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Mercury Monitoring in Texas Waters of the Gulf of Mexico



A CONCURRENT STUDY WITH
THE NATIONAL COASTAL
CONDITION ASSESSMENT

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<https://i.ytimg.com/vi/9jVxQvVh424/maxresdefault.jpg>

Introduction

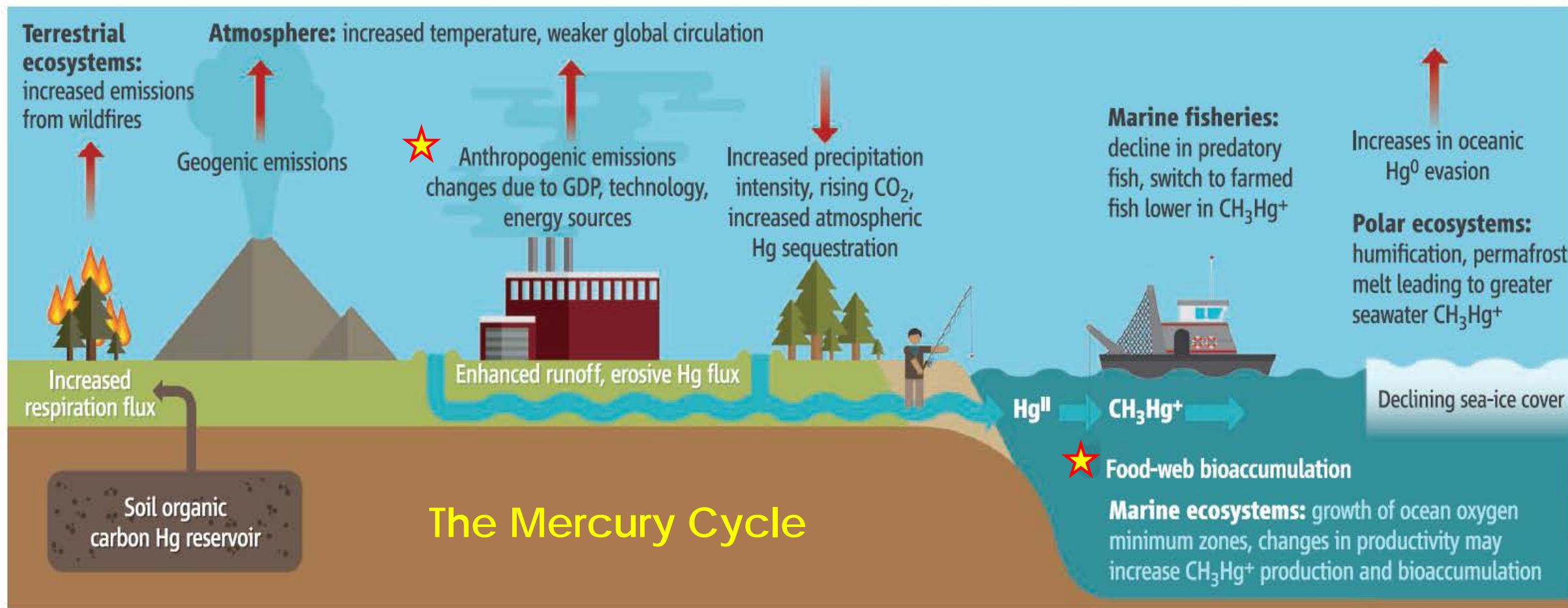
- ▶ No known biological function
- ▶ High bioaccumulation potential and also biomagnifies (Marburger 2004)



Photo Credit: Rowlatt 2013, <http://www.bbc.com/news/magazine-25130770>

Introduction

- ▶ Can pass to humans where it can cause nerve damage or convulsions
(Loftus 2000)
- ▶ FDA sets a fish mercury action level of 1mg/kg (FDA 1979)
- ▶ EPA recommends a daily mercury intake of no more than 0.0001 mg/kg daily (U.S. EPA 2008)



