

FAQ for *Lactococcus garvieae* outbreak in Southern California fish hatcheries

Updated January 2021

Three California Department of Fish and Wildlife (CDFW) hatcheries in Southern California and the eastern Sierra are currently fighting a bacterial outbreak *Lactococcus garvieae* among their fish stocks. The disease was previously unknown in California, and CDFW staff have been trying multiple treatments and strategies to try to resolve the outbreak over the last three months. Efforts have been unsuccessful. Consequently, and as a last resort, CDFW pathologists have recommended that the fish be euthanized, and the facilities disinfected before repopulating the hatcheries with *L. garvieae*-free fish.

What is this bacteria, and how does it harm fish?

Lactococcus garvieae is similar to streptococcus. The bacterium has caused disease in freshwater and saltwater aquaculture facilities around the world, although this is the first time it has been detected in California. *L. garvieae* can cause a blood-borne disease with symptoms including anorexia, bulging eyes with hemorrhaging around the edges, lethargic or erratic swimming, darkening of the skin, swollen abdomens and increased mortality. Infected fish may also show no signs of infection depending on several factors, including water temperature and stress.

When was the bacterium discovered, and which CDFW hatcheries are affected?

The *L. garvieae* bacteria is known to be present in the US but to date has only been identified in a handful of aquaculture facilities. It had not been found in California, either in aquaculture facilities or in the wild, prior to its discovery at the Mojave River Hatchery in late April 2020. That hatchery was immediately placed on quarantine. CDFW pathologists and hatchery staff have been battling the outbreak from late April to the present. CDFW pathologists identified *L. garvieae* in the Fish Springs and Black Rock Fish hatcheries on June 25. Fish Springs and Black Rock Hatcheries were immediately quarantined. Due to its proximity to the positive Eastern Sierra hatcheries, Hot Creek Hatchery was also quarantined. Extensive testing at Hot Creek Hatchery revealed it to be free of the bacteria and the quarantine was lifted on June 25.

Do we know the source of the original outbreak? How might it have come to California?

Pathologists do not know the source of the original outbreak at the three hatcheries. The California isolate was compared to a strain found in the Columbia River Basin. DNA analysis revealed that the California strain did not come from the Columbia River Basin. This bacterium is usually spread by movement of fish or eggs, but we do not believe that is the case for the three CDFW hatcheries. Our current belief is that it was carried into the hatchery by birds that picked it up from an environmental source.

How quickly, and through what means, is it known to spread?

Rainbow trout can be infected with the bacteria, but not be diseased by it, at water temperatures up to 59 degrees F. At temperatures above 59 degrees F, the bacteria can become pathogenic for trout. The bacteria can be spread between hatcheries or other water sources through movement of infected fish, fish eggs or even feed produced with fish meal contaminated with the bacteria. Contaminated equipment (nets, buckets, boots, etc.) may also contribute to its spread. The bacteria have also been identified in the feces of birds. Once it has spread into a hatchery and a fish becomes infected, it easily spreads from fish to fish.

How many fish are at the hatcheries?

There are approximately 3.2 million rainbow trout, brown trout and Lahontan cutthroat trout at the three hatcheries, ranging in size from fry and fingerlings to catchable fish.

Are bacterial outbreaks common among fish?

Disease outbreaks of different types are not uncommon in fish hatcheries. Most fish pathogens are present in the lakes and rivers of the state and come into hatcheries with the water. They only cause infection and disease when conditions such as elevated water temperatures or crowding stress tilt in their favor. Hatchery staff are trained to recognize sick fish and consult with CDFW veterinarians to treat illnesses as needed. What is unusual about this outbreak is that this pathogen is new in California. Further complicating the treatment of the fish is that the bacteria is resistant to most of the few antibiotics approved by the US Food and Drug Administration (FDA) for treating fish in aquaculture.

What treatments were tried prior to making the decision to euthanize the fish?

CDFW fish pathologists and veterinarians placed fish on a specialized immune system boosting diet and administered multiple rounds of antibiotics. Hatchery staff also attempted to spread fish out as much as possible to reduce stress. Unfortunately, *L. garvieae* is resistant to most antibiotics approved by the FDA for use in food fish. CDFW veterinarians treated the fish with the one FDA-approved antibiotic to which the bacteria showed any susceptibility – and that susceptibility was only moderate. In addition, this bacterium can live in a biofilm on raceway walls and other surfaces. Even if the fish were able to rid itself of the bacteria, the chances of reinfection from contaminated surfaces in the hatchery would be significant.

Were the fish be euthanized humanely?

The decision to euthanize animals is not a decision we take lightly. CDFW has strict policies governing euthanization of animals in our care. CDFW followed recommendations put forward by the American Veterinary Medical Association (AVMA) to ensure the procedure was performed in the most humane way possible.

What was done with the euthanized fish?

Unfortunately, the bacterial contamination made these fish unsuitable for use as animal feed, fertilizer, food banks or any other consumptive use. CDFW followed published CalEPA guidance on emergency disposal of animal carcasses and the fish were buried at secure sanitary landfills.

How will the facilities be disinfected?

CDFW has developed a comprehensive disinfectant plan. We partnered with specialists at UC Davis to run experimental treatment scenarios to determine the most effective disinfectant options. We also pulled from knowledge gained at fish farms around the world that have experience with this bacterium, to ensure we used the most effective disinfection procedures possible. Ultimately, our disinfection protocol involved thorough cleaning of all surfaces and equipment followed by disinfection with hydrogen peroxide at a concentration shown to remove biofilms and inactivate the bacteria. Disinfection will be completed by the end of January.

What is CDFW doing to monitor for outbreaks in other hatcheries?

