

The Role of American Water Willow in Mediating Juvenile Largemouth Bass Survival and Anti-Predator Behavior



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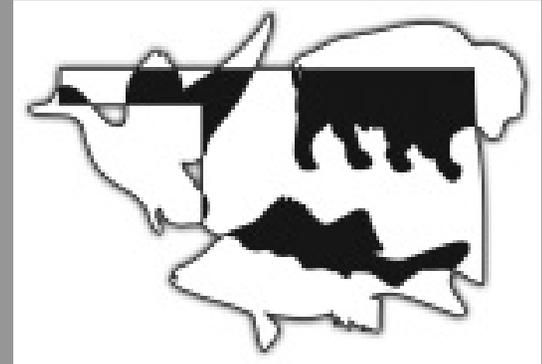
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*NATURAL RESOURCE
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Introduction

- Largemouth bass (LMB)
 - Most pursued sport fish in reservoirs
 - Inconsistent recruitment across range
 - Several factors can affect recruitment
 - Hatching date
 - Water-level fluctuations
 - Prey availability
 - Predation
 - Availability of cover

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Introduction



grophytes



Introduction

- LMB and aquatic macrophytes
 - Presence of macrophytes may help minimize recruitment limiting factors
 - Mechanisms within recruitment process unclear
 - Survival?
 - Foraging ability?
 - Forage abundance?
 - Other unknown factors?
 - Previous research has focused only upon submersed macrophytes
 - Little or no information exists on other macrophyte types

Introduction

- LMB and aquatic macrophytes
 - Reservoirs often lack macrophytes
 - Aging – Reduced habitat
 - Turbidity
 - Water level fluctuations
 - Propagation and introduction now common
 - Erosion control
 - Fish habitat
 - Nutrient uptake
 - Competition with invasive aquatic plants