How mercury cycles through the environment. Global change interacts directly and indirectly with mercury cycling. Numerous physical, chemical, and

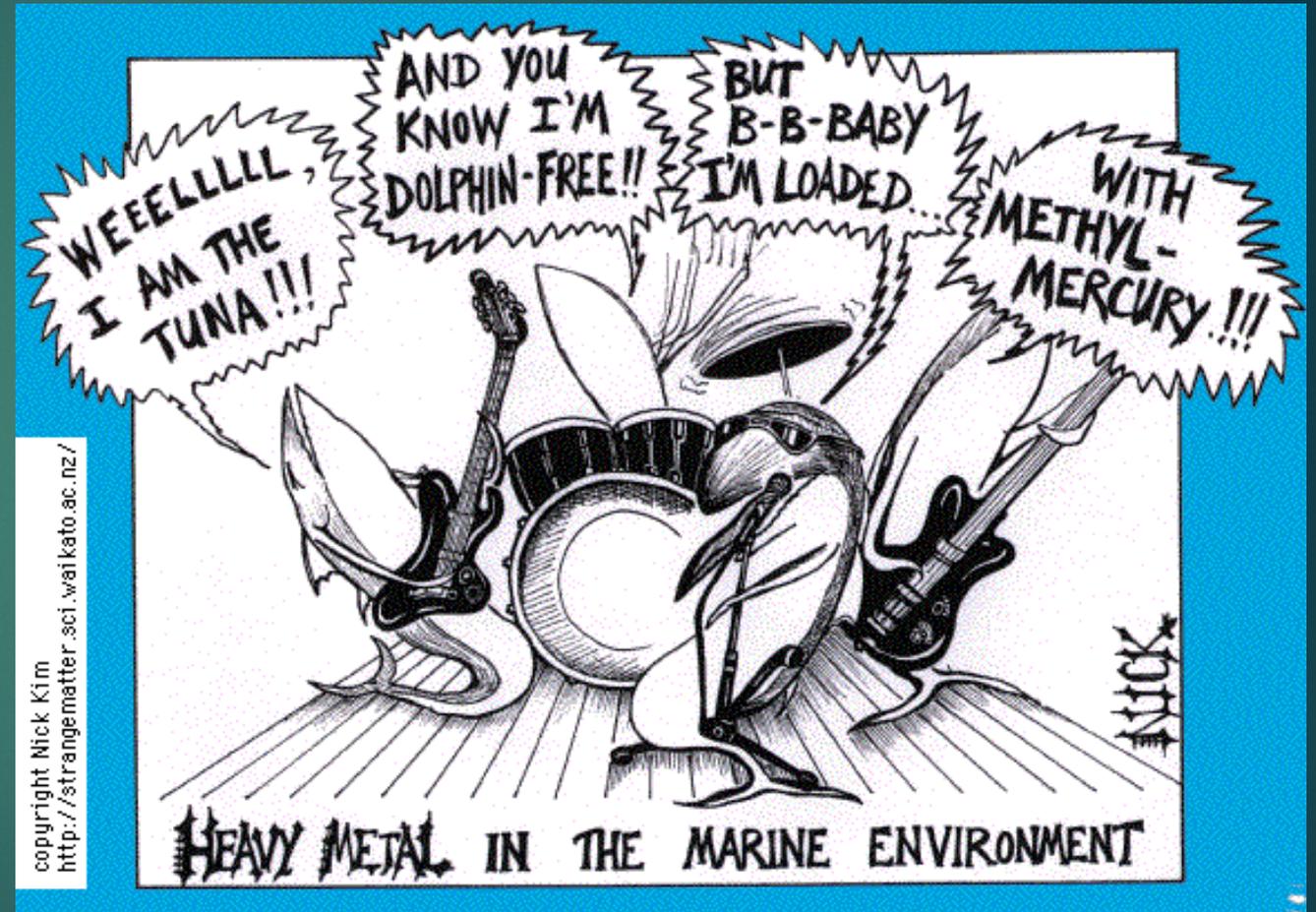
anthropogenic drivers will affect future mercury conditions in the atmosphere, terrestrial systems, and oceans.

