Tilapia Rapid Response and the Current Range Expansions and Research on Invasive Cichlids in Louisiana

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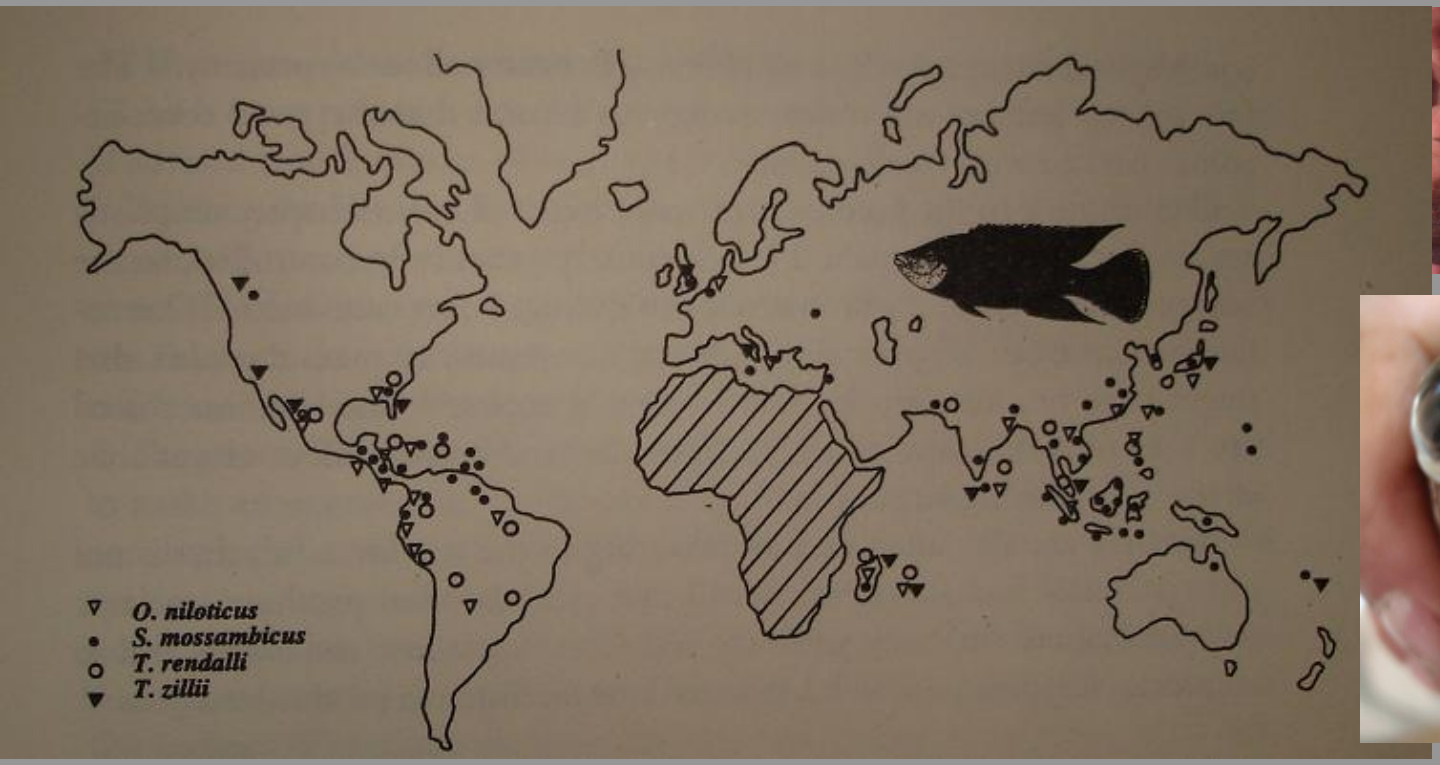
Invasive cichlid history in Louisiana

- No invasive cichlid species reported before 1997
- Rio Grande cichlids have spread and increased in numbers dramatically since 1997
- Tilapia were introduced into waterways of southern Louisiana in 2008 (or earlier)
- Eradication efforts on tilapia have been largely successful thus far
- Extreme Rio Grande cichlid range extension observed in same location as tilapia introduction



Rio Grande Cichlid Invasion

- introduced ca. 20-30 years ago into New Orleans, established
- dense populations in the canal system and are commonly the most abundant fish species
- Occasionally found outside of canal system (LaBranch wetlands)
- First officially recorded in 1997

