Evaluation of Predator Recognition in Bonytail and Razorback Sucker in Mesocosms

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Improving survival of stocked natives

- Native fish species may be naïve to the fact that non-native predators are dangerous (i.e. Cox and Lima 2006)
- Conditioning results in altered behavior, utilization of predator-free areas, and improved survival (Mueller and Carpenter 2006, Ward and Figiel 2013)

2014 Lab Study

- Confirm that bonytail and razorbacks can be conditioned to recognize predators to improve survival
- Develop practical conditioning techniques for large scale hatchery operations

Conditioning

20 prey fish

1 Hindered Predator

20 prey fish

Alarm Substance

Methods

- Condition fish: Expose prey fish to a **hindered** predator in conjunction with alarm substance
  - Provides both visual and chemical predator signal in conjunction with alarm pheromone
  - No predation occurs during conditioning
- Document short-term survival of conditioned fish compared to unconditioned fish
  - Bonytail and razorback sucker as prey
  - Channel catfish, largemouth bass, and mixed bass/catfish as predators

2014 Survival Trials

20 Conditioned prey fish

4 Starved Largemouth

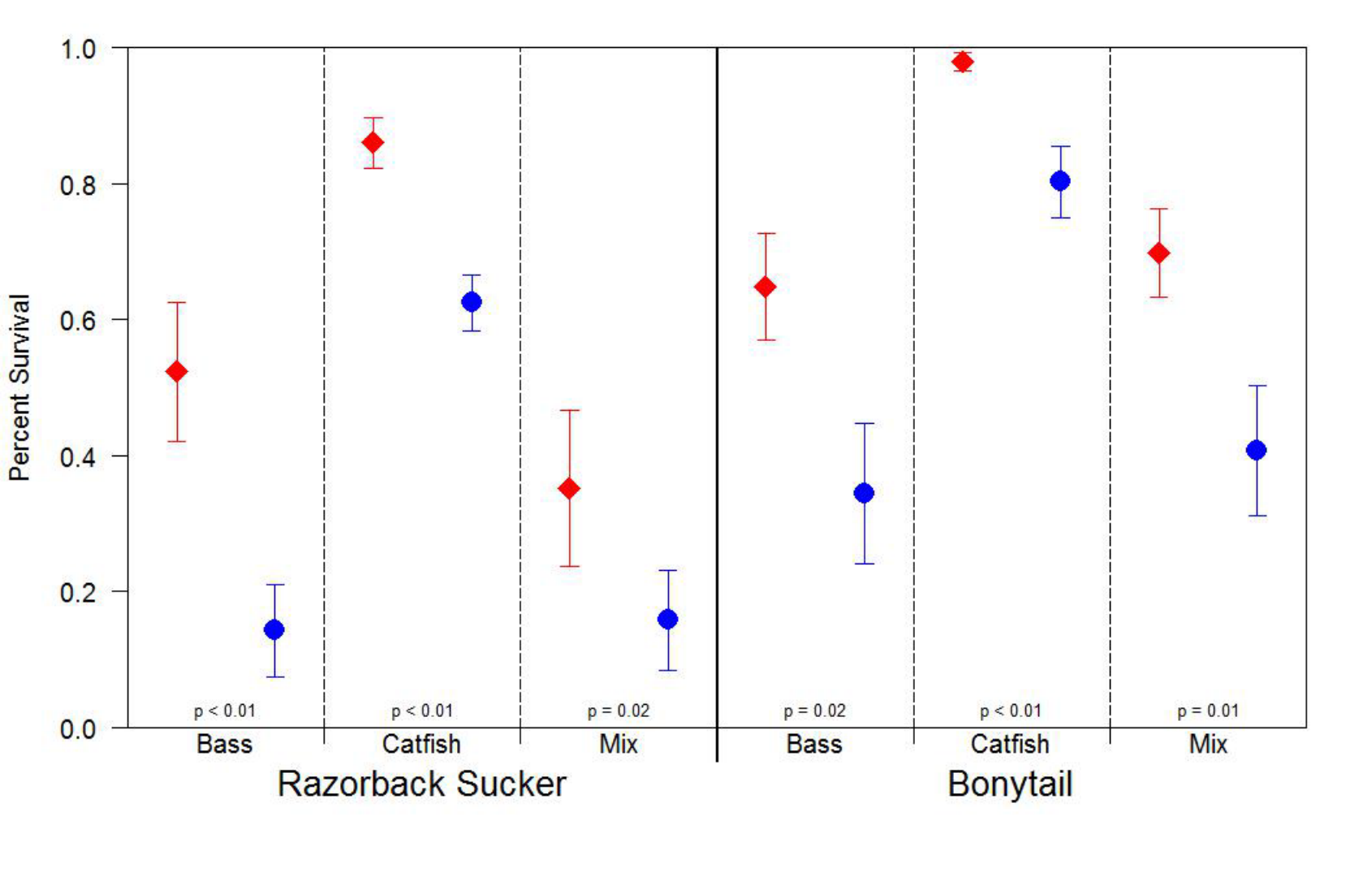
20 Unconditioned prey fish

24 Hours

Unconditioned prey fish

Conditioned prey fish

2014 Conditioning Results



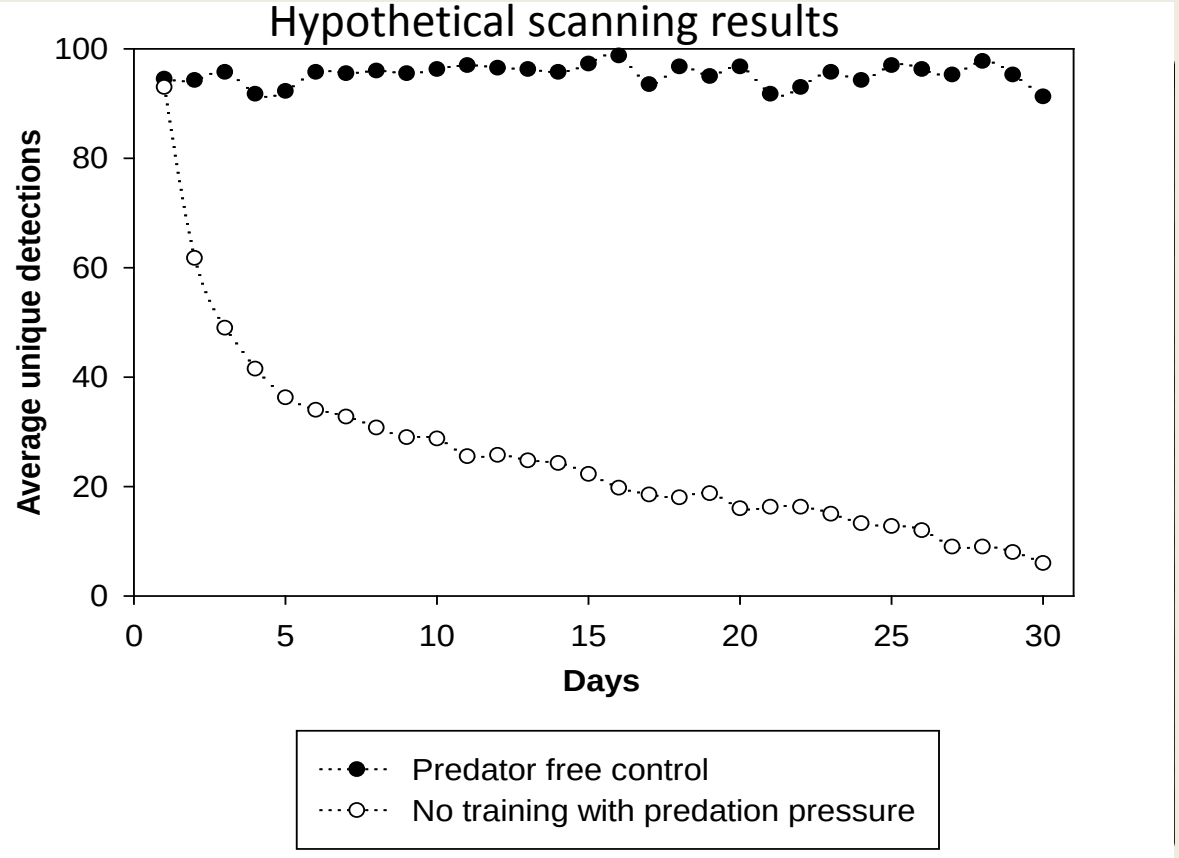
Conditioned
Unconditioned

2016 Mesocosm Pond Studies

- More natural environment; Long term influence of conditioning on survival
- Valle Vista Golf Course
  Kingman, AZ
- Replicated ponds for 1-month long trials
- Effect of multiple conditionings
  - Control, 0,1, and 3 conditionings

