

Genetic science could protect spring Chinook salmon

Awaiting a federal decision

By JES BURNS
Oregon Public Broadcasting

A logjam on a river can be a beautiful thing — especially if you’re a salmon. Logjams collect the gravel salmon need to lay their eggs.

But if you’re a spring Chinook on the South Umpqua, the slick gray-green sheets of rock that line the course of the river can be a bleak place.

“The water just rips through it. And because the bedrock offers very little resistance, all the gravel and substrate just move out and don’t get retained,” U.S. Forest Service fisheries biologist Casey Baldwin said.

Baldwin has been working for more than a decade to add logs back to the river and improve its spawning habitat. Logs were pulled from the river by his agency in the 1960s and ‘70s in a misguided practice called “stream clean out,” where the logjams were removed in an attempt to make it easier for fish to get upstream.

“A lot of the river’s pretty much its base or worst state that it can be in. I mean, you really (can) say it’s a beautiful ditch of bedrock,” he said.

The progress has been slow. The past few years, Baldwin’s workforce has been busy fighting wildfires instead of being available for restoration work. And funding can be unpredictable from year to year.

Every year the river continues to resemble a massive bedrock waterslide, spring Chinook numbers continue to fall. Only about 60 “springers” came back this year to the South Umpqua River. “We’re looking at the last breaths of a species,” said Stanley Petrowski, a board member of Umpqua Watersheds.

Petrowski said spring Chinook declines on coastal Oregon rivers haven’t been given the conservation attention they need because the spring and fall fish are lumped together and regarded as a single species.

For decades, based on what scientists knew about salmon genetics, wildlife managers in the Pacific Northwest considered Chinook salmon that return to deposit and fertilize eggs in the spring and those that return in the fall to be the same fish. So, even though wild spring Chinook salmon runs on many rivers in Northern California and Oregon have crashed, there hasn’t been the urgency to change anything — as long as the fall runs remain strong.

Wildlife managers thought that if spring Chinook salmon disappeared, then fall Chinook would just reevolve to start their homeward migration in spring — replenishing that run of fish.

But recently, there’s been a significant shift in understanding of salmon genetics. Researchers have found a distinct area in salmon DNA where the spring and fall Chinook differ.

“Now that we know that



Craig Tucker and Amy Fingerle take a break from snorkeling on the Salmon River. This is the last stronghold of wild spring Chinook in the Klamath Basin, but only 161 fish were counted this year.

there’s a genetic difference, they should be managed as that. And that’s what we’re pushing for,” Petrowski said.

Umpqua Watersheds and other groups filed a petition based on this new science Tuesday. They want to extend Endangered Species Act protections to spring Chinook in Oregon coastal rivers roughly between Port Orford and Seaside — a stretch that covers most of the Oregon coastline.

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Genetic revelations

Being a spring run Chinook instead of a fall run Chinook can definitely have advantages.

Spring Chinook get their name because they enter rivers in spring when water flows are high and rivers are deep. This allows them to move farther inland to access spawning grounds. The fish hang out in cold river pools all summer while they develop the ability to reproduce.

By the time fall run fish leave the ocean, river flows are usually lower. What looked like a speed bump to a spring salmon might be more like a tall, insurmountable waterfall later in the year.

Both runs of fish spawn at roughly the same time (springers generally lay their eggs about a month earlier), but because spring fish access parts of the river fall fish can’t, they reduce the level of competition for spawning grounds.

The genetic difference between fall and spring Chi-

nook salmon was first documented in a 2017 paper coauthored by University of California, Davis geneticist Mike Miller. But scientists had been looking into the genetic differences between the fish since the 1970s.

“What (had) been found over and over again is that when you look at pairs of spring and fall Chinook from the same watershed, they tend to be really related to each other ... they were indistinguishable,” Miller said.

Based on this, scientists concluded that the fish first developed a preference for a specific home river before they evolved to return to that river at a different time of the year.

“It would suggest that the spring run evolved lots of different times in lots of different places,” he said.

If this change in behavior emerged many times in the past, what’s to say it couldn’t reemerge again when conditions are favorable?

Miller decided to look a little closer at the issue using new high-resolution genetic analysis technology.

“We were really surprised we found that there was one region of the genome that was basically ... perfectly correlated with whether individuals were either spring run or fall run,” he said.

They did the same analysis for winter and summer runs of steelhead and found the same genetic variation between the two runs.

It didn’t matter where the spring Chinook they analyzed came from, they all had the same genetic marker. This means the genetic mutation happened once, likely tens of thousands of years ago or more and then spread. This was not something that could be counted on to happen again in our lifetime.

This presented a new avenue to argue that spring Chinook should be protected separately under the Endangered Species Act.

