

Alligator Gar in Texas' Coastal Zone: *Insights from Otolith Microchemistry and Genetic Analyses*

***D. J. Daugherty¹, K. L. Pangle², W. Karel³, C. R.
Robertson¹, N. Boyd³, D. Buckmeier¹, N. Smith¹, and
F. Baker²***

¹ Texas Parks and Wildlife Department, Inland Fisheries Division

² Department of Biology, Central Michigan University

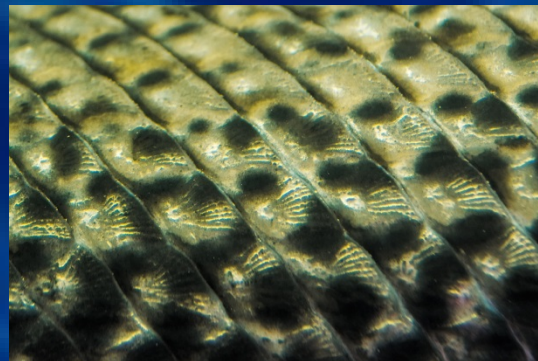
³ Texas Parks and Wildlife Department, Coastal Fisheries Division



**TEXAS
PARKS &
WILDLIFE**

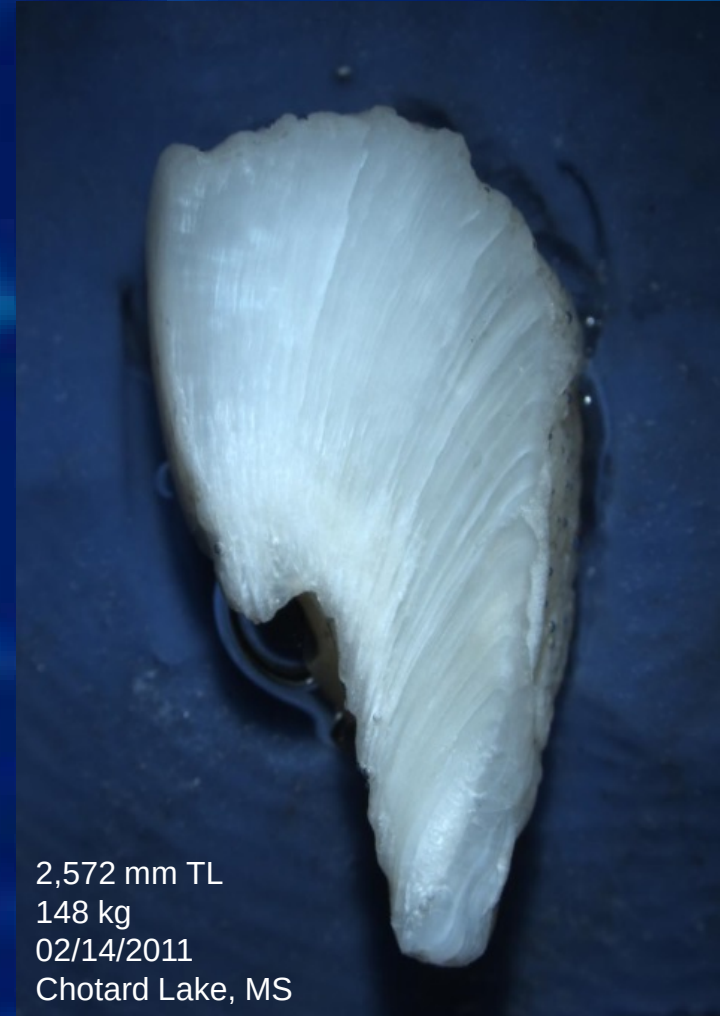
Why Alligator Gar?

- Biodiversity



Why Alligator Gar?

- Biodiversity
- Periodic strategist
 - Long lived > 50 y
 - Late maturing (5–10 y)



2,572 mm TL
148 kg
02/14/2011
Chotard Lake, MS

Why Alligator Gar?

- Biodiversity
- Periodic strategist
- Apex predator
 - Community structure
 - Invasives



Why Alligator Gar?

- Reduced range
- Native to 14 states
- Extirpated from 6



Why Alligator Gar?

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- Native to 14 states
- Extirpated from 6



Why Alligator Gar?

- Texas
 - Stronghold
 - Trophy fisheries



Why Alligator Gar?

- Texas
 - Increased publicity
 - Increased pressure



Why Alligator Gar?

- Conservation value
- Recreational/economic value
- Active management (2009)
- Priority species for research