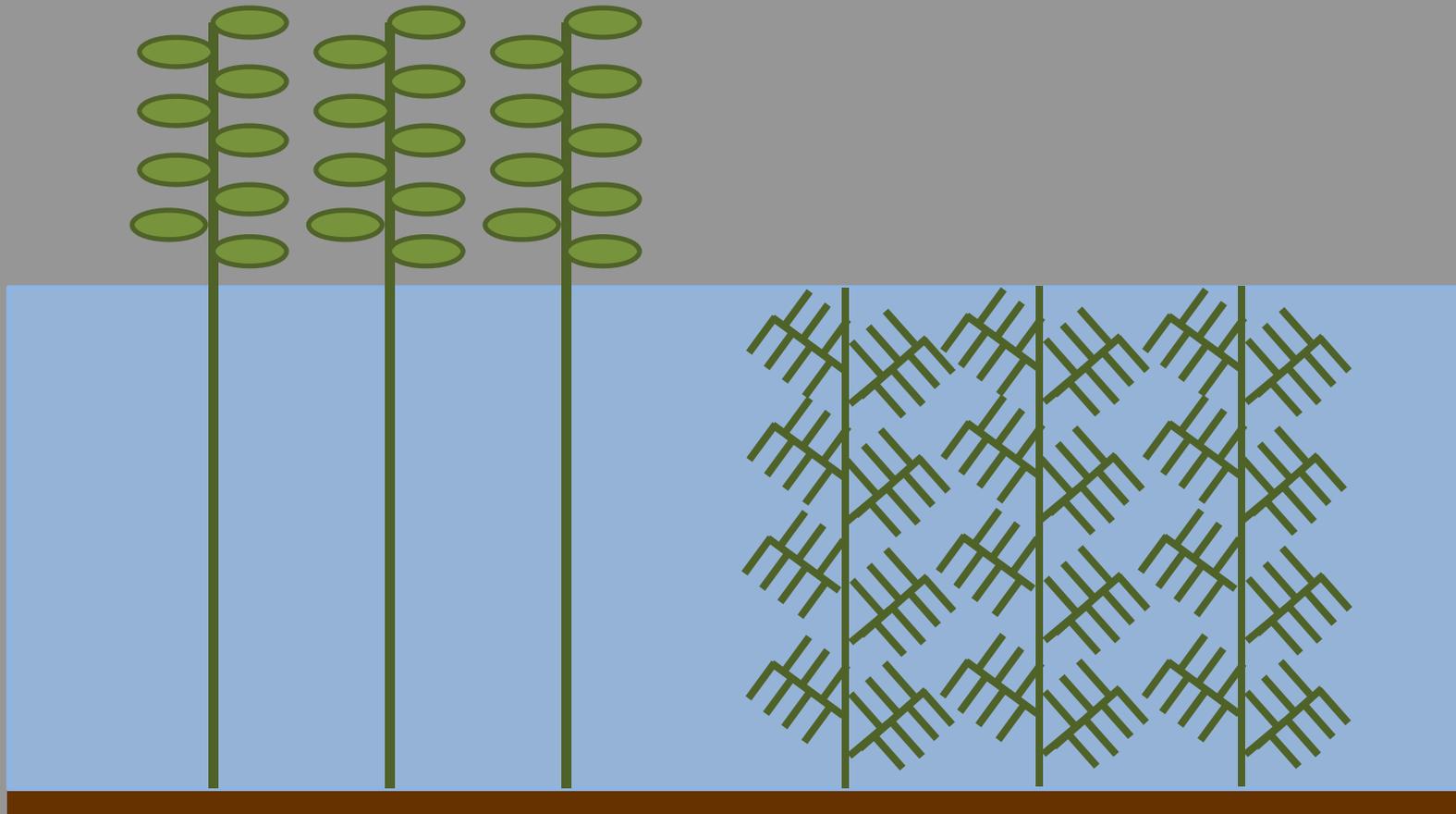


Introduction

- American water willow
 - Currently being planted in many reservoirs across the U.S.
 - Goal to increase recruitment of sport fishes
 - Propagates and establishes easily
 - Considered less structurally-complex than submersed macrophytes



Emergent vs. Submersed macrophytes



Objective

Examine the effect of American water willow on survival of juvenile LMB exposed to predation pressure



Study Design

- Experiments within the OSU Wet Lab Facility
- Adult (> 250 mm) LMB used as model predator
 - Boat electrofishing
- Juvenile (< 100 mm) LMB
 - Seining
 - Backpack electrofishing



Study Design

- Observations made within round, polyethylene tanks (1.98 m diameter, 0.86 m deep)
- Treatment 1: Water willow
 - Collected from field
 - Natural stem density
 - Planted on one-half of tank
- Treatment 2: Control
 - Void of vegetation

