

Wild rainbow trout critical to health of steelhead populations

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New research shows that a steelhead, such as the large fish in this image, is just one of the options for steelhead reproduction, along with other fish such as rainbow trout. (Photo by John McMillan)

Genetic research is showing that healthy steelhead runs in Pacific Northwest streams can depend heavily on the productivity of their stay-at-home counterparts, rainbow trout.

Steelhead and [rainbow trout](#) look different, grow differently, and one heads off to sea while the other never leaves home. But the life histories and [reproductive health](#) of wild trout and steelhead are tightly linked and interdependent, more so than has been appreciated, a new Oregon State University study concludes.

The research could raise new challenges for fishery managers to pay equally close attention to the health, stability and habitat of wild rainbow trout, the researchers say, because healthy steelhead populations may require healthy trout populations.

In a field study in Hood River, Ore., researchers used [DNA analysis](#) to determine that up to 40 percent of the genes in returning steelhead came from wild rainbow trout, rather than other steelhead. And only 1 percent of the genes came from "residualized" hatchery fish – fish that had stayed in the stream and mated, but not gone to sea as intended by the hatchery program.

"It used to be thought that coastal rainbow trout and steelhead were actually two different fish species, but we've known for some time that isn't true," said Mark Christie, an OSU postdoctoral research associate and expert in fish genetic analysis. "What's remarkable about these findings is not just that these are the same fish species, but the extent to which they interbreed, and how important wild trout are to the health of steelhead populations."

This research, just published in the journal *Molecular Ecology*, was based on a 15-year analysis of 12,725 steelhead from Oregon's Hood River, each of which was sampled to determine its genetic background and parentage. It was supported by funding from the Bonneville Power Administration.

The study reveals a complex picture of wild trout and steelhead intermingling as they reproduce. A steelhead might be produced by the spawning of two steelhead, two wild trout, or a returning steelhead and a trout.

Rainbow trout are small to moderate-sized fish in most rivers, but if that same fish migrates to the ocean it can return as a huge steelhead weighing 30 pounds or more, prized for sport fishing. Researchers still don't know exactly why some trout choose to go to the ocean and others don't, although they believe at least some part of the equation is genetic.

Studies of rainbow trout and steelhead have been undertaken, in part, to

better understand the implications of hatcheries. Including all salmonid species, more than one billion hatchery salmon are released into Pacific Northwest streams each year. And because hatcheries produce fish that are less able to survive and successfully reproduce in the wild, there is concern about hatchery fish mating with wild fish.

"One implication of this study is that the genetic contribution by wild trout is diluting the input of genes from hatchery fish to the wild steelhead population," said Michael Blouin, an OSU professor of zoology and co-author on this study.

"The genetic influences of hatchery fish on wild steelhead populations are still a concern," Blouin said. "But the good news from the Hood River is that the hatchery [genes](#) are being diluted more than we thought, and thus may not be having as much impact on dragging down the fitness of the wild steelhead."

The genetic influence of wild rainbow trout, the scientists said, is roughly cutting in half the genetic input of hatchery fish that reproduce in the wild – a mitigation of their impact that's of some importance.

The scientists cautioned that results from one river might not be representative of all steelhead populations. Nevertheless, Christie said, "The importance of trout in maintaining steelhead runs should not be underestimated.

"They can act as a healthy genetic reservoir and preserve reproductive populations during years when ocean conditions make steelhead survival very difficult," he said. "So a good way of looking at it is, whatever is good for wild rainbow trout is also good for steelhead."

Worth noting, the researchers said, is that most other salmonids, such as coho or chinook salmon, do not have this type of fall-back system to

help produce fish with a higher capability of surviving. As such, they may be more vulnerable than steelhead to the concerns about genetic weaknesses produced by [hatchery fish](#).

Provided by Oregon State University

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