Jun 21st, 2:10 PM - 2:30 PM

Going Beyond Visible Light; Monitoring Adult Fish Passage in Turbid Conditions with Technological Advancements and Sense of Public Outreach

Ryan Cuthbert
FISHBIO

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Going Beyond Visible Light: Monitoring Adult Fish Passage in Turbid Conditions with Technological Advancements and Sense of Public Outreach

Date: June 21, 2017

Presented to the International Conference on Engineering and Ecohydrology for Fish Passage

by

Ryan Cuthbert (FISHBIO)
Outline

• Vaki Riverwatcher Overview
  ◦ How does the Riverwatcher work – what are the counters abilities?
  ◦ How is it being used in the field?

• Salinas River Case Study
  ◦ Adult steelhead migration monitoring

• Stanislaus River Case Study
  ◦ Adult steelhead and Chinook salmon migration monitoring

• New Technology and Public Outreach Potential
Vaki Riverwatcher Overview

- **Uses and Advantages**
  - Passive
  - Adaptable
  - Cost Effective
  - Effective in Extremely Turbid Conditions
  - Accurate
  - Remote Monitoring

- **Standard Riverwatcher**
  - Estimates Length
  - Records Passage Date and Time
  - Determines Passage Direction
  - Silhouette Images
  - Records Speed and Position
  - Streamline Species ID

- **Camera Riverwatcher**
  - Video Clips
Vaki Riverwatcher Overview
Vaki Riverwatcher Overview
Vaki Overview

Total Length = \( Lm / D \)

Depth = \( Lc \)

\[ Lc = Lm / D \]

\[ Le = D \times Lc \]
Vaki Riverwatcher Overview

Male vs. Female

Adipose vs. No Ad
Study Area
### Table: Fish Data

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<thead>
<tr>
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<th>Category</th>
<th>Direction</th>
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</table>

**Graph:**
- Fish silhouette
- Video frame (FISHBIO logo)

**Legend:**
- CHNF: Chinook Salmon
- SASU: Salmon
- STB: Steelhead
- WHC: Winter Chinook
- Other: Non-specific fish species

**Additional Information:**
- Date and time of observations
- Depth and length measurements
- Category and direction
- Speed of the fish
- Frame position
- File number

• Weir Directs Fish Into Riverwatcher

• Low Steelhead Counts
  ◦ Between 0 – 44 Adult Steelhead Annually

• Extremely High Turbidity Throughout Monitoring Season
  ◦ Between 20 – 500+ NTU’s
Turbidity Improvements

Passage tunnel with camera and lights

Passage tunnel with air filled chamber
Salinas River

Steelhead w/o AFC

2013-01-21 17:37:44

Steelhead w/ AFC

2012-02-23 18:03:13

Sac. Sucker w/o AFC

2012-12-15 17:19:04

Sac. Sucker w/ AFC

2012-03-27 23:04:20
*Dec and Feb Max Turbidity was 1330 NTUs and 890 NTUs, respectively.
Stanislaus River

- Fourteen Years of Monitoring (2003-2016)
  - Fall-Run Chinook and Steelhead
- Weir Directs Fish Into Riverwatcher
- Low Steelhead Counts
  - 63 Total Steelhead
- High Turbidity During Steelhead Migration Periods
How many fish will habitat support?

- 45
- 50
- 55
- 60
- 65
- 70
- 75

<table>
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<th>Water Temperature °F</th>
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<th>2015</th>
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<tr>
<td>December</td>
<td>52</td>
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- 100% Expected Egg Mortality
- 50% Expected Egg Mortality
- Chronic Stress
How many fish will habitat support?

Number of Female Spawners (1997-2014)

Total Juvenile Passage (Millions)
Aceituno, M.E. 1993 Stanislaus River IFIM. The relationship between instream flow and physical habitat availability for Chinook salmon on the Stanislaus River, CA. USFWS.
### Stanislaus Ad-Clip Observations at Weir

<table>
<thead>
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<th>Ad-clipped</th>
<th>Total Passage</th>
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<td>14,384</td>
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<tr>
<td>2015</td>
<td>3,293</td>
<td>12,686</td>
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<tr>
<td>2014</td>
<td>657</td>
<td>5422</td>
<td>20%</td>
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<tr>
<td>2013</td>
<td>1272</td>
<td>5459</td>
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<tr>
<td>2012</td>
<td>4782</td>
<td>7249</td>
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**Skibo Castle, United Kingdom**

This is a river equipped with RiverWatcher, a device to monitor the migration of fish up and down the river. The RiverWatcher Daily system makes information about migration of multiple rivers accessible via the internet.

More info at: www.riverwatcher.is

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**Measured migration in [Skibo Castle] from Feb 18, 2015 to Oct 23, 2015**

- **Count**
- **Temperature (°C)**

<table>
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<th>Time</th>
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<td>Sep 2015</td>
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<tr>
<td>Oct 2015</td>
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</table>

**Last fish seen**

- Oct 23, 2015 08:25
- 5 hours and 38 minutes ago
- Estimated length: 58cm
- Direction: Up River
Questions?

• Riverwatcher Daily
• PIT Tag Equipment Compatibility
• Wider and Larger Scanners
• Automatic Species Recognition
• Expanded Water Quality Monitoring Options