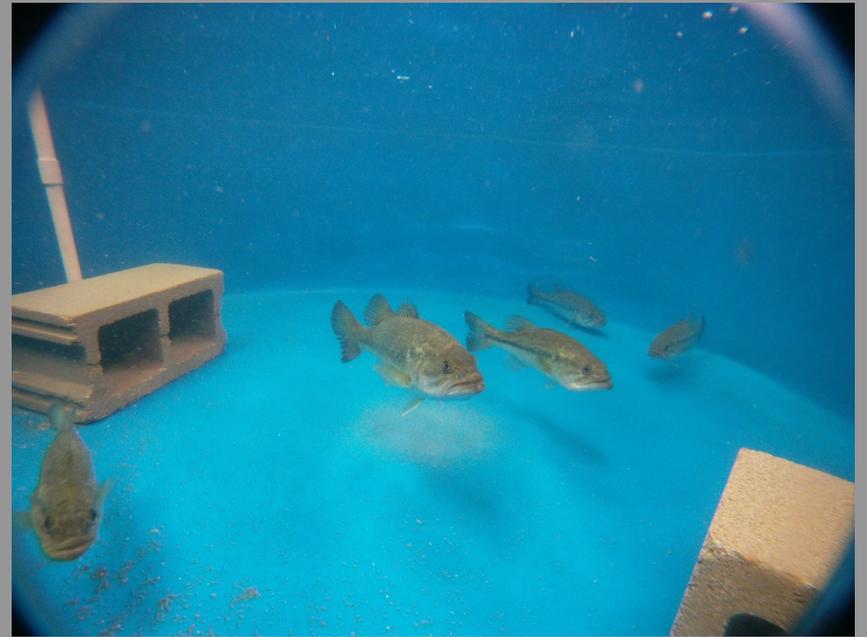


Study Design

- Video cameras installed above tank to monitor predator/prey behavior
- 10 juvenile LMB used in each trial
 - 20 to 25% of adult LMB TL
 - Optimal prey size for adult LMB
- 1 adult LMB used in each trial
- Trials conducted for 1 h
