

The use of video to monitor Columbia River juvenile salmonids at Bonneville and McNary dams in 2011

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Abstract

This project sought to determine whether video technology could be used to collect information that would allow a reduction in the number of juvenile salmonids handled at Columbia Basin mainstem dams. In 2011, video systems were sent up at sites at Bonneville and McNary dams.

At the Bonneville Dam juvenile bypass, video was recorded from April through October, 2011 of fish passing a viewing window we installed. A subsample of this video was reviewed and we determined that only 8.6% of the passing fish could be identified by species due to high turbidity, algae growth, the rapid speed of the fish, and the width of the area being monitored.

In 2011 video and PIT tag technology was also used at the McNary Dam juvenile bypass to capture PIT tag code-imprinted video images of selected juvenile fall Chinook tagged upstream as they passed through a 10 cm diameter pipe. We detected 81 of the 86 PIT tagged fish which passed. Of the detected fish that could be positively identified, for 61.5% the presence/absence of an adipose fin could be determined and 47.8% were oriented parallel to the flow. Fish traveled through our system at up to 4.5 m/s resulting in only one to two images per fish being captured. The majority of the fish observed (56.4%) appeared to be making contact with the inside of the pipe as they passed.

McNary Dam

Objective

Determine if images of individual PIT tagged smolt could be captured of sufficient quality to allow fish condition and length to be estimated for comparison with data collected at release.

Methods

PIT tag juvenile Hanford Reach fall Chinook and divert these fish at McNary Dam through a 10 cm pipe and on to the tailrace.

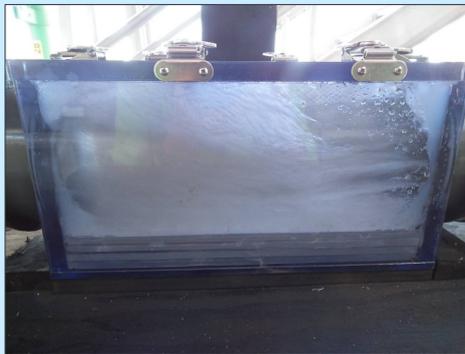
Equipment:

- Clear acrylic box with 10 cm pipe fittings
- 3 CCD cameras recording 30 fps at 1/2000s shutter speed
- 3 72 LED 230 lumen lights
- 2 FS2001 PIT tag readers
- A DVR plus 2 computers running Salmonsoft FishTick software (one a quad view recording images from 3 cameras, the other from 1 camera)

The system was tested at Hanford prior to deployment



Fish holding in the box at Hanford



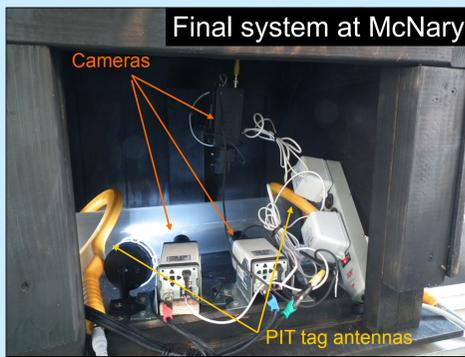
Too much turbulence at McNary!

Results

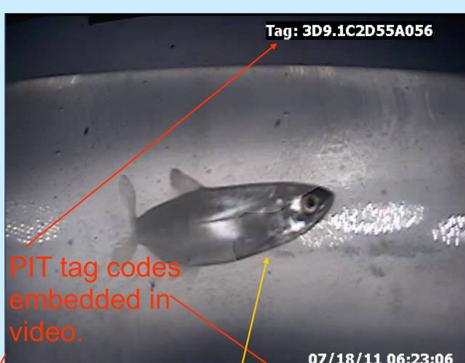
The system obtained good images at Hanford but fish held up in the viewing box. Turbulence at McNary required replacing the box with a clear acrylic pipe. The system was run at McNary from July 1-20, 2011 and captured images of 81 of 86 PIT tagged fish passing. Only one of 51 PIT tagged fish was missed when both antennas were operating. Video images could be identified for 78 PIT tagged fish; the remaining three fish passed at the same time as untagged fish and could not be individually identified. Fish moved so fast we often only had a partial frame of the fish. Fish were observed in all orientations.



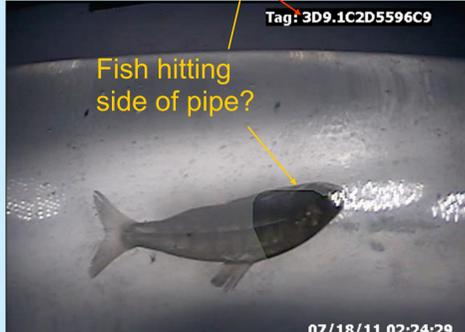
Dead???(Fish hasn't been detected again.)



Final system at McNary



PIT tag codes embedded in video.



Fish hitting side of pipe?

Bonneville Dam

Objective

Determine if video could be used to, at least in part, substitute for handling to estimate abundance by species and condition of passing juvenile salmonids, thereby reducing mortality.

Methods

- A viewing window was inserted in the juvenile bypass and artificial lighting provided.
- Video images were captured using a DVR as well as a computer running Salmonsoft FishTick software.
- Review video to estimate abundance and condition.



Results

- Reliable species composition was impossible due to fish traveling too fast through an area too big as well high turbidity and algae growth. Only 8.6% of passing fish were identified.
- Over 90% of the juvenile salmonids identified were upright and oriented vertically with the flow.



Lamprey

This adult steelhead stayed in the juvenile bypass for at least 80 hours

Conclusions

At both sites, fish moved too fast to be adequately assessed. At Bonneville Dam, the area fish moved through was also too wide and too deep, and it was too difficult to keep the window clean.

At both Bonneville and McNary (as well as other locations in the Columbia Basin), there are smaller flumes where fish are traveling slower that video could be used with a high likelihood of success.



Potential monitoring sites for video

Bonneville Dam juvenile bypass

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