

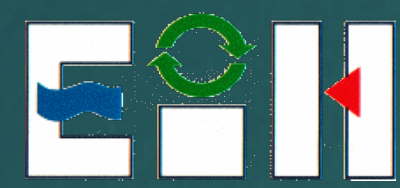
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# An apparent increase in bottlenose dolphins in upper Galveston Bay: city slickers or tourists?

Kristi Fazioli<sup>1</sup>, Vanessa Mintzer<sup>2</sup>, George Guillen<sup>1</sup>

<sup>1</sup> University of Houston, Environmental Institute of Houston – 2700 Bay Area Blvd, Houston TX 77058  
<sup>2</sup> The Galveston Bay Foundation - 17330 Highway 3, Webster, Texas 77598



## Galveston Bay (GB)

- Estuary of National Significance
- 600 sq. mile anthropogenically altered shallow bay
- Growth & industrialization from the 1950's – 70's contributed to 95% decline in submerged aquatic vegetation and led to listing on the EPA's top 10 most polluted waterways
- Management activities have improved water quality & health; however, concerns over pathogenic bacteria & chlorinated organic compounds persist<sup>1,2</sup>

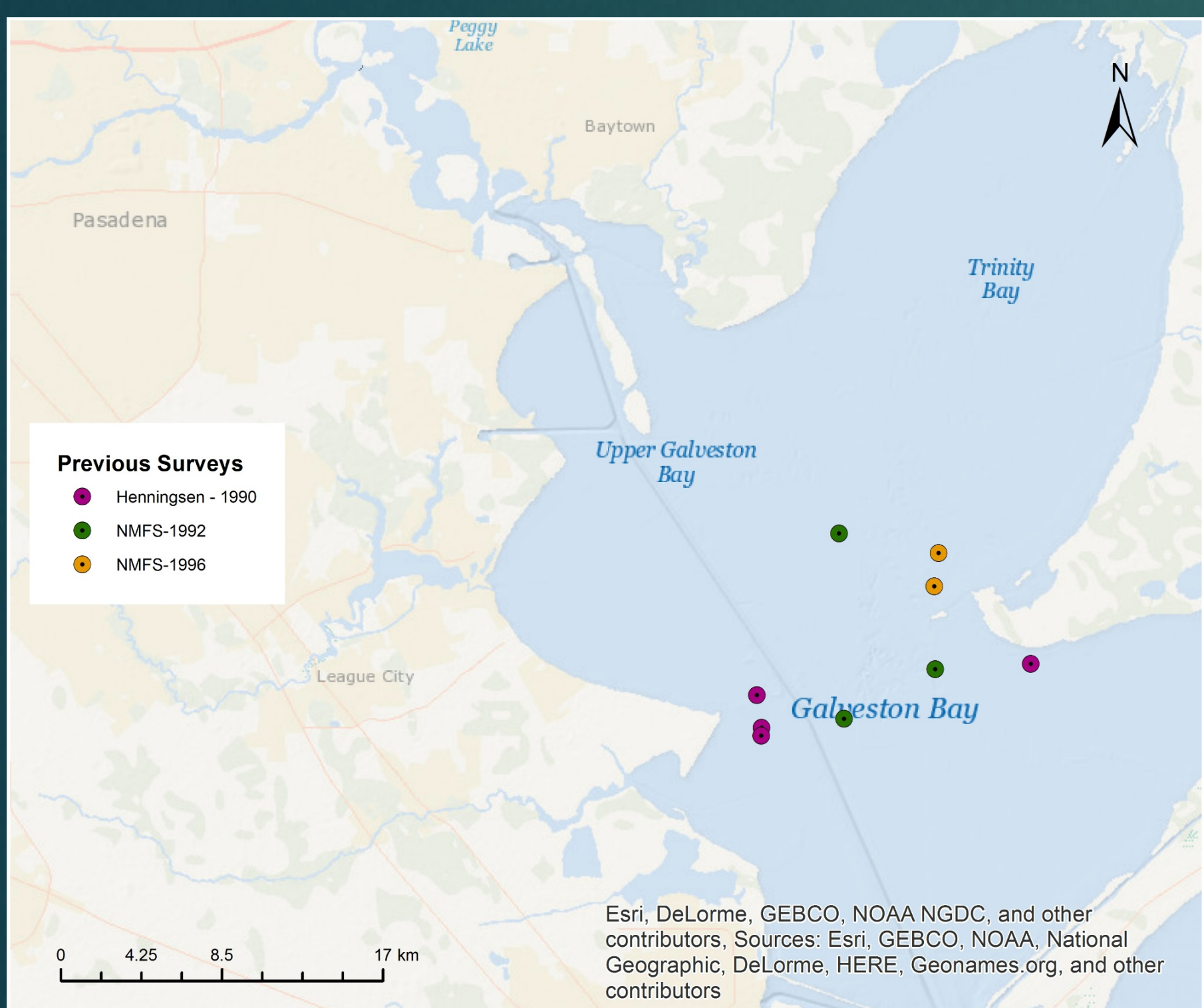