- 12 total adults used in experiment
- Juvenile and adult LMB acclimated 24 h prior
- Juvenile LMB behavior recorded every 5 minutes

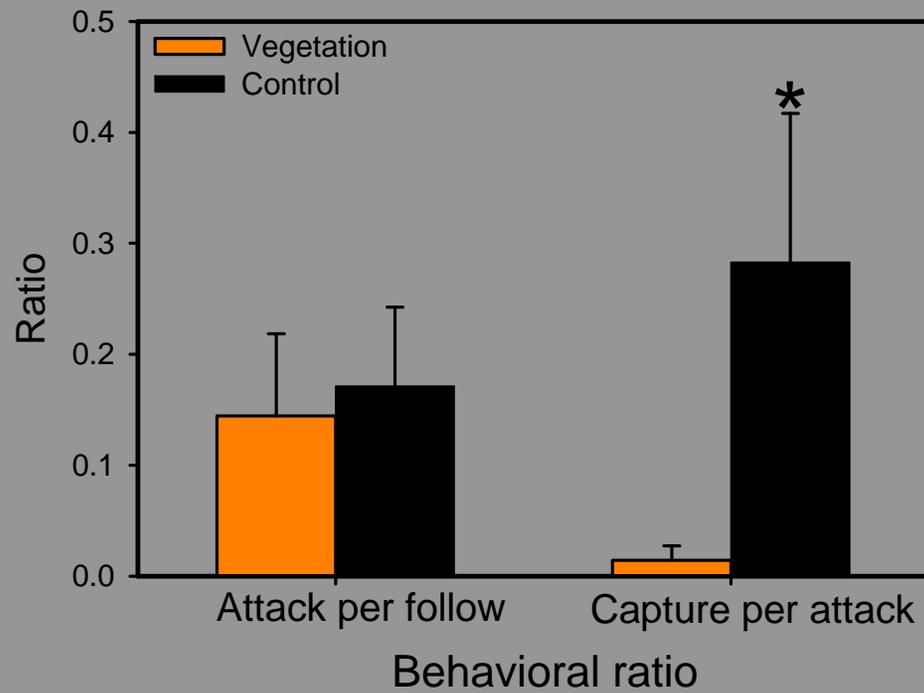
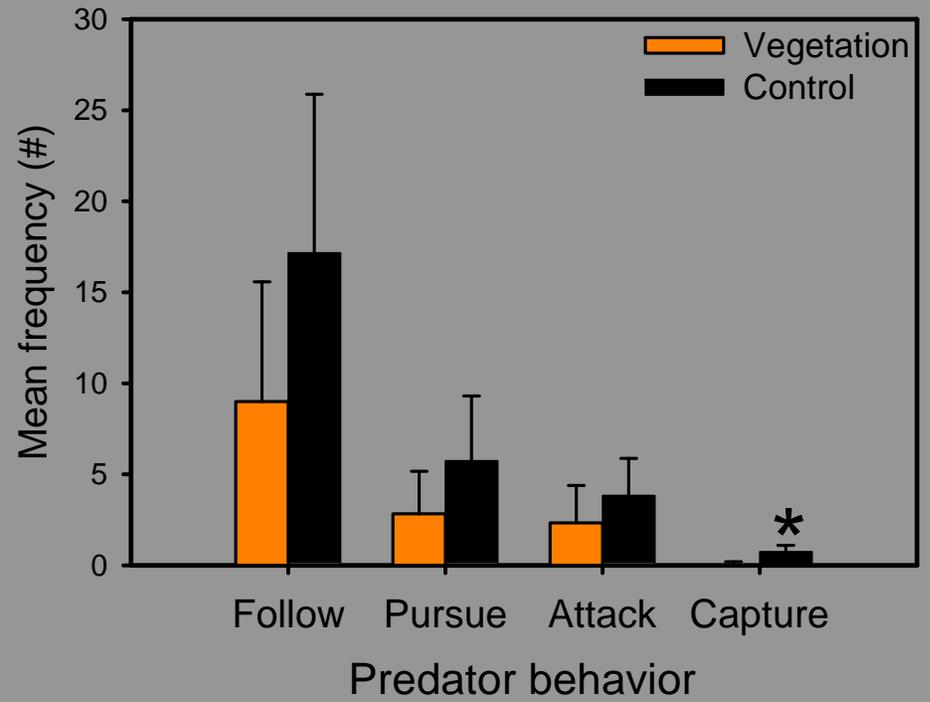
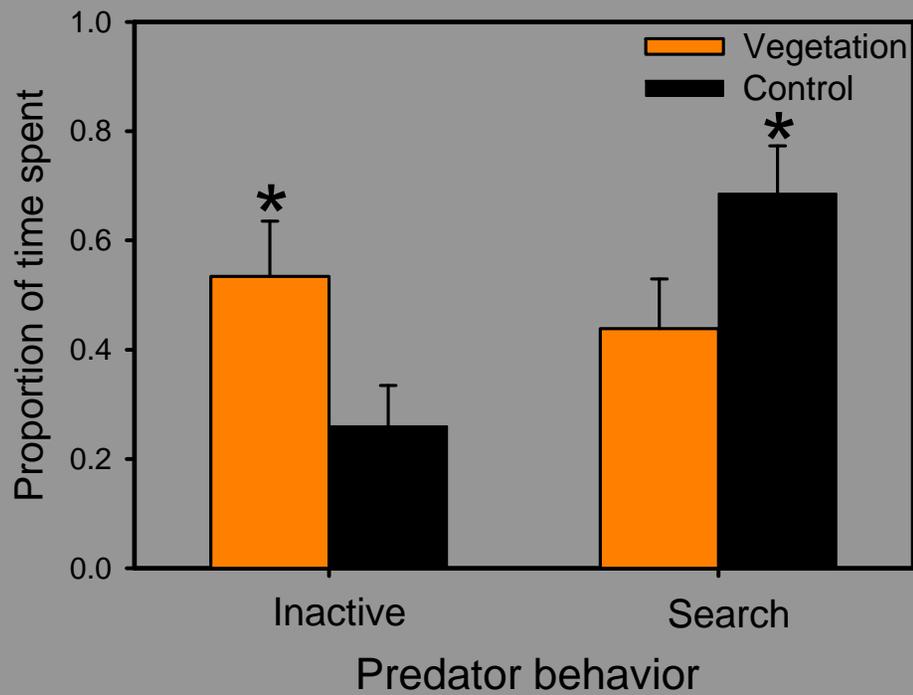
Study Design