Introduction: Texas Mercury

- ▶ **1973-1980** EPA spends millions on upgrades to water treatment facilities (Youngblood 2010)
- ▶ **1994** Still no routine testing of seafood or risk assessment (Youngblood 2010)
- ▶ **2001** Texas Natural Resource Conservation Commission re-organization into Texas Commission on Environmental Quality (Youngblood 2010)

Significance

- ▶ “Interagency Working Group on Methylmercury” called for a review of historical data and trends (Marburger 2004)
- ▶ Texas mercury exceeds USEPA standards 19% of the time (Harvey 2008)



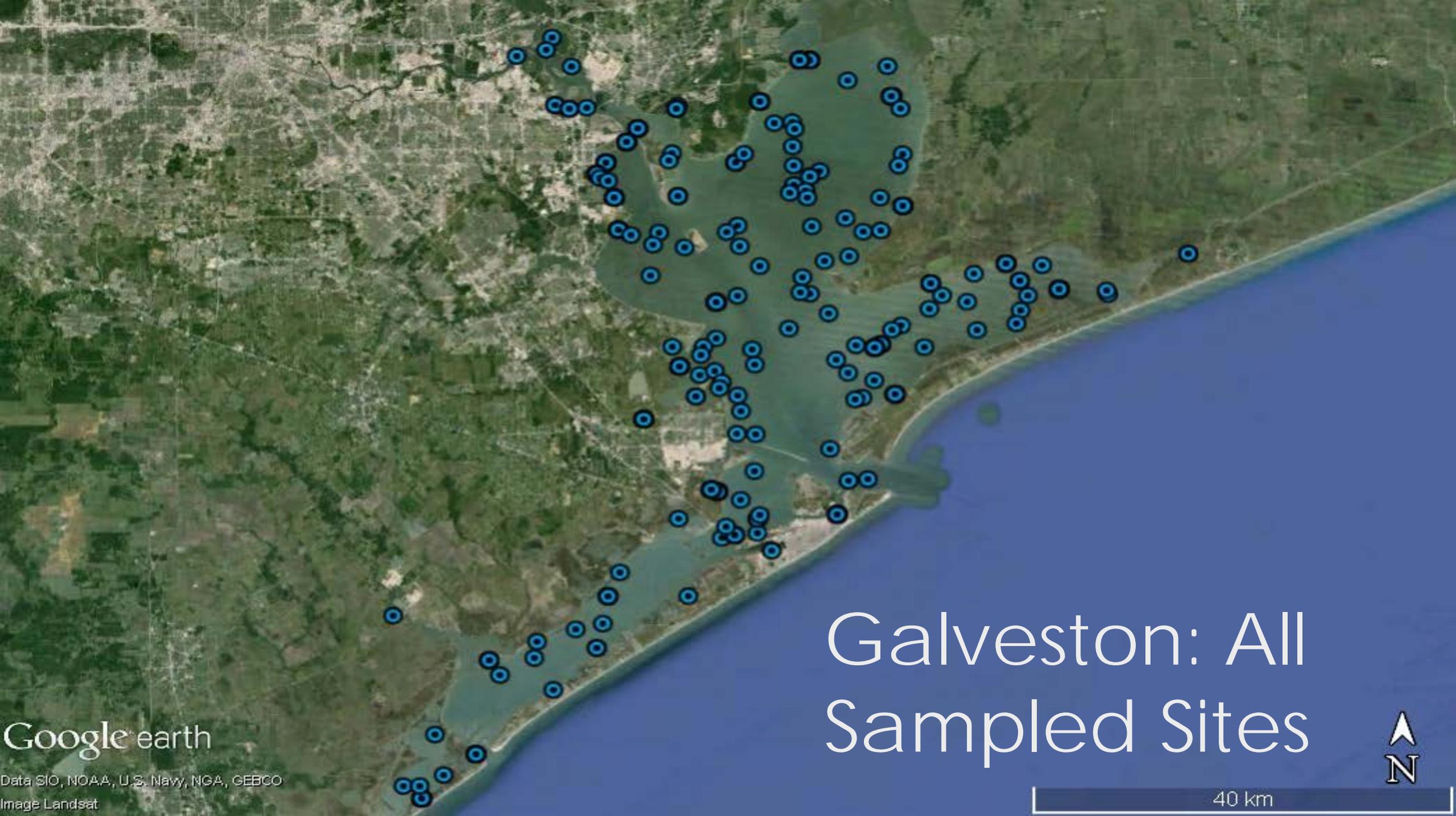
http://www.lab-initio.com/screen_res/nz296.jpg