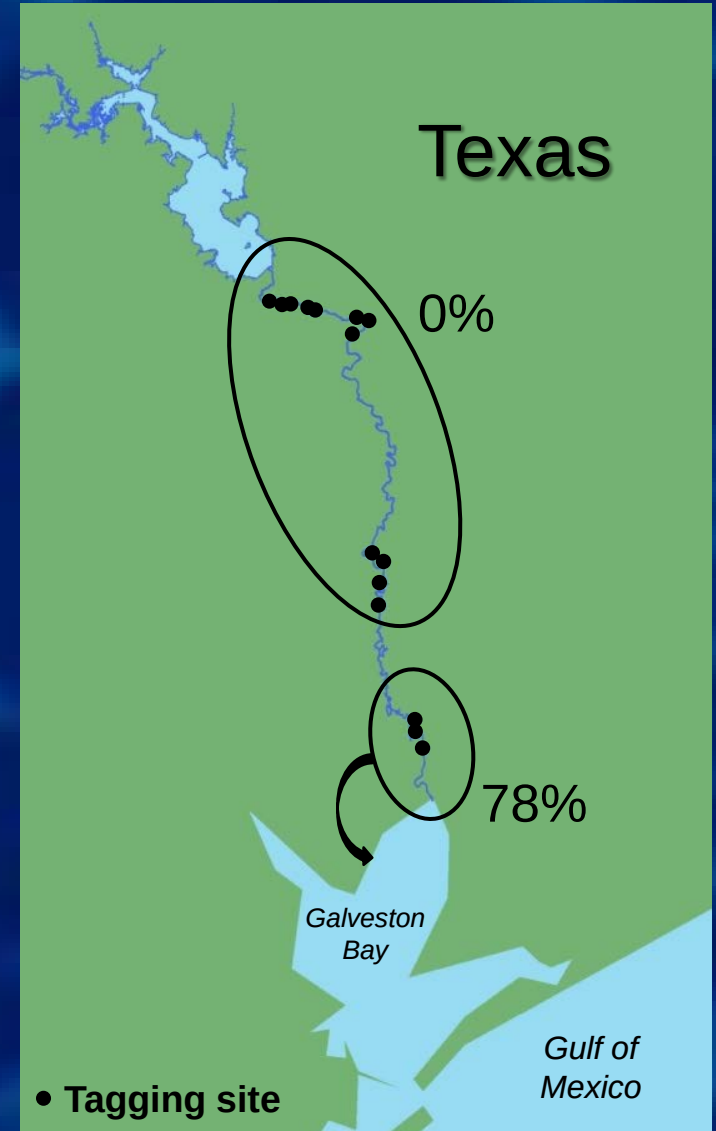
Movement/Habitat Use

- Lower Trinity River
- Tagged 51 fish
- 22-month study



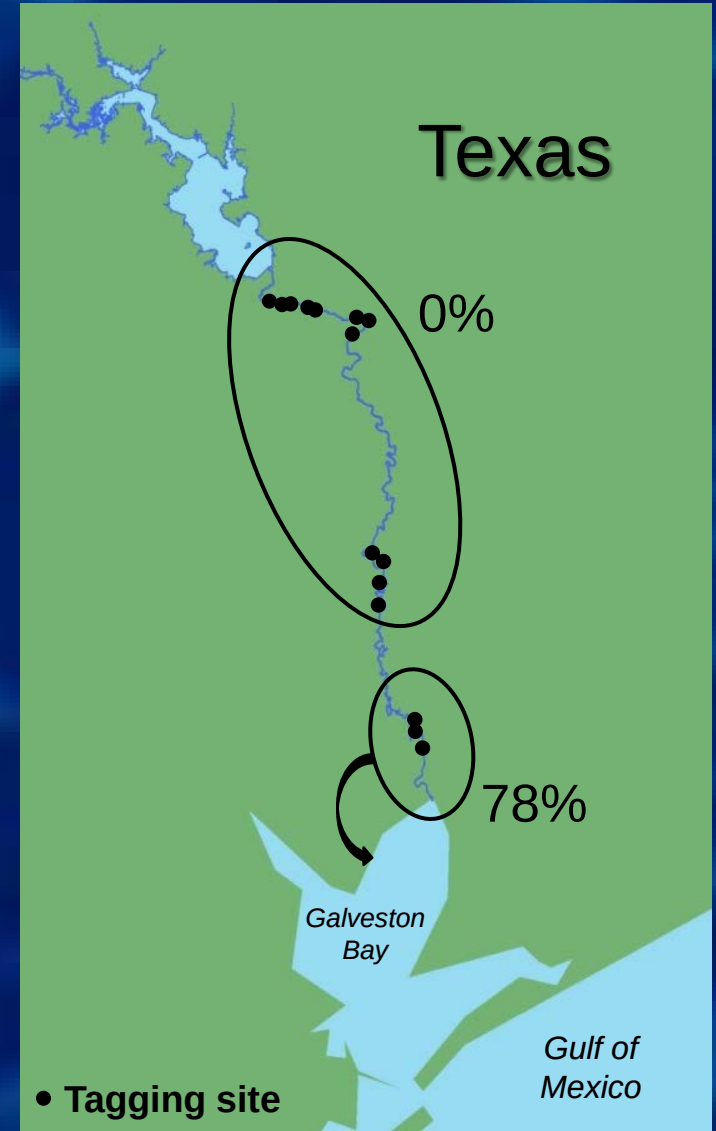
Movement/Habitat Use

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Movement/Habitat Use

- Lower Trinity River
- Tagged 51 fish
- 22-month study
- >2,000 caught in bay



Movement/Habitat Use



Coastal River Populations

- Discrete stocks?



Coastal River Populations

- Discrete stocks?
- Mixed stock?
- Management scale



Coastal River Populations

- Discrete stocks?
- Mixed stock?
- Management scale
- Importance of bay habitats



