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Dec 15, 2019

To:  
Columbia River Inter-Tribal Fish Commission  
700 NE Multnomah St., Suite 1200  
Portland, OR 97232

USACE Bonneville AFF Project Coord.  
Bonneville Lock & Dam  
Cascade Lock, OR 97014

**RE: End of Season Steelhead Report: Final Update 5 (April 25- Oct 18, 2019)**

Dear Jon Hess, Jeff Fryer, John Whiteaker, Stuart Ellis and Andrew Derugin,



FishL™ Recognition System Imaged  
Steelhead at the Bonneville AFF

4/25/19-10/18/19 Whooshh Innovations Inc.

From April 25<sup>th</sup> to October 18<sup>th</sup> 2019 the Whooshh FishL™ Recognition System, installed and operational at the terminal end of the right bypass flume at the Bonneville Adult Fish Facility (AFF), autonomously collected images of the fish that passes through the system via a water stream and gravity slide. The FishL™ Recognition System imaging has been commonly referred to as a scan. Each scan is actually 18 separate images linked together in a composite. Six cameras at fixed angles are used, each generating three images per fish. The images are evaluated in real time utilizing proprietary size computational programming generating output reports including scan date, scan time, image file name, computed forklength, girth and speed of passage through the scanning system.

**12307 scan files** were logged across the six-month period. Each 18-image composite was visually analyzed to determine the species of the fish passing through, adipose status and in the case of Steelhead, dorsal fin status. Table 1, provided as a separate excel file (*BV Steelhead Table 1 Final Update Report 5*), contains the records of all of the Steelhead that passed through the FishL™ Recognition System at the Bonneville AFF in 2019. **Seven hundred and fourteen Steelhead** were recorded. There are a small number of scans (N=9, 1%) in which multiple fish were present. Size calculations are not recorded for these scans.

