Steelhead trout
Oncorhynchus mykiss

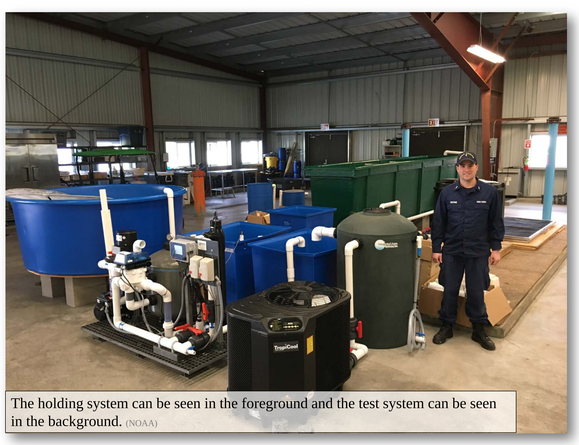
Juvenile Salmonid Leaping Ability Assessment:

A Multi-Agency Cooperative Research Effort

Coho salmon
Oncorhynchus kisutch

What are we doing?

We are finding out how high juvenile steelhead can leap at different water temperatures and flow rates. The round blue tank in the image below is for holding fish, and the long rectangular green tank is where fish jump.



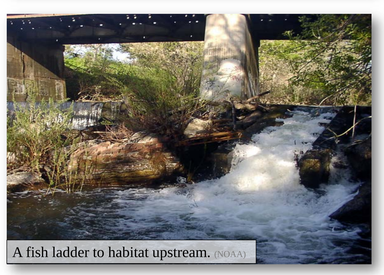
The holding system can be seen in the foreground and the test system can be seen in the background. (NOAA)

Why are we doing this research?

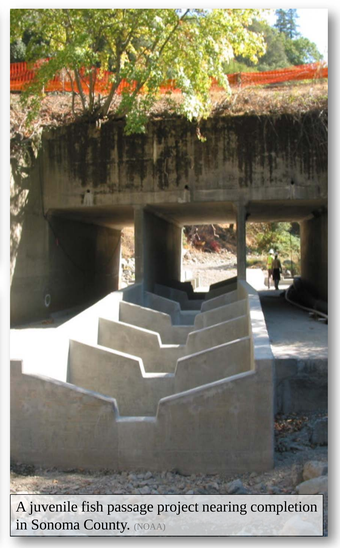
Juvenile salmon and steelhead move around in rivers and creeks quite a bit to find the best food and places to grow. In fact, our understanding of how much they move around is still expanding, as it is very difficult to monitor the movement of such small fish.

In many cases, they face waterfalls of various heights while attempting to go upstream. These waterfalls are often caused by structures such as dams, fish ladders and road culverts. While the leaping abilities of adult fish are well understood, little information exists on the leaping abilities of small fish. Because of this gap in our knowledge, state and federal guidelines for juvenile salmonids are inconsistent regarding appropriate design jump heights at fish passage facilities (such as fish ladders and boulder weir structures). Fish passage facilities are expensive, so we want to understand the leaping abilities of the fish better so we can build the most efficient fish ladders.

A juvenile steelhead leaping at a barrier. (Mail Tribune)



A fish ladder to habitat upstream. (NOAA)



A juvenile fish passage project nearing completion in Sonoma County. (NOAA)

Who is involved?

US Army Corps of Engineers®

California Department of Fish & Wildlife

California Fish Passage Forum

NOAA Commissioned Corps 1917

NOAA Fisheries West Coast Region

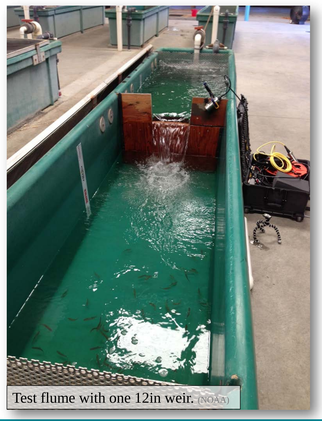
National Oceanic and Atmospheric Administration · U.S. Department of Commerce · NOAA

Southwest Fisheries Science Center

Juvenile Chinook salmon leaping. (Mail Tribune)

What have we found out so far?