## Previous Findings

From the 1980's to early 2000's, studies of bottlenose dolphins (*Tursiops truncatus*) in Texas (largely conducted by Texas A&M University Marine Mammal Behavior Lab) found:

- High concentrations of dolphins in the Galveston Ship Channel & Bolivar Roads; lower concentrations in GB & East Bay
- Mostly transient individuals (est. 200 residents) with increased abundance during summer & fall months
- Opposing abundance patterns in southern Texas bays, suggesting seasonal migration
- A decrease in abundance moving north from Bolivar roads in the Houston Ship Channel (HSC)<sup>4</sup> & little or no activity in upper & Trinity Bay regions<sup>5,6</sup>
- High levels of association between dolphins and man-made channels & shrimp boats

## Sightings from previous surveys with effort covering upper GB



Henningsen: 13 Surveys focused on upper and lower Galveston Bay and 8 surveys focused on Trinity Bay (May–October 1990)<sup>5</sup>

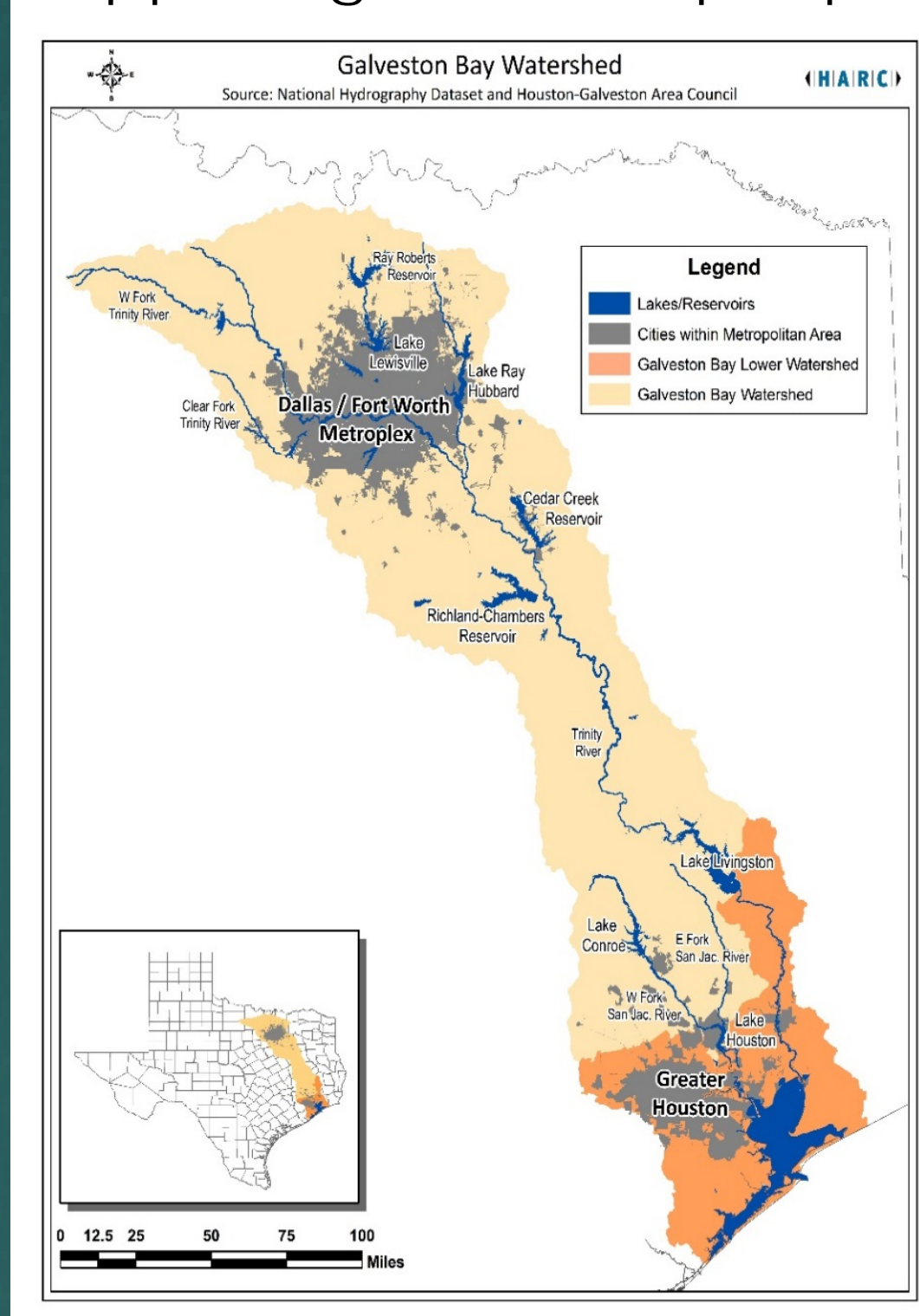
NMFS: Galveston Bay (Block 56) Gulf of Mexico Regional Aerial Surveys (September–October 1992<sup>6</sup> and 1996 (unpublished))