Pond Studies

- PIT tag Arrays to assess habitat utilization and survival through time across conditioning levels

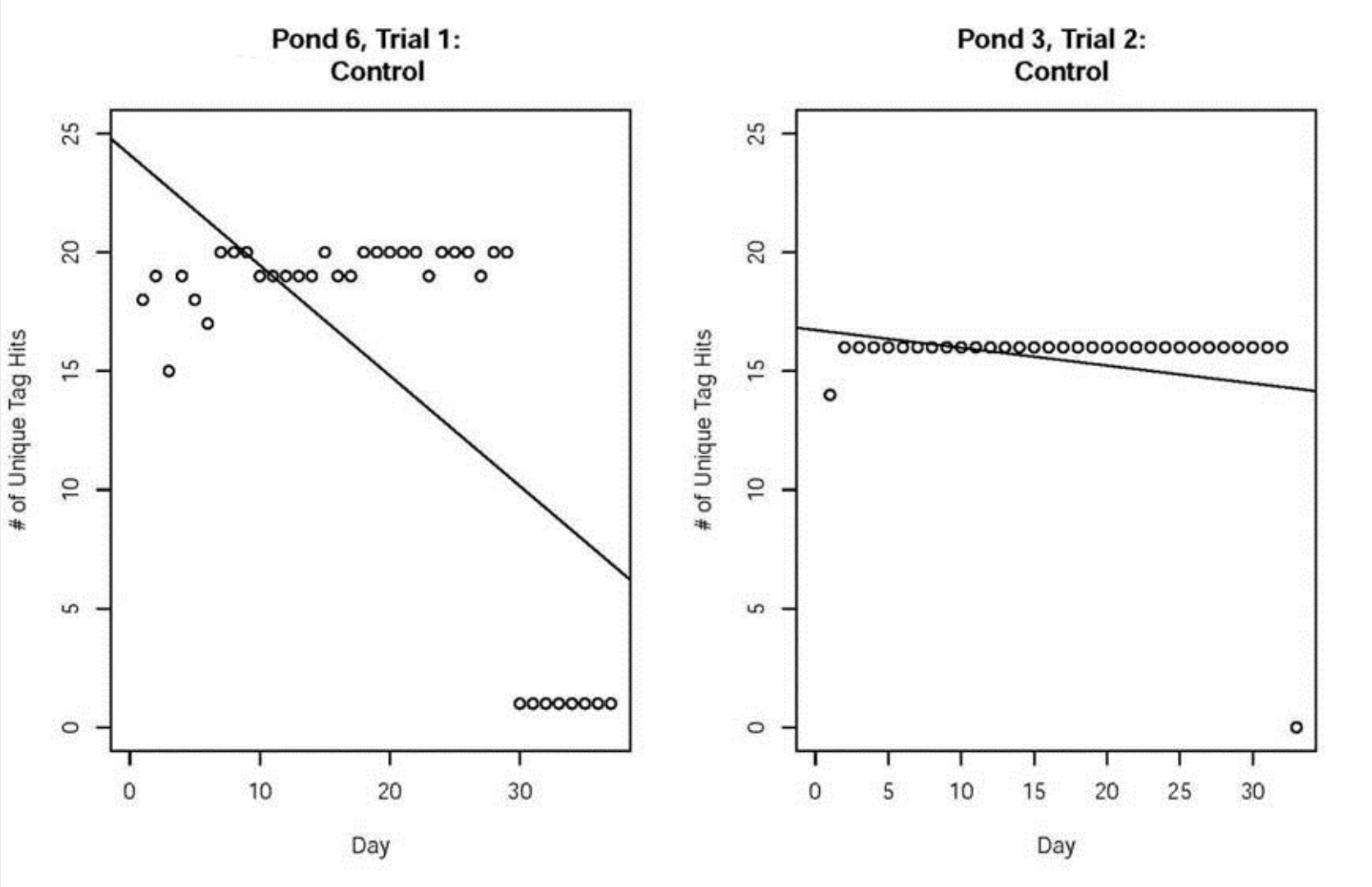


Preliminary Results

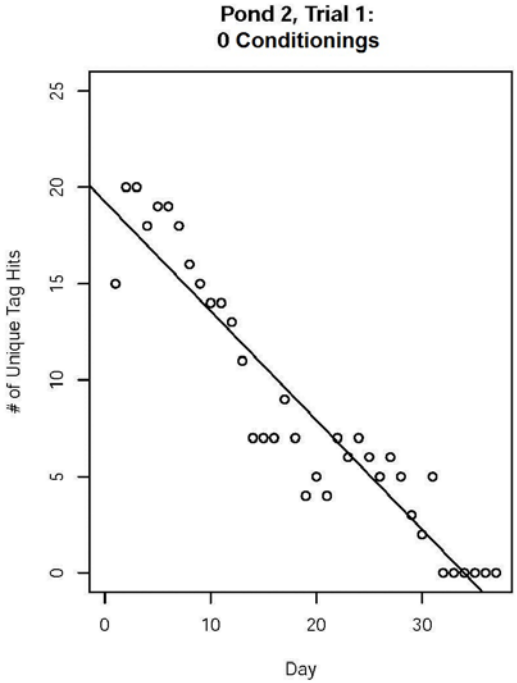
- Four Experimental Trials Completed in 2016