Range and expansion of cichlids

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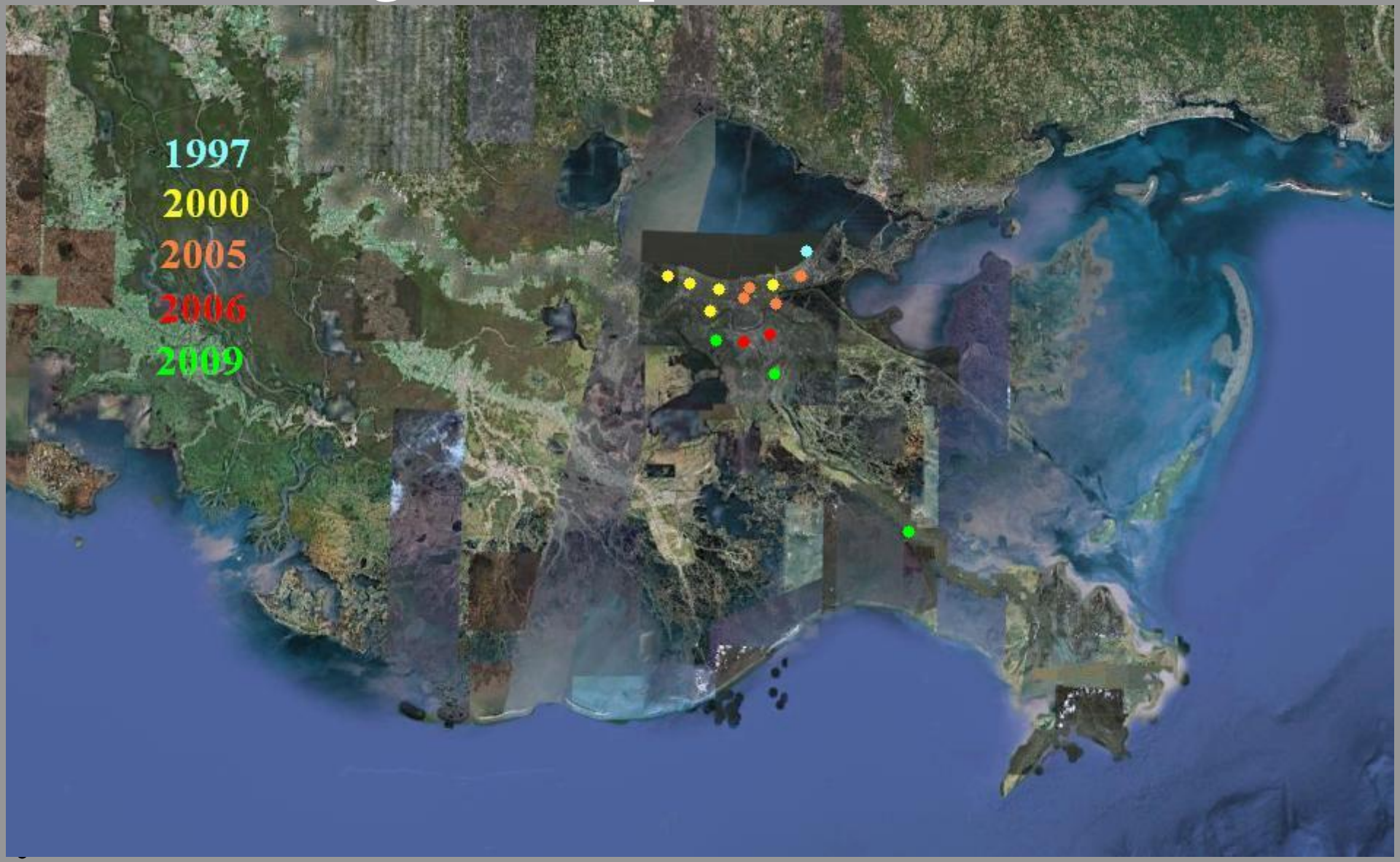
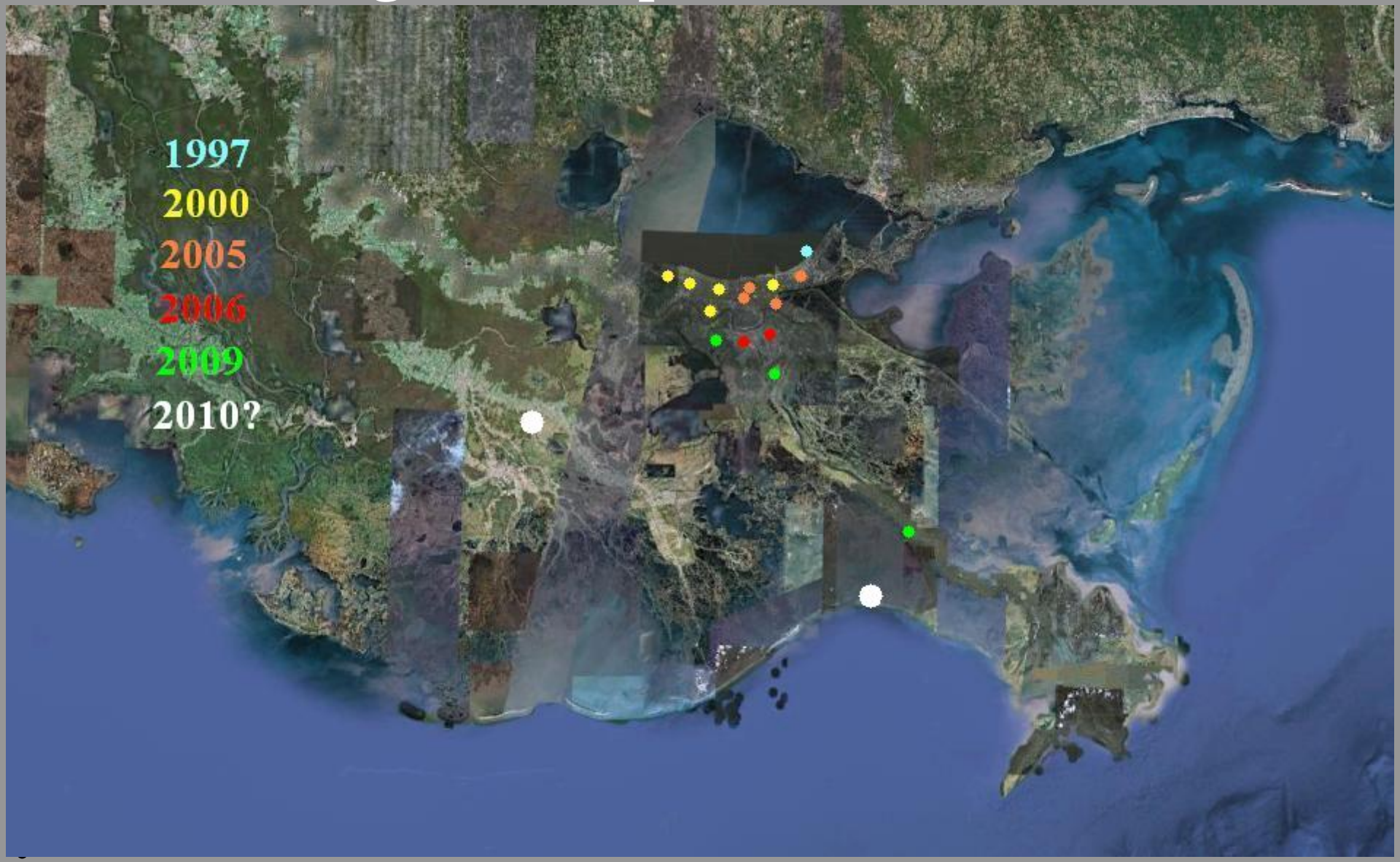


Range and expansion of cichlids



Past and present research

- Past research:
  - Survey
  - Behavior
  - Salinity trials
- Current research
  - Genetics
  - Diet
  - Telemetry
  - More salinity
  - Impact on non-percoid fishes

Aggression in Cichlids and Centrarchids

- Aggression seems to be common in the field between Rio Grande cichlids and centrarchids
- Preliminary bouts showed that many centrarchids and cichlids fought over territory at all sizes and ages

