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Effects of salinity on distribution and epidermal integrity of bottlenose dolphins (*Tursiops truncatus*) in Galveston Bay, Texas

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GALVESTON BAY
DOLPHIN RESEARCH PROGRAM

Environmental Institute of Houston

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Activities conducted under NOAA Fisheries Scientific Research Permit #23203

Galveston Bay Dolphin Research Program (GDRP)

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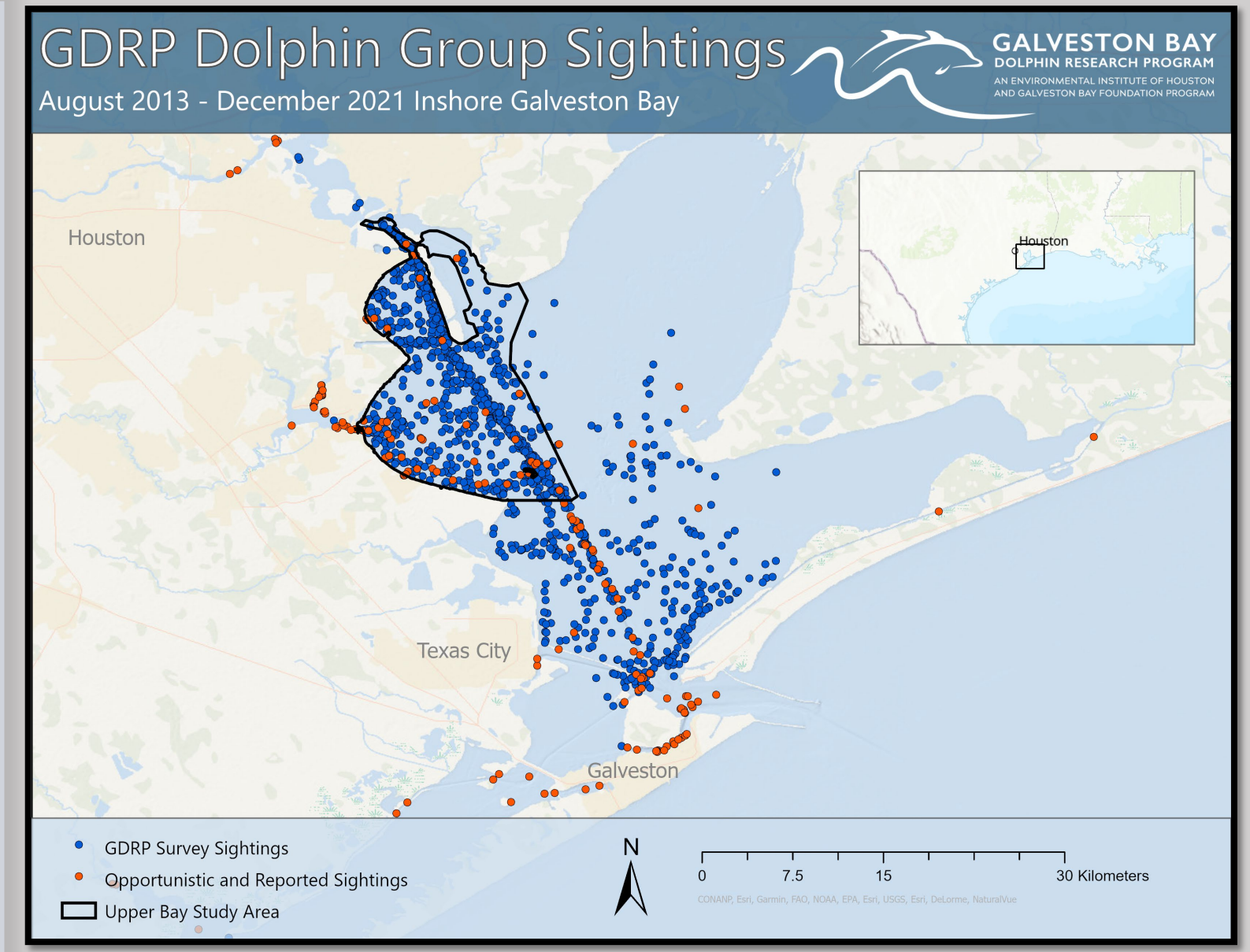
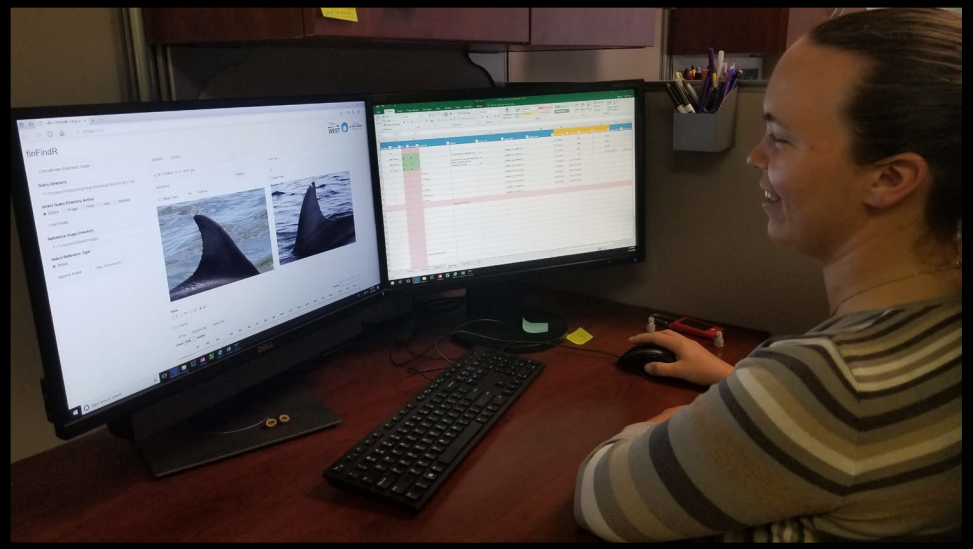
- Long-term monitoring to study the ecology, behavior and health of the bottlenose dolphin population
- Boat-based surveys since 2013 (standardized monthly since 2016)
- Focus on Upper Galveston Bay
- Photo-Identification
- Catalog: 942+ distinct individuals; ~200 “residents”