  - Bonytail as prey
  - LMB as predator
  - Presenting on First 2 trials

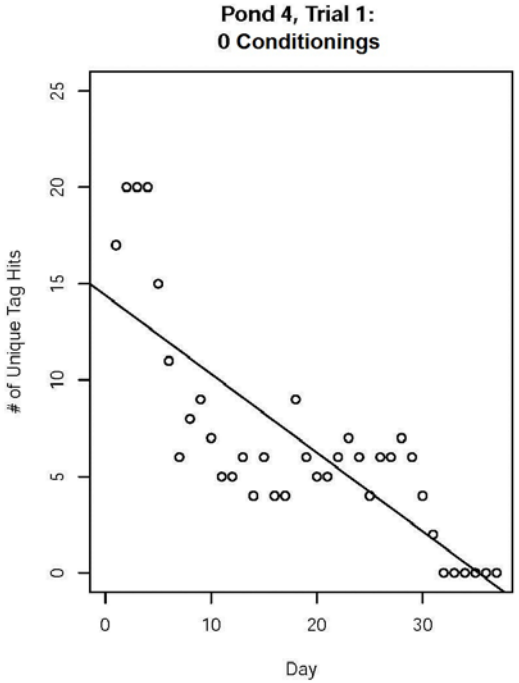
Treatment	N	Average # of fish survived
0 Conditionings	3	3.3 ± 0.9
1 Conditioning	4	4.0 ± 1.1
3 Conditionings	3	6.3 ± 2.0