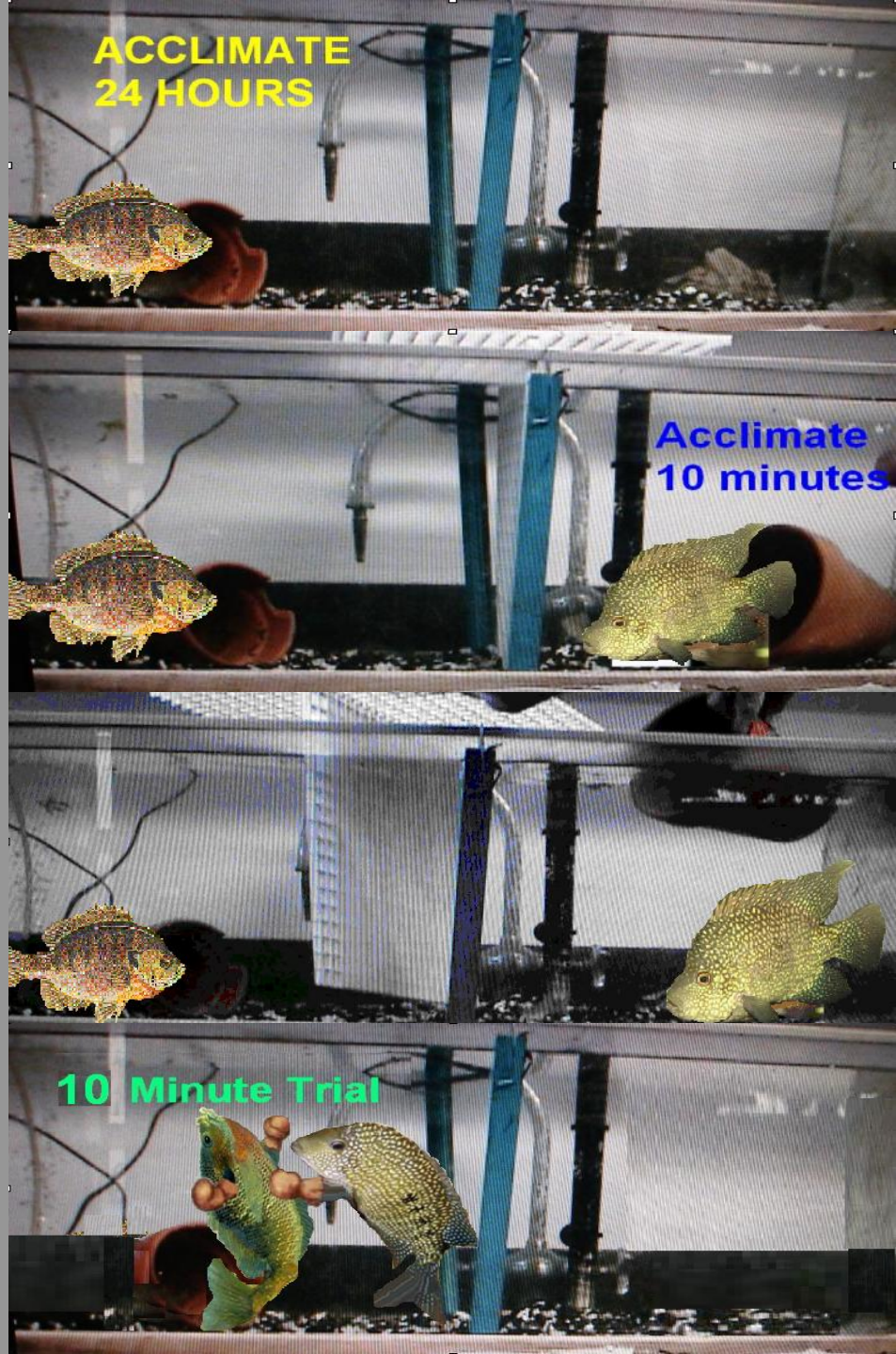
Methods for behavioral study

Prior residence trials

40 with cichlid as prior resident

40 with bluegill as prior resident

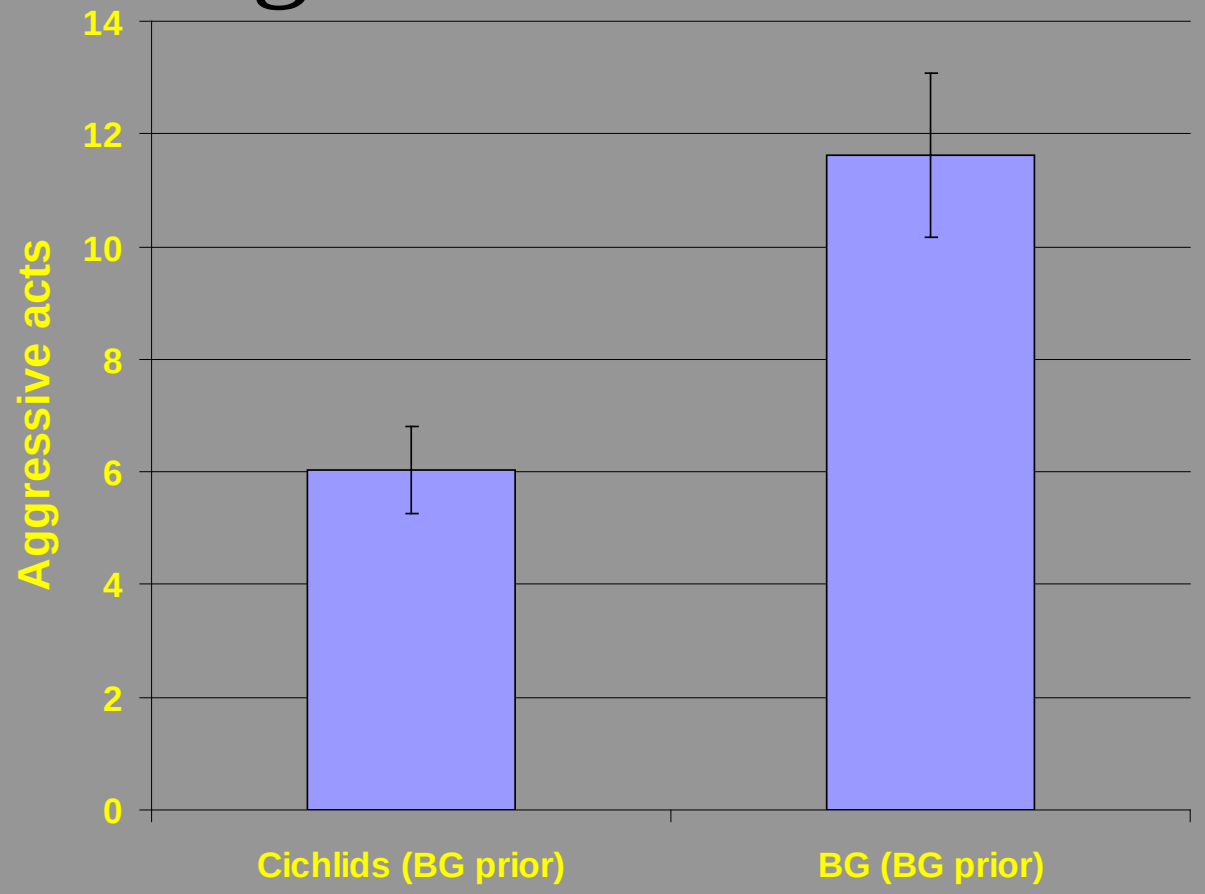
75-liter aquaria (20-long)
Constant temperature (23.5 C)
Complete water change between trials



Behaviors measured

- “Lunging”: sudden approach (but not a chase) with opercula flared
- “Lateral display”: body is displayed to the opponent, often with a ‘waving’ of the body
- “Chasing/biting”: where one fish chases and/or bites at the other

