Broodstock and Hatchery Management

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Aquaculture in U.S.

- Demand for lean, mild-flavored products
- Striped bass *Morone saxatilis*
  - Depletion of wild stocks has led to intermittent closures of this fishery
  - Fostered commercial culture interest
- Hybrid striped bass (HSB)
  - Better candidate for aquaculture
    - Tolerance of intensive culture practices
    - Relative ease of production
  - High consumer acceptance
Hybrid Striped Bass

• Cross between

  1. Striped Bass
     *Morone saxatilis*

  2. White Bass
     *Morone chrysops*
Hybrid Striped Bass: Original Cross

- 1st cross of the two species
  - Female striped bass
  - Male white bass
- Historically, referred to as the “original cross”
- Common name “Palmetto bass”
Hybrid Striped Bass: Reciprocal Cross

- 2\textsuperscript{nd} cross of the two species
  - Male striped bass
  - Female white bass

- Historically, referred to as the “reciprocal cross”

- Common name “Sunshine bass”
Industry Standard: Sunshine Bass

*Morone chrysops* ♀

*Morone saxatilis* ♂

Sunshine Bass
*M. chrysops x M. saxatilis*
Reciprocal Cross
Hybrid Striped Bass
Collection of Broodstock

- With the appropriate PERMITS, pure white bass and striped bass can be collected from wild as broodstock
  - Electrofishing, trap nets, hook and line, etc.
  - Care must be taken not to collect wild hybrids
- Broodstock can also be purchased
  - Commercial producers
  - Commercial fishermen
Transportation

- Hauling Tanks
  - Filled with water where fish were collected
  - Raised salinity (5 ppt)
  - Ideal hauling temperature is about 18°C (64°F)
    - Ice can be used
Habituating Broodstock

- Broodstock can be stocked into indoor water recirculating systems

MUST FEED!!
Current, no commercial feeds available specifically for broodstock white bass

Broodfish readily accept live foods (minnows)

Number of eggs produced and hatch are influenced by the diet of female white bass

Live food has proved effective as a broodstock diet for white bass
Although…

• Live foods possess many negative aspects
  • Labor intensive
  • Expensive (>$3.00/lb)
  • Vector for pathogens

  *Streptococcus iniae*

• Prepared feeds
  • Cost-effective (<$0.60/lb)
  • Simplifies feeding regime
  • Safeguards domestic lines
Habituating Broodstock

• Acclimate to recirculating system
• Treat for disease and parasites
• Feed-trained to formulated feeds
  • 50:50 dry trout feed to raw gizzard shad
  • Two-week weaning period
  • Transition to 100% dry feed
Separating Sexes

- Sometimes advantageous to separate by gender
  - Feed costs
  - Reduced densities (fish/cm³)
- Distinguishing sex
  - Abdominal pressure
    (near spawning season)
  - External examination of genital regions
    - Females have highly convoluted opening, males smooth
- Ultrasonification
Controlled Spawning

• Manipulation of photothermal regime

• Photothermal manipulation
  • Light control
  • Temperature control
Habituating Broodstock

- Ultimately, white bass fed feed for several months will become sexually mature in captivity
  - If following an appropriate photothermal protocol and watchful culture (no disease)

Gravid white bass female
Anesthesia

• Broodstock anesthetized prior to
  1. Hormonal injections
  2. Manually stripping of gametes

• Finquel recommended
  • Former name (MS-222)
  • 50-100 mg/L (ppm)
  • Buffer to pH 7 with sodium bicarbonate
Synchronous Spawning Event

- Human Chorionic Gonadotropin (hCG)
- CHORULON®
  - Intramuscular injection (150 IU/kg hCG)
    - Both females and males
- All 50 fish spawned viable eggs within 8 hours
Controlled Spawning

- Small sample of eggs were expressed to determine timing of egg maturation
- Predict when fertilization should take place
Controlled Spawning

- Eggs examined microscopically
  - Mature eggs relatively clear, not bloodied
  - Single oil droplet and intact chorions
  - Successful fertilization
    - Two hour window within which fertilization must take place
Controlled Spawning

- Eggs squeezed into Teflon dish
Controlled Spawning

- Striped bass semen added to white bass eggs
- Produces Sunshine bass (reciprocal cross)
Controlled Spawning

• Mass *Morone* eggs hatched in McDonald jars at commercial operations

Keo Fish Farms, Inc.
Controlled Spawning

- Swim-up fry allowed to freely enter larger tanks
- Producers control number of fry per tank by placing a set number of McDonald jars on tanks
NaCl Extender Technique

- Plastic 25 cc tissue culture flasks excellent for storing extended semen under refrigeration
- Cap was open weekly to allow fresh air to circulate
Larval Rearing Techniques

• *Morone* larvae are about the size of an eyelash!!
## Larval Rearing

<table>
<thead>
<tr>
<th>Species</th>
<th>Days</th>
<th>Feed</th>
<th>Size (day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Bass</td>
<td>4-21</td>
<td>small zooplankton</td>
<td>0.7 – 1.1 cm TL (21)</td>
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<tr>
<td></td>
<td>(died when moved)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reciprocal Cross</td>
<td>4 – 11</td>
<td>small zooplankton</td>
<td>1.2 – 1.7 cm TL (30)</td>
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<tr>
<td></td>
<td>12 – 18</td>
<td>brine shrimp nauplii</td>
<td></td>
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<tr>
<td></td>
<td>19 – 24</td>
<td>decapsulated brine shrimp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25 -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original Cross</td>
<td>4 – 10</td>
<td>brine shrimp nauplii</td>
<td>1.5 -2.0 cm TL (30)</td>
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<tr>
<td></td>
<td>11 – 16</td>
<td>decapsulated brine shrimp</td>
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<tr>
<td></td>
<td>17 – 30</td>
<td>prepared feed</td>
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