Matt Sloat, a scientist with the Wild Salmon Center in Portland, said the finding could be the “biggest thing to influence how the Endangered Species Act governs

salmon in a long time.”

Trailblazers

The mutation that initially was an evolutionary boon for spring Chinook salmon has left them particularly vulnerable because of the way humans have changed the rivers.

Dams were built that blocked off large chunks of the upstream habitat springers relied on, pitting them against fall fish in downstream spawning grounds. Wild fish advocates say hatcheries are undermining wild populations. The water quality of the rivers has been altered by land uses like logging, grazing and mining, and by communities withdrawing water for agriculture, drinking supplies and industrial use. River levels are lower and water temperatures are warmer, affecting spring fish that need cold water habitat to get them through the hot summer months.

This is the case on the Klamath River, which drains parts of southern Oregon and Northern California. Once springers were the dominant run of fish, and very important to the Native American tribes in the region. Now the only stronghold of wild spring Chinook left is found on a tributary called the Salmon River — if 161 fish can be considered a stronghold.

The Karuk Tribe and Salmon River Restoration Council were the first to use

the new genetic science to try to get spring Chinook listed as threatened or endangered. That petition is currently awaiting action from the National Marine Fisheries Service, which was supposed to issue a decision at the end of 2018.

A fisheries service spokesperson said the decision is now expected before the end of this year. With this decision will come the first clue whether salmon conservation will change to reflect the expanding understanding of salmon genetics.

Not all scientists working in the field of salmon genetics agree on the interpretation of the new genetic data. In fact, a group of scientists working with Miller on the 2017 paper removed their names before it was published.

NOAA Fisheries ecologist Carlos Garza was one of those scientists, although he agrees the underlying work showing the genetic difference between spring and fall Chinook was good and has subsequently been confirmed by his own, as yet unpublished, work.

Garza says the genes that mark spring run salmon only correlate with the time they enter rivers, not any other physical or developmental difference. And he says people are going too far with the interpretation of what the genetic difference means.

“If you’re proposing that we change the way that we label these fish to focus on something that is not descriptive of the way that they are actually existing in nature, then that ... becomes an issue of anthropogenically categorizing things in a way that is not consistent with their biology,” he said.

In addition, through research on the Salmon River, Garza has learned that spring and fall Chinook occupy the same spawning grounds — they interbreed, which helps conserve the genetic variation.

“That means that effectively in the Salmon River, spring and fall Chinook are part of one population,” he said.

Garza doesn’t see spring and fall fish as being any more different than siblings with different colored eyes.

“One can have a very simple genetically controlled trait lead to a cascade of phenotypic (observable characteristics) changes that cause people to perceive what could be two full siblings as being dramatically different organisms,” he said.

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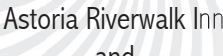
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The family of Aliisa D. (Wallin) Wirkkala of Naselle, Wa formerly of Ilwaco Wa wish to acknowledge the prayers, loving expressions of sympathy & gestures of kindness lavished upon us following the sudden loss of our precious Aliisa and Nana.

We have a deep, inexpressible gratitude for the overwhelming outpouring of love from our community and nearby communities that Aliisa touched during her too short time here.

To the many friends, neighbors, coworkers, church family and our family members who prayed when she was injured & continue praying for us after her passing God bless you.

To all who attended her celebration of life. You do not know how much it meant to us who love her and feel the loss so deeply.

To all who provided emotional & practical support to those who traveled long distances, sent floral tributes, cards, messages of condolence & those who made charitable contributions in her memory to the ministry's she held dear, we are deeply grateful.

To the Naselle ambulance crew, para medics, emergency room doctors & nurses at Columbia Memorial, who all took such good care of Aliisa at the time of her injury and a month later at her passing. To Life Flight Network and Legacy Emanuel in Portland who did everything they could. God bless you.

To Aliisa's coworkers at TLC/FibreFederal , Seaside, Astoria, Tillamook and Longview & those from Jones New York, Liz Claiborne in Seaside your Prayers and loving support are amazing.

To Penttila's Chapel by The Sea for their sensitive professional handling of the funeral arrangements, to Artistic Boquets & Ericksen's Floral for the beautiful floral arrangements thank you.

To Pastor Higginbotham, Pastor Seavey, their dear wives, Naselle Assembly of God, Aliisa's Sunday school kids (prayers), everyone's prayers, those who organized & served at the reception and all those who helped in any way, your contribution made our grief more bearable.

Our Loving appreciation to all of you & may God's most precious blessing, Christ our Lord & Savior go with each of you.

Arne Wirkkala, the Wirkkala tribe & the Lawrence & Barbara Wallin family

Proverbs Ch. 31 verse 10-31 - Romans Ch. 10 verse 15
How beautiful are the feet of those who preach the gospel of peace who bring glad tidings of good things.
Romans Ch. 5 verse 6-11



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