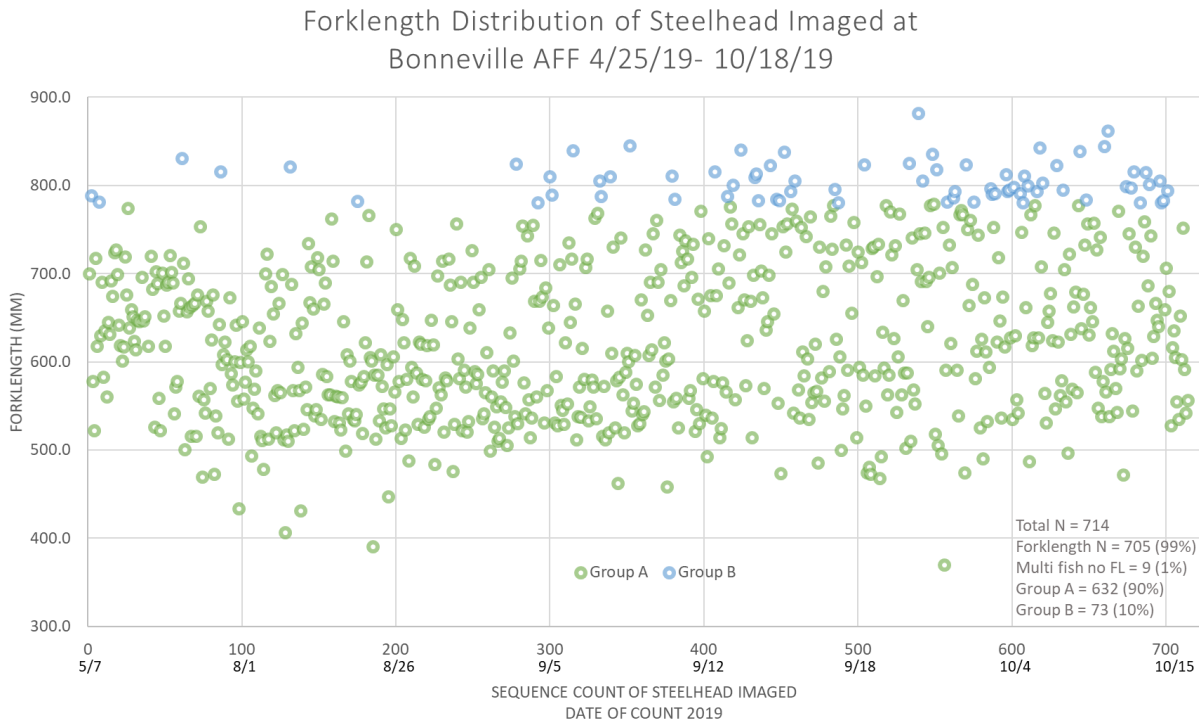


Figure 1. Forklength Distribution of FishL™ Recognition System imaged Steelhead at the Bonneville AFF 2019. Green= Group A Steelhead ≤ 780.0 mm forklength. Blue = Group B Steelhead > 780.0 mm forklength.

The average forklength of the total 705 Steelhead was 637.4 mm. It is interesting to eyeball the average forklength on Figure 1 and find that very few fish were actually close to this length. There appears to be a spatial separation in the distribution around that size with a group bigger than ~650 mm and a group smaller than ~625 mm, after August 1. This spatial separation, potentially, could reflect the differences in Steelhead age. Fisheries Management of Steelhead place those fish > 780 mm into Group B and those ≤ 780 mm into Group A. **Six hundred and thirty-two Group A** and

**seventy-three Group B Steelhead** were scanned. The histogram in Figure 2 places the fish in size buckets.

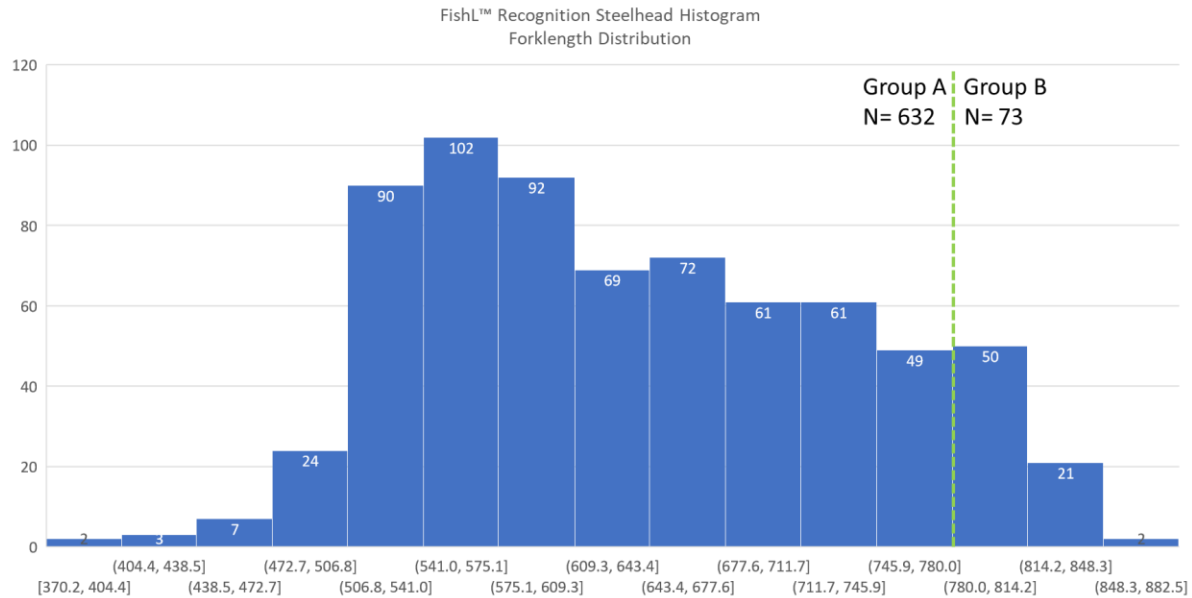


Figure 2. Histogram of Steelhead Forklengths of the FishL™ Recognition System imaged Steelhead at the Bonneville AFF 2019. Steelhead counts on the Y axis and forklength measurements in millimeters (mm) on the X-axis.