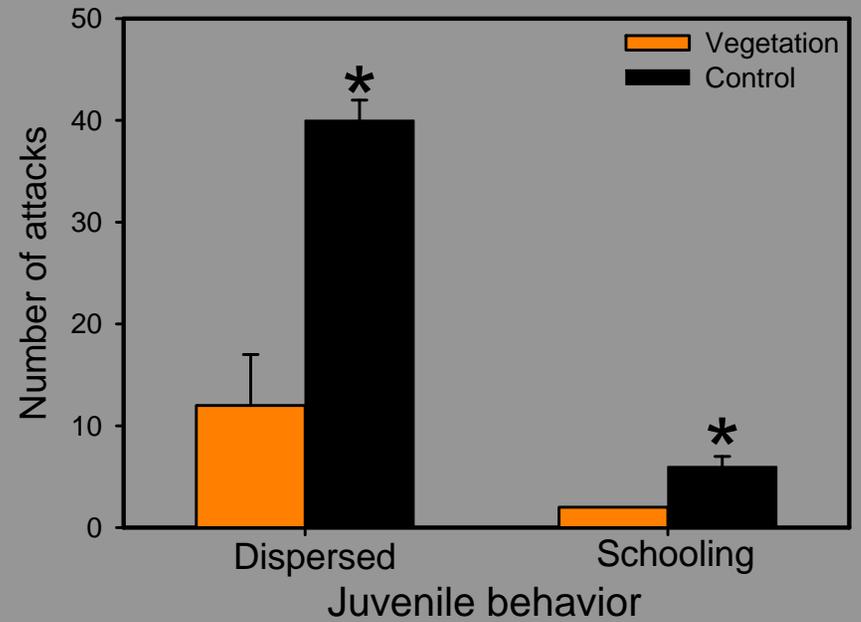
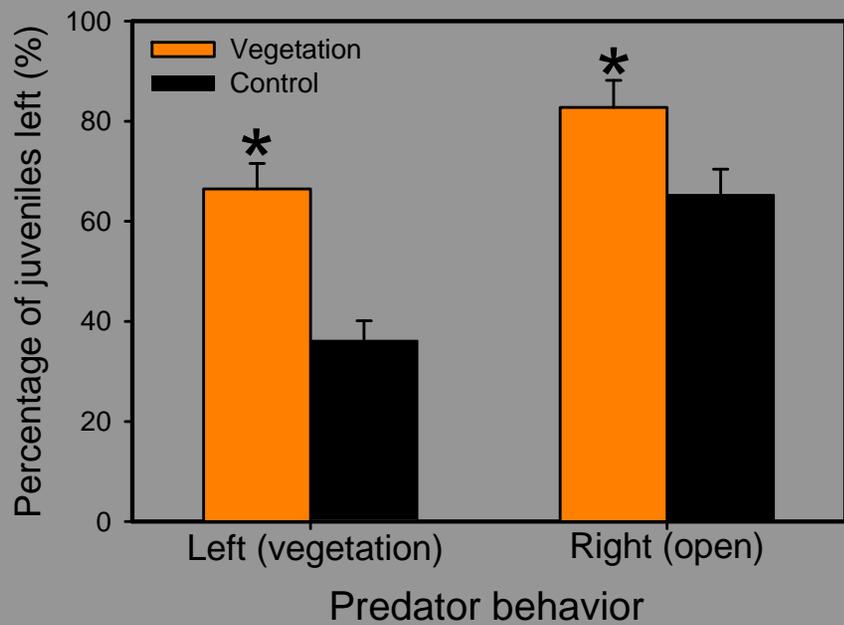
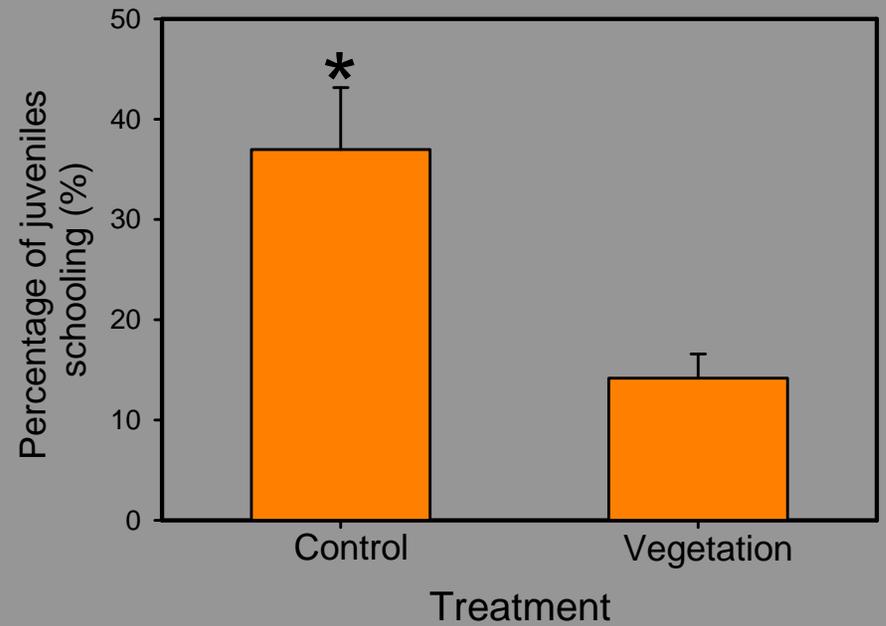
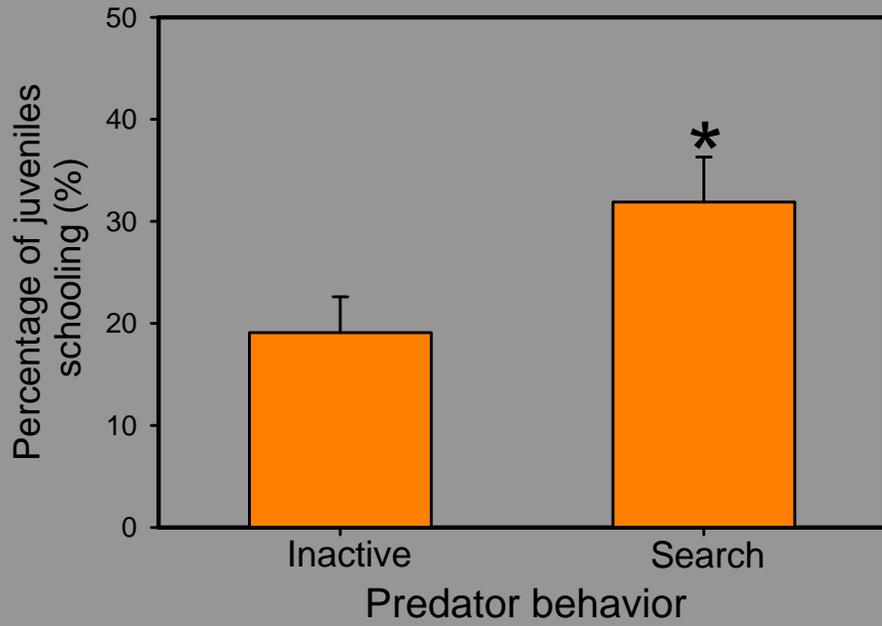
- Predator behavior
 - Inactivity: resting motionless
 - Searching: Swimming, not oriented
 - Following: Swimming while oriented
 - Pursuing: Following at burst speed
 - Attacking: Striking at prey
 - Capturing: Ingest prey