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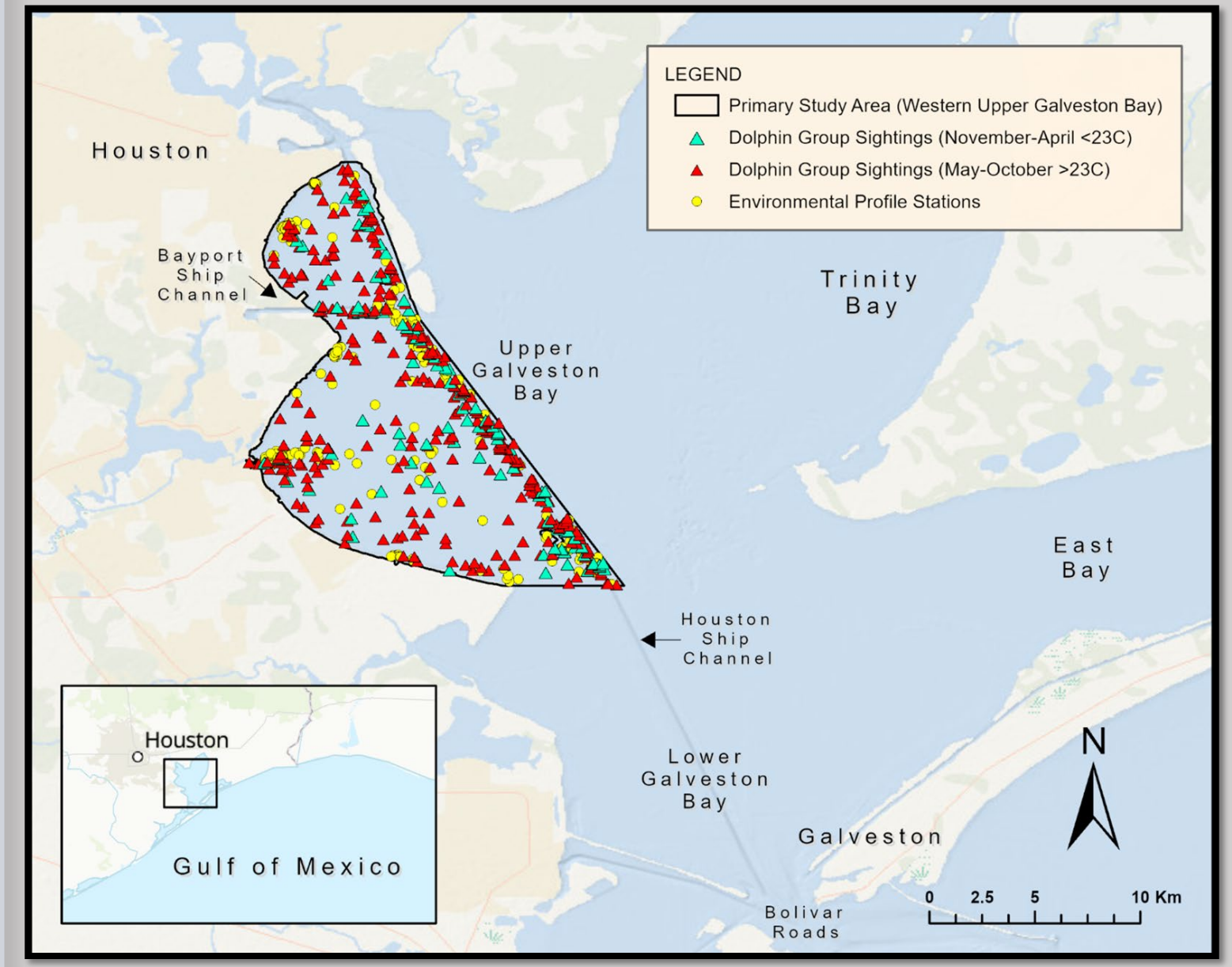
Encounter Rates

