Prioritization of pink salmon samples and analyses 2015/2016: TD 11

Alaska Department of Fish & Game
Gene Conservation Lab

March 2016 AHRP Meeting
Anchorage, AK
First possible results for PWS pink salmon adult-to-adult

- Odd year pink salmon samples for five streams
- First set of adult-to-adult parentage analyses
- Changes from original design and unanticipated run sizes:
  - Increased sampling effort and unusually high-abundances in 2013 and 2015
  - Larger than anticipated number of samples for potential analyses (~60,000 samples)
- Result: More samples available for analysis than current funding and laboratory capacity
Factors considered in prioritization

- Depth over breadth
- Only natural-origin fish required for F1
- High statistical power
- Cost
Power:
How often we expect to detect an effect

Power increases with...
- In our control
  - ↑ Number families
  - Stray rate > 10%
  - ↑ Proportion offspring
- Out of our control
  - Distribution of RS
    - ↑ Mean
    - ↑ Dispersion
  - ↓ True RRS

Depends on:
- Number parents ($F_0$) sampled
  - Hatchery $\sim f$(stray)
  - Natural
- Proportion offspring ($F_1$) sampled
- Distribution of RS (productivity)
  - Mean
  - Dispersion
- RRS
  - Difference between H and N
  - Benchmark RRS = 0.5
Previous work

Erb 2013
Dispersion = 10; N = 235; H = 36
Estimating power

\[
\hat{RS}_{\text{Natural}} \sim \frac{F_{1\text{Natural}}}{F_{0\text{aerial}}} \times (1 - 0.5p_{F_{0\text{Hatchery}}})
\]

Lots of uncertainty in aerial survey data and in stream walk data!!!

Where

\[
F_{1\text{Natural}} = (1 - p_{F_{1\text{Hatchery}}}) \times n_{F_{1\text{aerial}}}
\]

\[
F_{0} = n_{F_{0\text{aerial}}}
\]
Estimating power

Erb 2013
Dispersion = 10; N = 235; H = 36

Mean RS Natural-origin

F1 sampling proportion

Power

0.0
0.2
0.4
0.6
0.8
1.0
Estimating power

Erb 2013
Dispersion = 10; N = 235; H = 36

HoganBay 2013
Dispersion = 10; N = 137; H = 289

Paddy 2013
Dispersion = 10; N = 52; H = 6

Spring 2013
Dispersion = 10; N = 423; H = 9

Stockdale 2013
Dispersion = 10; N = 465; H = 104
## 2013/2015 Samples available

<table>
<thead>
<tr>
<th>GCL Priority</th>
<th>Project Component</th>
<th>Samples available</th>
<th>Laboratory Genotyping Cost</th>
<th>2013 Stray rate</th>
<th>Likely Statistical Power</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stockdale Creek Adult</td>
<td>8,602 ~9,000</td>
<td>$288,000</td>
<td>10.2%</td>
<td>High</td>
<td>Intermediate stray rate and high power</td>
</tr>
<tr>
<td>2</td>
<td>Hogan Bay Adult</td>
<td>9,441 ~5,000</td>
<td>$160,000</td>
<td>56.4%</td>
<td>High</td>
<td>High stray rate and high power</td>
</tr>
<tr>
<td>3</td>
<td>Erb Creek Adult</td>
<td>13,039 ~12,000</td>
<td>$384,000</td>
<td>10.8%</td>
<td>Medium</td>
<td>Intermediate stray rate and medium power</td>
</tr>
<tr>
<td>4</td>
<td>Spring Creek Adult</td>
<td>12,469 ~13,500</td>
<td>$432,000</td>
<td>1.5%</td>
<td>Low</td>
<td>Low stray rate but low power</td>
</tr>
<tr>
<td>5</td>
<td>Stockdale Creek 2014 Alevin</td>
<td>- 2,728</td>
<td>$87,300</td>
<td>10.2%</td>
<td>Likely Low</td>
<td>Only alevin stream</td>
</tr>
<tr>
<td>6</td>
<td>Paddy Creek Adult</td>
<td>8,710 ~7,500</td>
<td>$240,000</td>
<td>15.3%</td>
<td>Very Low</td>
<td>Intermediate stray rate and very low power</td>
</tr>
</tbody>
</table>

