The Effect of Predator Recognition Conditioning Frequency on Survival of Hatchery-reared Bonytail and Razorback Sucker

Kristopher J. Stahr and Ryan D. Mann
Acknowledgements

- U.S. Bureau of Reclamation
  - Jeff Anderson

- Arizona Game and Fish Department
  - Josh Walters
  - Nathan Chase
  - Julie Tolby

- SNARCC (Dexter National Fish Hatchery)
Introduction

• Populations currently sustained by stocking efforts
  – 660,000 Razorback Suckers
  – 620,000 Bonytail

• Post-stocking survival very low
  – Attributed to piscivorous and avian predation

• How do we increase post-stocking survival???
Introduction

- Fish are naïve within hatchery setting
  - Artificial food
  - Flow conditioning
  - Anti-predator behavior?

- Can we condition naïve hatchery fish to avoid predation?
Introduction

• Previous AZGFD Study
  – Shreckstoff’s Substance
    ▪ Alarm pheromone within tissue of Bonytail and Razorback Sucker
  – Alarm pheromone introduced at same time of largemouth bass
    ▪ Fish then associate “danger” with the introduced predator

• How do we keep predators from consuming fish during conditioning?
  – Botox!
    – Restricts jaw muscles, allows for pellet capture but not fish
Introduction

• Preliminary experiment evaluated conditioning within ponds for 24 hrs
  – 30% increase in survival for conditioned fish

• Further refinement
  – # of Conditionings Needed
  – Conditioning Retention
  – Large batch conditioning
  – Evaluation of artificial structures
  – Avian predator conditioning
Introduction

• Preliminary experiment evaluated conditioning within ponds for 24 hrs
  – 30% increase in survival for conditioned fish

• Further refinement
  – **# of Conditionings Needed**
  – Conditioning Retention
  – Large batch conditioning
  – Evaluation of artificial structures
  – Avian predator conditioning
Methods

• Bonytail and Razorback Suckers received from SNARCC in Dexter, New Mexico

• 2 m diameter round fiberglass tanks (0.5 m water depth)

• Three treatments:
  – 0 Conditionings (control; naïve fish)
  – 1 Conditioning
  – 3 Conditionings
Alarm Pheromone Collection

- 2 prey fish (30 g)
- 500 mL water
Methods

• Conditioning protocol
  – Study prey fish added to 2 m circular tank
  – 1 Razorback Sucker and 1 Bonytail (~150 mm TL)
    ▪ Euthanized and added to blender for one minute
  – 1 Largemouth bass (hindered with Botox) and fish solution added to tank
    ▪ Care made to add fish/pheromone without visual contact of staff
  – Conditioning takes place for 5 minutes
  – Largemouth Bass removed
Methods

• 1 adult Largemouth Bass in each trial as predator
  – Mean TL: 335.1 mm (Range 297 to 356 mm)
  – 10 prey fish used in each trial
    ▪ Razorback Sucker or Bonytail
  – 20 to 25% of adult Largemouth Bass TL
    ▪ Optimal prey size for Largemouth Bass
  – Mean TL: 74.8 mm (Range: 68 to 83 mm)

• Trials conducted for 1 hr
Methods

• Repeated measures design
  – Each subject (LMB) used in 6 treatment combinations
    ▪ Razorback Sucker or Bonyail
    ▪ 0,1, and 3 Conditionings
  – Treatment order and tank placements randomized prior to study

• Prey fish and LMB acclimated 24 hr
  – LMB starved for a 24 hr period
  – LMB restricted in movement within tank

• Trial start when LMB released
  – # of remaining fish recorded
  – Conditioned to consume prey prior to experiment

• Mean tank temperature: 19.3°C
Preliminary results: Razorback Sucker

Mean consumed (#) vs. Conditioning frequency.

N = 15
Preliminary results: Bonytail

Mean consumed (#)

0 1 3

Conditioning frequency

N = 15
Future Research and Implications

• Trials completed by Spring 2018
• 2\textsuperscript{nd} Experiment will evaluate retention
  – Control (naïve fish)
  – 1, 10, and 30 days post-conditioning
• 3\textsuperscript{rd} Experiment will evaluate artificial structures
• Ultimate goal
  – Develop a protocol for conditioning large batches of fish
  – Use conditioning in conjunction with other strategies to increase survival (e.g., artificial structures)