Coastal River Populations

- Lower Guadalupe River
- San Antonio Bay



Coastal River Populations

- Otolith microchemistry
 - Cost effective
 - Lifetime record
 - “Novel” for gar

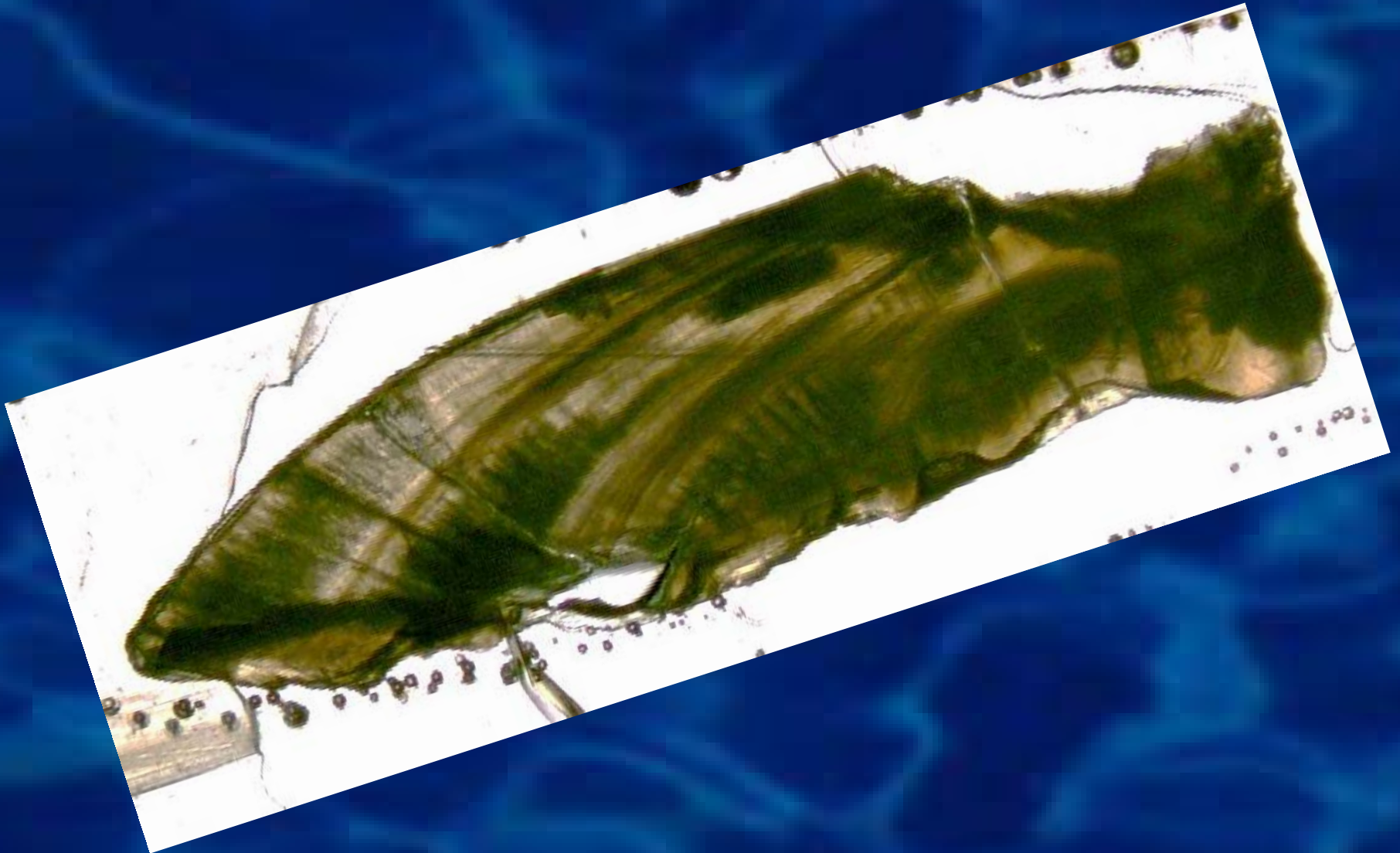


Otolith Microchemistry

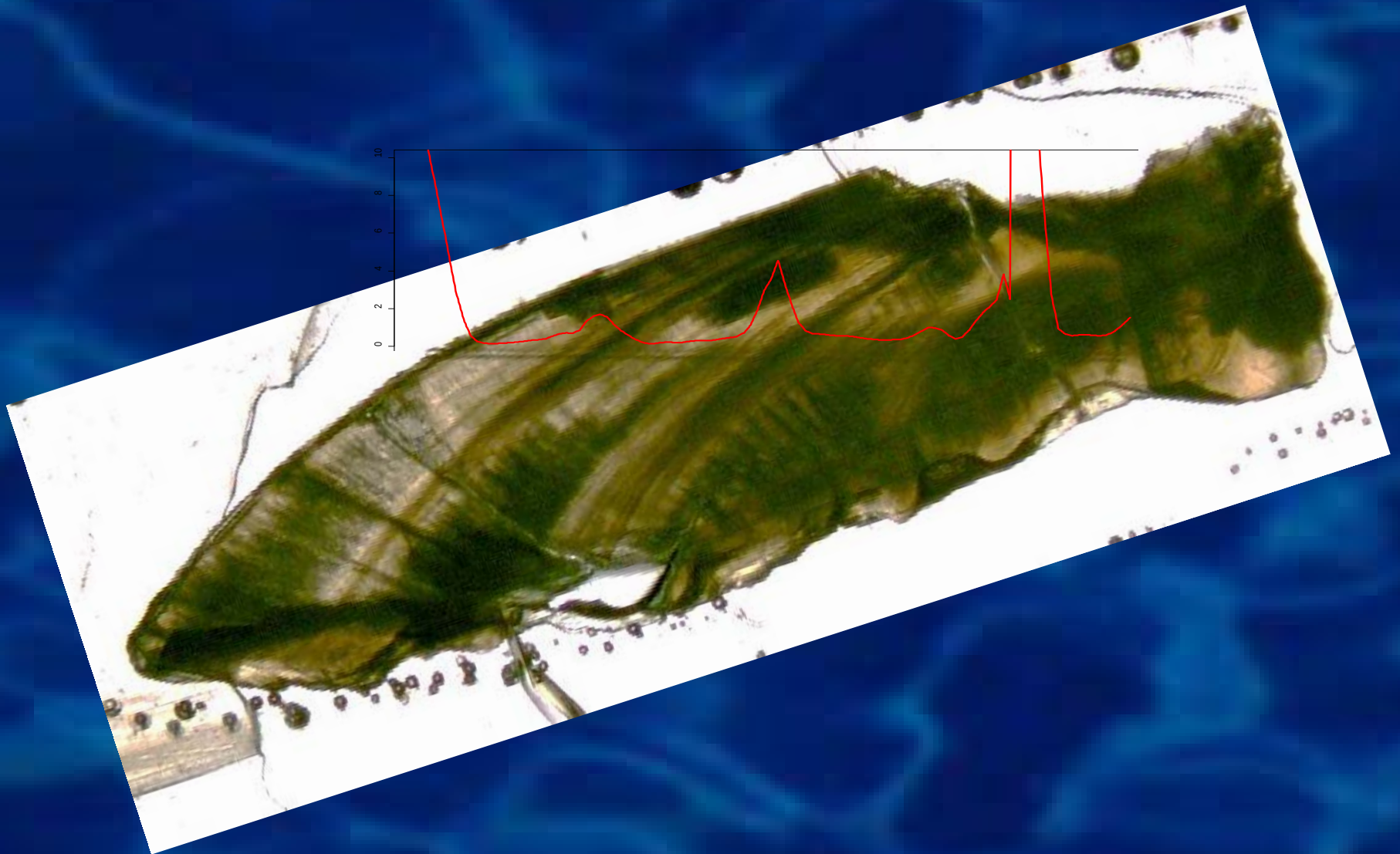
- Laser Ablation
- ICPMS
- Elemental signatures



Otolith Microchemistry



Otolith Microchemistry



Objectives

- Evaluate efficacy of otolith microchemistry in differentiating Alligator Gar habitat use in coastal systems
- Characterize movement, habitat use and potential for stock structuring
- Compare results to genetic analyses

Fish Collection



Fish Collection

- Catch location
- Total length
- Sex
- Otoliths
- Fin clip



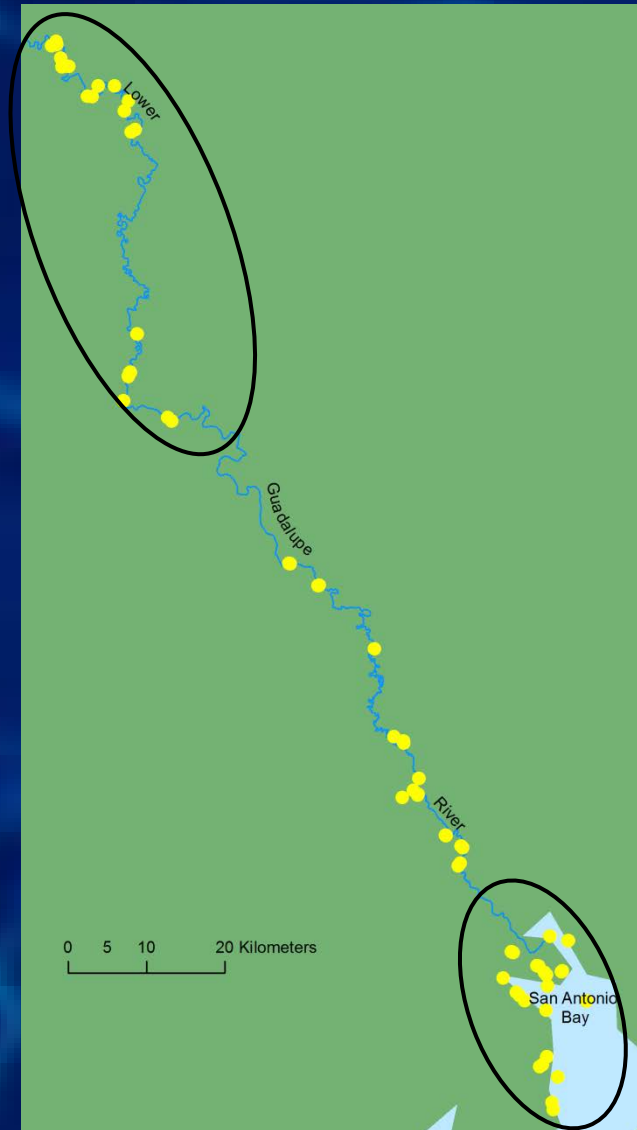
Otolith Microchemistry

- Laser Ablation ICP-MS
 - Core-to-edge transect
 - Pulse rate: 12Hz
 - Spot size: 40 μ m
 - Pass rate: 20 μ m/s



Otolith Microchemistry

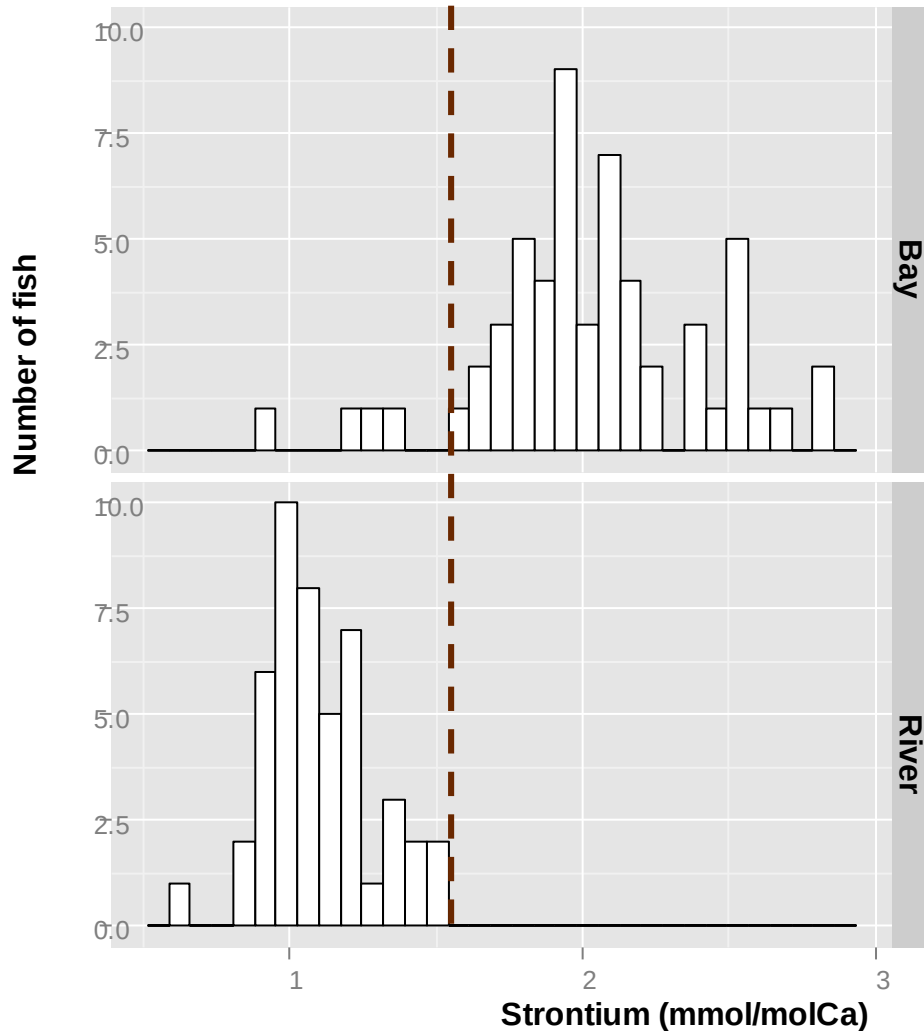
- SW/FW signature
 - LDFA
 - Otolith edge
 - Bay vs. middle/upper river fish
 - Suite of 8 elements - Sr
- Applied across transects
 - Historic water chemistry consistent and expected



