Advances in Salish Sea Acoustic Telemetry: 2015 Array Deployments and Promising Transmitter Performance

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Advances in Tracking Juvenile Salmon: 2015 Salish Sea Array Deployments and Promising Performance of VEMCOs New V4 Transmitter

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Why Smaller is Better

- Early marine survival in the SoG is thought to be critical for determining productivity
- We use tracking data and Cormack-Jolly-Seber models to estimate early marine survival
- Limited to large salmon smolts
- Acoustic tags are ~$400 each
- If we are testing hypotheses, how does the reduce detection efficiency affect the power analysis?
Acoustic Transmitter Specs

- **V9**: 9 x 24 mm, 3.6 g
- **V7**: 7 x 20 mm, 1.6 g
- **V4**: 3.6 x 5.7 mm, 0.42 g
Tag Specs

**V9**
Frequency: 69 kHz
Weight in air: 3.6 g
Power output: 151 dB
Range: 300-500 m

**V4**
Frequency: 180 kHz
Weight in air: 0.42 g
Power output: 134 dB
Range: ~80 m

<table>
<thead>
<tr>
<th>Nominal Delay (seconds)</th>
<th>V9-2L</th>
<th>V9-2H</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>400</td>
<td>155</td>
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<tr>
<td>120</td>
<td>685</td>
<td>285</td>
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<tr>
<td>180</td>
<td>910</td>
<td>405</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal Delay (secs)</th>
<th>V4-1H</th>
<th>V5-1H</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>34* (41)**</td>
<td>59* (70)**</td>
</tr>
<tr>
<td>40</td>
<td>46* (55)**</td>
<td>91* (107)**</td>
</tr>
<tr>
<td>60</td>
<td>53* (62)**</td>
<td>113* (131)**</td>
</tr>
</tbody>
</table>
Array Design (and Recovery) Strategy

- Location
- Detection
- Physical Environment (bathymetry, currents, etc)
2015 Telemetry Array
Dual Frequency Sub-arrays Deployed in 2015: Discovery Islands
Seymour River Hatchery (North Vancouver)
Kintama: V4 Transmitter Performance
(Double Tag Study, n=50)

- **V9-1H**: 9 x 24 mm, 3.6 g
- **V4-1H**: 3.6 x 11 x 5.7 mm, 0.42 g
Transfer

Transport

Release
2015 Telemetry Array
http://Kintama Animator/
Dynamic Animations
- Seymour River, BC Steelhead (juvenile)
- Chilko Lake, BC Sockeye (juvenile)
- Cook Inlet, AK Chinook and Sockeye (adult)

Static Animations
- Cultus Lake, BC Sockeye (juvenile)
- Sakinaw Lake, BC Sockeye (juvenile)
- Columbia River, USA Chinook (juvenile)
Transmitter Detection Rate on Discovery Islands Sub-array (Kintama)

Map showing Discovery Passage, Sutil Channel, Desolation Sound, and Northern Strait of Georgia. The bar chart on the right indicates a detection rate of 74% for the Discovery Islands sub-array.
# of Detections per ID code

![Box plot showing the number of detections for two ID codes: V9-1H and V4-1H. The median number of detections for V9-1H is 72 with a sample size of 19. The median number of detections for V4-1H is 6.5 with a sample size of 14.](image)
Single Detections

The diagram illustrates the count of fish detections for different categories:

- **V9-1H**
- **V4-1H**

The categories are:

- **Single**
- **2-5**
- **>5**

The count of fish is shown on the y-axis.
Survival from release to Discovery Islands
V4 Tag Considerations

Pros
• Small: Size of a Tic Tac
• Light: Weight of a Tic Tac (actually less- only 0.42 grams)
• Reduces tag burden
• Can be used in smaller smolts than previously possible
• Can be used in more populations and species

Cons
• Reduced range
  – Solution: more receivers
• Reduced battery life
  – Solution: clever tag programming and clearly focused study goals
• Requires 180 kHz acoustic receivers
Future Telemetry Studies: Smaller Smolts and Reduced Tag Burden

100 mm, 10 g smolt
Acknowledgements

**Funders**
- Pacific Salmon Foundation (SSMSP)
- Ocean Tracking Network
- BC Salmon Farmers Assn.

**Logistics**
- Seymour River Hatchery staff
- Canfisco and the Captain and crew of the Denman Isle
- Seymour Salmonid Society Board