

## California Drought: Delta smelt survey tallies one fish, heating up debate over water supply

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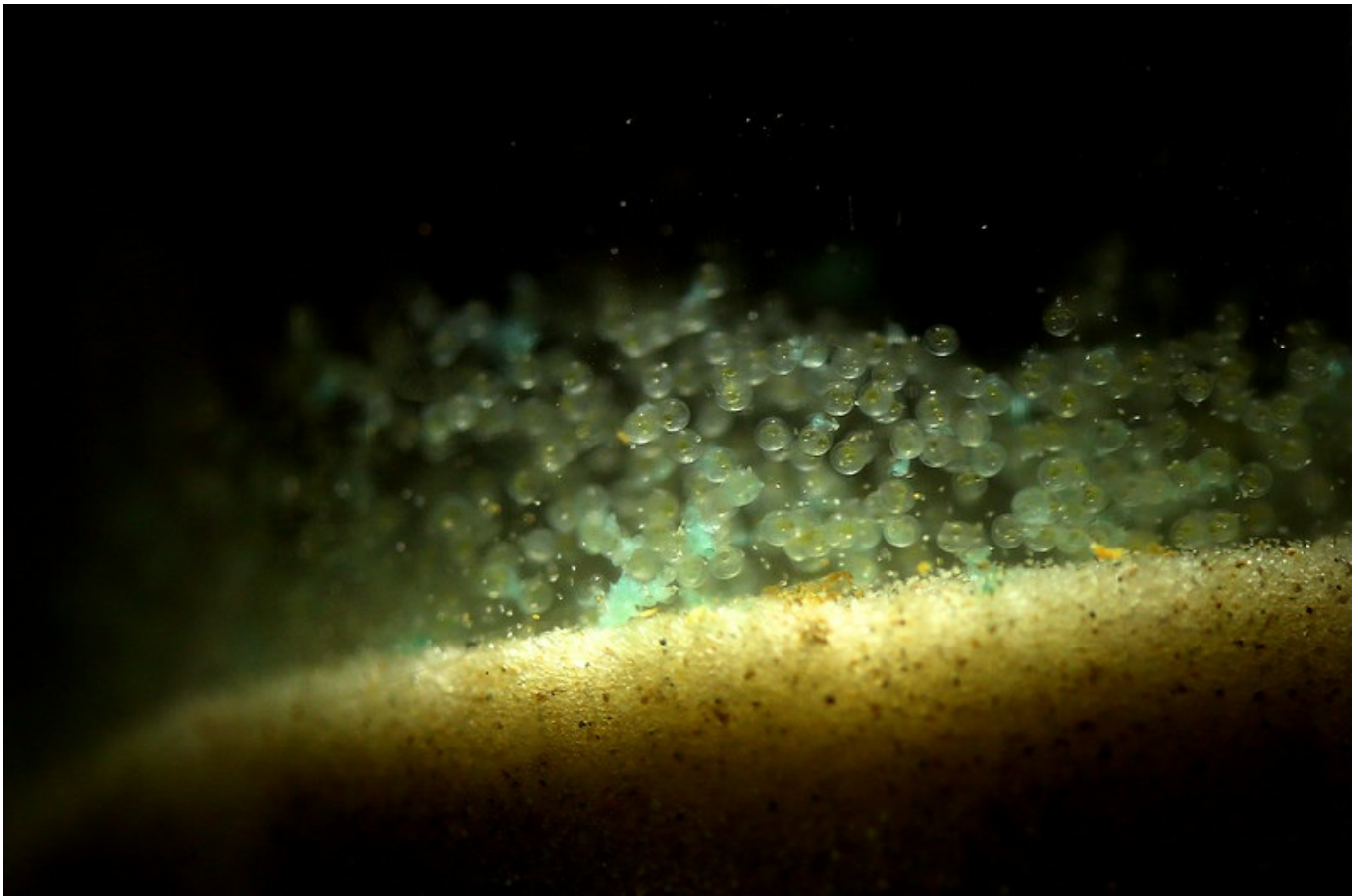
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Adult smelt are photographed at the UC Davis Fish Conservation and Culture Lab on Tuesday, April 14, 2015, in Byron, Calif. (Aric Crabb/Bay Area News Group)

Photos: Endangered smelt at the center of struggle for water



Smelt eggs develop for seven days in an incubator at the UC Davis Fish Conservation and Culture Lab on Tuesday, April 14, 2015, in Byron, Calif. (Aric Crabb/Bay Area News Group)

Photos: Endangered smelt at the center of struggle for water



An adult smelt is photographed after being tagged at the UC Davis Fish Conservation and Culture Lab on

Tuesday, April 14, 2015, in Byron, Calif. (Aric Crabb/Bay Area News Group)

Photos: Endangered smelt at the center of struggle for water

An adult smelt is tagged at the UC Davis Fish Conservation and Culture Lab on Tuesday, April 14, 2015, in Byron, Calif. (Aric Crabb/Bay Area News Group)

