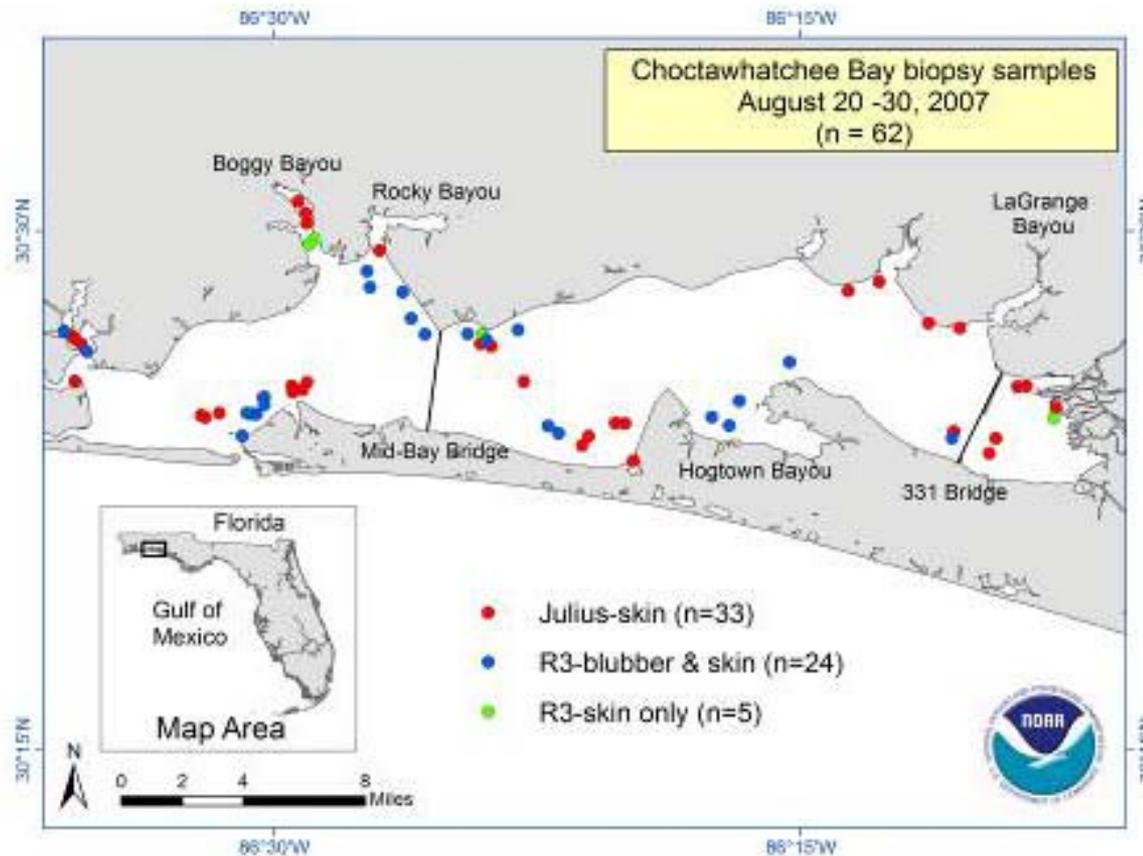
# Abundance & Stock Structure Sampling Strategy & Needs

- “Bottlenose Dolphin Stock Structure Research Plan for the Central Northern Gulf of Mexico” (Mullin et al. 2007)
  - Conduct winter & summer aerial surveys of coastal stocks every 5 years.
  - In BSE stock areas, conduct winter & summer sampling every 5 years.
    - Initially, conduct 4 weeks of photo-ID sampling for capture-recapture abundance estimates followed by biopsy sampling to obtain samples from both the BSE & adjacent coastal waters.

# NMFS Photo-ID & Biopsy Sampling Surveys

To date, one survey was conducted in Choctawhatchee Bay, FL during Summer 2007.

