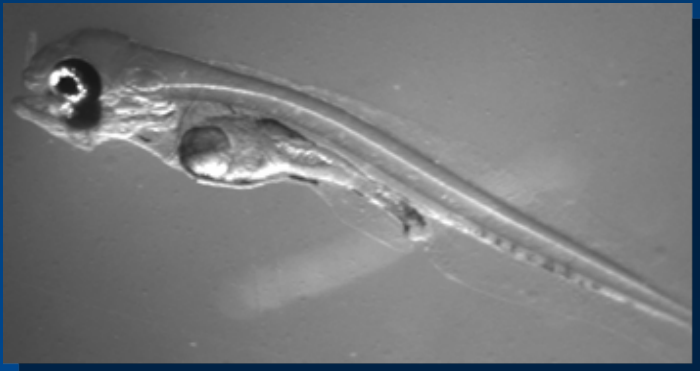
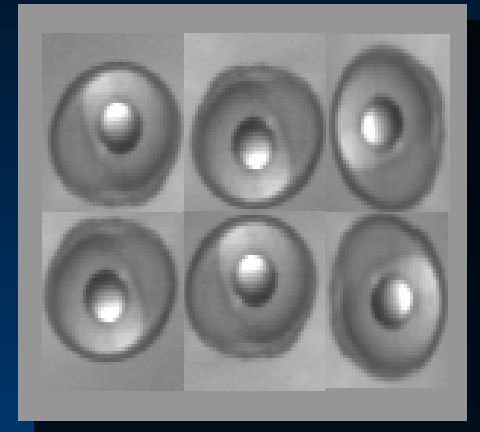


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# Broodstock and Hatchery Management



Ryan L. Lane, PhD

# 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*

**Striped Bass**



**White Bass**

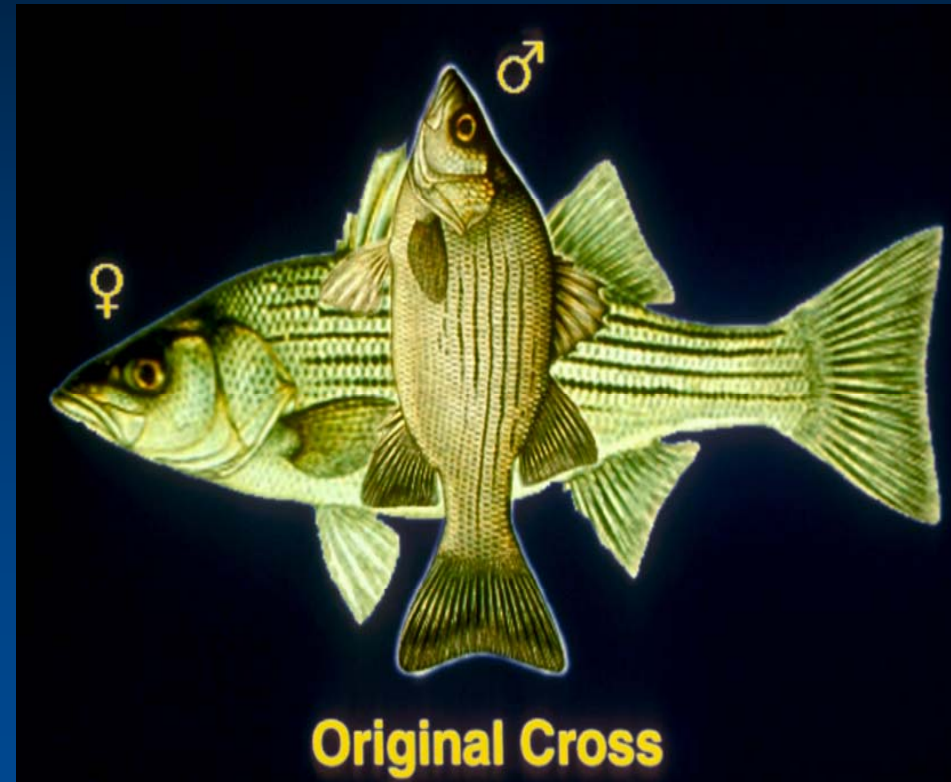


**Hybrid**



# Hybrid Striped Bass: Original Cross

- 1<sup>st</sup> 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<sup>nd</sup> 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