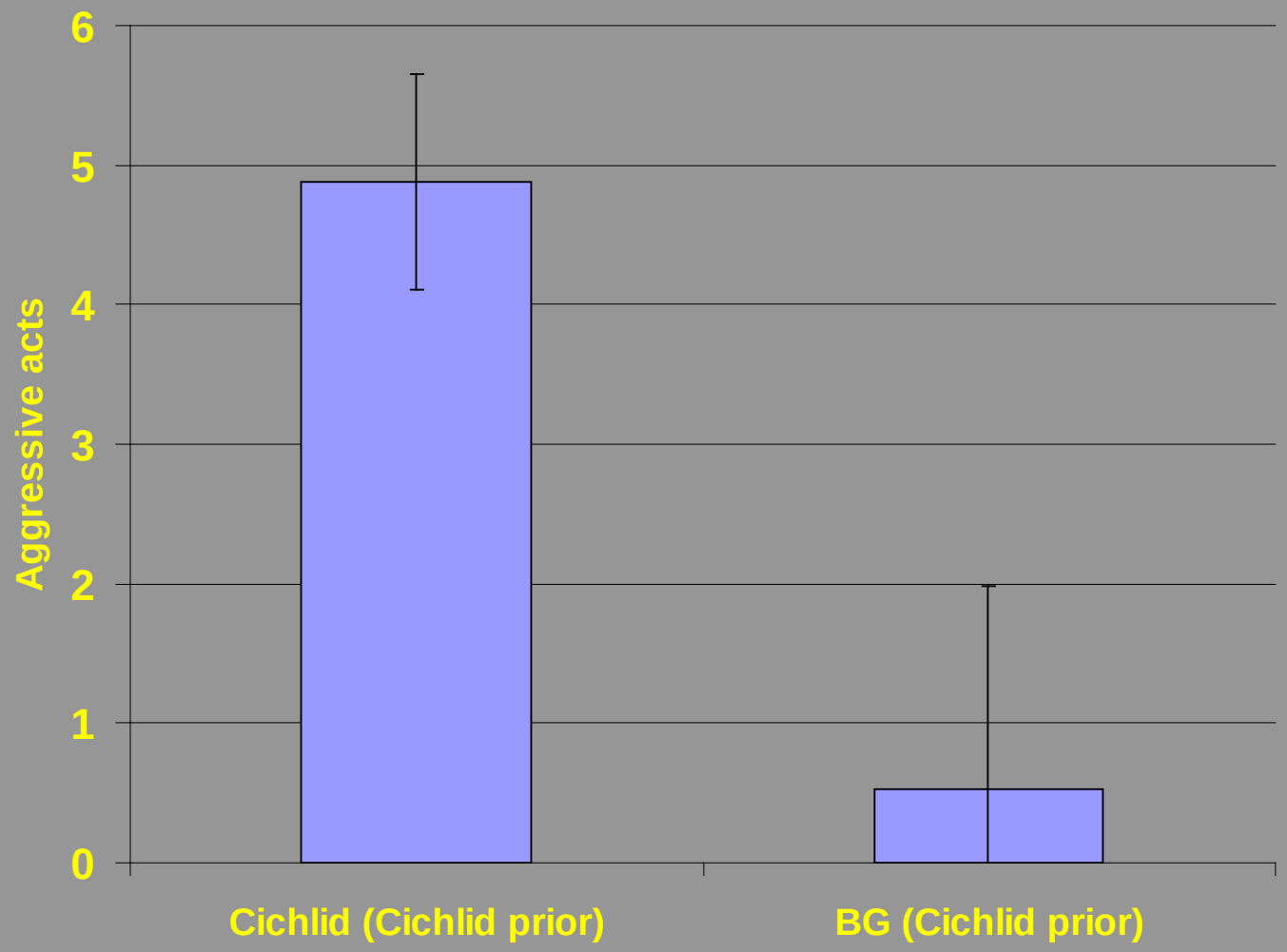
Bluegill as Prior Residents



- Results indicate that both species are aggressive, but with different strategies depending on residence
- Bluegills as prior residents were very aggressive
- Cichlids were aggressive invaders and appeared to be successful at evicting bluegill when the bluegill was the smaller fish