Genetics

- Microsatellites (14 loci)
- Mitochondrial DNA
- Structuring
 - Catch location
 - Chemistry data

Results



N = 151 fish

Males = 621 -1,515 mm

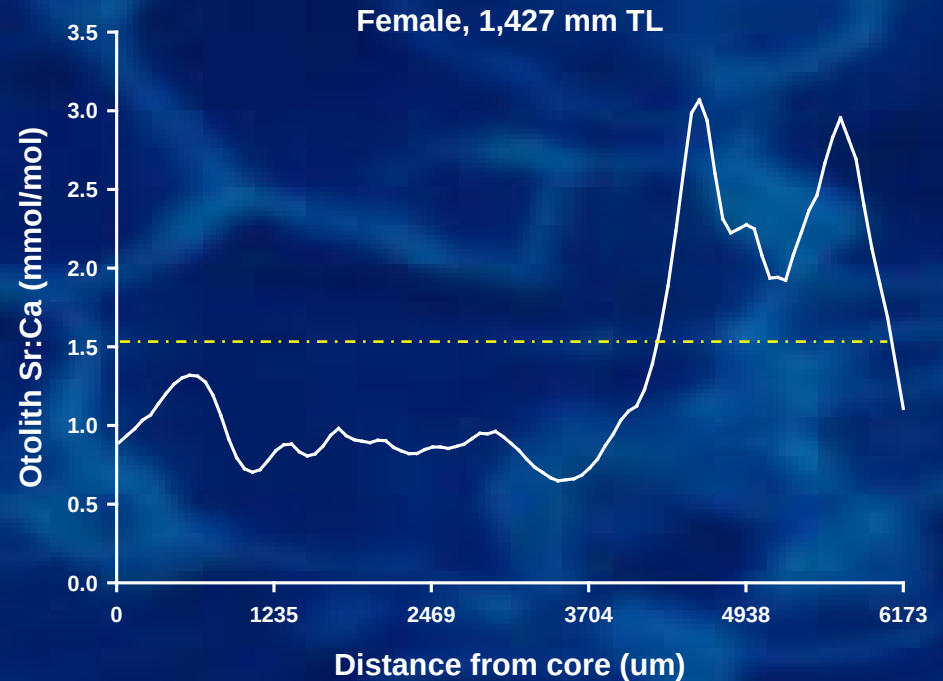
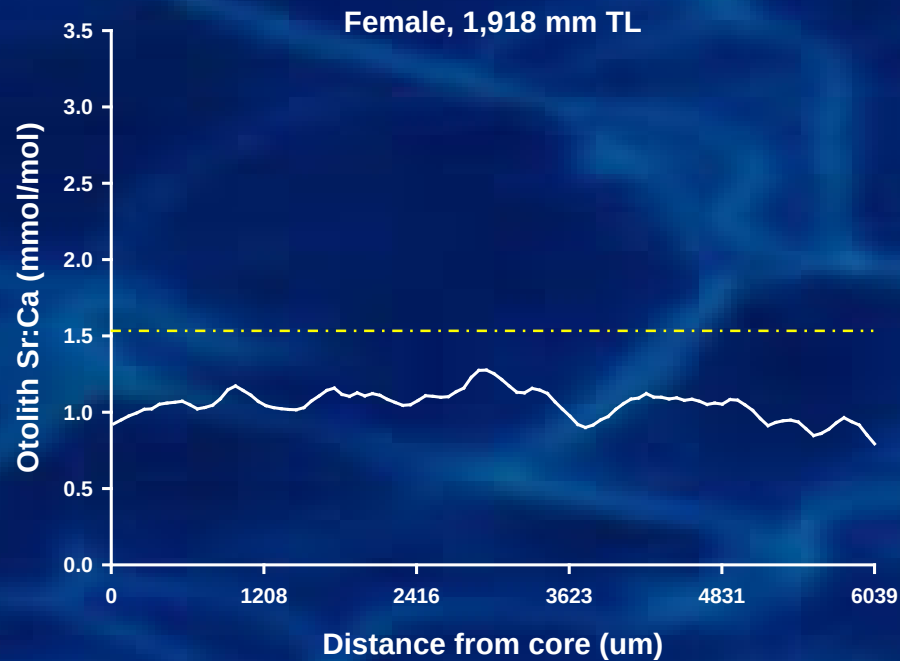
Females = 1,058 – 2,173 mm

