PREDATORY FISH IN LOOKOUT POINT AND FOSTER RESERVOIRS

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Objectives

• Investigate potential impacts of northern pikeminnow on juvenile spring Chinook salmon in Lookout Point Reservoir.

  1) Population estimate for northern pikeminnow in Lookout Point Reservoir
  2) Estimate consumption of Chinook by pikeminnow
  3) Distribution of northern pikeminnow

• Assess predation on juvenile spring Chinook and winter steelhead in Foster Reservoir.

  1) Predatory fish community
  2) Predator diet sample analysis
Why Lookout Point Reservoir?
Abundant and diverse predator community
Large number of adult Chinook transported upstream
Long reservoir (10 mi.)
Low survival in this 3-dam system
2012 Lookout Point Dam – Paired Release Study

What is the Reservoir Effect on Survival?

Cumulative Detections at Willamette Falls

- HOR
- TR

470 mm, 18.5 in.
755 mm, 29.7 in.
Why Focus on Spring?
Why Northern Pikeminnow?
Standardized Sampling 2013 - Catch Per Unit Effort (CPUE)
<table>
<thead>
<tr>
<th>Zone</th>
<th>NPM Tagged</th>
<th>Recaptured</th>
<th>Effort (hrs)</th>
<th>CPUE (NPM/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower</td>
<td>112</td>
<td>9</td>
<td>13.6</td>
<td>8.2</td>
</tr>
<tr>
<td>Middle</td>
<td>216</td>
<td>21</td>
<td>20.7</td>
<td>10.4</td>
</tr>
<tr>
<td>Upper</td>
<td>516</td>
<td>28</td>
<td>34.5</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>844</td>
<td>58</td>
<td>68.8</td>
<td>12.3</td>
</tr>
</tbody>
</table>
Results
Lookout Point Reservoir – Size Distribution

- Lower
- Middle
- Upper

Number of northern pikeminnow

Fork length

PISCIVOROUS > 250 mm

Photo: Northern Pikeminnow Sport Reward Program

- Lookout Point Reservoir
- Size Distribution
- PISCIVOROUS > 250 mm

- Lower
- Middle
- Upper

Number of northern pikeminnow

Fork length
Population Estimate – NPM – Lookout Point 2013

Huggins closed-capture model in program MARK (White and Burnham 1999)

Cormack-Jolly-Seber estimator (open population estimator) to estimate survival
1) between weekly sampling intervals (99.3%) and
2) over the course of our 10 wk season (93.2%)

2,059 NPM captured/scanned at Dexter Pikeminnow Derby (Jul 27-28)

225 times less likely to recapture a tagged fish in a zone other than the zone where it was initially marked
### Population Estimate – NPM – Lookout Point 2013

<table>
<thead>
<tr>
<th>Model</th>
<th>NPM Estimate</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huggins closed-capture model</td>
<td>7,067</td>
<td>5,466</td>
<td>9,224</td>
</tr>
<tr>
<td>Heirarchical Bayes Model</td>
<td>32,062</td>
<td>28,534</td>
<td>36,039</td>
</tr>
</tbody>
</table>

\[ c\text{-hat for the Huggins model was 5.9 (acceptable values of < 1) = variance in the data set that cannot be accounted for by our model (overdispersion).} \]

**Conservative population estimate** \((7,067) \times \)

**Daily consumption rate for NPM in the spring** \((0.160 \text{ (Monzyk et al. 2012))} \times \)

**Spring season (90 d) =**

\[ 101,765 \text{ Chinook consumed in the spring – by NPM} \]
South Santiam Screw Trapping Data, 2013

Weekly Salmonid Catch

Month

Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec

O.mykiss | Chinook

0 20 40 60 80 100 120 140 160 180 200

O.mykiss | Chinook

1 cm 2 3

Image of O.mykiss and Chinook salmon.

Image showing scale in centimeters.
Predators in Foster Reservoir
<table>
<thead>
<tr>
<th>Piscivorous Species</th>
<th>Lookout Point Number Captured (Fork length range; mm)</th>
<th>Foster Number Captured (Fork length range; mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Pikeminnow <em>(Ptychocheilus oregonensis)</em></td>
<td>140 (197-490)</td>
<td>95 (40-525)</td>
</tr>
<tr>
<td>Yellow Perch* <em>(Perca flavescens)</em></td>
<td>0</td>
<td>128 (54-290)</td>
</tr>
<tr>
<td>Largemouth Bass* <em>(Micropterus salmoides)</em></td>
<td>74 (140-383)</td>
<td>3 (126-440)</td>
</tr>
<tr>
<td>Smallmouth Bass* <em>(Micropterus dolomieu)</em></td>
<td>0</td>
<td>270 (38-383)</td>
</tr>
<tr>
<td>Cutthroat Trout <em>(Oncorhynchus clarkii)</em></td>
<td>12 (84-390)</td>
<td>1 (169)</td>
</tr>
<tr>
<td>Rainbow Trout <em>(Oncorhynchus mykiss)</em></td>
<td>262 (120-445)</td>
<td>300 (57-283)</td>
</tr>
<tr>
<td>Walleye* <em>(Sander vitreus)</em></td>
<td>29 (205-745)</td>
<td>0</td>
</tr>
<tr>
<td>Crappie* <em>(Pomoxis spp.)</em></td>
<td>101 (155-398)</td>
<td>5 (99-120)</td>
</tr>
<tr>
<td>Bullhead* <em>(Ameiurus spp.)</em></td>
<td>22 (176-323)</td>
<td>14 (56-240)</td>
</tr>
</tbody>
</table>
Diet Samples

1) Collect Specimen

2) Remove Stomach

3) Bake

4) Pick and Bone Identification
1 O. mykiss, 4 unknown salmonids

<table>
<thead>
<tr>
<th>Season</th>
<th>Frequency of Occurrence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>N = 22</td>
</tr>
<tr>
<td>Summer</td>
<td>N = 9</td>
</tr>
<tr>
<td>Fall</td>
<td>N = 4</td>
</tr>
</tbody>
</table>

- Macroinvertebrates
- Fish
- Crayfish
- Misc
7 Chinook, 6 *O. mykiss*, 2 unknown salmonids
Frequency of Occurrence (%)

- Spring: N = 31
- Summer: N = 2
- Fall: N = 2

Legend:
- Blue: Macroinvertebrates
- Green: Fish
- Purple: Crayfish
- Orange: Misc
Conclusion:

Lookout Point

• 7,000 NPM in Lookout Point is likely an underestimate.

• Using the conservative estimate, NPM have an impact on juvenile Chinook survival (> 100,000 in spring).

• Highest density and largest NPM in the upper section of the reservoir in spring (when Chinook enter).

• Refine spatial information to increase capture efficiency and decrease c-hat.
Conclusion:

Foster

• Variety of predators (slightly different than Lookout Point).

• Smaller reservoir. Juveniles (Chinook, winter steelhead) are able to exit the reservoir in a more timely manner.

• Predatory fish eat *O.mykiss* and juvenile Chinook in Foster, particularly bass in the spring.
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