Note: These numbers assume genotyping all 2013 adults regardless of origin (potential parents), but only natural-origin adults for 2015 (potential offspring). Numbers of natural-origin adults for 2015 were estimated assuming the same stream-specific stray rates as 2013. Laboratory genotyping costs with GCL’s current genotyping technology are estimated at $32/fish.
# Stockdale Creek timeline

<table>
<thead>
<tr>
<th>Component</th>
<th>Start date</th>
<th>End date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive all samples from PWSSC</td>
<td>September 2015</td>
<td>October 2015</td>
</tr>
<tr>
<td>Separate heart from otoliths for Stockdale samples</td>
<td>October 2015</td>
<td>November 2015</td>
</tr>
<tr>
<td>New SNP markers available</td>
<td>November 2015</td>
<td>February 2016</td>
</tr>
<tr>
<td>Read otoliths from 2015 Stockdale samples</td>
<td>November 2015</td>
<td>March 2016</td>
</tr>
<tr>
<td>Genotype 2013 &amp; 2015 Stockdale samples</td>
<td>January 2017</td>
<td>March 2017</td>
</tr>
<tr>
<td>Parentage analysis on Stockdale samples</td>
<td>April 2017</td>
<td>September 2017</td>
</tr>
<tr>
<td>Report results of parentage analysis and RRS</td>
<td></td>
<td>March 2018</td>
</tr>
</tbody>
</table>
Our recommendation:

- Stockdale Creek 2013/2015
  - Adequate sampling of the 2013 parents
  - Intermediate stray rate (10.2% in 2013)
  - Intermediate population size yields high statistical power
  - Intermediate cost
Science Panel recommendation:

- Hogan Bay 2013/2015
  - Adequate sampling of the 2013 parents
  - High stray rate (56.4% in 2013)
  - Intermediate population size yields high statistical power
  - Lower cost
Wrote proposals for funding

**iv. Mariculture and wild-hatchery interactions**

NPRB is interested in research on mariculture issues, including various aspects of the development of invertebrates and seaweeds for mariculture, sea ranching, and stock enhancement. Studies might focus on the survival of hatchery-reared individuals in the wild, on genetic surveys of populations to aid in broodstock development for hatchery culture, on multi-trophic aquaculture systems, and on ecological and genetic interactions between hatchery-reared and wild individuals. NPRB would encourage researchers to examine ongoing projects and avoid duplication (e.g., Alaska Department of Fish and Game projects on hatchery-wild stock interactions).

**The Saltonstall-Kennedy Grant Program**

The goal of the SK program is to fund projects that address the needs of fishing communities, optimize economic benefits by building and maintaining sustainable fisheries, and increase other opportunities to keep working waterfronts viable. The FY16 solicitation seeks applicants that fall into seven priorities. The seven priorities are:
NPRB

- $289,435
- September 1, 2016-June 30, 2018
- Hogan Bay pink adults 2013/2015 and 2014/2016
- 829 (2013) and 1,417 (2015) $F_0$ (all)
- 5,754 $F_1$ (natural-origin)
NOAA – Saltonstall-Kennedy

• $250,000
• September 1, 2016-June 30, 2018
• Stockdale Creek pink adults 2014/2016
• 1,551 $F_0$ (all)
• 6,449 $F_1$ (natural-origin)
# Timelines

<table>
<thead>
<tr>
<th>Task</th>
<th>Funding</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
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<tr>
<td>Stockdale</td>
<td>SK</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>2014/2016</td>
<td></td>
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<tr>
<td>Hogan</td>
<td>NPRB</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2013/2015</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hogan</td>
<td>NPRB</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>2014/2016</td>
<td></td>
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</tbody>
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**Stages of completion**: 1 Fitness Extraction, 2 Genotyping, 3 Data analysis, 4 Draft Report, 5 Final reporting
No guarantee of funding