Photos: Endangered smelt at the center of struggle for water





Tewdros Ghebremariam nets adult smelt for spawning at the UC Davis Fish Conservation and Culture Lab on Tuesday, April 14, 2015, in Byron, Calif. (Aric Crabb/Bay Area News Group)

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Eggs are removed from a female adult smelt at the UC Davis Fish Conservation and Culture Lab on Tuesday,

April 14, 2015, in Byron, Calif. (Aric Crabb/Bay Area News Group)

Photos: Endangered smelt at the center of struggle for water



Director emeritus Joan Lindberg of the UC Davis Fish Conservation and Culture Lab looks over smelt eggs being incubated on Tuesday, April 14, 2015, in Byron, Calif. (Aric Crabb/Bay Area News Group)

Photos: Endangered smelt at the center of struggle for water

[See additional gallery images here.](#)





Luke Ellison, left, and Tewdros Ghebremariam transfer adult smelt for spawning at the UC Davis Fish Conservation and Culture Lab on Tuesday, April 14, 2015, in Byron, Calif. (Aric Crabb/Bay Area News Group)

Photos: Endangered smelt at the center of struggle for water

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BYRON -- There's only one place left on Earth where imperiled Delta smelt are thriving, where their water remains cold and clean.

In the wild, the fish is on the brink of extinction. This month, in their April trawl survey, state Fish and Wildlife scientists caught only one of the pinky-sized, politicized fish with an outsized role in California's water wars, an alarming indication of just how few smelt are left. And the drought may inflict the final blow.

But here in this UC Davis-run hatchery, large tanks are filled with thousands of baby smelt -- where, for now, they'll stay, generation after generation -- because the Delta's warm, brackish and polluted water is too inhospitable.



Luke Ellison, left, and Tewdros Ghebremariam transfer adult smelt for spawning at the U.C. Davis Fish Conservation and Culture Lab on Tuesday, April 14, 2015 in Byron, Calif. (Aric Crabb/Bay Area News Group) ( ARIC CRABB )



The fate of this fish -- wild or forever captive -- throws into question the future of one of the world's most contentious plumbing systems: the 700,000-acre Sacramento-San Joaquin River Delta, the nexus of water moving from the state's north to south.

In the fourth year of a historic drought, biologists are issuing desperate pleas to devote Delta water for those few wild creatures that remain -- not just Delta smelt, but also longfin smelt, Sacramento splittail, Sacramento perch, river lamprey, green sturgeon, Central Valley steelhead trout and spring and winter runs of chinook salmon. It's not just about saving a single species, they say, but about saving a precious ecosystem.

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But farmers say it's time to concede the fish is a lost cause -- and to supply more of the Delta's water to help humans.

Amid the crisis, there's this question: Do these cultured captive fish represent a new beginning in the wild, or an experiment in futility? The future of the Delta smelt -- and its impact on California's water supply -- is the latest installment of this newspaper's series "A State of Drought."

The fish itself is unremarkable -- short-lived, tiny and so translucent it's almost invisible. It lacks the charisma of a bald eagle, grizzly bear or bison. Until now, it's been durable, surviving millions of years through droughts far worse than this one. It was once the most abundant fish in the Delta.

This countdown toward extinction represents the failure of what was once the largest estuary between Patagonia and Alaska.

"The policy of the people of United States is not to let any species go extinct," said fish biologist Peter Moyle, associate director of the Center for Watershed Sciences at UC Davis.

"But the situation is pretty grim," he said. "And if it's unfavorable for the smelt, it's probably unfavorable for other species, as well."

An adult smelt are photographed at the U.C. Davis Fish Conservation and Culture Lab on Tuesday, April 14, 2015 in Byron, Calif. (Aric Crabb/Bay Area News Group) ( ARIC CRABB )



The fish exerts such force on the Delta's waters that the U.S. Fish and Wildlife Service regulates how and when pumping can be done to protect it and other imperiled endangered species. Since the smelt is protected under the Endangered Species Act, a federal court order can -- and has -- reduced pumping to farmers and cities in Southern California. Yet this protection hasn't been enough for a species that lives in the pipeline of California's critical hydraulic system.

In March, when the California Department of Fish and Wildlife conducted one of its monthly spring trawl surveys for adult smelt, it found only four females and two males hidden in the grasses of a vast network of man-made islands and channels at the confluence of the Sacramento and San Joaquin Rivers. April's survey found a single fish. While these surveys are merely a sampling of the population, they are a shadow of previous counts: In 2012, the March survey tallied 296 fish, while the April catch was 143. When smelt numbers get too low, it makes it harder for males and females to find each other, said UC Davis' Moyle. Another species, the longfin smelt, was also found in record-low numbers.