Objectives

- ▶ Assemble a database of verifiable, quality, reproducible data
- ▶ Determine trends from 1970 to 2010 in levels of mercury in bay systems with a focus on Atlantic Croaker (*Micropogonias undulatus*)
- ▶ Compare croaker mercury levels between bay systems

Methods

- ▶ Target species: Atlantic Croaker (*Micropogonias undulatus*)
- ▶ Database include: National Coastal Condition Assessment, Department of State Health Services, Environmental Monitoring and Assessment Program
- ▶ Data grouped by bay systems then analyzed using Kruskal-Wallis and Mann-Kendall nonparametric tests
- ▶ All data evaluated using a statistical package in Minitab

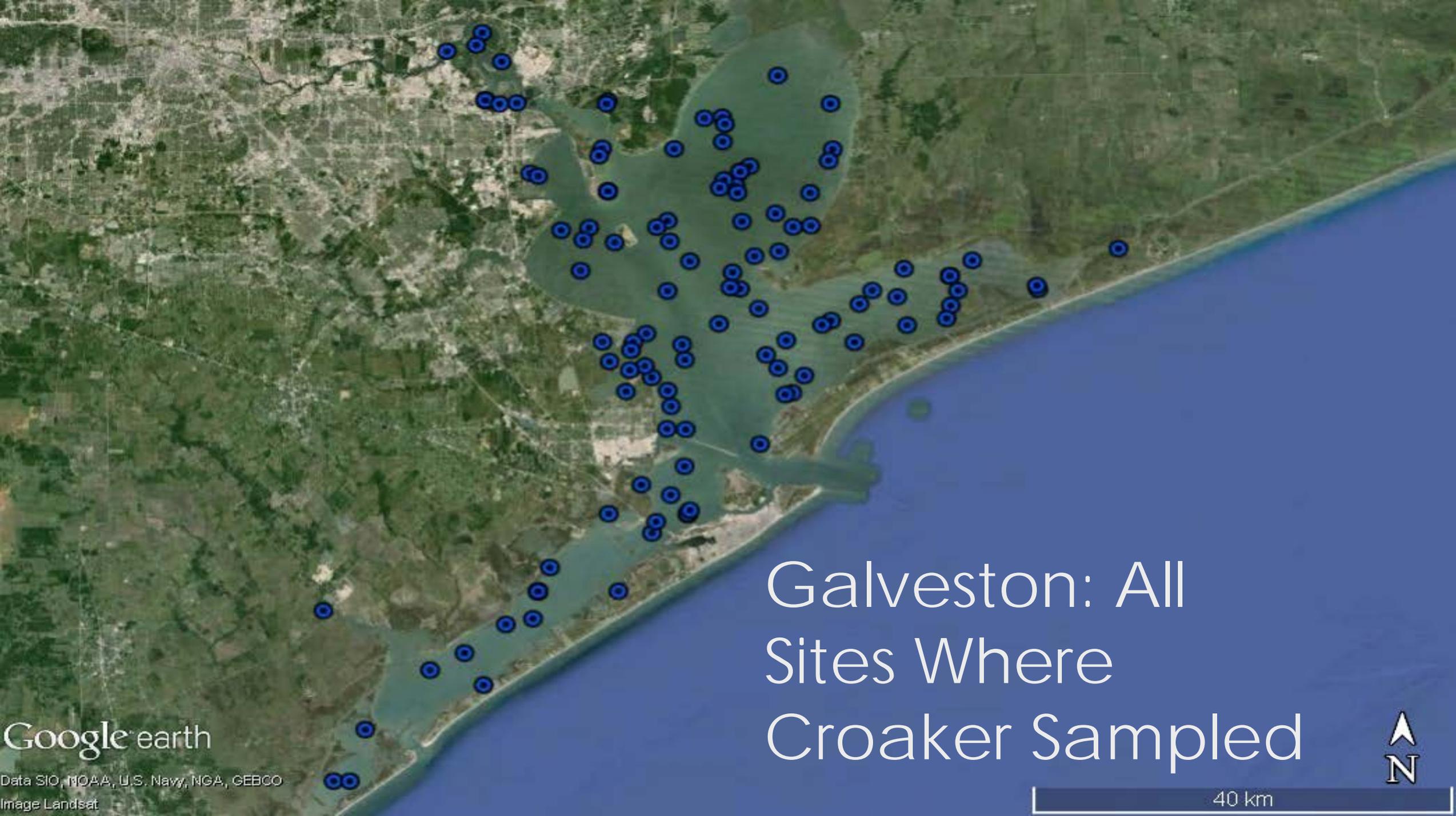


Galveston: All Sampled Sites

Google earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat





Galveston: All Sites Where Croaker Sampled

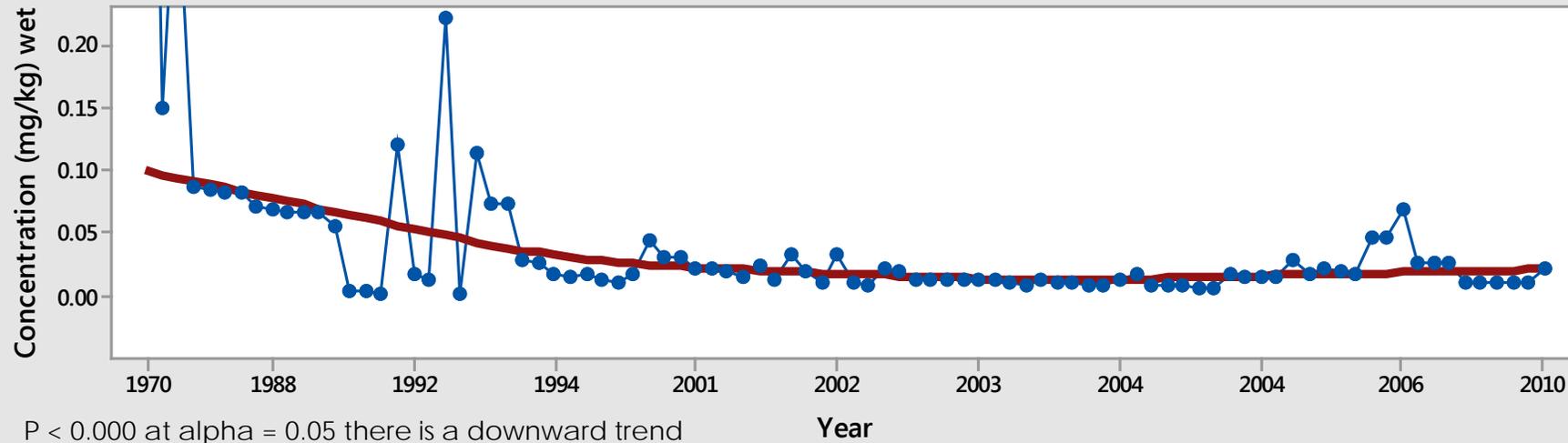
Google earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat