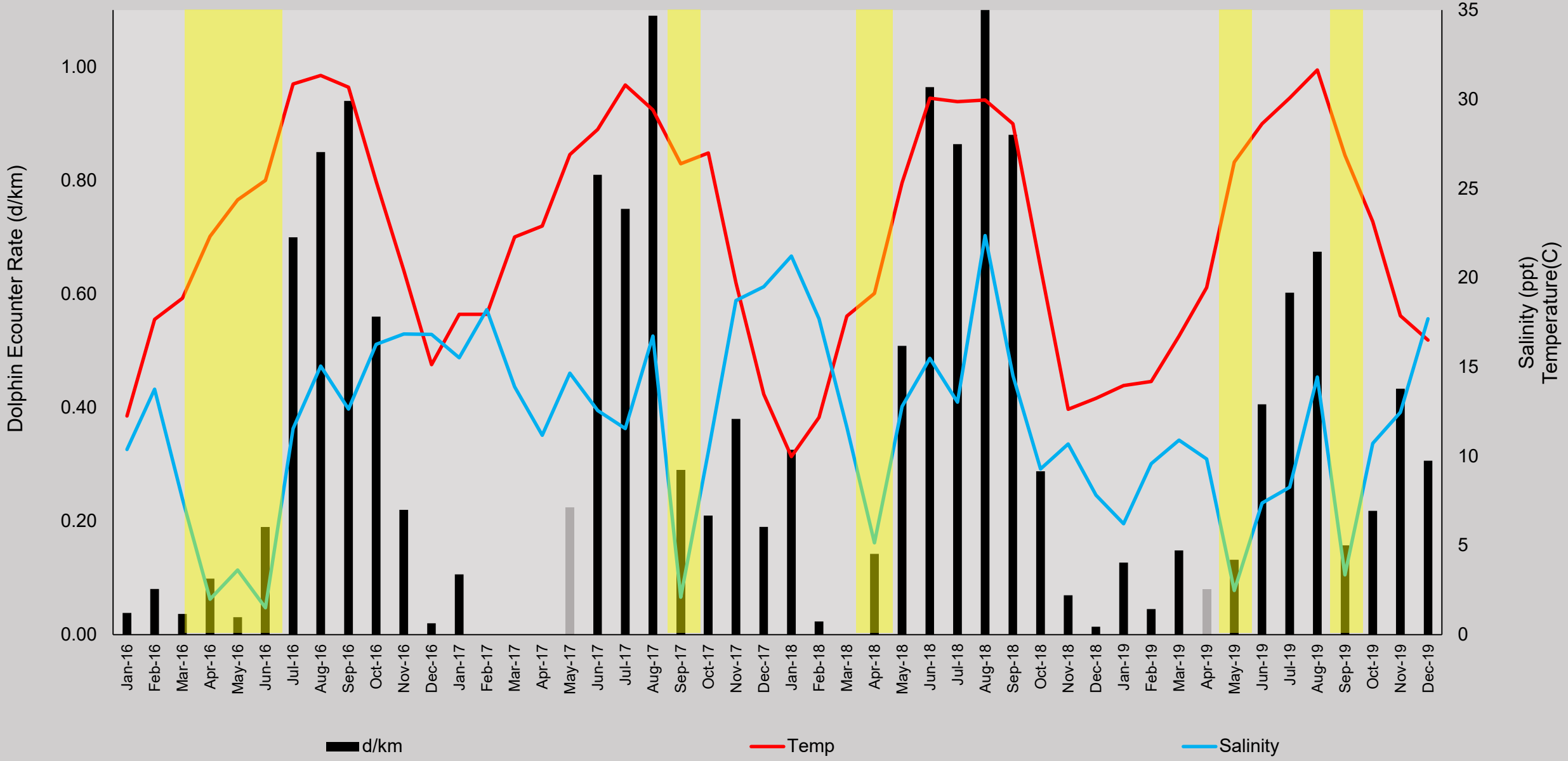
d/km = # dolphins sighted per linear km surveyed