Lab assistant Jeremy Gordon tags adult smelt at the U.C. Davis Fish Conservation and Culture Lab on Tuesday, April 14, 2015 in Byron, Calif. (Aric Crabb/Bay Area News Group) ( ARIC CRABB )



The impact of the drought is adding fury to hard and long-established arguments over the Delta smelt.

Efforts to stave off the fish's demise have been pointless and magnify the human suffering of the drought, said Chris Scheuring, attorney for the California Farm Bureau Federation.

"A lot of water has been thrown at the problem, to no apparent effect," he said. "Twenty million Californians depend on a water supply kept away from them by one small, little population of fish."

Good riddance, wrote Fresno-based Harry Cline of the Farm Press Blog. Turning off the pumps that serve the state and federal water projects wasted about 800,000 acre-feet of water in 2013 "based on the science of four buckets of minnows. That is enough water to produce crops on 200,000 acres or 10 million tons of tomatoes; 200 million boxes of lettuce; 20 million tons of grapes."

California needs to redouble its efforts to save those smelt that remain, counters conservation biologist Jon Rosenfield of the Bay Institute. Fish need far more freshwater inflows to oxygenate their water than they've been getting, as they also struggle against rising temperatures, salinity, pollution and predators, he said.

In early April, there was more bad news for Delta fish, with the State Water Resources Control Board's decision to reduce Sierra runoff to the estuary because of the drought, denying fish the pulse of cold, fresh water that helps them get through the year.

"This decision represents a major failure to protect the fish and wildlife that belong to all Californians," Rosenfield said. Failing to protect native species is asking for a wave of extinctions to commence, he said.

In desperation, UC Davis fish biologists have created what's widely regarded as the most sophisticated fish breeding programs in the nation. There's a smaller backup population at a U.S. Fish and Wildlife Service hatchery below Shasta Dam.

The goal is to save the Delta smelt's diverse gene pool before it is gone forever.

So the little fish has joined the ranks of other animals that owe their existence to captive-breeding efforts, including the Arabian oryx, the black-footed ferret, the red wolf, the Guam rail and the California condor. A UC Davis captive breeding program of the Amargosa vole, one of the most endangered mammals in North America, has been so successful that this week more than two dozen voles were released back into the wild.

Here at the little-known Fish Conservation and Cultural Laboratory, this "refuge population" of fish is thriving and reproducing. Unlike the Delta outside, the water here is reliable and abundant. It's chilled to 52 to 60 degrees. It's disinfected and filtered of dangerous pollutants. Six times a day, the fish are fed a diet of live zooplankton, brine shrimp or special dry food, at a taxpayer cost of \$2.5 million a year.

The lab started with 160 wild smelt in 2006 and has bred 250 pairs every year, yielding distinct "families" of fish with thousands of offspring.

To ensure future genetic diversity, each fish is tagged and its fins are clipped, then sent to a UC Davis lab for DNA sequencing. The results guide matchmaking and identify the optimal crosses for reproduction.

"You always want to keep as much variation as you can. You don't know what genes it will require in the future," said former lab Director Joan Lindberg.

The lab then conducts tedious artificial insemination: Each female fish is squeezed, creating a pool of eggs around the size of a quarter. Then the sperm from the males is added. The fertilized eggs, safe in a small bowl of water, are incubated until they hatch 40 days later.

It's likely that these captive fish will be the only survivors of their species. Moyle advised the state's Delta Stewardship Council that wild smelt could be gone within the next two years.

Farmers and cities may then petition to have smelt "delisted" as an endangered species, contending that no protection is needed for a dead fish, said Scheuring, the farm bureau's attorney.

"If the Delta smelt go extinct, in the short run that could improve the pumping operations of water for humans," he said. "It will free the pumps to start pumping a fair amount more."

Environmentalists would, in turn, argue that other species also deserve protection, and would fight more pumping. There are at least seven strong candidates for Endangered Species Act protection, including sturgeon and some salmon. "They're queued up," Moyle said.

If smelt can't live in the wild, is there any point to the Davis lab?

Yes, biologists say, because humans have a moral obligation to save a species we ourselves exterminated.

"It is absolutely worth saving the historical legacy of this fish. If we don't have them, we will never have them again," said Casey Dillman, a fish scientist at the Smithsonian Institution in Washington, D.C.

The survivors in the UC Davis hatchery provide biologists a potent reason to keep fighting for Delta restoration. If reintroduced, the resurrected fish also might be protected by the Endangered Species Act -- and could assert the same legal claims as their wild ancestor.

But as long as the Delta stays hot and dry, even the most carefully cultured fish can't replace the dying wild populations, said lab Director Tien-Chieh Hung.

"We know if it doesn't get better, there will be no point to putting them back," he said. "All we can do is keep them -- and when ready, we can reintroduce them and hope they survive better."

Until then, the tiny fish, a symbol of both loss and hope, will continue to swim -- generation after generation, perhaps forever -- in safe captivity.

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THREATS TO DELTA SMELT State and federal water export pumps  
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