Highlights of Winter 2004 Mechanical Removal of Non-Native Fishes From the Colorado River

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Preliminary Data Subject to Review and Revision 8/9/2004
Objectives

- Effect of Adult RBT and BNT on the Population Dynamics of the LCR HBC Population.
  - Will humpback chub recruitment increase as a result of non-native removal?
- Efficacy of Mechanical Removal of Adult RBT and BNT from the LCR Inflow Reach.
  - To what extent can we remove non-native fishes from a large reach of the Colorado River?
- Rainbow and Brown Trout Diet Analysis and Predation.
  - What are non-native fish eating?
Mechanical Removal Reach: Original Experimental Design

- **January 2003 Trip:**
  - 5 pass depletion in original reach (A-F)

- **February 2003 Trip**
  - 5 pass depletion in original reach (A-F)

- **March 2003 Trip:**
  - 5 pass depletion in original reach (A-F)

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Mechanical Removal Reach: Modified Experimental Design

- **July 2003 Trip:**
  - 5 pass depletion in original reach (A-F)

- **August 2003 Trip:**
  - 2 pass depletion in original reach (A-F)
  - 3 pass depletion in Lava Chuar to Tanner Reach (G-H)
  - 3 pass depletion in Tanner to Unkar Reach (I-J)

- **September 2003 Trip:**
  - 3 pass depletion in original reach (A-F)
  - 3 pass depletion in Lava Chuar to Tanner Reach (G-H).

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Mechanical Removal Reach: Modified Experimental Design

- **January 2004 Trip:**
  - 4 pass depletion in original reach (A-F)
  - 4 pass depletion in Lava Chuar to Tanner Reach (G-H)

- **February 2004 Trip:**
  - 4 pass depletion in original reach (A-F)
  - 4 pass depletion in Lava Chuar to Tanner Reach (G-H)

- **March 2004 Trip:**
  - 5 pass depletion in original reach (A-F)
  - Trip cut 2 days short due to logistical problems
Little Colorado River Removal Reach Results

Electrofishing Catch by Species and Month within the Little Colorado River Removal Reach

<table>
<thead>
<tr>
<th>Species</th>
<th>Jan-03</th>
<th>Feb-03</th>
<th>Mar-03</th>
<th>Jul-03</th>
<th>Aug-03</th>
<th>Sep-03</th>
<th>Jan-04</th>
<th>Feb-04</th>
<th>Mar-04</th>
<th>2003 &amp; 2004 Total</th>
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</thead>
<tbody>
<tr>
<td>Speckled Dace</td>
<td>7</td>
<td>2</td>
<td>8</td>
<td>6</td>
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<td>34</td>
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<td>Flannelmouth Sucker</td>
<td>188</td>
<td>161</td>
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<td>119</td>
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<td>Humpback Chub</td>
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<td>Fathead Minnow</td>
<td>17</td>
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<td>8</td>
<td>4</td>
<td>14</td>
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<td>622</td>
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</table>
Lava-Chuar to Tanner Removal Reach Results

Electrofishing Catch by Species and Month within the Lava Chuar to Tanner Removal Reach

<table>
<thead>
<tr>
<th>Species</th>
<th>Aug-03</th>
<th>Sep-03</th>
<th>Jan-04</th>
<th>Feb-04</th>
<th>2003 &amp; 2004 Total</th>
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</thead>
<tbody>
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<td>Speckled Dace</td>
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<td></td>
<td>3</td>
<td>3</td>
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<tr>
<td>Flannelmouth Sucker</td>
<td>1</td>
<td>15</td>
<td>14</td>
<td>25</td>
<td>55</td>
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<tr>
<td>Humpback Chub</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Bluehead Sucker</td>
<td>2</td>
<td>16</td>
<td>21</td>
<td>24</td>
<td>63</td>
</tr>
<tr>
<td>Fathead Minnow</td>
<td></td>
<td></td>
<td>3</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>Common Carp</td>
<td>7</td>
<td>15</td>
<td>5</td>
<td>6</td>
<td>33</td>
</tr>
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<td>Brown Trout</td>
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<td>9</td>
<td>18</td>
<td>17</td>
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<tr>
<td>Rainbow Trout</td>
<td>128</td>
<td>312</td>
<td>271</td>
<td>220</td>
<td>931</td>
</tr>
</tbody>
</table>

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[Image of bar chart showing electrofishing catch by species and month]
Little Colorado River Removal Reach Results
Rainbow Trout Abundance

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Little Colorado River Removal Reach Results
Rainbow Trout Length Frequency Distribution

Little Colorado River Removal Reach Rainbow Trout Winter 2003

Little Colorado River Removal Reach Rainbow Trout Summer 2003

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Little Colorado River Removal Reach Results
Rainbow Trout Length Frequency Distribution

![Graph showing Rainbow Trout Length Distribution](image)

**January**

- **February**

- **March**

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Control Reach Length Frequency

- **Control Reach (RM 44-52)**
  - Purpose is to evaluate changes in trout abundance and size distribution that are a result of factors other than mechanical removal (e.g. fluctuating flows)
  - Each trip, 24 500m sampling units are randomly selected and electrofished to estimate catch-rate.
  - All RBT and BNT >= 200mm are fitted with a floy-tag to assess movement and estimate abundance.

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Control Reach Length Frequency

Winter 2003 Control Reach RBT Length Frequency Distribution

Winter 2004 Control Reach RBT Length Frequency Distribution

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Hoopnetting

- Relative abundance estimates for juvenile HBC and other natives.

- 30 sets/site ~
  - LCR Inflow
  - Tanner
  - Unkar
Hoopnetting Results

Humpback Chub Catch Rate in Hoopnets in the Removal Reaches and LCR Discharge

Date
- Little Colorado River Removal Reach
- Lava Chuar - Tanner Removal Reach
- Tanner - Unkar Removal Reach
- LCR DISCHARGE

CPUE (Fish/Hour)
LCR Discharge (CFS)

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2003-04 Preliminary Conclusions

- Non-native removal efforts more effective than anticipated. > 50% removal efficiency for Rainbow Trout.
- Immigration rate >800 fish/month in the LCR Inflow Reach. Immigration rate may differ among months.
- 2003-2004 data suggest persistent annual effect on RBT abundance, not so for BNT.
- Differences in overall RBT length frequency distribution may indicate variable immigration rates as a function of size. Small fish possibly more likely to move, result is smaller average size in removal areas.
- Hoopnet catches of HBC provide contradictory information relative to increased survival of HBC.
- Rigorous assessment of whether mechanical removal is affecting (improving) HBC population dynamics will not be available until at least 2006 and likely 2007.
All Removal Reach Results 2003 & 2004

Electrofishing Catch by Species and Reach during 2003 and 2004

<table>
<thead>
<tr>
<th>Species</th>
<th>LCR</th>
<th>Lava Chuar - Tanner</th>
<th>Tanner - Unkar</th>
<th>2003 Total</th>
<th>LCR</th>
<th>Lava Chuar - Tanner</th>
<th>2004 Total</th>
<th>2003 &amp; 2004 Total</th>
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</thead>
<tbody>
<tr>
<td>Speckled Dace</td>
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<td>0</td>
<td>0</td>
<td>41</td>
<td>179</td>
<td>3</td>
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<tr>
<td>Flannelmouth Sucker</td>
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<td>926</td>
<td>497</td>
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<td>Humpback Chub</td>
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<td>Common Carp</td>
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<td>237</td>
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<tr>
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<td>491</td>
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</table>

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Power Analysis for Estimating a Binomial Proportion

Coefficient of Variation ($\frac{SE(p^)}{p^}$)

Sample Size

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