Laboratory Spawning and Rearing of Garfish

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Why Gar??

• Because they have BIG teeth:
Of Course, There Are Other Reasons...

- They date back approximately 180 million years
- They are a top predator
- Common in most aquatic habitats throughout geographic range
- Most importantly, there is much to learn about the basic biology of these animals
• **2003** – We wanted to determine if we could successfully spawn and rear spotted gar in our lab  
  – We were successful!

• **2004** – Used knowledge from the 2003 season to produce spotted gar larvae for other research  
  – Methods used in 2004 are outlined here
Collection of Broodstock

- Small lake in the Atchafalaya River Basin (12/11/03)
- Monofilament gill nets (38 mm bar mesh)
- Transported back to NSU

We caught a lot of gar, but we didn’t see this
Maintenance of Broodstock

- Temperature Controlled
- Natural Photoperiod
- Live Fish and Crawfish for feed
Temperature Regime - 2004

1st attempt – unsuccessful spawn

Temperature maintained at 13.6°C since 12/11/03

2nd attempt – successful spawn
Ovaprim® Injection

• Length, weight, and girth measured for each individual
• Intramuscular injections

• 0.2 ml/kg
  – Didn’t work
• 0.5 ml/kg
  – Did work
# Adult Measurements

<table>
<thead>
<tr>
<th>Sex*</th>
<th>Length (mm)</th>
<th>Weight (kg)</th>
<th>Girth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (6)</td>
<td>695 ± 28</td>
<td>1.6 ± 0.2</td>
<td>233 ± 9</td>
</tr>
<tr>
<td>Male (15)</td>
<td>584 ± 39</td>
<td>0.9 ± 0.2</td>
<td>183 ± 15</td>
</tr>
</tbody>
</table>

*Sex estimated by external morphology*
Timeline

• April 14 – Injected with Ovaprim®
  - two days later:

• April 16 – Spawning activity observed
  - six days later:

• April 22 – Hatching began
  - six days later:

• April 28 – Free swimming larvae transferred to aerated 38 L glass aquaria
  - Fed newly hatched artemia nauplii three times daily
  - 70% water exchange daily
Photos by Rebecca Hotard

Early Embryo’s

Late Embryo

Yolk-sac larvae

Hatching!
Spotted Gar
4 days post-hatch
3 April 2003

11.17 mm TL
Spotted Gar
6 days post-hatch
5 April 2003

12.98 mmTL
Spotted Gar
8 days post-hatch
7 April 2003

15.09 mm TL
Spotted Gar

11 days post-hatch
10 April 2003

21.91 mm TL
25 days post-hatch
22.22 mm TL

26 days post-hatch
24.04 mm TL

30 days post-hatch
25.2 mm TL

49 days post-hatch
49.1 mm TL

Spotted Gar Teeth!
Hatching of Wild-collected Alligator Gar Eggs

- Spartina and attached eggs were placed into two aerated 38 L aquaria
  - One 0 ppt and one 7 ppt
- 14:10 photoperiod / room temperature
- Hatching began about three days later
Alligator Gar
2 days post-hatch

5 days post-hatch
17.31 mm TL

8 days post-hatch
18.48 mm TL
Alligator Gar Teeth!
We have shown that....

- Wild-caught adult spotted gar can be induced to spawn in a laboratory by injecting with 0.5 ml/kg Ovaprim®

- Wild-collected alligator gar eggs can be hatched and reared in a laboratory (UANL)

- Larvae readily feed on newly hatched artemia nauplii (UJAT)

- Juveniles feed on live fish
Salt Tolerance

- First recording of alligator gar spawning in 7 ppt
  - Adults can tolerate high salinities
  - Historic range up to St. Louis
Salinity 96 hr LC50

- Nominal test concentrations: 6, 8, 10, 12, 14, 16 ppt
- One L test water was added to plastic containers (DO always > 4.0 mg/L)
  - Each container contained three individuals (TL = 41 ± 5.8 mm; Weight = 0.18 ± 0.05g)
  - Three containers per treatment
- Fish were fed live Gambusia affinis
- 14:10 photoperiod
- Room temperature (21.9 ± 0.4°C)
## Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>12</td>
<td>44</td>
</tr>
<tr>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>0</td>
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Salt concentrations 104% of nominal

96-hr LC50 = 12.3 ± 1.02 mg/L
Cumulative Mortality

% Cumulative Mortality


Disease

Transition to live fish
Future Direction......

Ammonia and Nitrite Toxicity
- LC50
- Characterization and inhibition of nitrite uptake
Acknowledgements

- NSU Department of Biological Sciences
- Nicholls State University Research Council