Teaming to achieve hatchery reform in a Columbia River Hatchery

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Hatchery Programs

- 5 million to 5.6 million subyearlings for GPUD at PRH
- 1.7 million subyearlings for ACOE at PRH
- 3.5 million subyearlings for ACOE at Ringold
- About 5,500 adult brood needed
Massive harvest of PRH fish

• Ocean and river harvest
• 23,256 mean annual harvest BY 1997-2010
• 107,044 in BY 2010
New definition of success (HSRG)

1. Meet mitigation requirements
2. Continue to contribute to high harvest
3. Limit risks of domestication selection (PNI>0.67)
PNI and definitions \((E=mc^2)\)

- **Single population proportionate natural influence (PNI)**
  
- \(\text{PNI} = \frac{\text{pNOB}}{\text{pNOB} + \text{pHOS}}\)

- \(\text{pNOB}\) is the proportion of natural origin brood in the hatchery
- \(\text{pHOS}\) is the proportion of hatchery origin spawners in nature
Challenge: achieve PNI > 0.67

- Estimates of PNI were about 0.4
- Maintain program size (large)
- Marking controversy (constraint)
- Other hatchery programs (limited control, PNI estimation)
- New hatchery
- Record returns
- Difficulty obtaining NOB (options)

- This talk is about how we overcame obstacles to achieve a PNI goal
Strategies for achieving goal

1. Marking and tagging
2. Hatchery rebuild
3. pHOS management
4. pNOB for spawning
5. Spawning strategy
6. Multiple program PNI estimation
Improve marking and tagging (compromise)

- Increase Ad clip proportion (about 50%, 2010 release)
- Increase CWT proportion (1.2 million DIT, 2010 release)
- Increase in PIT tags from 3,000 to 43,000 (2012 release)
- 100% otolith mark (2008 release)
Priest Rapids Hatchery otolith mark
“Don’t fix what isn’t broken”
PHOS management at volunteer trap (24/5,7)
Over 75% of PRH fish returning to the Reach can be removed at the trap.
About 80,000 removed in 2014
The graph shows the number of fish removed from Priest Rapids Hatchery and donations to food banks from 2010 to 2016.

- **Fish Removed from Priest Rapids Hatchery**
  - 2010: 20,000
  - 2011: 25,000
  - 2012: 30,000
  - 2013: 35,000
  - 2014: 70,000
  - 2015: 60,000
  - 2016: 30,000

- **Donations to Foodbanks**
  - 2010: 5,000
  - 2011: 10,000
  - 2012: 15,000
  - 2013: 20,000
  - 2014: 70,000
  - 2015: 60,000
  - 2016: 30,000
Prioritizing collection of naked fish at the hatchery trap (>95% HO, insufficient)
Collecting fish from a mainstem river trap

- Goal of 1,000 fish,
- Doubled pNOB from 0.05 to 0.11 (insufficient)
Teaming with anglers to collect fish in the natural environment (goal = 400 fish)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Anglers</th>
<th>Number of Boats</th>
<th>Broodstock Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>2012</td>
<td>81</td>
<td>31</td>
<td>43</td>
</tr>
<tr>
<td>2013</td>
<td>169</td>
<td>67</td>
<td>293</td>
</tr>
<tr>
<td>2014</td>
<td>115</td>
<td>45</td>
<td>174</td>
</tr>
<tr>
<td>2015</td>
<td>165</td>
<td>65</td>
<td>205</td>
</tr>
<tr>
<td>2016</td>
<td>245</td>
<td>85</td>
<td>130</td>
</tr>
<tr>
<td>2017</td>
<td>374</td>
<td>136</td>
<td>178</td>
</tr>
</tbody>
</table>

Coastal Conservation Association
Increase of pNOB by 37% at PRH
Real time otolith reading and spawning protocol adjustments
38% increase in pNOB
## Multi-population PNI (Busack)

<table>
<thead>
<tr>
<th>Sources</th>
<th>Natural Population</th>
<th>PRH</th>
<th>RSH*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Population</td>
<td>0.8904</td>
<td>0.066</td>
<td>0.066</td>
</tr>
<tr>
<td>PRH</td>
<td>0.058</td>
<td>0.934</td>
<td>0.934</td>
</tr>
<tr>
<td>RSH*</td>
<td>0.0514</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total (each column must add to 1.0)</strong></td>
<td><strong>1.0</strong></td>
<td><strong>1.0</strong></td>
<td><strong>1.0</strong></td>
</tr>
</tbody>
</table>

RSH* includes out of basin strays which likely have very low pNOB... similar to RSH for most years.
Lessons learned

• Many years, many partners (CCA), and many approaches to achieve our harvest, mitigation, and PNI goals
• Marking/tagging, 3 locations of broodstock collection, alternative mating strategies, multi-pop PNI estimator
• Balancing genetic risks
• It hasn’t been easy (politically, scientifically, or financially)
• Creativity, collaboration, and cash were keys to success
Thanks

- PRH hatchery and M&E staff
- Eric Lauver
- HSRG
- Coastal Conservation Association
- Priest Rapids Coordinating Committee’s Hatchery Sub-committee