Yellow Perch Broodstock

Geoff Wallat, Aquaculture Specialist
Perch 101

• Spawn once a year: Late March in So. Ohio
• Eggs produced in ribbon structure – requires unique procedures for incubation and hatching
• Fry (juveniles) need small live organisms for first few weeks’ feeding – 6 week culture period in open ponds.
• Juveniles trained to accept formulated diets – “Feed training” or “Feed Trained Fingerlings”
• Open ponds – 2 seasons (18 months) to food fish market size of ≥ 8” from fry size
Broodstock Conditioning

- Perch broodstock require a cold period of around 140 days, at or below 10 °C
- We have used 1 m $^3$ culture cages in open ponds and maintenance feeding with pelleted trout diet
- Also use outdoor tanks with natural temperatures and light cycle
- Broodstock conditioning research is an area of need for optimal nutrition
Broodstock Sorting

- Spawning temperatures of around 12 C in late March in southern Ohio
- Columbus and north usually 2 to 3 weeks later
- Broodstock are sorted in early March for tank spawning
Sexual Differentiation

- Males are generally smaller than females and slower growing – Sexual dimorphism
- In late Winter/Spring, females abdomen swollen; ovopore swollen and extended
Sex Determination

Female

Male
Ripe Female
Broodstock Nutrition

- Very Important component
- We typically feed a prepared diet at maintenance rations (1% BW) once or twice a week
- Have found some difficulties with egg quality in pellet-raised fish, seems wild-caught are better
- Diets we use are TROUT diets, higher fat
- We now supplement with live feeds – fathead minnows to improve egg quality
Broodstock Nutrition Study 2004-2005

- Dr. Paul Brown, Purdue U., assisted us with providing diet formulations – diets made at OSU Feed Mill
- Our study had diets formulated to vary the amount of total fat
- 4 treatments
  - 3 prepared diets, held at 36% protein
    - Low Fat 8%
    - Medium Fat 12%
    - High Fat 16%
  - Control diet was minnows only, fed twice a week to satiation
Broodstock Nutrition Study 2004-2005

- 20 females and 50 males total per treatment
- Split to 3 tanks in equal proportions (3 reps)
- Fed daily from December 2004 to March 2005
Broodstock Nutrition Study Results

<table>
<thead>
<tr>
<th>Diet Type</th>
<th>Egg Ribbons produced</th>
<th>Surviving Egg Ribbons</th>
<th>Mean Number of Fry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Fat (8%)</td>
<td>7</td>
<td>5</td>
<td>17,244</td>
</tr>
<tr>
<td>Medium Fat (10%)</td>
<td>8</td>
<td>5</td>
<td>3,453</td>
</tr>
<tr>
<td>High Fat (16%)</td>
<td>9</td>
<td>7</td>
<td>8,354</td>
</tr>
<tr>
<td>Minnows</td>
<td>12</td>
<td>6</td>
<td>10,130</td>
</tr>
</tbody>
</table>

- Several Egg Ribbons did not survive to full term
- Low spawning rate ( < 50 % for most treatments)
- Next step - Lower fat diet with minnow supplementation?
Selection of Broodstock

- Need healthy, good sized broodstock
- Minimum 2 years old, 3 is better
- Size is about 10 to 14 inches at that age
- Geographical strain differences for growth may also be a factor
- Our Genetics Improvement program has noticed differences in performance between strains
Broodstock Summary

- Use a good, reliable source of broodstock
- Conditioning period (cold period)
- Nutritional component still needs more work
Spawning Techniques for Yellow Perch
*Perca flavescens*

Geoff Wallat, Aquaculture Specialist
Broodstock Sorting

- Spawning temperatures of around 12 C in late March in southern Ohio
- Broodstock are sorted in early March to determine readiness for spawning
- For OSU research, pairs are selected based on genetic pedigree
  - Reducing the amount of inbreeding
- On-farm – usually selected by size and/or readiness
  - Caution that new broodstock should be added to gene pool every few years
Open Pond Spawning

- Perch broodstock are stocked to ponds with substrate (Christmas trees) added
- Broodstock can be removed later, or left in if feed trained
- Stocked 20 males, with 10 females
- Our results were average 10,000 fry per 0.25 acre pond
Unique Egg Ribbon Structure

• Requires substrate in ponds to attach to, or some structure in tanks to hold
Pond Spawning Substrate
Improving Spawning Methods