- 2016-2019 monthly surveys
- 105 survey days; 6655 km; 2388 dolphins in 355 groups
- Environmental Profiles

Results:

- Average 0.34 d/km
  range 0.00 – 1.23
- Dolphins found year-round in UGB




Encounter rates (dolphins/km) in Upper Galveston Bay from 2016-2019
Dolphin Ecounter Rate (d/km)
1.00
0.80
0.60
0.40
0.20
0.00
35
30
25
20
15
10
5
0
Salinity (ppt)
Temperature(C)
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
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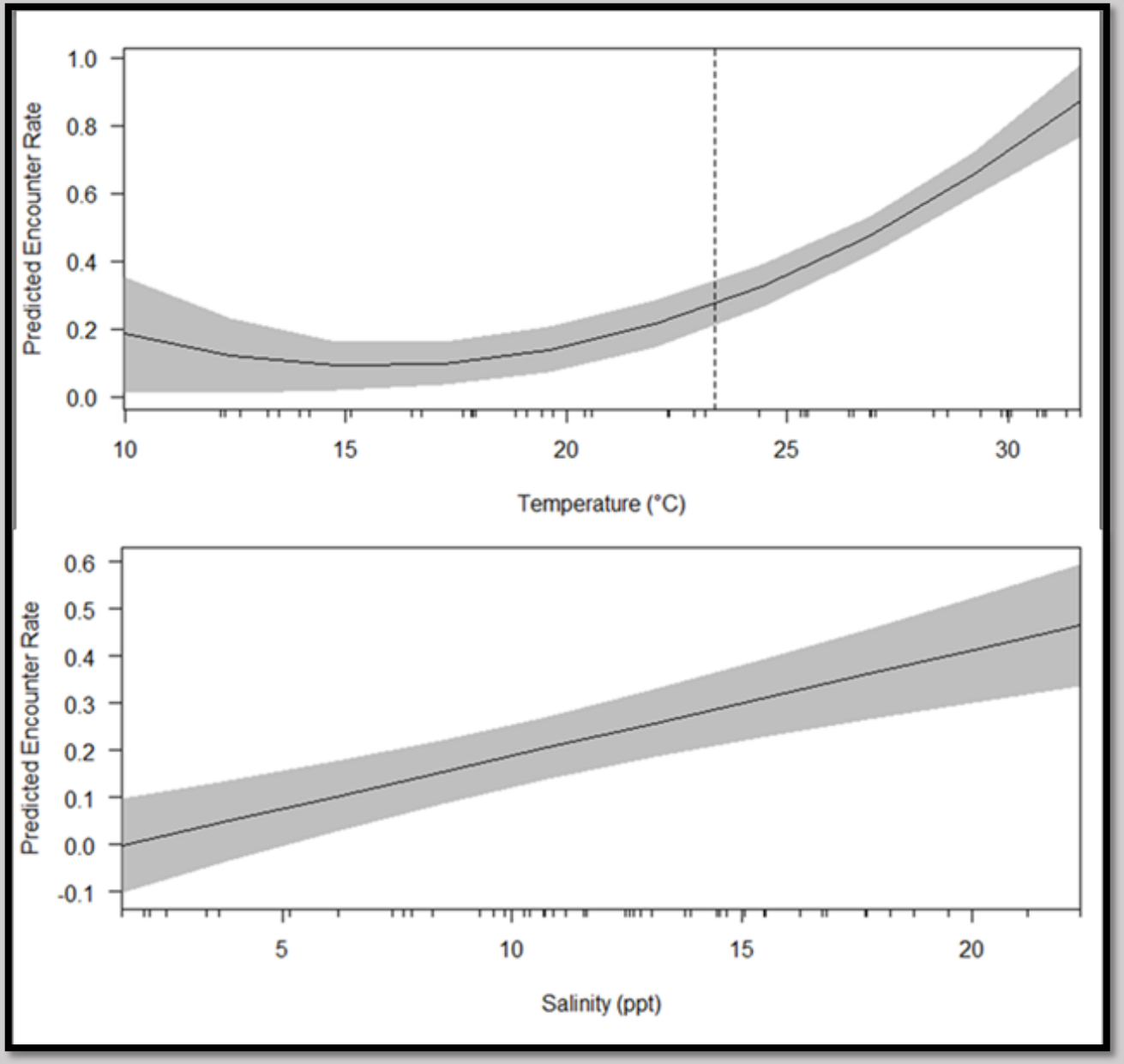
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
d/km
Temp
Salinity

