

FAQ for *Lactococcus garvieae* outbreak in Southern California fish hatcheries July 20, 2020

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, but DNA analysis of the strain shows high similarity to a strain found in 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 has 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's unusual about this particular 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. garveae* 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.

Will 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 will follow recommendations put forward by the American Veterinary Medical Association (AVMA) to ensure the procedure is performed in the most humane way possible.

What will be done with the euthanized fish?

Unfortunately, the bacterial contamination makes these fish unsuitable for use as animal feed, fertilizer, food banks or any other consumptive use. CDFW is still working on a disposal plan, which will follow published CalEPA guidance on emergency disposal of animal carcasses.

How will the facilities be disinfected?

CDFW is developing a comprehensive disinfectant plan. We have partnered with specialists at UC Davis to run experimental treatment scenarios to determine the most effective disinfectant options. We will also pull from knowledge gained at fish farms around the world that have experience with this bacterium, in order to ensure we use the most effective disinfection procedures possible.

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 canceled, due to this outbreak?

Mojave River, Fish Springs and Black Rock Hatcheries are responsible for stocking the majority 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

What waters are being stocked in those counties?

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?

Currently three of our largest trout production hatcheries in the state are shut down, and two others are coming back online after significant infrastructure problems and not yet at full production. In addition, a catchable size fish takes around two years to get to size. There is no way for the remaining trout hatcheries to make up that level of fish production. CDFW is evaluating the possibility of re-allocating fish destined to be stocked in northern California waters to a small group of high use, easily accessible Eastern Sierra and Southern California waters, but there are still significant logistical details to be worked out including safety of staff and travel under current COVID-19 restrictions.

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.

Can humans get sick from this bacteria? 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's the long-term projection for future year 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. We typically have rainbow trout eggs available in the state December through March. At the depopulated hatcheries, we won't likely have catchable size fish ready from eggs they hatch until December 2021 or January 2022 at Mojave and the spring of 2022 at Fish Springs and Black Rock hatcheries. There is some potential to jumpstart those facilities by transferring small fish in from other hatcheries, but we will need to be sure the hatcheries test clean prior to doing any fish transfers.

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