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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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Activities conducted under NOAA Fisheries Scientific Research Permit #23203
Galveston Bay Dolphin Research Program (GDRP)

- 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”
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 Encounter Rate (dolphins/km)
- Temperature (C)
- Salinity (ppt)

Encounter rates (dolphins/km) in Upper Galveston Bay from 2016-2019
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 1.00 ppt 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
**Hurricane Harvey Case Study**

**August 27\textsuperscript{th}, 2017**

**Skin Lesions**

**Minimum Prevalence** = proportion of identified individuals that exhibited visible lesions

**Extent** = percentage of each individual’s epidermis covered by lesions

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**Low Salinity Event (LSE)**

- **Pre-Harvey**: SALINITY (PPT)
- **During Harvey LSE**: SALINITY (PPT)
- **Post Harvey LSE**: SALINITY (PPT)

- **Hurricane Harvey LSE**

- **Jun Jul Aug Sep Oct Nov Dec**

- **SALINITY (PPT)**
  - 0
  - 2
  - 4
  - 6
  - 8
  - 10
  - 12
  - 14
  - 16
  - 18
  - 20

- **Low Salinity Event (LSE)**
  - 11
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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Publications