## Literature Cited

- 1 TCEQ *The State of the Bay: A Characterization of the Galveston Bay Ecosystem, Third Edition*. 2011, Texas Commission on Environmental Quality. 356pp
- 2 DSHS. *Characterization of Potential Adverse Health Effects Associated with Consuming Fish from the San Jacinto River - Houston Ship Channel, Harris County, Texas*. 2013, Department of State Health Services, Division for Regulatory Services: Policy, Standards, and Quality Assurance Unit; Seafood and Aquatic Life Group. 53 pp.
- 3 "Waterborne Commerce Statistics Center, New Orleans, LA." U.S. Army Corps of Engineers Navigation Data Center. Accessed Web. 30 Mar. 2015. <<http://www.navigationdatacenter.us/wcsc/wcsc.htm>>
- 4 Moreno, M.P.T., *Environmental Predictors of Bottlenose Dolphin Distribution and Core Feeding Densities in Galveston Bay, Texas*. 2005, Texas A&M University.
- 5 Henningsen, T. 1991. *The distribution and ecology of bottlenose dolphin (Tursiops truncatus) in Galveston, Texas*. Thesis from the Faculty of Mathematics and Natural Sciences of the University of Kiel. 79 pages
- 6 Blaylock, R. A. and W. Hoggard (1994). "Preliminary estimates of bottlenose dolphin abundance in southern US Atlantic and Gulf of Mexico continental shelf waters." NOAA Tech. Memo. NMFS-SEFSC 356(10)

