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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/9jVxQfWh424/maxresdefault.jpg
Introduction

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

(Krabbenhoft 2013)
Introduction: Mercury in Galveston Bay

- **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 reorganization 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)
Objectives

- Assemble a database of verifiable, quality, reproducible data
- Determine trends from 1970 to 2015 in levels of mercury in Galveston Bay with a focus on Atlantic Croaker (Micropogonias undulatus)
- Compare Galveston Bay croaker mercury levels to other bay systems in Texas
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
Results

Galveston Bay Croaker: 1970 - 2010

Daily Consumption Limit
EPA daily level = 0.0001 mg/kg\(^1\)
ASTDR daily level = 0.0003 mg/kg\(^1\)

Commercial Limit
EPA standard = 0.30 mg/kg\(^1\)
TDH standard = 0.70 mg/kg\(^1\)
FDA action level = 1.00 mg/kg\(^1\)

Marine Fish Toxicity Level
Marine Fish TRL = 0.31 mg/kg\(^1\)

\(P < 0.0254476\) at alpha = 0.05 there is a downward trend

Indicate significant differences between Galveston vs other bays.

P<0.0003 Galveston vs Sabine
P<0.0000 Galveston vs Corpus Christi

Family Alpha: 0.2
Bonferroni Individual Alpha: 0.007

 Indicates significant differences between Galveston vs other bays

Family Alpha: 0.2
Bonferroni Individual Alpha: 0.007
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.
- Galveston Bay mercury in croaker does not significantly differ from most other bay 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
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Questions?