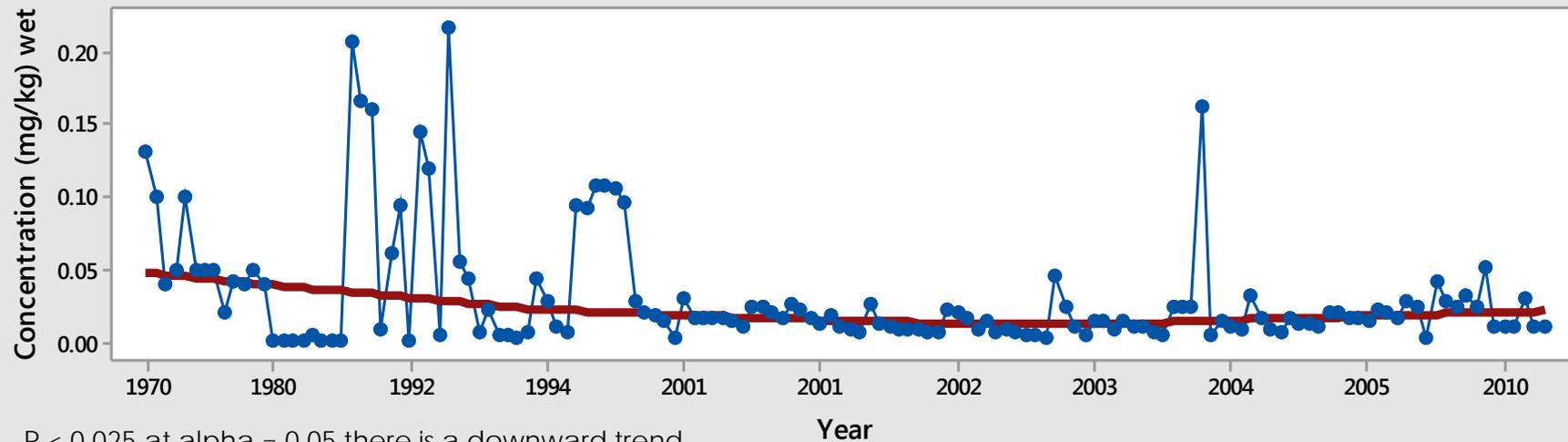
Results

Matagorda Bay Croaker: 1970 - 2010



P < 0.000 at alpha = 0.05 there is a downward trend

Galveston Bay Croaker: 1970 - 2010



P < 0.025 at alpha = 0.05 there is a downward trend

Daily Consumption Limit

EPA daily level = 0.0001 mg/kg¹

ASTDR daily level = 0.0003 mg/kg¹

Commercial Limit

EPA standard = 0.30 mg/kg¹

TDH standard = 0.70 mg/kg¹

FDA action level = 1.00 mg/kg¹

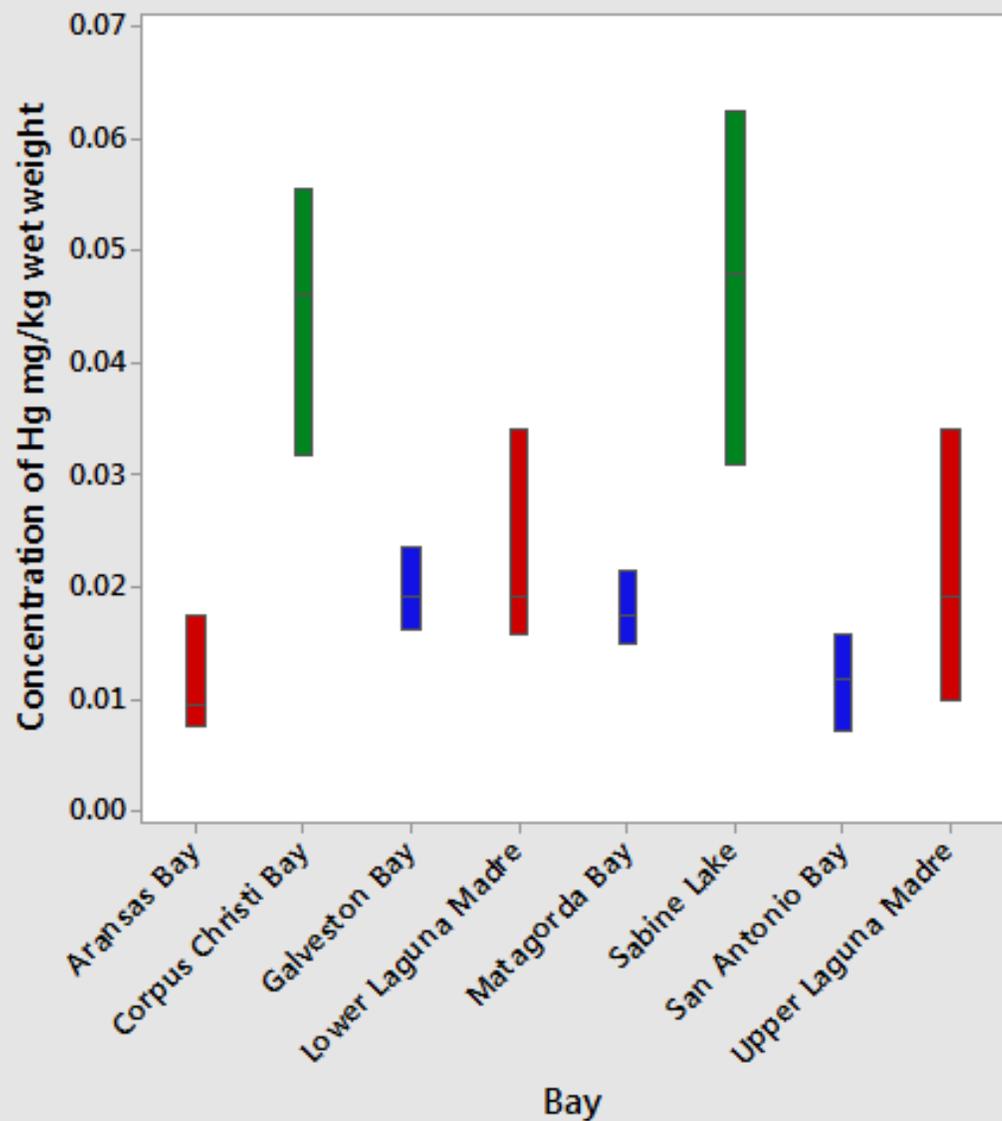
Marine Fish Toxicity Level

Marine Fish TRL = 0.31 mg/kg¹

1. U.S. EPA 2008, U.S. FDA 1979, GASP 2004, Bowersox 2015, TDSHS 2015

1970 to 2010 Kruskal-Wallis Comparisons

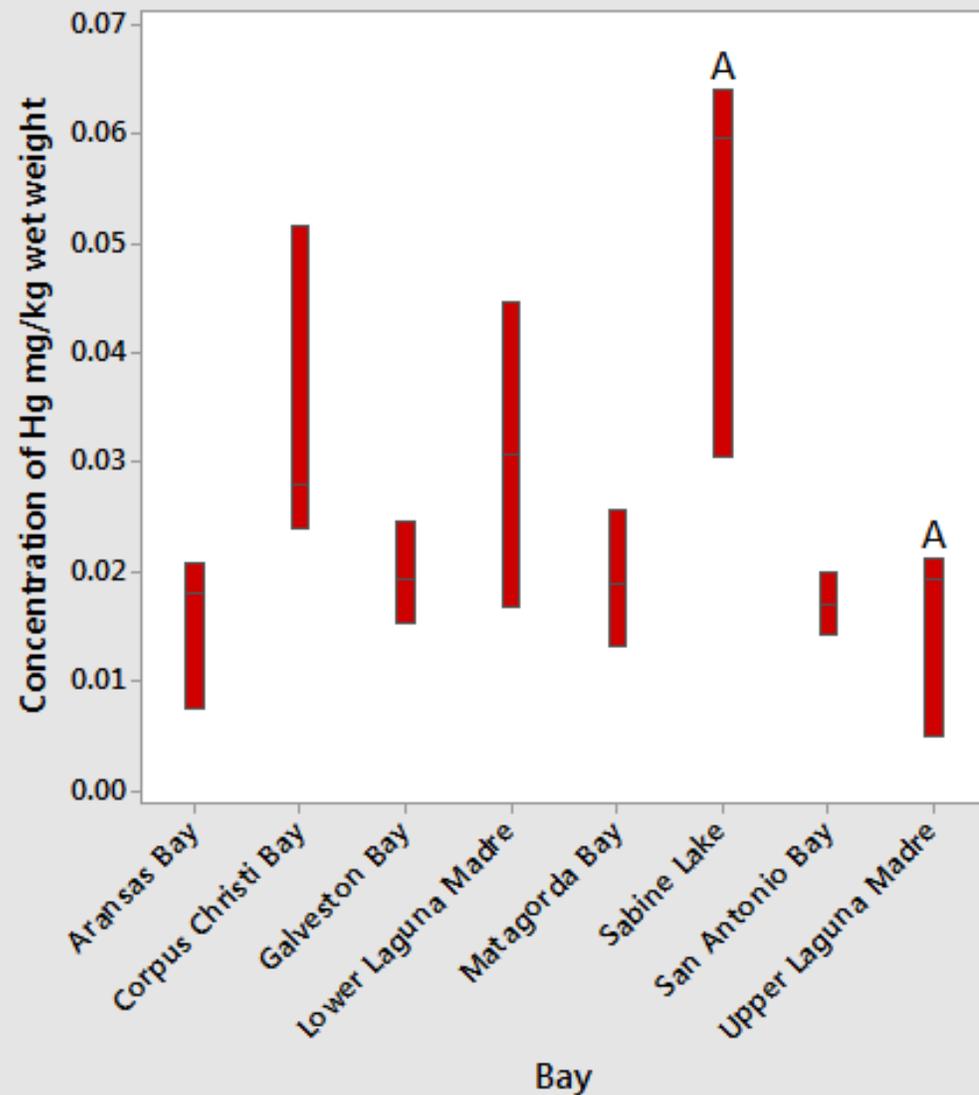