Of the total 714 Steelhead, **285 are of presumed wild origin with an intact adipose fin, 414 are presumed hatchery origin with no adipose fin** and there were 15 fish with adipose status unknown due to adipose visualization prevented due to water or fish orientation. Graphing the 705 Steelhead with forklength information and grouping based upon adipose status (Figure 3), 282 adipose, 410 no adipose and 13 adipose not visible are plotted.

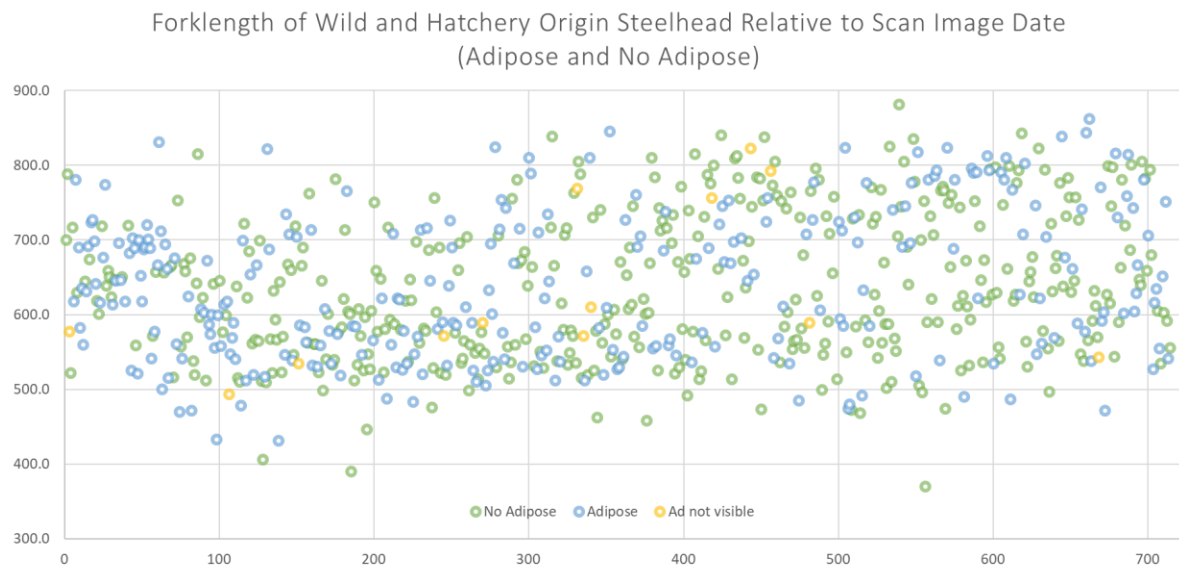


Figure 3. Steelhead Adipose Fin Forklength Distribution of FishL™ Recognition System images. Green= Hatchery origin, no adipose, Blue= Wild origin, adipose fin present, Yellow= adipose fin not visible.