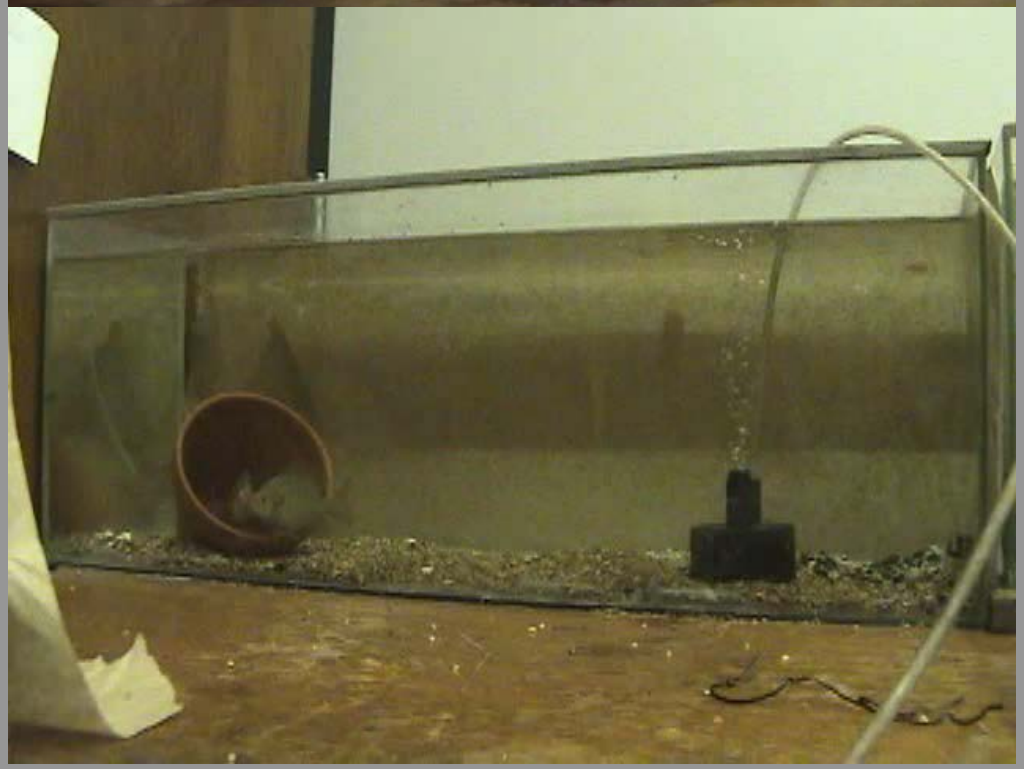
Video of bluegill as prior resident

Cichlid as prior residents

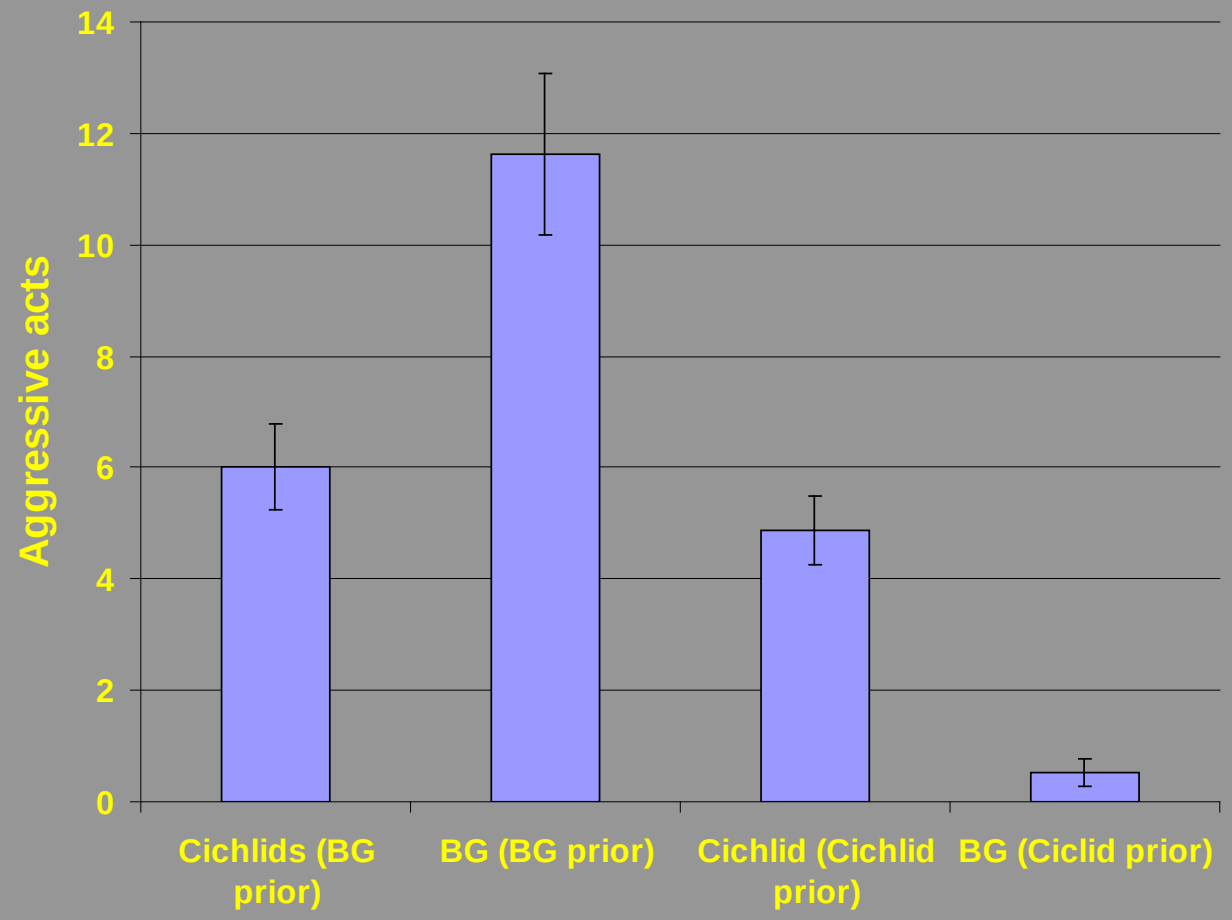


- Cichlids as prior residents were just aggressive as cichlids as invaders
- Bluegill demonstrated almost no aggressive behaviors

Cichlids as prior residents

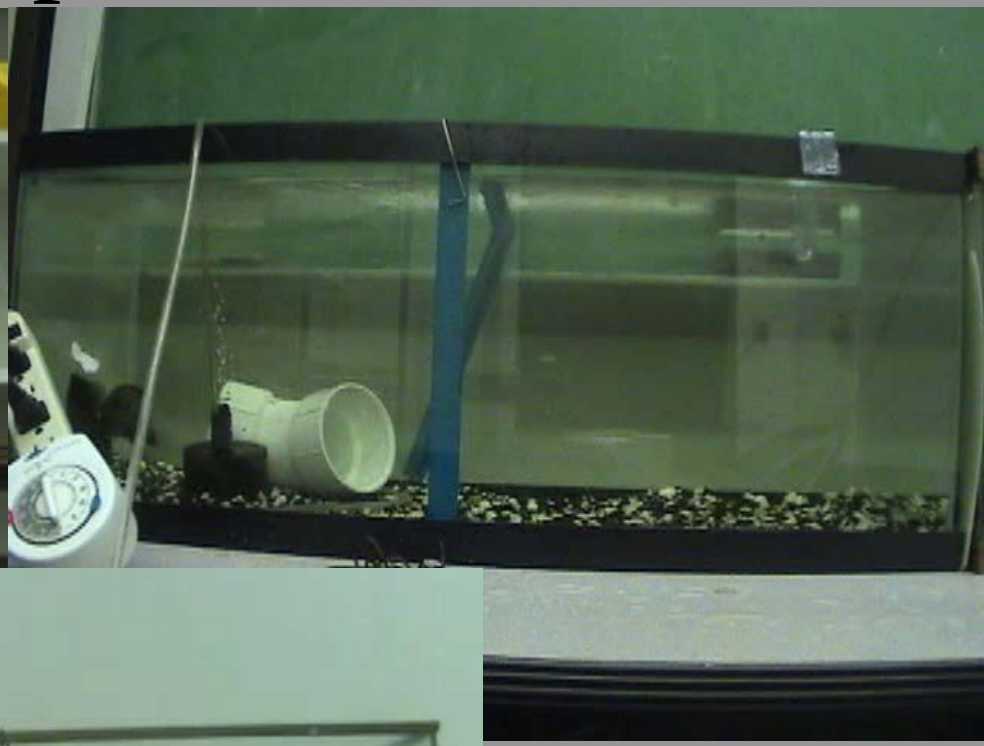


Overview



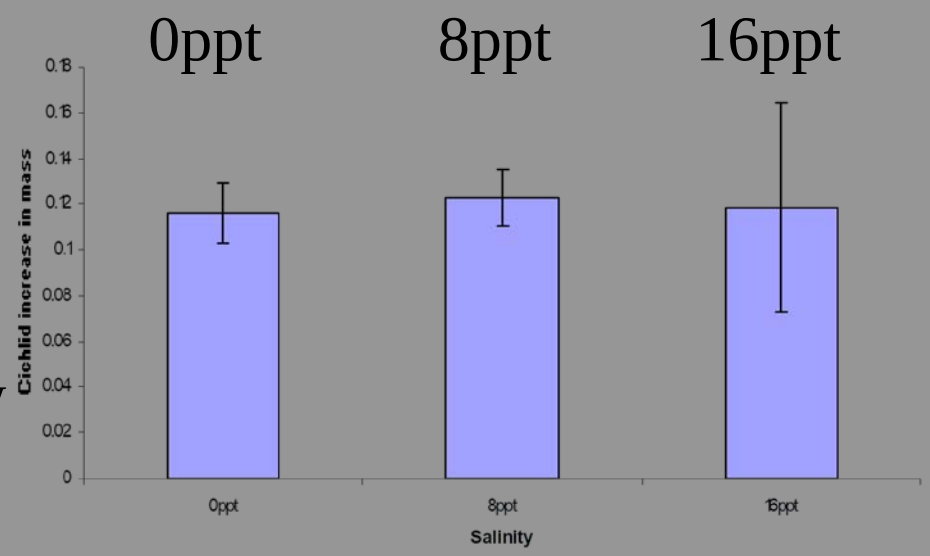
- Cichlids are hawk-like: always attack (even with asymmetry of prior residence)
- Bluegill are bourgeois-like: behave like hawks as prior residents, but do not escalate as invader
- Sequential assessment: important only with bluegill as prior residents, with communication breakdown at jaw wrestle stage