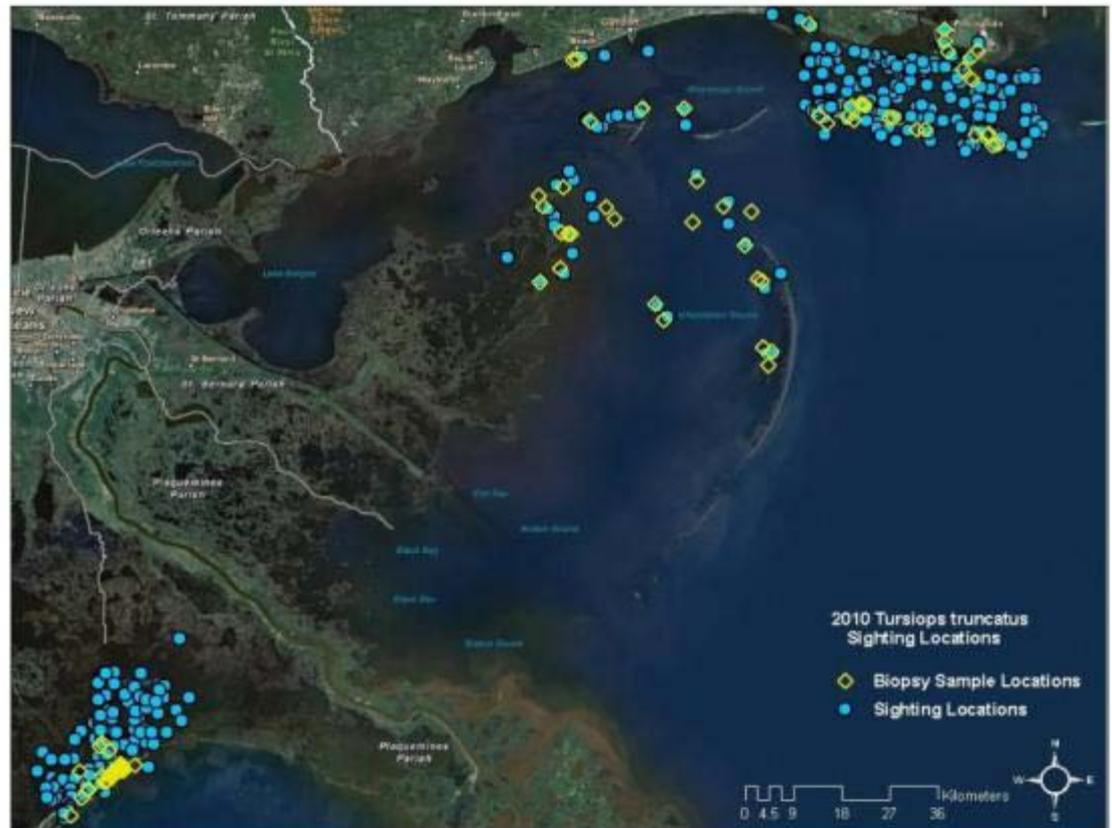
This area was selected to be the first bay sampled primarily because it was in the region of the 2006–2007 UME but also because its enclosed geography made it conducive to capture-recapture sampling.



After the BPDWH oil spill as part of the NRDA process, NMFS-SEFSC & the National Ocean Service conducted seasonal photo-ID & biopsy sampling in Barataria Bay & Mississippi Sound, & seasonal biopsy sampling in Chandeleur Sound from May 2010 through June 2011.

## Objectives

- Monitor abundance
- Delimit stock structure
- Estimate survivorship
- Estimate fecundity



# NMFS-BOEMRE

## Collaborative Bottlenose Dolphin Research 2011 – 2012

- Continue/initiate monitoring in Barataria Bay, Chandeleur Sound & Mississippi Sound or adjacent BSE areas.
- Conducted biopsy sampling during winter & summer (at a minimum) within each BSE & adjacent coastal waters to delimit stock structure.
- In each area, during winter & summer (at a minimum) conduct photo-ID capture-recapture surveys to monitor abundance (resident & non-resident), fecundity, survivorship & habitat use.



# References

- Mullin, K., P. Rosel, A. Hohn, and L. Garrison. 2007. Bottlenose dolphin stock structure research plan for the central northern Gulf of Mexico. NOAA Technical Memorandum NMFS-SEFSC-563. 27 pp.
- Sellas, A.B., R.S. Wells, and P.E. Rosel. 2005. Mitochondrial and nuclear DNA analyses reveal fine scale geographic structure in bottlenose dolphins (*Tursiops truncatus*) in the Gulf of Mexico. *Conservation Genetics* 6(5):715–728, doi: 10.1007/s10592-005-9031-7.