Edge classification accuracy

River	100%
Bay	93%

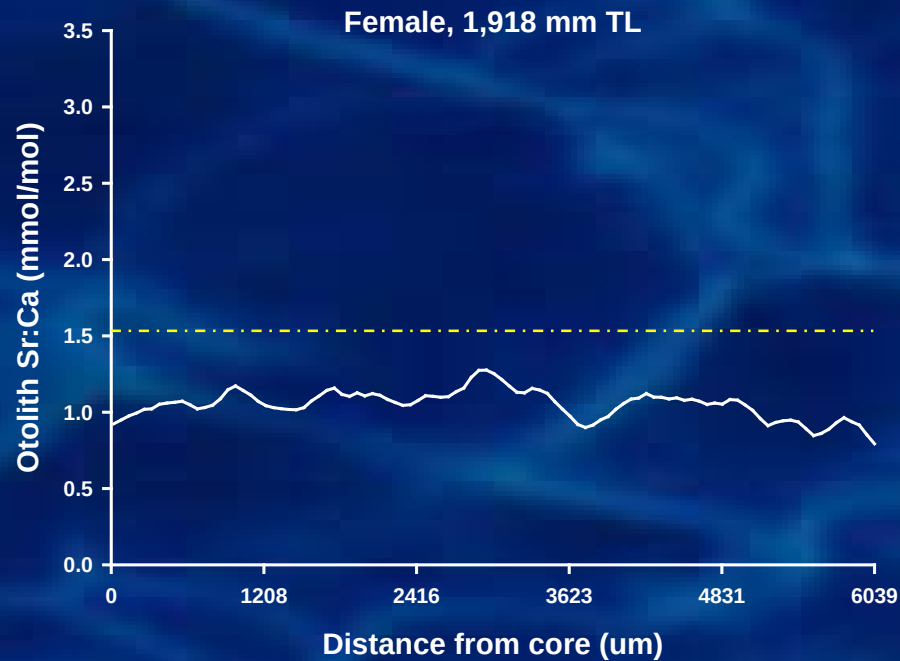
River Fish

Lower River

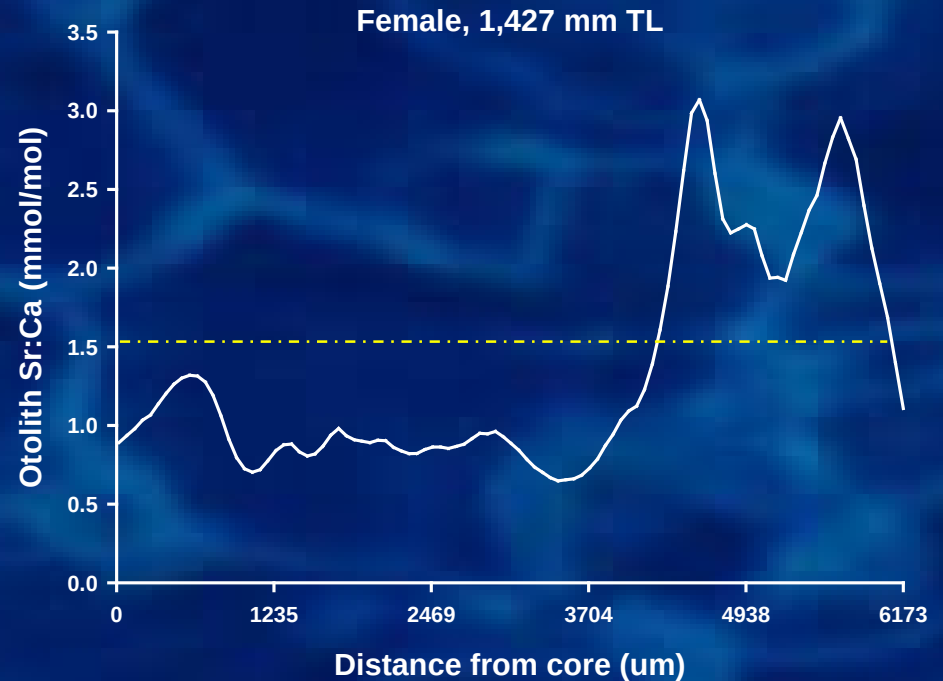


River Fish

Lower River



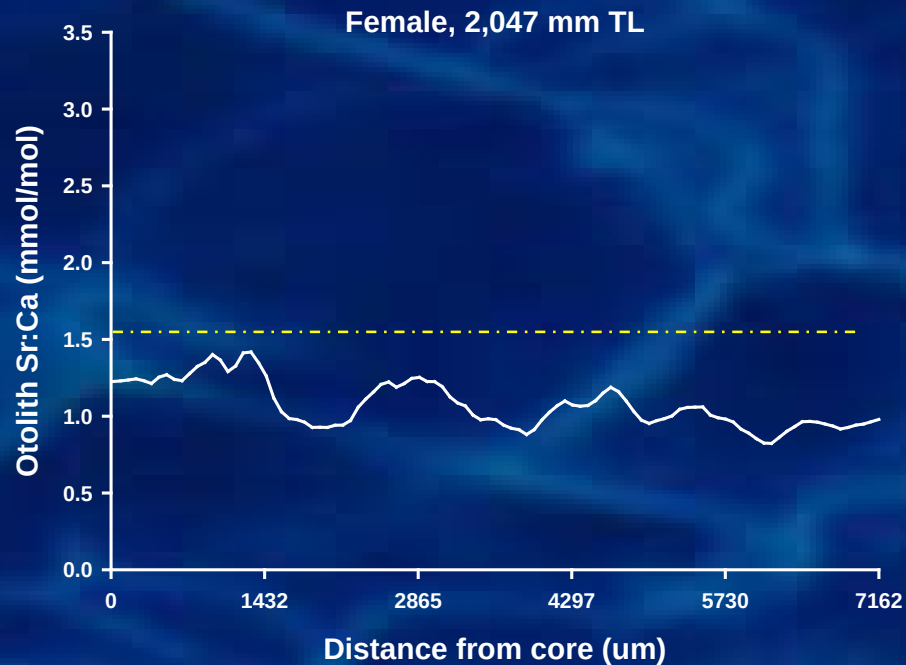
32%



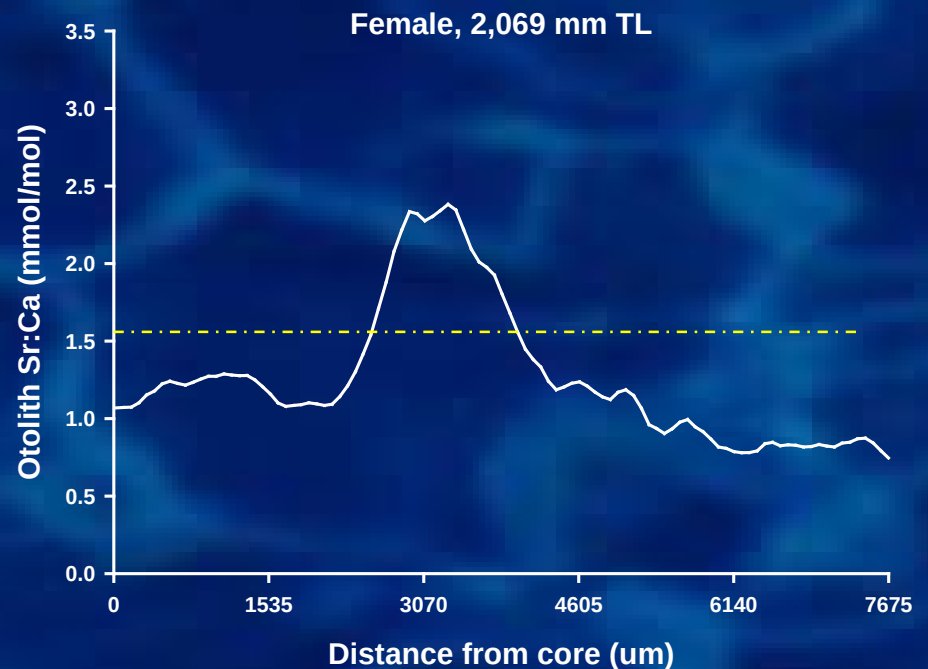
68%

River Fish

Middle River



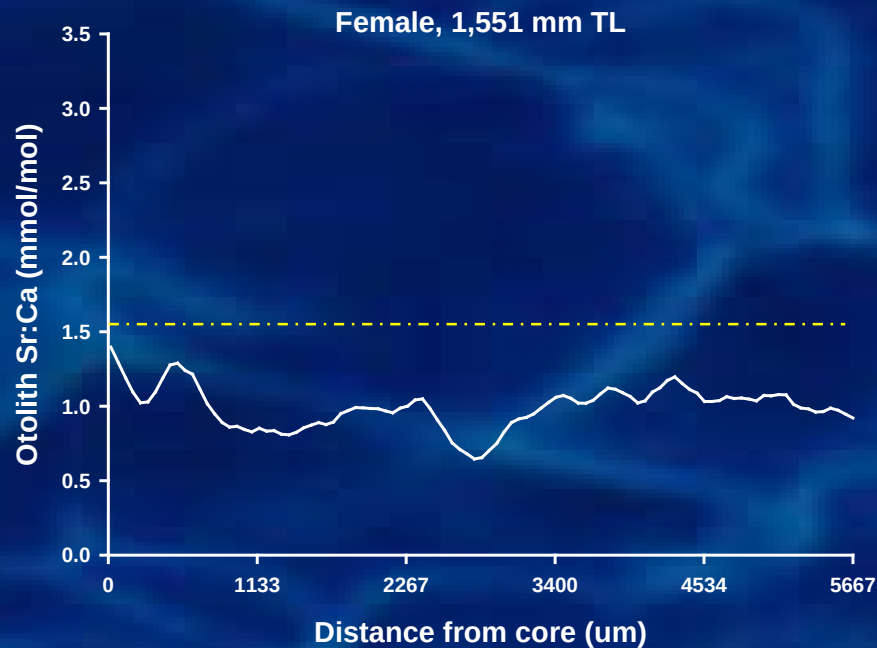
52%



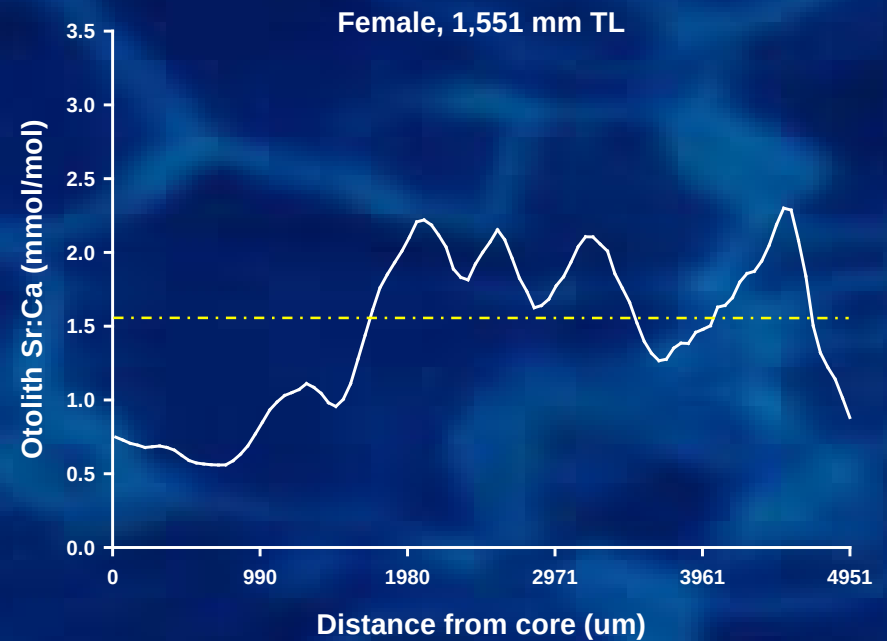
