Population dynamics of razorback sucker in Lake Mohave

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Acknowledgements
Lake Mohave 1st year survival

Marsh et al. (2005)

Kesner et al. (2012)
1\textsuperscript{st} year survival (Zelasko et al. 2011)
Razorback sucker post-stocking survival

– 0.02 to 2.6% in San Juan (277 mm TL)
  – Bestgen et al. 2009
– 9.0% in Upper Colorado River (302 mm TL)
  • Seasonal variation with Spring survival as high as 29%
  • Year to year variation between 3 to 20%
  – Zelasko and Bestgen 2011
– 5 to 10% in Lake Mohave (300 mm TL)
  • Marsh et al. 2005
  • Kesner et al. 2012
Razorback sucker adult survival

- 77% annually in San Juan
  - Bestgen et al. 2009

- 71 to 94% in the Upper Colorado River basin
  - Modde et al. 1996; Bestgen et al. 2002; Zelasko and Bestgen 2011

- 75% annually in Lake Mohave
  - Marsh et al. 2005
Lake Mohave age structure

- Simulation based on 75% annual adult survival, 10,000 fish released per year
- 1st year survival has no impact on age structure, only on total population size
  - At 10% 1st year survival population size is 3,997
Lake Mohave age structure

- Simulation based on 85% annual adult survival, 10,000 fish released per year
- 1st year survival has no impact on age structure, only on total population size
  - At 10% 1st year survival population size is 6,309
Lake Mohave simulation

Kesner et al. 2012
Lake Mohave 1\textsuperscript{st} year survival

- Poor six month post-stockling survival
  [7 to 67\% subadults]   [36 to 80\% adults]
- Large variation in survival between years
- In 2009 no post-stockling mortality was recorded
Lake Mohave simulation
Annual variation in adult survival
PIT scanning in 2011 & 2012

• River PIT scanning
  – 730 individual razorback sucker in 2011
  – 1,934 individual razorback sucker in 2012

• Basin PIT scanning
  – 321 individual razorback sucker in 2011
  – 854 individual razorback sucker in 2012

• Total fish scanned in 2012 (2,748) exceeded the population estimate for 2011 (2,577)
Razorback sucker site fidelity - One year post-release

River (2,442)
Liberty (31)
Basin (954)
Katherine

0%  20%  40%  60%  80%  100%

River
Liberty
Basin

River
Basin
Razorback sucker site fidelity - Two years post-release
Razorback sucker site fidelity - Three years post-release

- River (762)
- Liberty (12)
- Basin (409)

0% 20% 40% 60% 80% 100%

River
Liberty
Basin

0 25 km
Depletion population estimate

Population estimate = 2,174 (1,974 to 2,375 95% CI)
# Annual cohort returns

<table>
<thead>
<tr>
<th>Year</th>
<th>Zone</th>
<th>mean TL</th>
<th>Count</th>
<th>mean TL</th>
<th>Count</th>
<th>% Contacted</th>
<th>mean TL</th>
<th>Count</th>
<th>% Contacted</th>
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<tbody>
<tr>
<td>2008</td>
<td>River</td>
<td>461</td>
<td>102</td>
<td>487</td>
<td>13</td>
<td>12.7%</td>
<td>494</td>
<td>24</td>
<td>23.5%</td>
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<td></td>
<td>Liberty</td>
<td>480</td>
<td>51</td>
<td>539</td>
<td>6</td>
<td>11.8%</td>
<td>513</td>
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<td>17.6%</td>
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<td>454</td>
<td>642</td>
<td>467</td>
<td>13</td>
<td>2.0%</td>
<td>491</td>
<td>35</td>
<td>5.5%</td>
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<tr>
<td>2009</td>
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<td>441</td>
<td>483</td>
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<td>690</td>
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<td>378</td>
<td>3336</td>
<td>390</td>
<td>42</td>
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<td>393</td>
<td>84</td>
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<td>387</td>
<td>2860</td>
<td>458</td>
<td>83</td>
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<td>470</td>
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<td>Kath</td>
<td>493</td>
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<td>329</td>
<td>1584</td>
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<td>405</td>
<td>1827</td>
<td>465</td>
<td>106</td>
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<td>180</td>
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<td>117</td>
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<td>396</td>
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<td>-</td>
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<td>431</td>
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</tbody>
</table>

Released: 2011 Scanned
Scanned 2011: 74.4%
Scanned 2012: 26.0%

Summary:
- 2008: 74.4%
- 2009: 26.0%
- 2010: 12.9%
- 2011: 33.7%
• Poor six month post-stockling survival
  [7 to 67% subadults]  [36 to 80% adults]
• Large variation in survival between years
• In 2009 no post-stockling mortality was recorded
  Only large adults released