Encounter Rates

Multiple Linear Regression

- 80% of variables explained by temperature and salinity
- Breaking point of 23°C when ERs increase
- Positive linear relationship with salinity
  → 0.02 d/km increase with 1.00ppt increase



Potential health consequences of low salinity exposure

"Freshwater Intoxication"

- Skin lesions = "hydropic degeneration" of the epidermis; may be accompanied by opportunistic fungal or algal growth
- Potential for:
  - Secondary infection
  - Electrolyte imbalance
  - Corneal edema
  - Increase disease and contaminant exposure risk
  - Mortality

NMFS Permit# 18881

NMFS Permit#18881

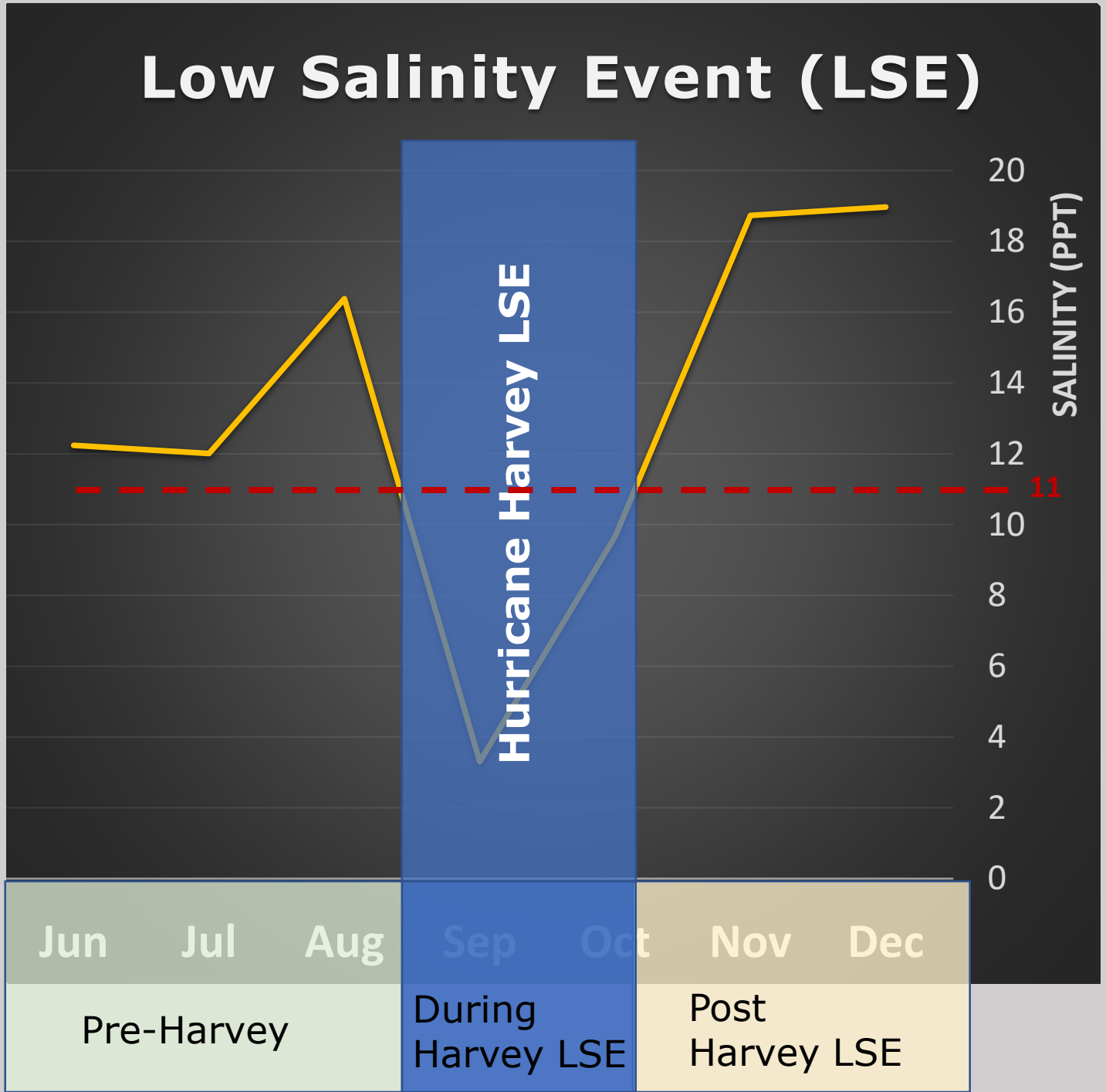
Hurricane Harvey Case Study

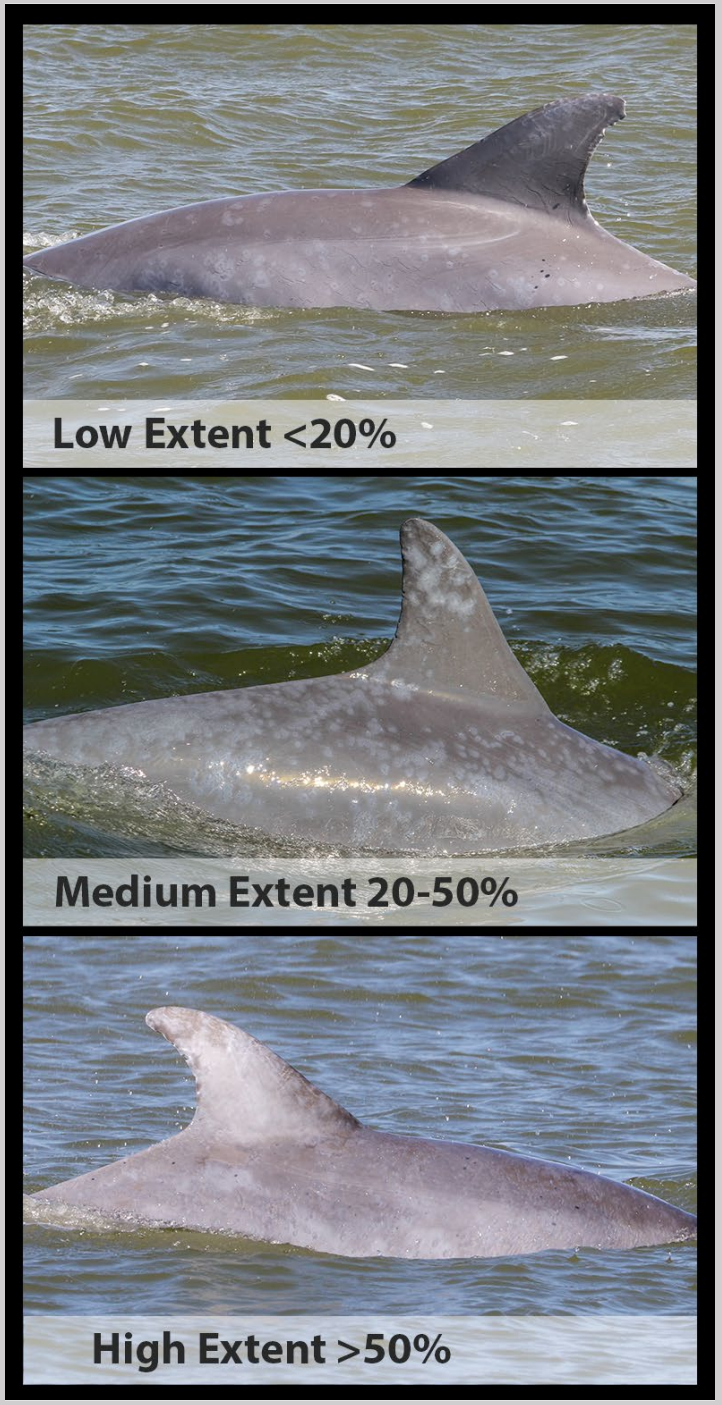
August 27th, 2017

Skin Lesions

Minimum Prevalence = proportion of identified individuals that exhibited visible lesions