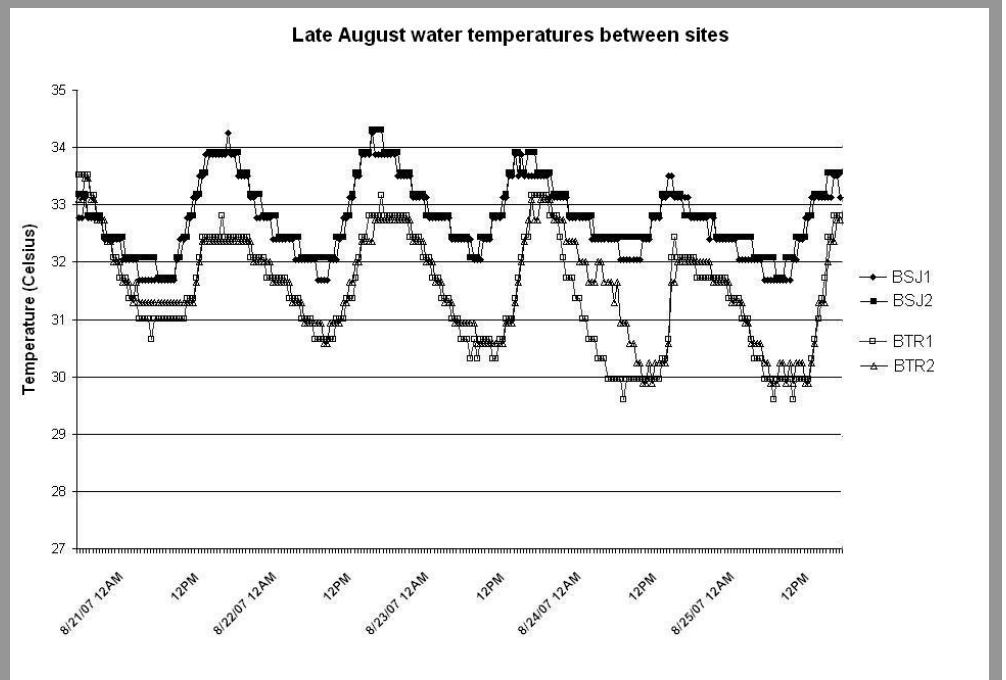
Other species

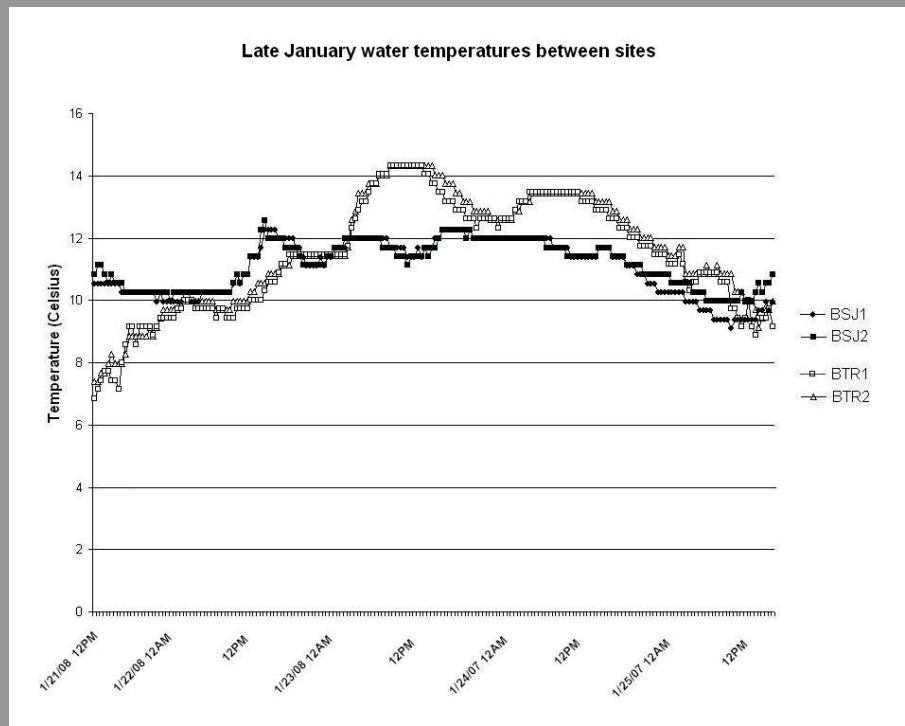


Salinity and temperature

- Salinity has little effect on cichlid growth up to at least 16 ppt
- Temperature variation and winter low temperatures may affect cichlid survival outside of the city
- Possibility of thermal refuge to be investigated by telemetry

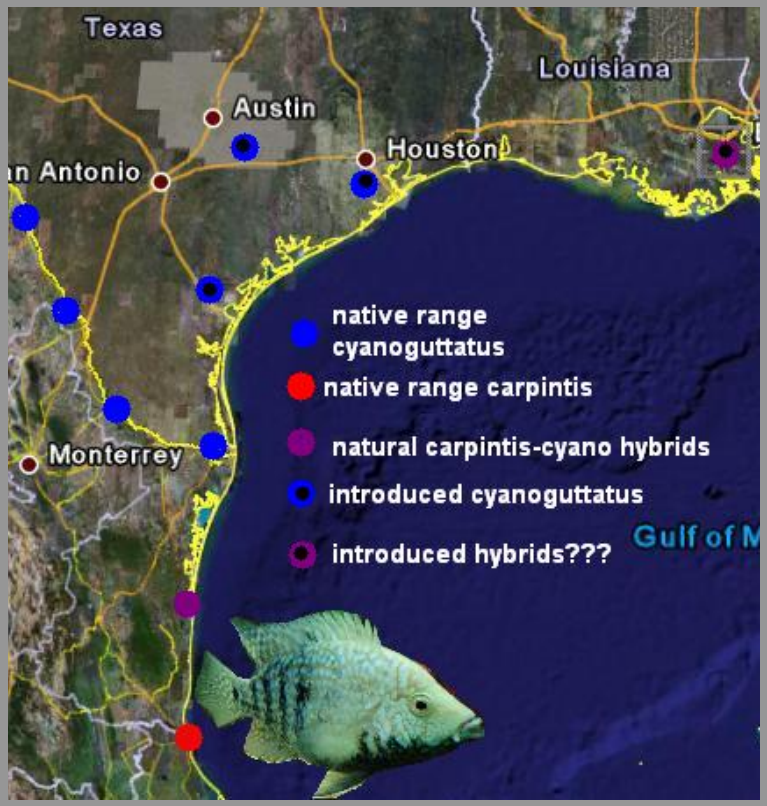


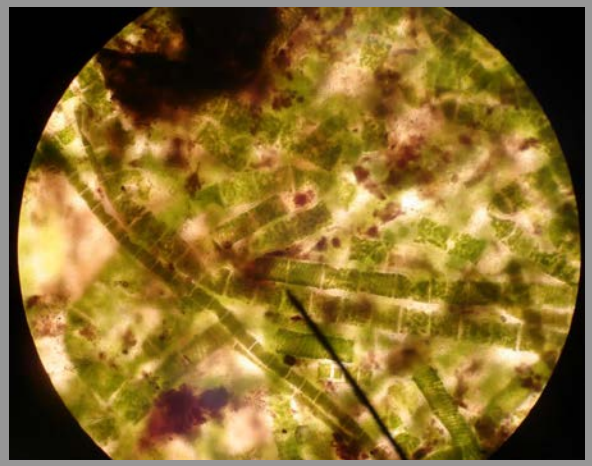




Current study

- These cichlid may be hybrids of salt-tolerant *H. carpintis* and cold-tolerant *H. cyanoguttatus*
- Genetic studies could determine if they are hybrids and if there are multiple introductions.
- Diet is demonstrating dramatic variation depending on the site
- New experiments may demonstrate impact on smaller fish species