48%

River Fish

Upper River



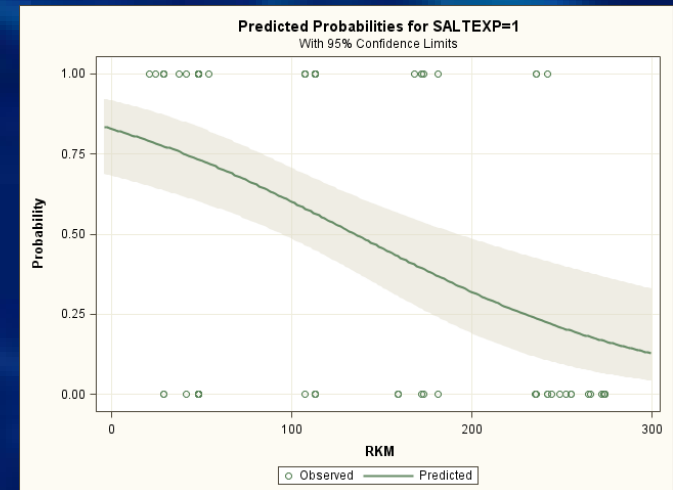
70%



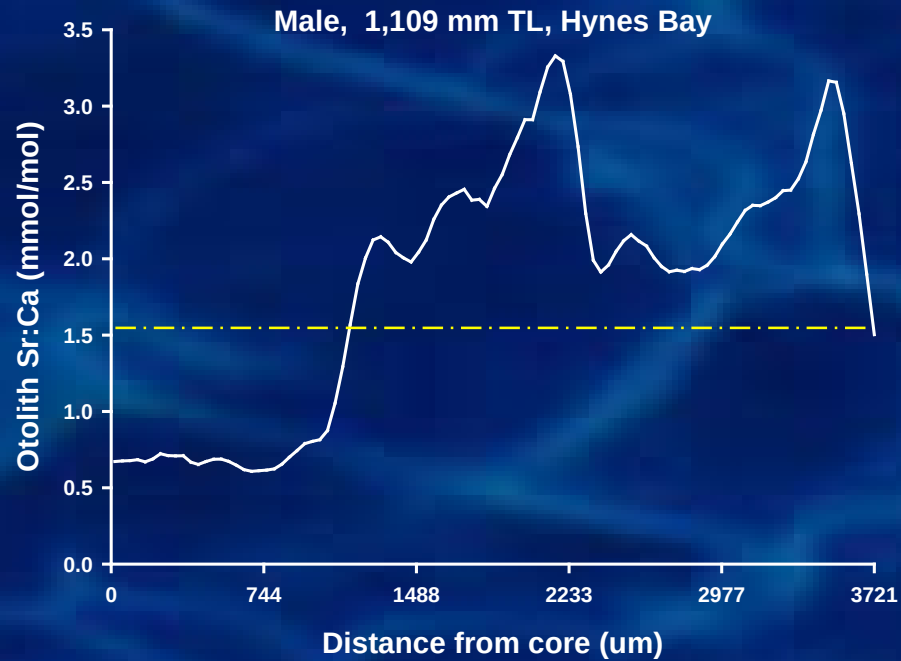
30%

Likelihood of Bay Use

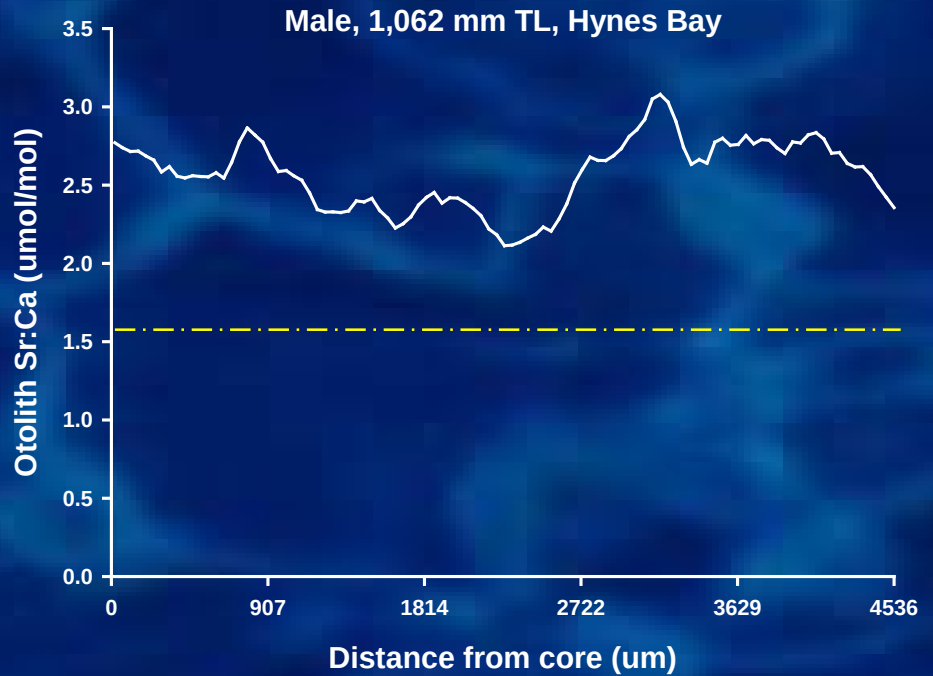
- Related to catch location, sex, or size(age)?
 - Multiple logistic regression
 - Catch location(rkm)
 - Sex
 - TL
 - All interactions
- Catch location ($P = 0.018$)