Extent = percentage of each individual's epidermis covered by lesions

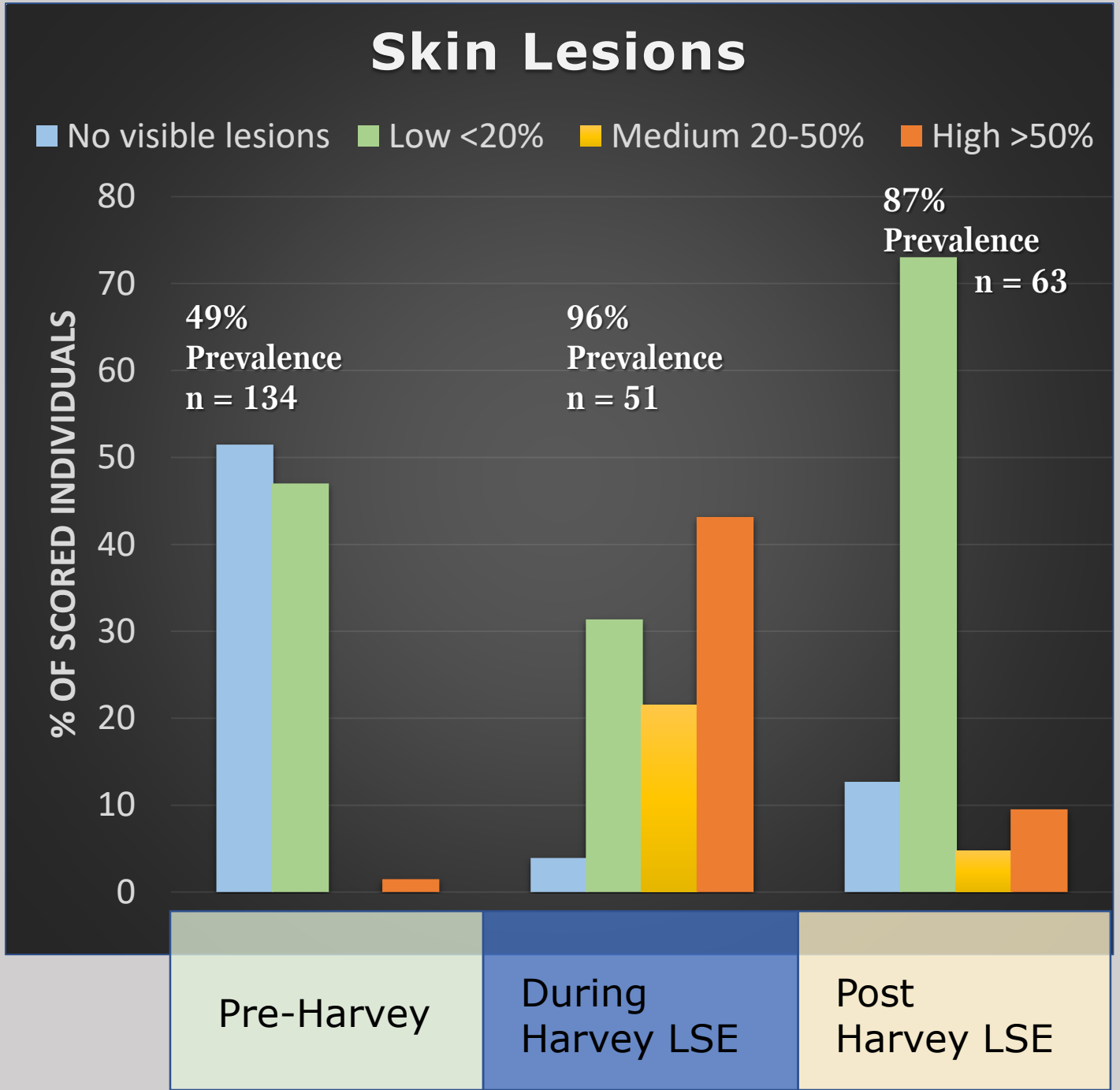


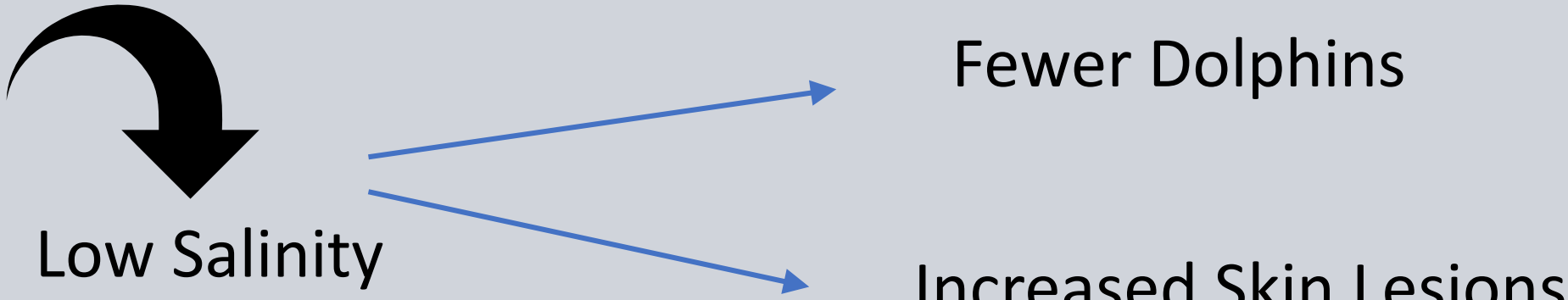

Low Extent <20%
Medium Extent 20-50%
High Extent >50%

Skin Lesions

- Prevalence and extent of skin lesions increased from Pre-Harvey to During Harvey LSE (*p<0.05, n=20)
- Lesion extent decreased from During Harvey LSE to Post Harvey LSE (*p<0.05, n=21)
- Lesion prevalence was higher Post Harvey LSE compared to Pre-Harvey(*p<0.05, n=29), but lesion extent did not differ

*McNemar's test for paired comparisons





Future Questions

- Effects of repeated freshwater exposure on individual and population health
- Who in the population is the most vulnerable?
- Critical habitats? Salinity refuge?
- Potential effects of climate change and coastal infrastructure projects

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GULF OF MEXICO ALLIANCE

RESTORE AMERICA'S ESTUARIES

CONSERVATION FUND

SEAWORLD BUSCH GARDENS

THE TRULL FOUNDATION

Publications

Mintzer, V. J. and K. L. Fazioli (2021). Salinity and Water Temperature as Predictors of Bottlenose Dolphin (Tursiops truncatus) Encounter Rates in Upper Galveston Bay, Texas. *Frontiers in Marine Science* 8(1627). https://doi.org/10.3389/fmars.2021.754686

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