TILAPIA REMOVAL EFFORT

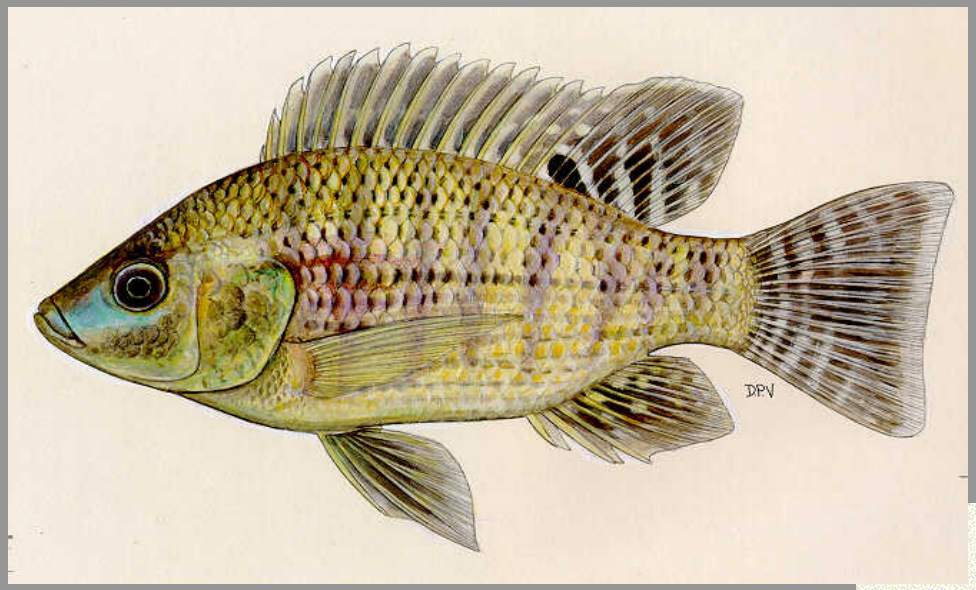
PORT SULPHUR, LA

LOUISIANA

WILDLIFE & FISHERIES

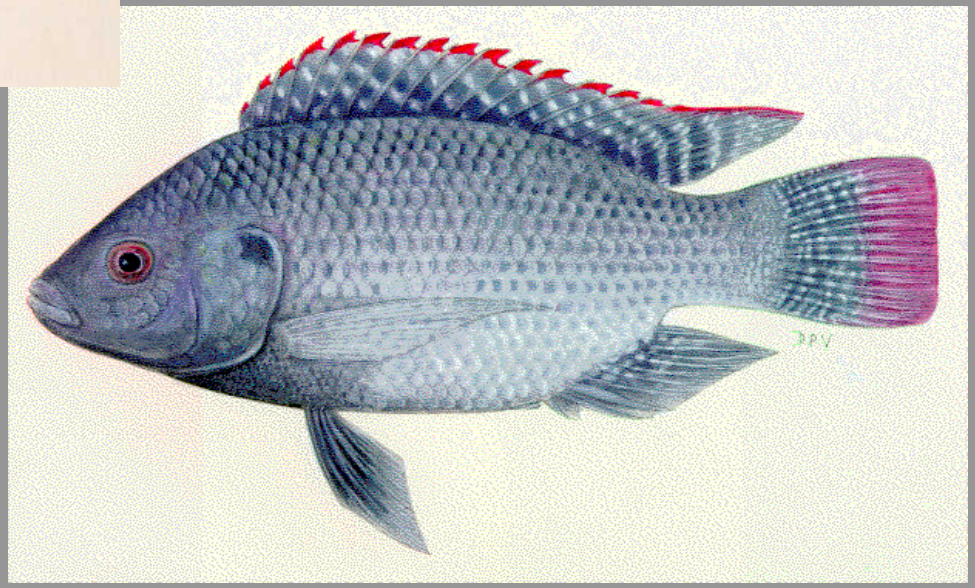
TILAPIA

Species Identification



Cold tolerant

Salt tolerant



Oreochromis niloticus
X
Oreochromis aureus

(LSU AgCenter School of Renewable and Natural Resources)

Presence/Absence Sampling

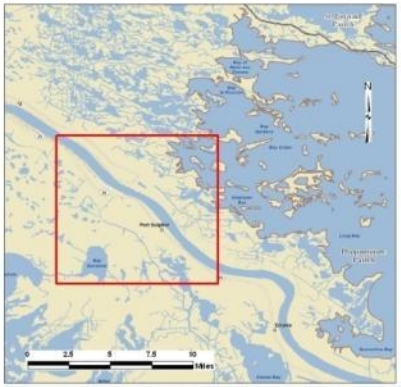
- 100 + stations were sampled in surrounding marsh, drainage ditches, rivers, borrow pits, and puddles
- Sampling methods included electrofishing, seining, cast nets, dip nets, lead nets, gill nets, trawls, and spot rotenone treatments
- Tilapia were present in approximately 20 samples
- Other species included: Rio Grande cichlids, sheepshead minnows, Gulf killifish, inland silversides, sailfin mollies, least killifish, rainwater killifish, mosquitofish, saltmarsh topminnow

Tilapia Sample Sites

Legend

Samples

- Absent
- Not Sampled due to Vegetation
- RG Cichlid
- Present
- Affected Waterbodies
- Tilapia Impact Zone
- State Highway
- Local Roads



Date: June 1, 2009
Author: S. Armand
Sources: LDWF, US Census, USDA NAIP Imagery, LDOTD
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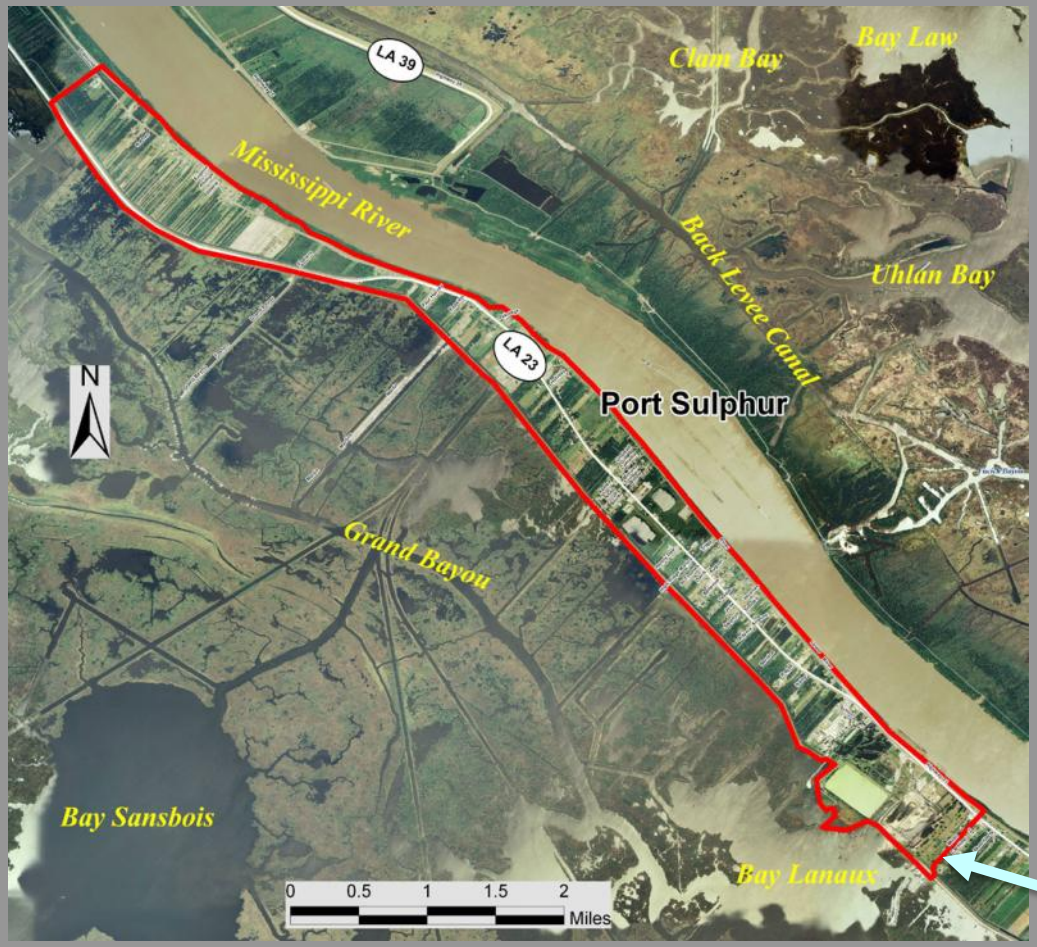
LOUISIANA WILDLIFE & FISHERIES