## The upper Galveston Bay study area: a high risk environment

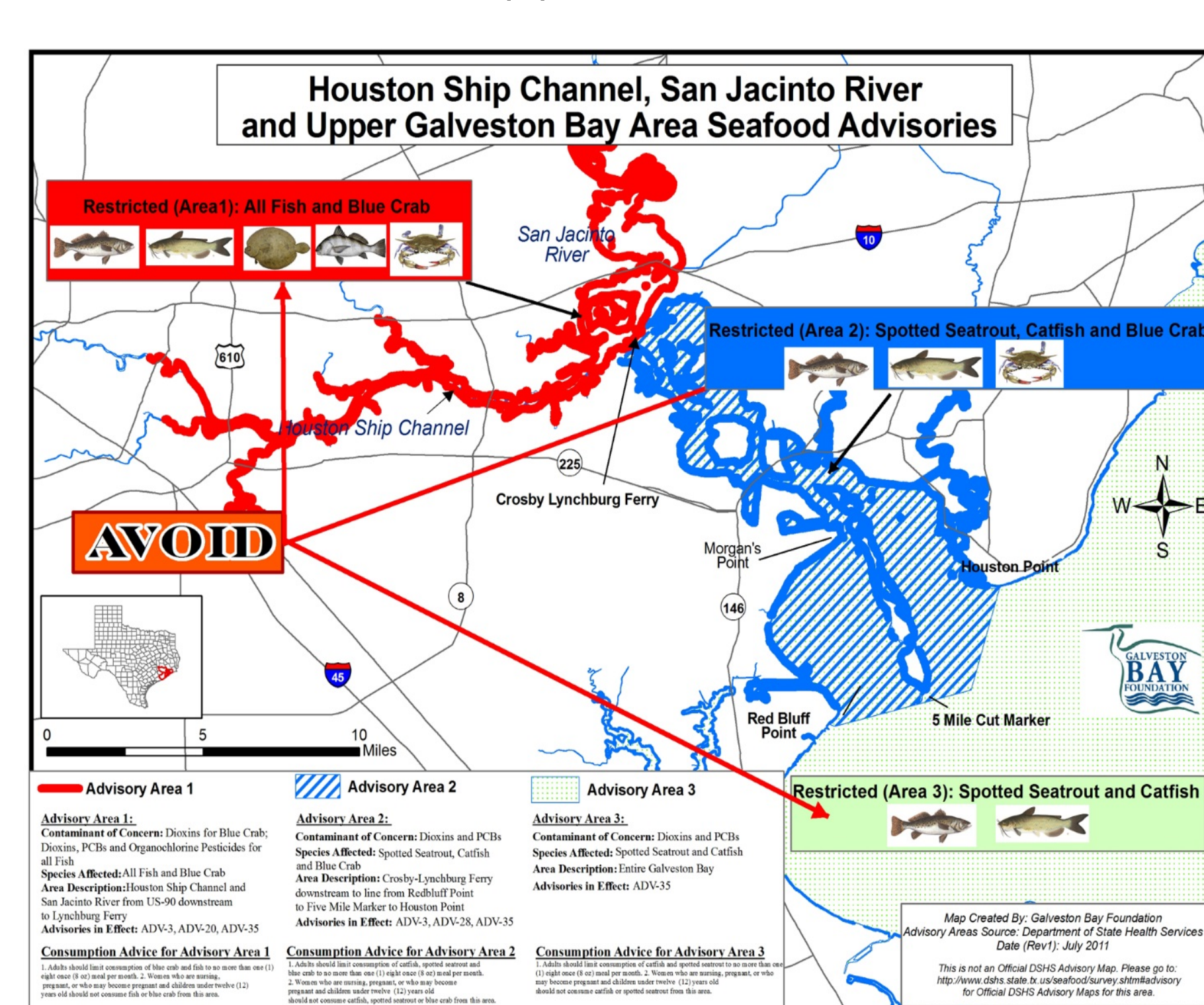
Fed by a watershed supporting >4 Million people



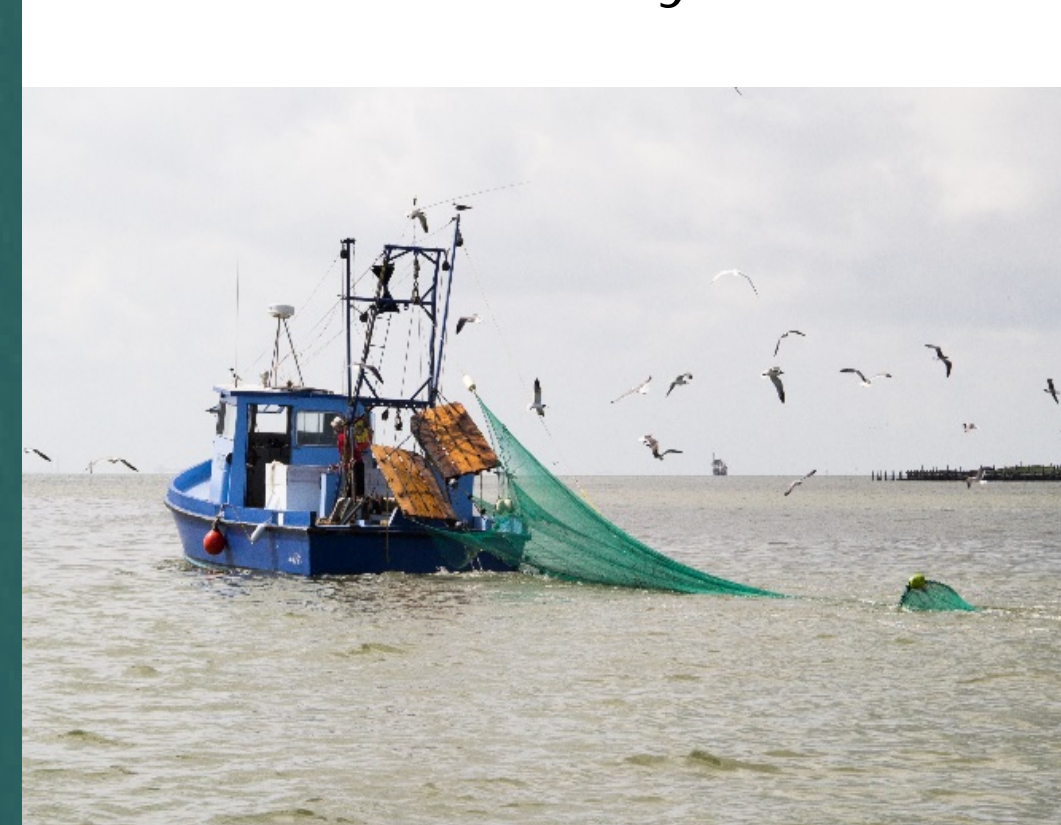
Second largest petrochemical complex in the world, including >100 waterfront facilities