Because the ability of a fish to jump depends a lot on water temperature and on fish length, we will need to test fish of many different lengths and at many different water temperatures to fully understand leaping behavior and potentially reconcile state and federal guidelines. So far, we have found that fish of a certain length and in 54°F water are able to ascend heights never documented before, and that similar numbers of these fish ascended 6 inch and 12 inch jump heights. We also found that steelhead were generally more successful leapers than coho salmon of a similar size, and that success for both species was related to fish length and weight. We also recorded leaping attempts above water and underwater on video to study leaping behavior. The results of this study have implications regarding the appropriate design of fish passage facilities, especially for juvenile salmonids.



Test flume with one 12in weir. (NOAA)

Test flume with two 6in weirs. (NOAA)

Detailed Results and Interpretation

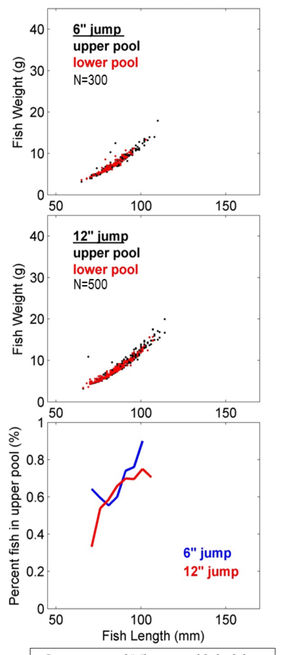
Test 1 Results:

Coho *Jumping Success Over 6in Weir vs 12in Weir in 24 Hours*

- Jumping success similar over both weirs for 80-90mm (approx. 3 to 3.5in) fish
- Success about 65%
- Small fish were more successful over 6in weir

Juvenile coho salmon. (NOAA)

Adult coho salmon. (NOAA)



Gentemann and White, unpublished data

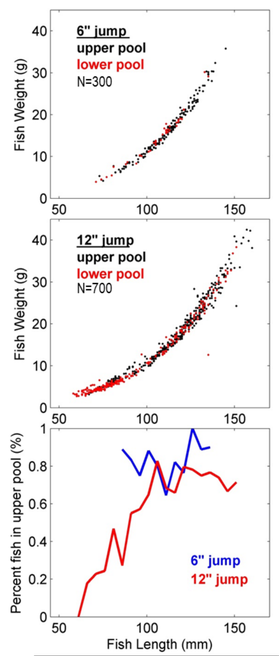
Test 2 Results:

Steelhead *Jumping Success Over 6in Weir vs 12in Weir in 24 Hours*

- Jumping success similar over both weirs for 105-125mm (approx. 4 to 5in) fish
- Success about 75%
- Small fish were more successful over 6in weir
- No success at 60mm (approx. 2in)

Juvenile steelhead. (NOAA)

Adult steelhead. (NPS)



Gentemann and White, unpublished data

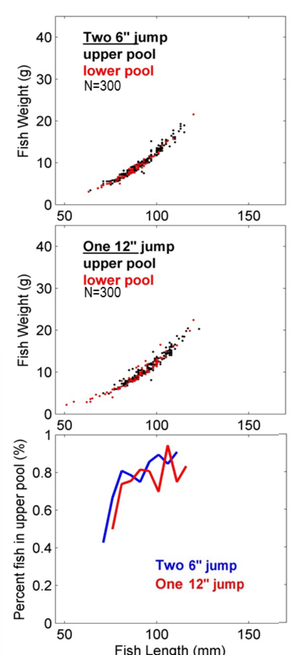
Test 3 Results:

Coho *Jumping Success Over **two** 6in Weirs vs **one** 12in Weir in 24 Hours*

- Jumping success similar over two 6in weirs as one 12in weir for 105-125mm (approx. 4 to 5in) coho salmon
- Success about 80%

Interpretation of Results

Preliminarily, it appears that 12 inches may be an acceptable jump height for juvenile salmonids. However, more testing is required for different fish lengths and at different water temperatures before this can be determined.



Gentemann and White, unpublished data

NOAA FISHERIES

MORE TESTING BEGINS:

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