Bay Fish

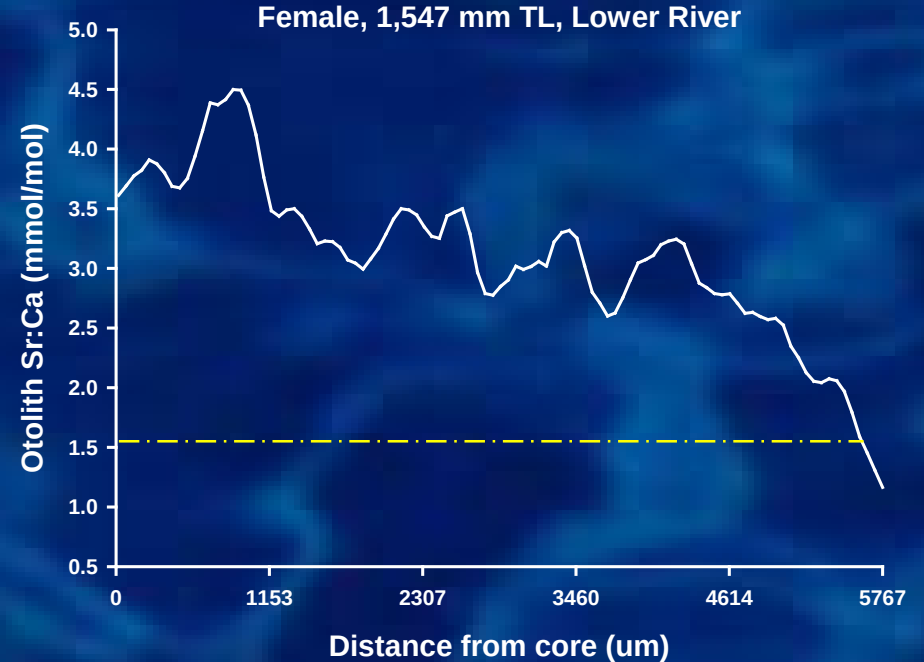
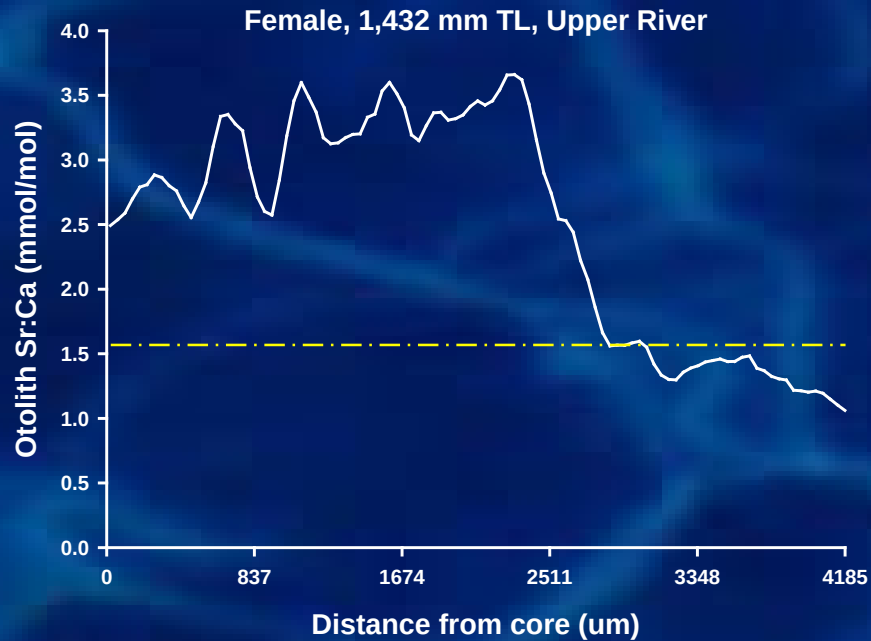