Active seafood advisories due to PCB's & Dioxins focus on upper GB & the HSC<sup>2</sup>



Heavy Commercial and Recreational Fishing, generating > \$1 Billion annually



Over 175,000 vessels transit the HSC annually carrying >200 million tons of cargo<sup>3</sup>; Two collisions caused significant spills in 2014-2015



## Dolphins associate frequently with vessels in the HSC



## GB Survey Summary 2013-2014

Date	Survey Distance* (km)	Total # of Sightings	Total # of Dolphins	Total # of Calves	Total # of Young of Year
27-Mar-2013	0	3	21	1	0
28-Aug-2013	76	10	39	2	0
14-Feb-2014	24	3	6	0	0
24-Mar-2014	65	1	1	0	0
10-Apr-2014	13	1	4	2	1
16-May-2014	56	2	7	1	0
4-Jun-2014	32	4	87	18	5
2-Jul-2014	44	10	73	11	1
11-Aug-2014	66	4	5	0	0
15-Oct-2014	70	2	9	2	0
23-Oct-2014	28	9	96	15	1
20-Nov-2014	66	2	4	1	0
4-Dec-2014	37	3	9	3	0
<b>TOTAL</b>	<b>577</b>	<b>54</b>	<b>361</b>	<b>56</b>	<b>8</b>

\*Survey Distance = Total # km surveyed while on effort under good or excellent conditions

## Future Investigations and Goals

of the Galveston Bay Dolphin Research and Conservation Program (GDRCP)

- Compare the upper GB catalog to others along the coast & submit to the Gulf of Mexico Dolphin Identification System.
- Survey long time bay users with questions regarding dolphin activity in upper GB
- Conduct structured mark-recapture surveys to estimate abundance
- Collect tissues for examination of persistent organic pollutants, stable isotopes & genetic markers (collaborating with NMFS SEFSC & NOAA Oceans and Human Health Branch)
- Investigate human interactions using an interdisciplinary perspective
- Develop education & outreach programs to increase public awareness and promote dolphins as sentinels for Galveston Bay ecosystem health

## Current Efforts

### Objectives

- Examine distribution, relative abundance, site fidelity & human interactions in upper GB
- Establish a long-term monitoring plan for the region

### Methodology

- Standard survey & photo-identification protocols
- FinBase Photo-Identification Database System
- Two seasons defined:  
 Summer-Fall (SF) = June – October  
 Winter-Spring (WS) = November – May
- Relative abundance: # dolphins sighted (d) per kilometer (km) surveyed
- Standard non-parametric tests to determine differences between seasons