- Indoor Spawning with Hormone Injection
  - Human Chorionic Gonadotropin (HCG)
  - Incubate eggs indoors, stock resulting fry to ponds

Compared to:

- Pond Spawning with no injection
  - Allow natural spawning in ponds
  - Egg incubation and fry culture in same pond
HCG Calculation

- Vials come in 10,000 International Units
- When mixed with diluent, 1,000 IU/mL
- We use 1 cc syringes. 1 cc = 1 mL
- Recommended dosage is 400 IU/kg body weight
- To calculate dosage:
  \[
  \frac{400 \text{ IU/kg} \times \text{body weight (kg)}}{1000 \text{ IU/mL}}
  \]
Sample Calculation

• 200 gram perch = 0.2 kg
  [400 IU/kg X 0.2 kg] / 1000 IU/mL
  = 0.08 cc dosage
Compare Natural Spawning and Induced

- **Pond Spawning**
  - 3 Quarter-acre ponds used
  - Each pond stocked with 10 females and 20 males

- **Indoor Spawning**
  - Match potential production of ponds
  - 30 tanks (70 L) stocked with 1 female and 2 males
  - Randomly assign tank to one of 3 groups, 10 females and 20 males per group
Indoor Spawning

- Females were injected one time with HCG
  - 400 IU / kg
  - Average weight of female : 219.6 g
  - Average water temperature : 11.5 °C
- Ovulation occurred within 2 - 8 days
  - Peak at 6 - 7 days
  - Strip spawn or collect fertilized ribbon from tank
HCG Injection – Inter-muscular
Strip Spawning Female Perch
The Learning Curve
Use Non-stick Pan
### Indoor Egg Incubation (n = 30)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rib. Wt (g)</td>
<td>152.4</td>
<td>83.8 - 310.1</td>
</tr>
<tr>
<td>% Fert.</td>
<td>95</td>
<td>37.5 - 100</td>
</tr>
<tr>
<td>Count</td>
<td>35,128</td>
<td>14,430 - 58,614</td>
</tr>
</tbody>
</table>
## Indoor Spawning - Fry Count and Stock-out

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td>Fry Count</td>
<td>22,993</td>
<td>1,403 - 48,784</td>
</tr>
<tr>
<td>Survival (%)</td>
<td>65</td>
<td>5 - 96</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Counts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pond 1</td>
<td>145,285</td>
</tr>
<tr>
<td>Pond 2</td>
<td>237,664</td>
</tr>
<tr>
<td>Pond 3</td>
<td>283,834</td>
</tr>
<tr>
<td>Total</td>
<td>666,783</td>
</tr>
</tbody>
</table>
## Pre-Feed Training Means

<table>
<thead>
<tr>
<th></th>
<th>Spawning Method</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Indoor</td>
<td>Pond</td>
<td></td>
</tr>
<tr>
<td>Harvest (kg)</td>
<td>5.12 (^z)</td>
<td>2.47 (^y)</td>
<td></td>
</tr>
<tr>
<td>Number of Fish</td>
<td>23,789 (^z)</td>
<td>8,390 (^y)</td>
<td></td>
</tr>
<tr>
<td>Ind. Weight (g)</td>
<td>0.20 (+.13)(^2)</td>
<td>0.29 (+.23)(^1)</td>
<td></td>
</tr>
<tr>
<td>Ind. Length (cm)</td>
<td>2.71 (+.32)(^2)</td>
<td>2.92 (+.55)(^1)</td>
<td></td>
</tr>
<tr>
<td>Survival (%)</td>
<td>12</td>
<td></td>
<td>(x)</td>
</tr>
</tbody>
</table>
# Pre-Feed Training Totals

<table>
<thead>
<tr>
<th>Spawning Method</th>
<th>Indoor</th>
<th>Pond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest (kg)</td>
<td>15.35</td>
<td>7.40</td>
</tr>
<tr>
<td>Number of Fish</td>
<td>71,368</td>
<td>25,170</td>
</tr>
<tr>
<td>Equiv. Per Acre</td>
<td>95,157</td>
<td>33,560</td>
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<tr>
<td>Equiv. Per Hectare</td>
<td>235,133</td>
<td>82,926</td>
</tr>
</tbody>
</table>
Observations

- Indoor spawning / egg incubation produces more fry
- Increased labor
- We have reduced our stocking density of fry, maximum of 100,000 per pond - around 15% survival = 15,000 fry
- 25,000 to 50,000 in 0.25 ac pond, return about 40% mean survival = 10,000 to 20,000 fry
Contact Information

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