93%

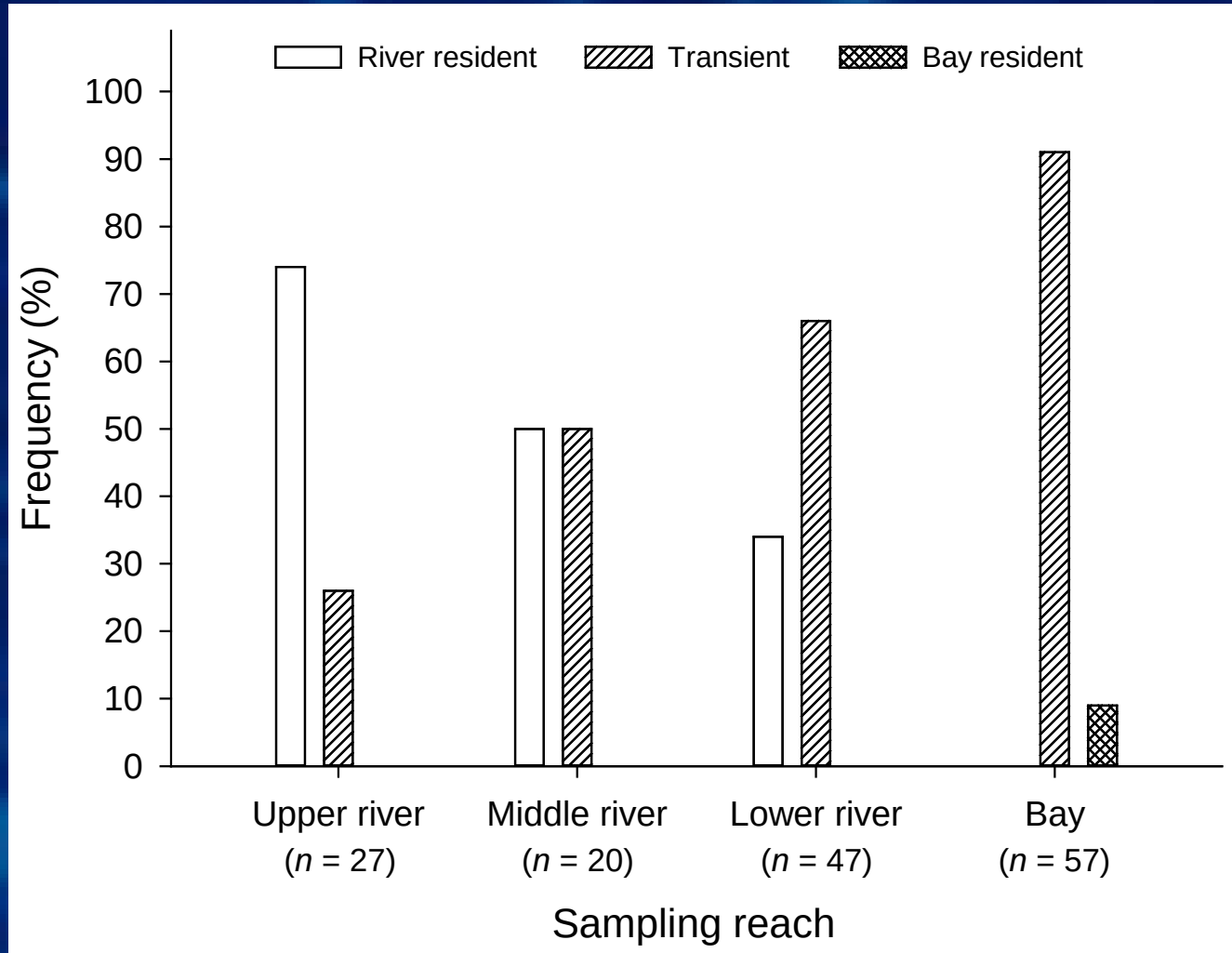


7%

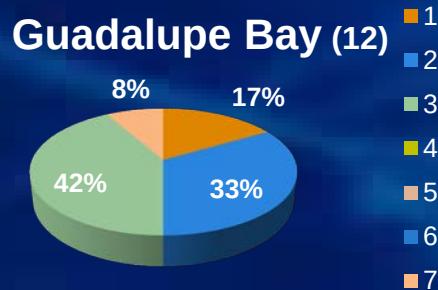
Anomalies



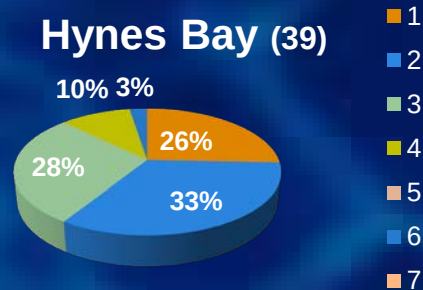
Spatial Patterns



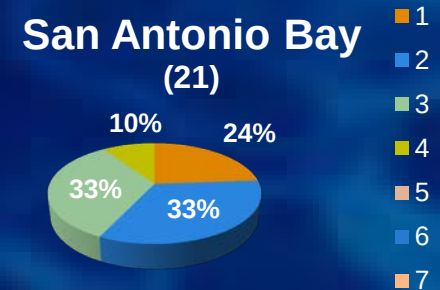
Microsatellite Analyses



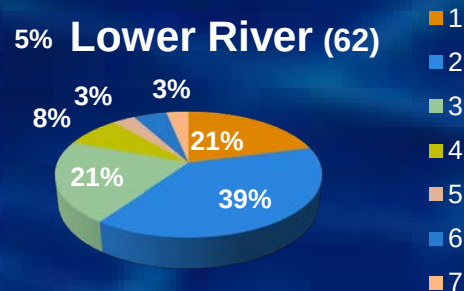
Hd=0.742



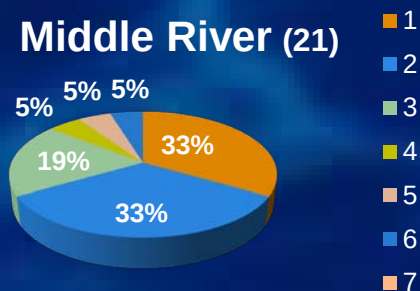
Hd=0.752



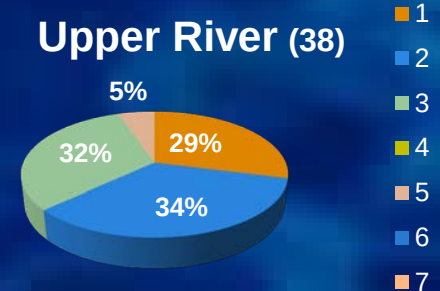
Hd=0.748



Hd=0.764

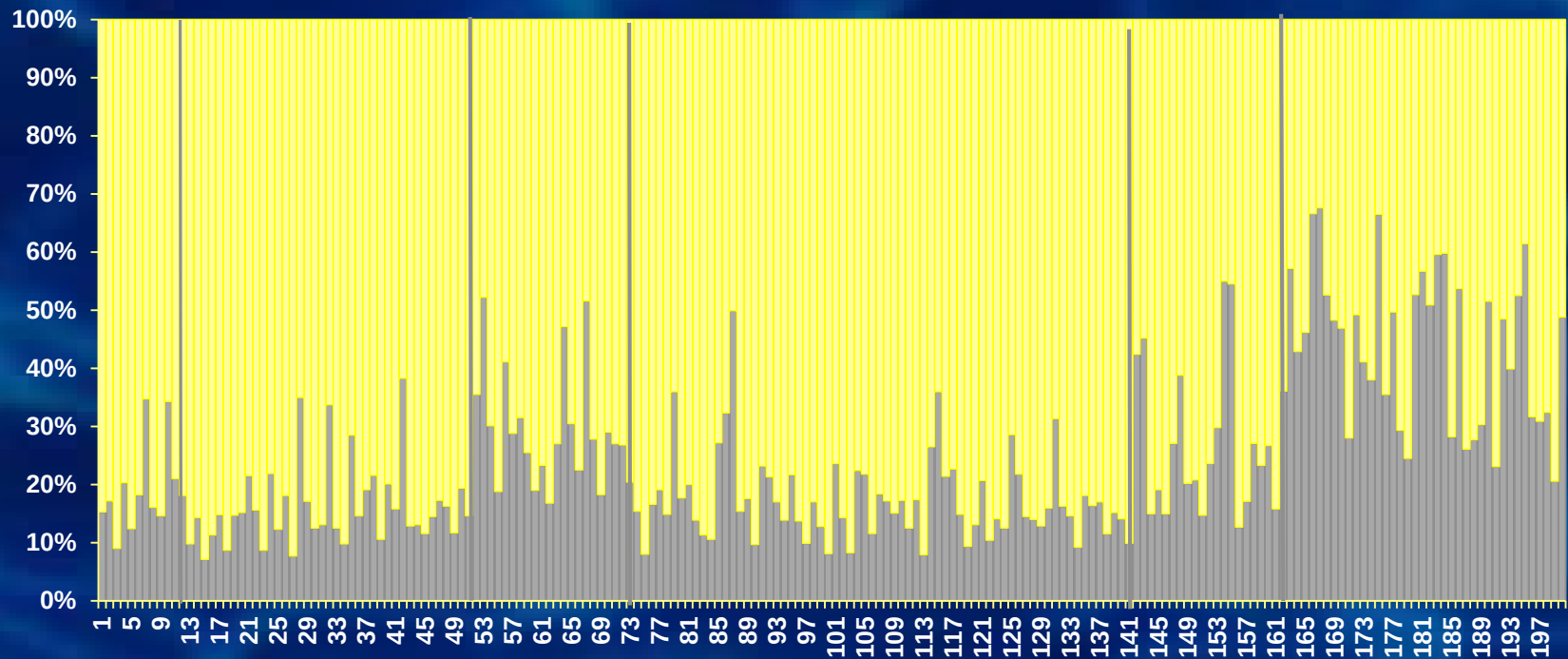


Hd=0.771



Hd=0.716

Mitochondrial Analyses



GB

(1-12)

HB

(13-51)

SB

(52-73)

LR

(74-141)

MR

(142-162)

UR

(163-200)

Summary

- Technique shows promise

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- Life-history variation exists
 - Well adapted for environmental stochasticity

Summary

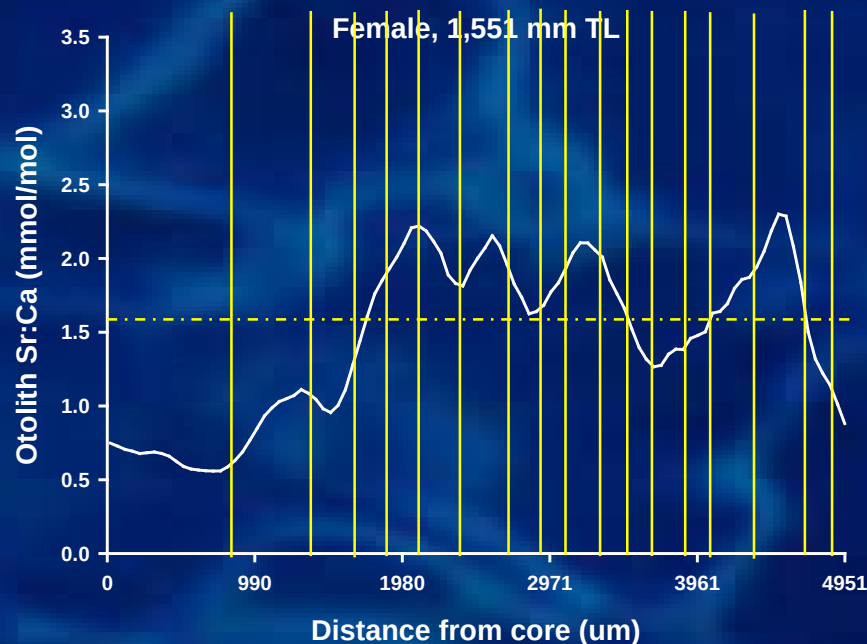
- Technique shows promise
- Life-history variation exists
- Limited spatial structuring
- No significant genetic structuring
 - Management likely best at system scale
 - “Jurisdictional overlap”

Summary

- Technique shows promise
- Life-history variation exists
- Limited spatial structuring
- No significant genetic structuring
 - Management likely best at system scale
 - “Jurisdictional overlap”
- Telemetry truly a snapshot

Future Directions

- Age estimation
- Links to hydrology and environment





Inland Fisheries
Coastal Fisheries
Administrative Resources
Executive Office



F-231-R
Texas Parks and
Wildlife Department