Desired Confidence: 94.285



Family Alpha: 0.2
Bonferroni Individual Alpha: 0.007

2005 to 2010 Kruskal-Wallis Comparisons

Desired Confidence: 94.285



Family Alpha: 0.2
Bonferroni Individual Alpha: 0.007

P<0.0053

Summary

- ▶ Creation of a database of all available verifiable, quality, reproducible mercury in fish tissue data
- ▶ Although highly variable, most mercury in A. Croaker muscle tissue has been generally declining over time
- ▶ Mercury in croaker does not significantly differ between bays systems

Conclusions/Implications

- ▶ Regulations have an impact based on trends in overall mercury
- ▶ Mercury may be increasing not from direct loading but from historical deposits (Harris 2007)
- ▶ Methods for cleaning or removing historical mercury deposits
- ▶ Necessity for continued mercury monitoring

Future Studies

- ▶ Sample tissue collected as part of the May to August 2015 National Coastal Assessment project in Texas bays
- ▶ Compare current data to 50-year trends from 1985 to 2015 in levels of mercury in game fish in Texas bays
- ▶ Continue to collect and compile data sources: Texas Commission on Environmental Quality, Regional Environmental Monitoring and Assessment (REMAP)



Photo Credit: Caren Brinkema

Acknowledgements



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Questions?