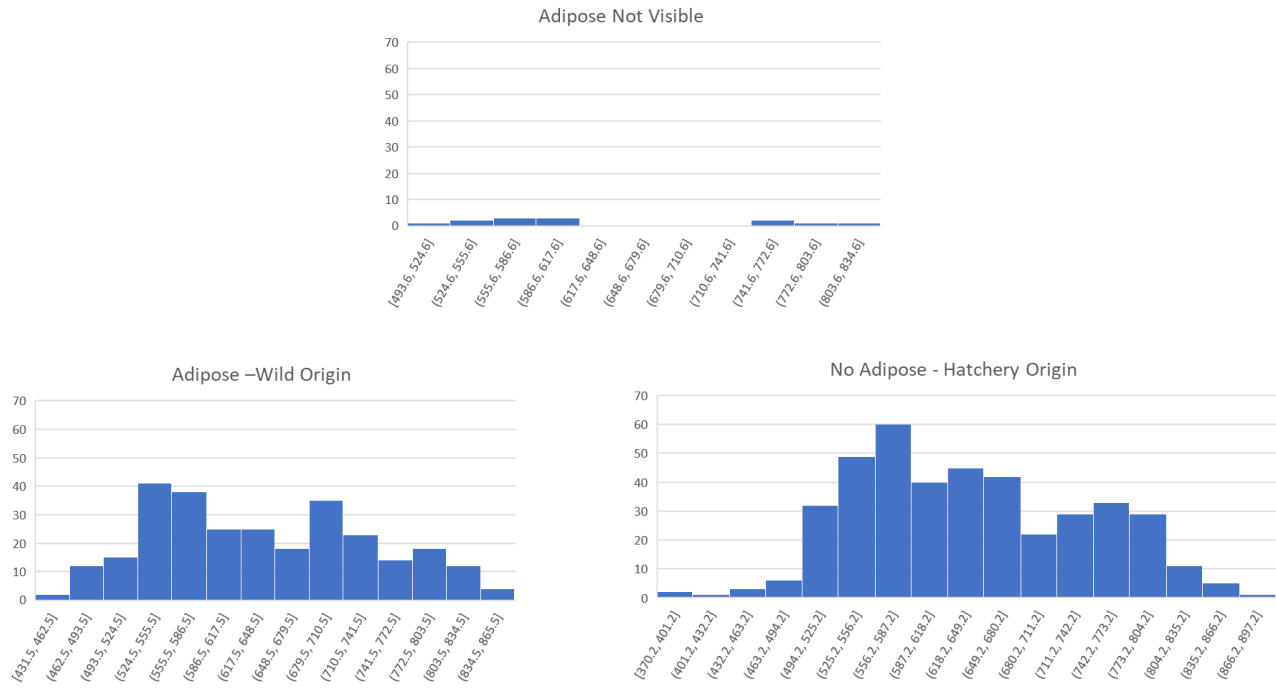


Figure 4. Histograms of Steelhead forklength size of the three Adipose fin status groups. Top is the adipose not visible group (n=13), left is the adipose fin present, wild origin group (n=282), and right is the no adipose, hatchery origin group (N=410). Steelhead counts on the Y axis and forklength measurements buckets in millimeters (mm) on the X axis.

Dorsal fin status was recorded when visible. Observations of split dorsal fins were noted as well as torn, associated with pinniped damage. Those that appear to be intact but with the edge having several small splits is listed as “ragged”. Those dorsal fins that were substantially eroded or all but absent were recorded as stubby. Table 2 lists the counts numbers of each dorsal fin classification and percentage of the total number of steelhead.

Table 2. Steelhead dorsal fin status with picture of stubby dorsal fin top right and normal dorsal fin bottom left and right.

Dorsal Fin Status	N= 714	Percentage
Healthy, normal dorsal fin	553	77.5%
Stubby dorsal fin	75	10.5%
Split dorsal fin	36	5.0%
Not visible (?)	36	5.0%
Ragged dorsal	11	1.5%
Torn fin	3	0.4%



Summary: Between April 25 and October 18, 2019, there were a series of dates in which the Bonneville AFF was operational and fish that passed over the right-side false weir, and were not selected for sampling, slid through the right-side bypass flume and were imaged via the Whooshh FishL™ Recognition system before exiting into a calm channel connected to the fish ladder. Within this timeframe and under these conditions, 12307 scans were recorded, and date and time of scan logged. **714 Steelhead** passed through the FishL™ Recognition system and were imaged. The forklength was computed on 705 Steelhead with 9 steelhead passing through at the same time as another fish and therefore no forklength was recorded. Group A ( $\leq 780$  mm) and Group B ( $>780$  mm) Steelhead are defined by the forklength measurement. **90%** of the 705 Steelhead were classified as **Group A** and **10% as Group B**. The composition of wild origin (adipose fin) vs hatchery origin (no adipose fin) was **40% adipose**, **58% no adipose** and **2% not visible**. The **dorsal fin** was **normal** and healthy in **77.5%** of the Steelhead with evidence of erosion or lack of dorsal fin “**stubby dorsal**” in **10.5%** of the Steelhead.

Our thanks to CRITFC and the USACE Project Coordinators of the Bonneville AFF for the opportunity to install the FishL™ Recognition System at the terminal end of the right bypass flume in the AFF to collect the scan images during the operational season in 2019.

Best regards,



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