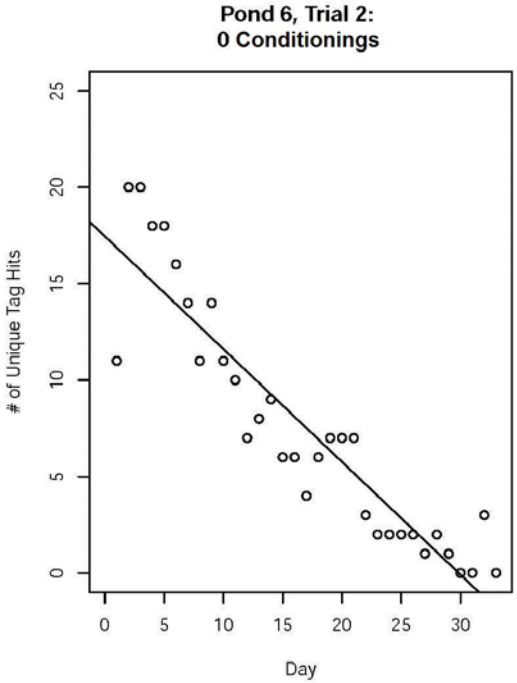
Control Ponds



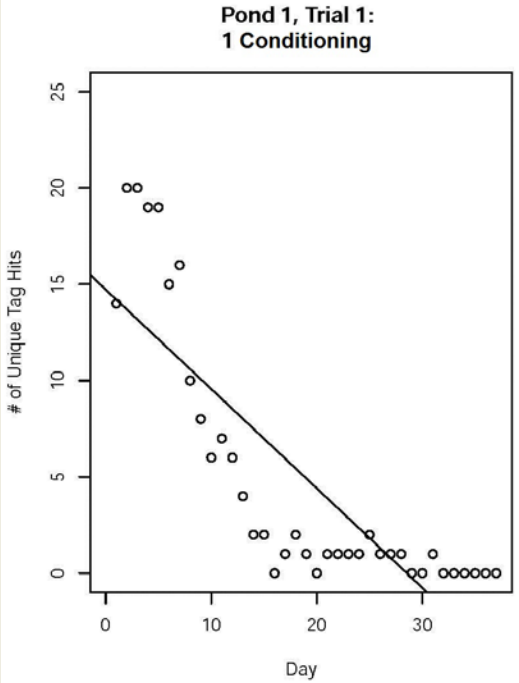
0 Conditionings

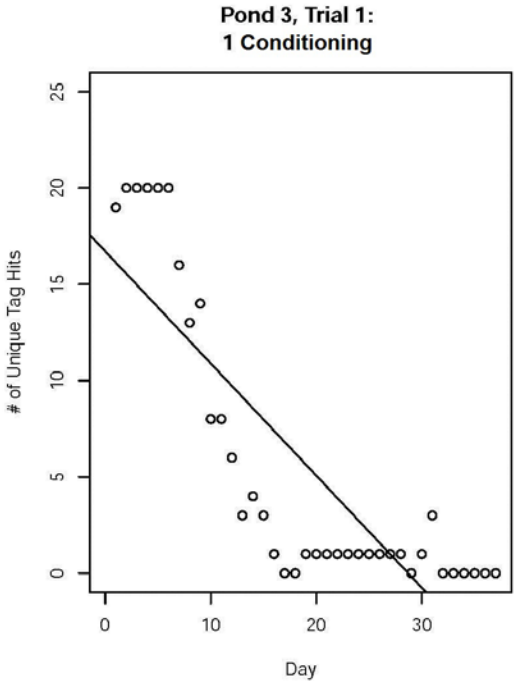


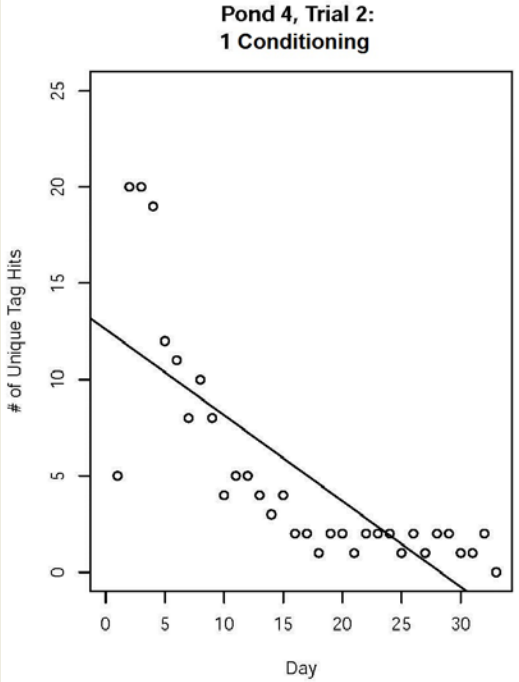


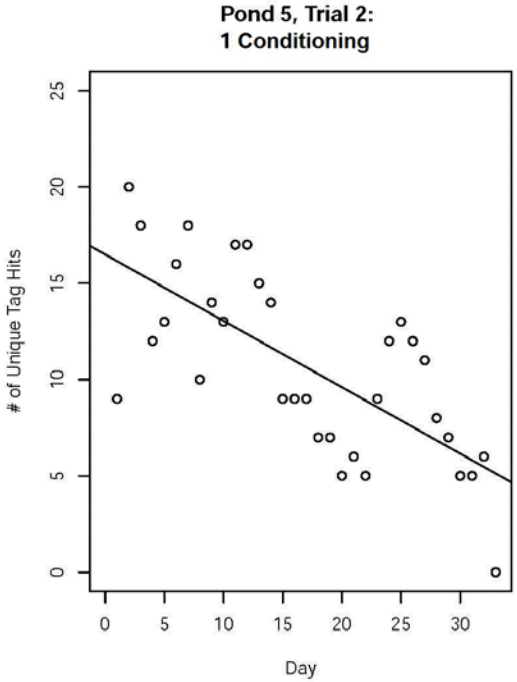


1 Conditioning

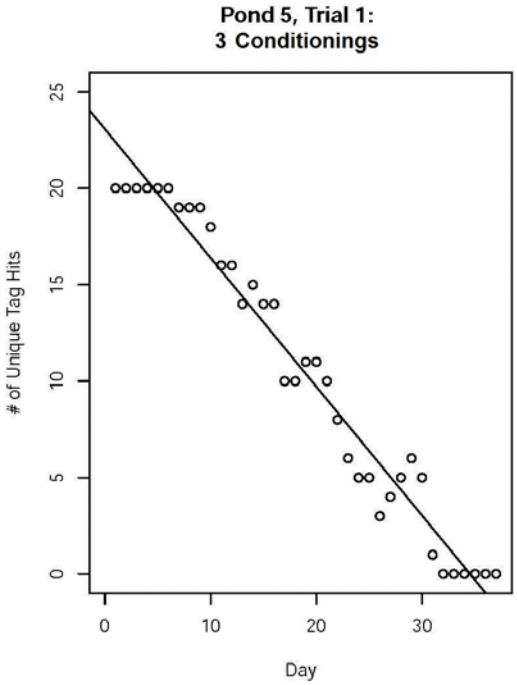


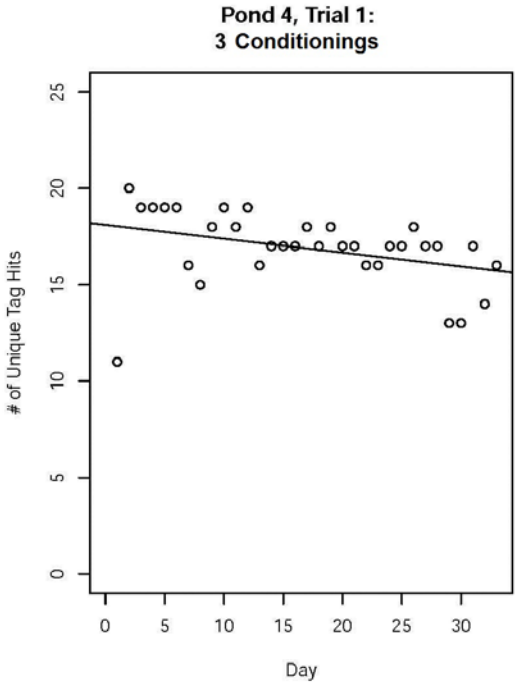


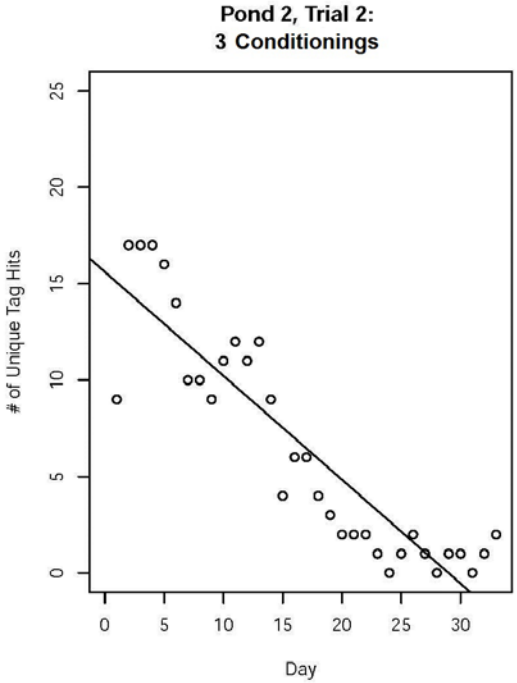




3 Conditionings







What have we learned?

- Ponds difficult to harvest
  - Screened trash pumps
  - Winch system for seines
    - Algae control, landscaping for sediment control
- PIT tag antenna issues
  - Node failures
    - Currently being repaired
- Public Tampering
  - Fishing, Stocking
- Survival Estimates, PIT arrays provided accurate daily detections and estimates of survival.

Future Research

- Completed LMB trials in fall 2016
  - Repeat some trials, complete analysis
- Dual Predator trials in spring 2017
  - LMB and Channel Catfish
- Razorback sucker trials
- Educational and ‘Do not disturb’ signs to limit public tampering
  - Outreach presentations for community
- Utilize experimental ponds for additional mesocosm-scale studies

Acknowledgements

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- Nathan Chase, AZGFD
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