Study Design

- Prey behavior
 - Dispersed: No close association
 - Schooling: Swimming, moving about as a unit
 - Side of tank (left vs. right)
- Data analysis
 - One-way ANOVA with repeated measures design
 - Predators treated as individual subjects
 - Alpha = 0.05 was used for all comparisons





Conclusions

- Adult LMB behavior
 - Reduced capture efficiency of adult LMB
 - Fish more active within open water treatment
- Juvenile LMB behavior
 - Water willow increased survival of juvenile LMB
 - Schooling most prevalent within open water and when predators active
 - Lower number of attacks overall when juvenile LMB exhibited schooling behavior

Conclusions

- Water willow does appear to provide adequate refuge from predation for juvenile LMB
- Vegetation also affected both adult and juvenile LMB behavior
 - Interaction ultimately due to presence of vegetation
- More complex LMB-macrophyte interaction than previously thought

Future research

- Unclear whether pattern holds on larger scales
 - May vary across waterbodies and macrophyte species
- Intensifies need to understand how much vegetation is needed to truly increase recruitment
 - Increased survival
 - Foraging effects?

Future research

- Determine if macrophyte complexity or stem density is ultimate driver of juvenile LMB foraging efficiency
 - Will help to elucidate specific mechanisms related to recruitment of LMB
- How does macrophyte stem density affect shift to piscivory in LMB?
 - Complex submersed macrophytes may reduce foraging efficiency
 - Degree of macrophyte stem density needed?

Future research

- Ultimately need to understand more about how macrophytes affect the early life history of LMB
 - Specific recruitment mechanisms
- Allows for more effective management of largemouth bass