CDFW has a comprehensive fish health program. Hatchery staff observe their fish multiple times daily for signs that they are not well. Signs of illness include loss of appetite, darkening of their skin, change in behavior or elevated mortalities. When these signs are observed, the hatchery managers will call the CDFW Fish Health Laboratory to have a fish pathologist or

veterinarian come to the hatchery and perform a diagnostic examination to determine the cause of the illness. The Fish Health Lab pathologists also perform routine examinations to confirm the well-being of fish at all CDFW fish hatcheries, even when no illness is apparent. This is how the infections at Black Rock Hatchery and Fish Springs Hatchery were identified (the bacteria were cultured from fish showing no obvious signs of disease).

What trout hatcheries do not have the bacteria?

There are currently seven other trout production hatcheries and two planting bases still in operation. These facilities mainly serve waters in the central and northern portions of the state from the westside of the Sierra Nevada mountains to the Pacific coast. One of the seven hatcheries not currently under quarantine, Fillmore Hatchery, does serve some Southern California waters. However, Fillmore is just coming back online after an extended closure due to infrastructure issues. Fillmore is expected to have a limited number of fish to stockable size for the fall planting season in Southern California.

Where have scheduled fish plants been affected, due to this outbreak?

Mojave River, Fish Springs and Black Rock Hatcheries are responsible for stocking most of the waterways in the eastern Sierra and Southern California. The counties affected include:

- Los Angeles
- San Bernardino
- Riverside
- San Diego
- Orange
- Ventura
- Santa Barbara
- Inyo
- Mono

Fish will still be stocked in these counties in 2021 but numbers will be reduced.

Hot Creek Hatchery is conducting their normal plants to waters they serve in Inyo and Mono counties. Those waters include:

- Owens River Sections I, II and III
- Crowley Lake
- Pleasant Valley Reservoir
- Bishop Creek Lower
- Lone Pine Creek
- Diaz Lake

Can CDFW make up for the canceled plants with fish from non-infected hatcheries?

Yes. The Department is initiated a phase stocking plan for Eastern Sierra and Southern California. This summer CDFW reallocated and stocked approximately 40,000 fish into 16 waters in the Eastern Sierra and Southern California as part of Phase 1 stocking plan.

In Phase II of the stocking plan, CDFW has reallocated and is in the process of planting approximately 30,000 sub-catchable brown trout and 125,000 sub catchable rainbow trout from northern California hatcheries to Eastern Sierra waters. These fish are intended to be “put and

grow” and available to anglers for the spring 2021 trout openers. These fish were reallocated from the June 2020 high elevation air plants that were cancelled due to staff safety concerns for COVID-19.

As part of Phase II, CDFW has also reallocated 160,000 catchable size rainbow trout from northern hatcheries to Southern California waters for the December through March planting season. CDFW went through an extensive water prioritization exercise to identify the highest priority waters in Southern California to stock, and the lowest priority waters in northern and central California that fish could be reallocated from. Most of these fish have already been transferred and will join the existing 500,000 rainbow trout already at Filmore, the first of groups of which are up to planting size and ready. Stocking to waters started in December.

When did CDFW stop stocking fish from the affected hatcheries?

The last plants from the Mojave River Hatchery were on May 1. Stocking operations at Fish Springs Hatchery and Black Rock Hatchery were halted when those facilities were placed under quarantine on June 19.

Are there concerns that infected hatchery fish could have been planted prior to detection of the bacteria?

While CDFW does not plant diseased fish, it appears possible some locations were planted with fish carrying the bacteria but not showing any outward signs or symptoms of bacteria from these hatcheries prior to the confirmation of *L. garvieae*. This pathogen is known to occur in the environment in the Pacific Northwest, including in the Columbia River. It has also been found in fish hatcheries in Indiana, Missouri, North Carolina, the Northeast US and Mexico.

Can humans get sick from this bacterium? Should people take extra precaution if eating fish they catch?

There is limited evidence *L. garvieae* bacteria has been passed to humans, but fish-to-human transmission is extremely rare. As always, anglers should follow USDA recommendations on cooking fish to an internal temperature of 145 degrees F.

What is the long-term plan for hatchery repopulation and stocking?

Depending on water temperatures and fish density, rainbow trout can take anywhere from 10 months to two years to get to a catchable size of a half-pound. Mount Shasta Hatchery will begin shipping eggs to the three depopulated hatcheries at the end of January and will continue through March. For the first time we will also be able to bring in eggs in June and July from Mount Shasta Hatchery’s new photo-period rainbow trout broodstock program. Eggs received will be ready to plant starting in 2022. After hatching, all fish will be vaccinated against *L. garvieae* once they are to the appropriate size.

CDFW has also identified about 400,000 sub catchable size rainbow trout that are currently at Central California hatcheries that will be used to give the depopulated hatcheries a “jump start” for planting this summer. These fish were initially slated to be stocked by airplane into high elevation waters around the state, however all air plants were cancelled in June due to staff safety concerns during the Covid-19 outbreak. The fish need to be vaccinated against *L. garvieae* before they can be transferred which will take place January through March. These fish will be ready to plant in Eastern Sierra and higher elevation Southern California waters in the mid to late summer of 2021.

How are you going to prevent reinfection of the fish you bring back to the hatchery?

First, we are undertaking a significant disinfection process at all three hatcheries. Second, CDFW Fish Health Laboratory veterinarians are collaborating with University of California at Davis School of Veterinary medicine and two US based vaccine manufacturers to develop and test a *L. garvieae* vaccination. Other fish farms around the world have successfully vaccinated their fish against *L. garvieae* so we are confident we will have a successful vaccination to protect fish brought into these hatcheries in the coming months.

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