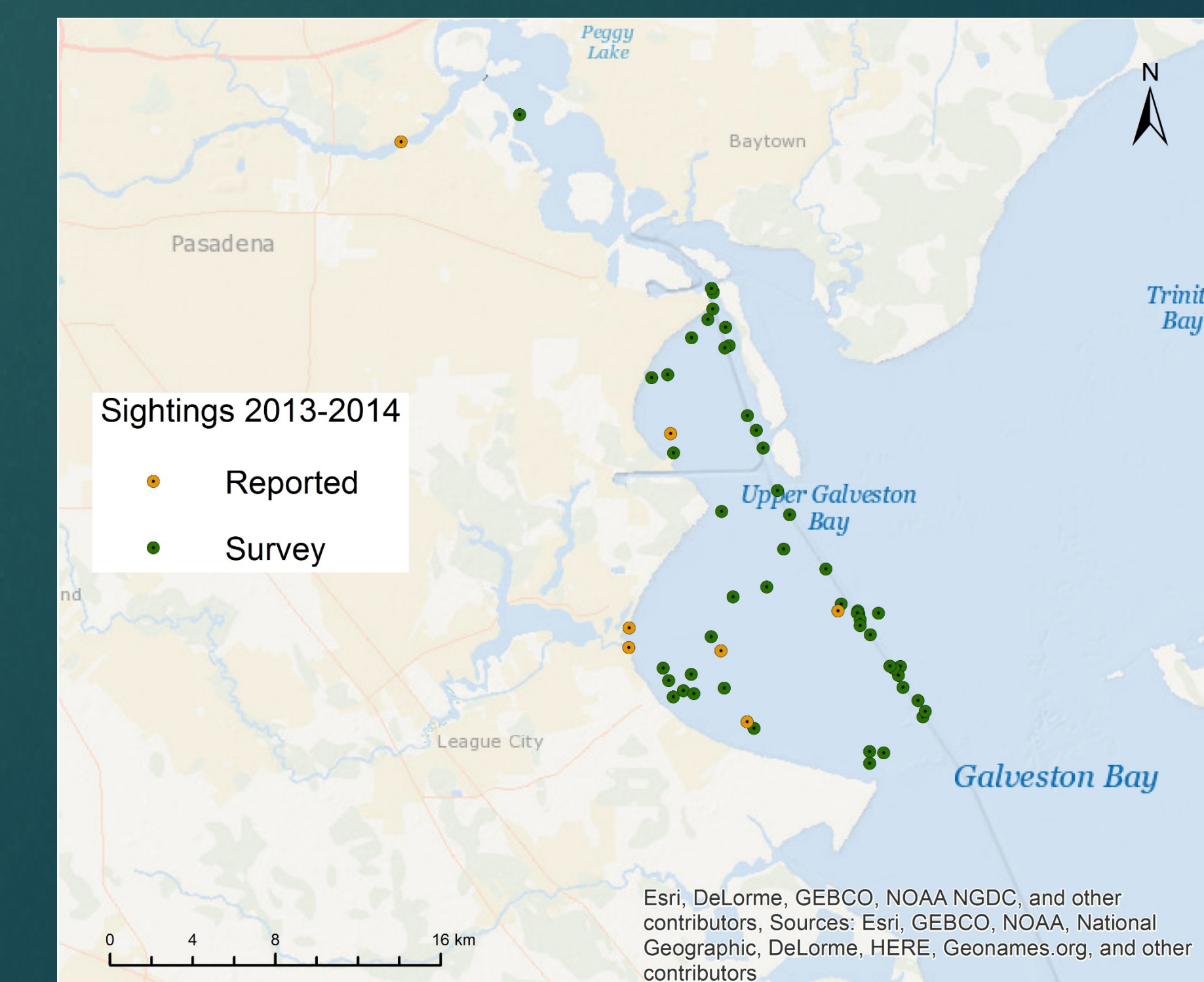
### Preliminary Results

- 13 surveys conducted from March 2013 to December 2014: 54 group sightings, 361 dolphins
- Identified 160 distinct individuals (total catalog marked proportion = 0.715): 113 sighted once, 42 twice, 7 three times, 2 sighted > three times
- Dolphins were sighted year round, however there was a significant difference in relative abundance (d/km) between seasons, with higher concentrations sighted in SF (Md = 1.080) compared to WS (Md = 0.093) (Mann-Whitney U = 31, n<sub>SF</sub> = n<sub>WS</sub> = 6, p = 0.021 one-tailed)
- Group size ranged from 1-31, with larger groups of 10 or more dolphins sighted only during SF (n=8); There was no significant difference in group size between SF & WS (Mann-Whitney U = 376, n<sub>SF</sub> = 39, n<sub>WS</sub> = 15, p = 0.055 one-tailed)
- 30% of groups sighted were patrolling around shrimp boats & 24% were bow-riding on a vessel (typically a cargo ship, barge or workboat in the HSC)

### Conclusions

Preliminary results of this ongoing project show that bottlenose dolphins utilize upper GB, a region previously thought to have little or no dolphin activity, throughout the year with an increase in relative abundance during SF. Dolphins often associate with shrimp trawlers and vessels in the HSC. More investigation is needed due to the high risk environment.

## All Dolphin sightings, on survey effort and reported by volunteers and staff (March 2013 – December 2014)



## Part of the Texas Bottlenose Dolphin Research Collaborative

A cooperative network of scientists and institutions facilitating the creation of a long-term monitoring program with goals to provide population distribution and abundance estimates, identify natural and human-generated risks and establish baseline health parameters for Texas bay, sound, estuary and near-coastal bottlenose dolphins.

