Black Bass Populations and Angling

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Outline

- Largemouth bass importance/ life history
- Study purpose
- Experimental fishing trials
- Are we finding all nests?
- Conclusions and future directions
Largemouth Bass: Socially and Ecologically Important

• Native top predators not dependent on stocking (in Michigan)
• Recognized as keystone species
  – Impacts on water clarity
  – Prey size distribution
• Among most popular game species
  – Generate millions in economic activity
  – Stepping stone species for recreational anglers
Largemouth Bass Life History

• Nest building species with male parental care
  – Males build nests when water reaches about 15 °C
  – Females deposit eggs in nest
  – Male fans eggs
  – Male guards eggs from potential nest predators

• 3 life stages:
Largemouth Bass Life History
Largemouth Bass are Vulnerable

- Visibility and aggressive behavior during nesting
- Individual negative effects of angling are well documented:
  - Metabolic
  - Brood reduction
  - Nest abandonment
- Population effects unclear
Study Purpose

• 2006 Michigan changed bass fishing regulations
  – Catch and immediate release (CIR) season added from April to Memorial Day
  – Previously bass fishing not permitted before Memorial Day weekend
• This research is part of an effort to evaluate effects of this regulation on Michigan bass populations
Methods

• Study Systems: Warner Lake

Barry County, MI
26 Ha, 16 meter max depth
8% of shoreline developed
Methods
Fishing Experiment

- Nests assigned into treatments:
  - Control, Treatment
  - 4 lures, 3 casts each:
Lab Methods

Extract DNA → PCR → Electrophoresis
Pedigree Reconstruction

3 step path to pedigree confidence:

1) Analyze data with multiple runs of a program
   – Conducted 100 iterations of each data set

2) Analyze data with multiple programs
   – Used PEDIGREE and COLONY programs
   – 92% concordant on full-sibs, 99% on half-sibs

3) Perform simulations
   – Analyzed a simulated data set of known pedigree
   – Program accuracy averaged 96.6% across 10 runs
Objectives:

• Estimate relative impact of experimental angling and natural features on nest success

• Estimate the number of nests not sampled
Analysis

• Assess relative impact of angling and natural features on nest success
  – Regression Tree
    • Dichotomous tree
    • No assumptions about data distribution

• Evaluate data to estimated number of nests missed
Variables

• **Dependent Variables**
  – # YOY

• **Independent Variables**
  – **Treatment**
  – Date of establishment
  – Depth
  – % Plant cover
  – Coarse Woody material
  – Twigs
  – Substrate
  – Bass Score
  – TAB
  – # Eggs per nest
Results - general

- 33 nests sampled Warner Lake 2010
- 98 YOY sampled via fyke netting, electrofishing
  - 34 assigned to nest
- Fished 9 nests
  - 5 bass captured
  - 4 bass not captured
- No nest predation observed
- Bass back to nest <5 min
Results---→ Relative importance of angling and natural features

N = 33 nests

Cover > 45%

0.49 YOY/nest
N = 21

TAB = 0

0.18 YOY/nest
N = 11

Cover < 45%

1.92 YOY/nest
N = 13

TAB > 0

0.7 YOY/nest
N = 10

PRE = 0.4
Results---＞ Does angling reduce male success?

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Not Caught</th>
<th>Caught</th>
<th>F</th>
<th>p</th>
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<td>N</td>
<td>7</td>
<td>4</td>
<td>5</td>
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<td>-</td>
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<tr>
<td># of YOY</td>
<td>1.28(0.57)</td>
<td>0.75(0.48)</td>
<td>0.4(0.4)</td>
<td>0.79</td>
<td>0.47</td>
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</table>

3X difference

Power ~ 0.20
Results----> Are we finding all nests

- How many nests were missed?
  - Unassigned YOY grouped into 15 unique families
  - Sampled 33 of 48 nests = 31% of nests missed (Lower limit)
  - 34 of 98 YOY assigned to a nest
  - ~35% of YOY assigned = 65% of nests missed? (Upper limit)
  - 31-65% of nests missed
Implications

• Natural features relatively more important than angling in our system
  — Nest habitat and male aggression
• Males caught in experiment appear to produce fewer YOY than control males
  — Angling vulnerability has been shown to be heritable in LMB
• Many nests seem to be well hidden
  — If we can’t find them can anglers?
Other research aspects

• Documenting largemouth bass mating behavior
  – Number of males and females contributing to nest

• Evaluating patterns of YOY dispersal from nest of origin
Future Directions

• Data from this and other studies to generate predictive models
  – Under what conditions would angling negatively affect bass populations?
• Expand sampling effort and techniques to locate more nests
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