STATE OF LOUISIANA

The Closed Fishing Area Is Highlighted RED

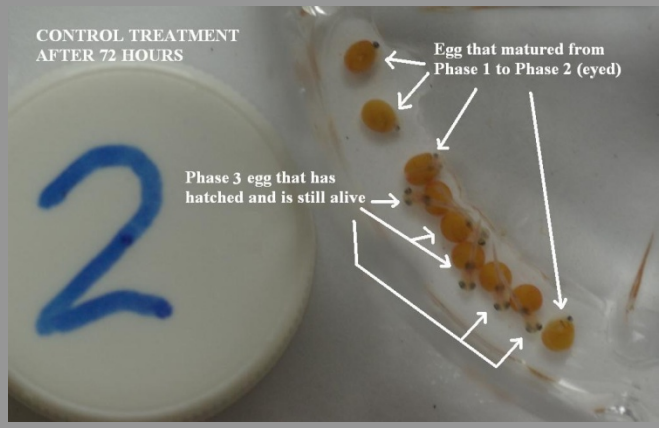


Milan Drive

- Fishing closure effective May 5, 2009 until further notice.
- The closure includes both public and private waters within the closed area.
- No person shall take or possess or attempt to take any species of fish from waters in the closed area.
- Immediately initiated an Incident Action Plan (IAP)

Rotenone Experiments

- Does rotenone affect tilapia eggs?
- What concentrations of rotenone are needed to successfully eradicate tilapia?
- Does sun exposure and/or organic material affect rotenone treatments?
- How long will rotenone be effective post-application?



Treatment Summary

- June 9, 2009 – 1st rotenone treatment
- June 12, 2009 – 2nd rotenone treatment (canal only)
- June 30, 2009 – 3rd rotenone treatment
- July 13, 2009 – 4th rotenone treatment (canal only)

June 9, 2009

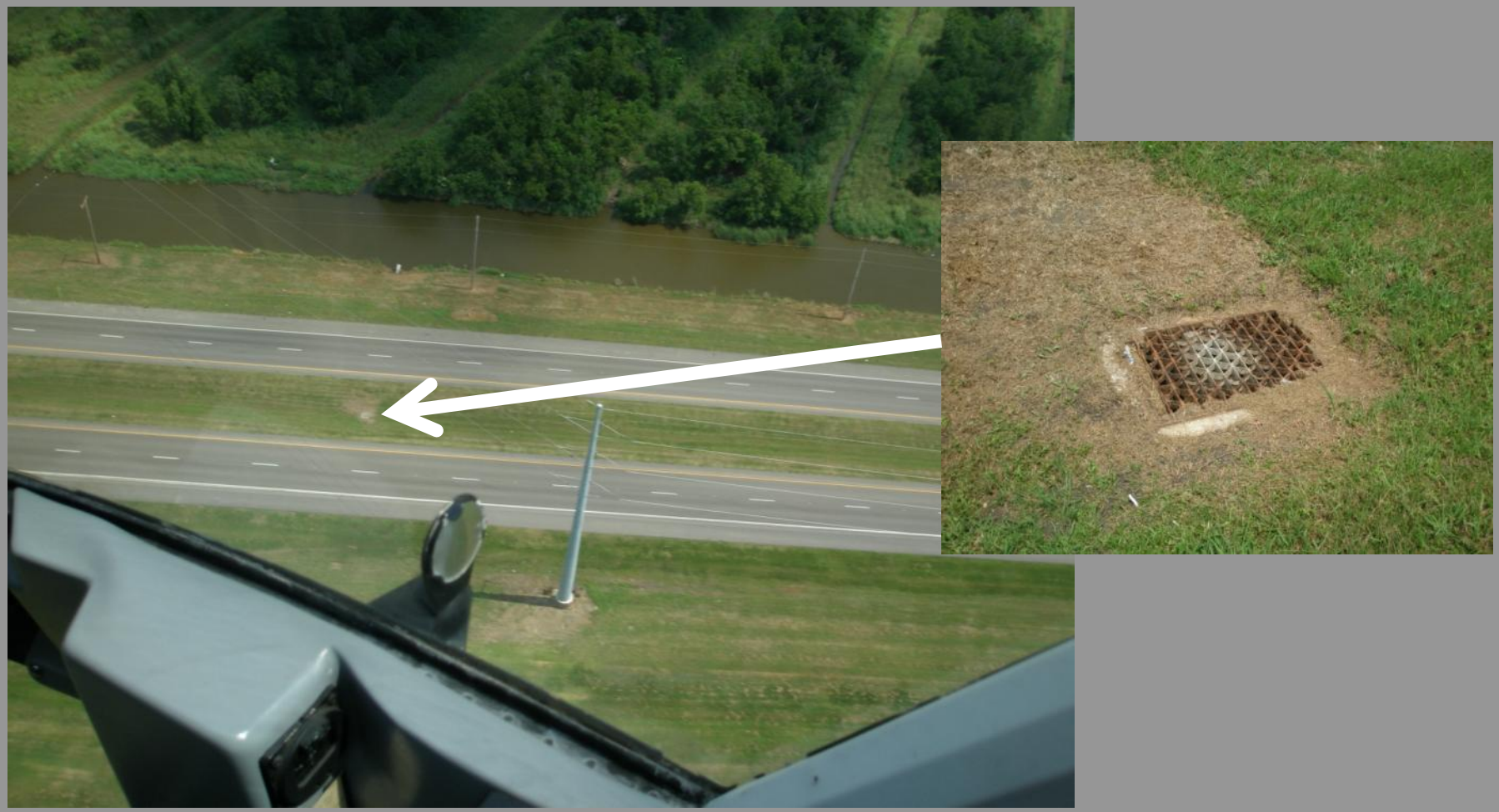
- **Rotenone**, an EPA-approved fish toxicant, was applied to waters within the closed area using various techniques.
- Approximately 1,400 gallons were applied.

Roadside/Truck Sprayer

Backpack Sprayer

Boat

Subsurface Drainage Issues



Rotenone Application to Subsurface Drainage Areas

Boat Application

Monitoring

June 10, 2009 Post -Application

2nd Major Rotenone Application

- A second application was applied during the week of June 29, 2009.
  - slow and thorough. All sites.
  - included all the same gear, except the roadside sprayers

Treatment Totals

- Total surface area treated = 81 acres
- Total volume treated = 596 acre-feet
- Total gallons of rotenone used = 2,260

Restocking Efforts

- Approximately…

40 bowfin

300 spotted gar

760 sunfish

30 catfish

115 largemouth bass

… have been stocked in the Port Sulphur canal

Restocking

Post-stocking

- Fishes were collected from various areas in the Atchafalaya Basin and the Bonnet Carre Spillway
- Post-monitoring effort on August 27, 2009
  - Electrofishing in drainage canal
  - Lead net sampling in borrow pits
  - No tilapia or Rio Grande cichlids observed

Monitoring Efforts

- Presence/absence sampling
- Diet analysis of predatory fishes
- Stocking efficiency of alligator gar
- Changes in community structure

Public Responses

Cooperators

- US Fish and Wildlife Service
- LA Department of Environmental Quality
- Army Corps of Engineers
- LA Department of Natural Resources
- Barataria-Terrebonne National Estuary Program
- Louisiana State University
  - SeaGrant
  - AgCenter - Extension
- Nicholls State University
- Tulane University
- University of New Orleans
- Plaquemines Parish Government
- US Department of Agriculture Wildlife Services
- Louisiana Department of Agriculture and Forestry