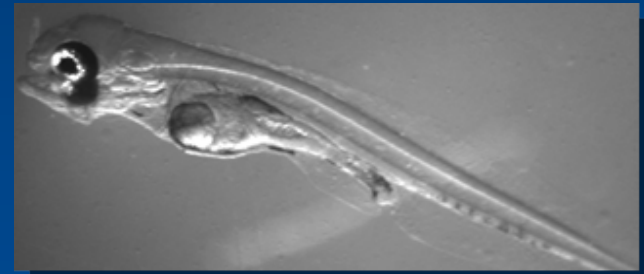
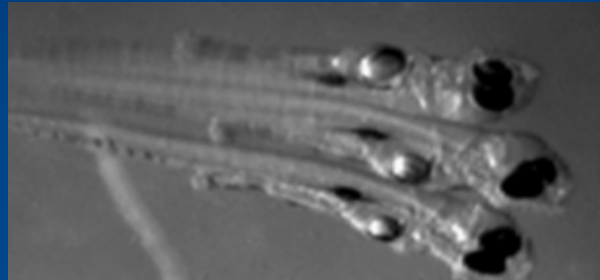
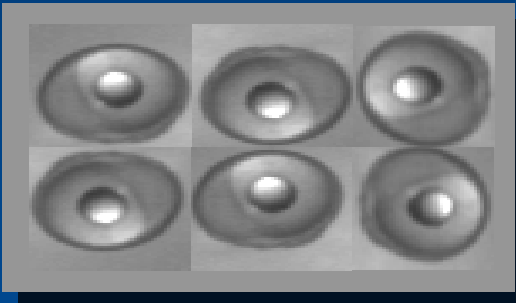
- Broodstock can be stocked into indoor water recirculating systems



**MUST FEED!!**

# White Bass Nutrition

- Currently, 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



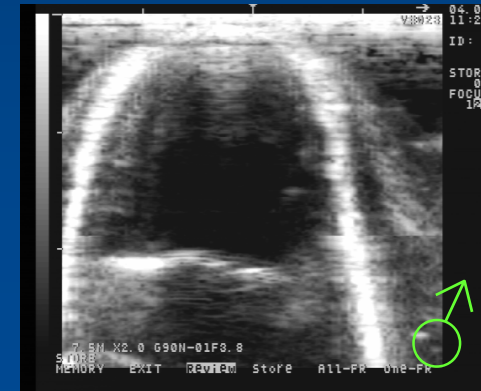
# Habituating Broodstock

- 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

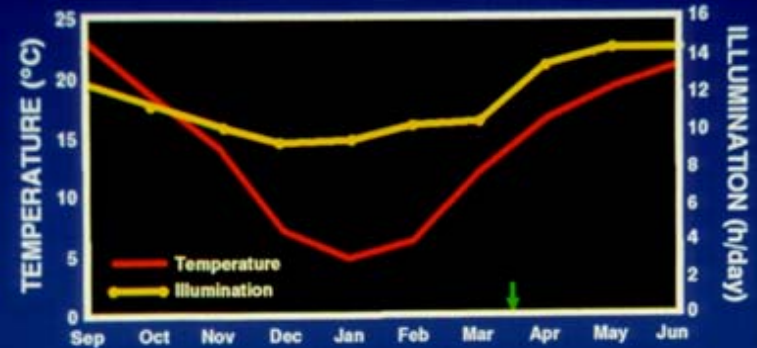
- Sometimes advantageous to separate by gender
  - Feed costs
  - Reduced densities (fish/cm<sup>3</sup>)
- Distinguishing sex
  - Abdominal pressure (near spawning season)
  - External examination of genital regions
    - Females have highly convoluted opening, males smooth
  - Ultrasonification



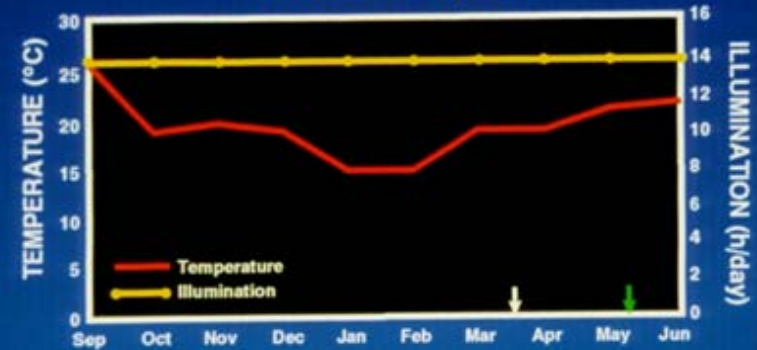
# Controlled Spawning

- Manipulation of photothermal regime
- Photothermal manipulation
  - Light control
  - Temperature control

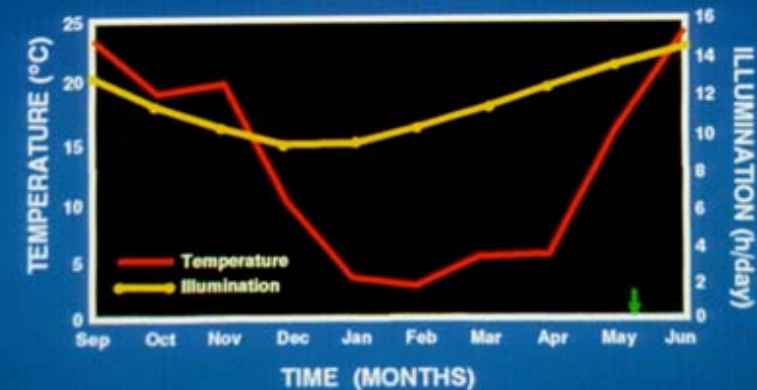
### Compressed Cycle



### Constant Cycle



### Ambient Cycle



# 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

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