AGFD Grand Canyon Systemwide Fish Monitoring

Jan K. Boyer
D. Rogowski, P. Wolters
Arizona Game and Fish Department,
Research Branch, 5000 W Carefree Hwy,
Phoenix, Arizona 85086
Objective

Describe distribution and relative abundance of fish (all species) in the Colorado River between Lees Ferry and Lake Mead
Role in GCDAMP

Goal 2: Maintain or attain viable populations of existing native fish, remove jeopardy for humpback chub and razorback sucker, and prevent adverse modification to their critical habitats

Long term, broad scale fisheries monitoring 2000 – present (no end date)
Role in GCDAMP

• Provide information on species and areas not targeted by other projects
• Data sharing with other projects
• Historical/baseline data to address future questions
Methods – boat electrofishing
Methods – hoop netting
Methods – angling
Sampled Area
2017

Sites Sampled:
632 electrofishing, 495 hoop nets

Sites used in analysis:
537 electrofishing, 466 hoop nets

Non-native fish: relative abundance decreasing
Native fish: relative abundance increasing
Rare non-natives

• Warmwater species
  – Monitor species already in river
  – Detect future invasions from Lake Powell, Lake Mead, Little Colorado River

• Brown Trout
## Rare non-natives

<table>
<thead>
<tr>
<th>Species</th>
<th>2017 Count</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Large Bodied Fish</strong></td>
<td></td>
</tr>
<tr>
<td>Brown Trout</td>
<td>32</td>
</tr>
<tr>
<td>Common Carp</td>
<td>19</td>
</tr>
<tr>
<td>Channel Catfish</td>
<td>2</td>
</tr>
<tr>
<td>Gizzard Shad</td>
<td>2</td>
</tr>
<tr>
<td>Striped Bass</td>
<td>1</td>
</tr>
<tr>
<td><strong>Small Bodied Fish</strong></td>
<td></td>
</tr>
<tr>
<td>Fathead Minnow</td>
<td>28</td>
</tr>
<tr>
<td>Red Shiner</td>
<td>19</td>
</tr>
<tr>
<td>Plains Killifish</td>
<td>1</td>
</tr>
</tbody>
</table>

4 trips, Lees Ferry to Lake Mead inlet
632 Electrofishing sites, 476 Baited hoop nets, 29 nights of angling
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Large Bodied Fish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown Trout</td>
<td>252</td>
<td>245</td>
<td>318</td>
<td>550</td>
<td>187</td>
<td>308</td>
<td>142</td>
<td>153</td>
<td>84</td>
<td>32</td>
</tr>
<tr>
<td>Common Carp</td>
<td>192</td>
<td>125</td>
<td>158</td>
<td>138</td>
<td>82</td>
<td>175</td>
<td>178</td>
<td>122</td>
<td>58</td>
<td>19</td>
</tr>
<tr>
<td>Channel Catfish</td>
<td>5</td>
<td>4</td>
<td>8</td>
<td>3</td>
<td>12</td>
<td>9</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Gizzard Shad</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Striped Bass</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>8</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Walleye</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Green Sunfish</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Yellow Bullhead</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Black Bullhead</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Small Bodied Fish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fathead Minnow</td>
<td>48</td>
<td>152</td>
<td>206</td>
<td>119</td>
<td>61</td>
<td>15</td>
<td>31</td>
<td>37</td>
<td>53</td>
<td>28</td>
</tr>
<tr>
<td>Red Shiner</td>
<td>1</td>
<td>239</td>
<td>130</td>
<td>103</td>
<td>37</td>
<td>27</td>
<td>5</td>
<td>16</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>Plains Killifish</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Mosquito Fish</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>0</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Rare non-native fish

- Channel Catfish
- Yellow Bullhead
- Black Bullhead
- Plains Killifish
- Red Shiner
- Mosquito Fish
- Fathead Minnow
- Striped Bass
- Green Sunfish
- Gizzard Shad
- Walleye

Brown Trout electrofishing CPUE

NPS removals at Bright Angel Creek
Brown Trout

Electrofishing CPUE (fish/hr) by river mile

2017
Brown Trout CPUE
Humpback Chub CPUE

Brown trout electrofishing CPUE (fish/hr)

Humpback Chub hoop net CPUE (fish/hr)

Colorado River Mile
Humpback Chub

- 2016 – Hoop nets added to sampling, caught high numbers of humpback chub in Western Grand Canyon
- 2017 - similar patterns in HBC catch
Gray bars represent Humpback Chub aggregation sites as defined by:

Persons et al. 2016

Valdez and Ryel 1995

Colorado River Mile
2017 Hoop Nets

× No Humpback Chub caught

- < 0.05 fish/hr
- 0.05 - 0.15
- 0.15 - 0.30
- > 0.30

Hoop net CPUE (fish/hr) by river mile
Mean Humpback Chub Total Length decreases moving downstream
Below Diamond Creek

- 536 unique Humpback Chub ≥ 80mm
- 29 recaptured fish (3 in fall 2016, 26 in 2017)
  - All tagged below Diamond (9 by AGFD and 18 by USFWS) (except 2 unaccounted for)
What about below Pearce Ferry?
Total: 8 Humpback Chub
(54 hoop nets, 1 trammel net capture)
Conclusions

• Native fish
  – Flannelmouth sucker most abundant species captured in Grand Canyon
  – Relatively high numbers of Humpback Chub below Diamond Creek

• Non-native fish
  – In Grand Canyon, Brown Trout at historically low numbers (especially few in Marble Canyon)
  – No new warmwater nonnative species detected
• GCMRC
• St. Judes LLC boatmen
• Volunteers & past AGFD employees
• Photos: AGFD, Susan Allen, Katherine Halama
• Cooperators
• Bio-WEST for additional data below Pearce Ferry
Supplemental Figures
A) Spring

- Upstream of Diamond Creek
- Downstream of Diamond Creek

B) Autumn

- Total Length (mm)
- Number of Fish

- Spring: n = 430
- Autumn: n = 347
Electrofishing Catch

A

Mean CPUE (fish/hr)

Upstream → Downstream

Rainbow Trout
Brown Trout
Common Carp
Flannelmouth Sucker
Bluehead Sucker
Speckled Dace

RM 0 - 56
RM 56 - 80
RM 80 - 130
RM 130 - 180
RM 180 - 220
RM 220 - 281.4
Hoop net Catch

- Flannelmouth Sucker
- Bluehead Sucker
- Speckled Dace
- A Speckled Dace
- Humpback Chub
Brown Trout – size and location

2017

Brown trout
△ Lees Ferry (n = 70)
○ Downstream (n = 31)

Total Length (mm)

Colorado River Mile

AGFD Lees Ferry and Grand Canyon fish monitoring data, 2015 - 2017
Add descriptive title

Increase font size in figure
Add descriptive title

Increase font size in figure
AGFD Lees Ferry and Grand Canyon fish monitoring data, 2015 - 2017

2017

Sample sites

- Lees Ferry (n = 134)
- Downstream (n = 627)