

Bacterial Kidney Disease Research



Surveying Colorado's Wild Trout and Sport Fisheries for Bacterial Kidney Disease

Background

Native and sport fish populations across Colorado are impacted by many factors including habitat alterations associated with changes in stream flows, temperature, and water quality, and a host of less obvious biological threats from diseases and parasites. While the prevalence of many fish diseases have declined in recent years due to good management practices, cases of bacterial kidney disease (BKD) seem to be increasing.

The causative agent of bacterial kidney disease is *Renibacterium salmoninarum*, a gram positive intracellular parasite. The disease is characterized by the presence of gray-white necrotic abscesses in the kidney (Figure 1) and can cause mortality in both wild and cultured salmonids. Unlike other common fish pathogens, this bacterium can be transmitted horizontally between fish through contaminated water and vertically from adult to egg. This likely plays a major role in the persistence of this bacterium in susceptible fish populations.

Before 1997, the bacterial pathogen was found in nine state or federal fish hatcheries in Colorado but went undetected during annual inspections of the state fish hatchery system over the next 18 years. In 2015, adult cutthroat trout broodstock at Glenwood SFH showed clinical signs of disease and experienced weekly mortalities. The bacterium was found in fish throughout the facility and it was necessary to euthanize the fish and disinfect the entire facility. This effectively eliminated the pathogen from the hatchery but had a major impact on fish management in the state and caused significant economic impact. It is estimated that the disease outbreak at Glenwood Springs cost CPW over \$2.1 million and impacted fish stocking statewide for several years, with the loss of over 675,000 sub-catchable and catchable trout. The bacterium has since been detected at three other state hatcheries, a federal hatchery, and a wild broodstock lake. State fish hatcheries play an important role in sportfish management and the conservation of imperiled native fish species and managers and biologists needed more information about how to best respond to this emerging threat.

Objective

Colorado Parks and Wildlife, in partnership with the U.S. Fish and Wildlife Service's Bozeman Fish Health Center, has undertaken a research project to inform future fish management decisions related to BKD. The objective of this project is to investigate the distribution and prevalence of *R. salmoninarum* in Colorado's wild trout and stocked sport fisheries and evaluate if recent stocking practices have affected it.



Figure 1. Clinical sign of bacterial kidney disease in an adult male cutthroat trout (*Oncorhynchus clarkii*) infected with *Renibacterium salmoninarum*. Characteristic gray-white necrotic abscesses are visible in the kidney (arrows).

Approach

Six to ten wild trout streams were selected in each of Colorado's major river basins for *R. salmoninarum* testing, as well as all lakes and streams stocked with large numbers of fish from hatcheries that later tested positive for the bacterium. The stocked sportfish waters include both coldwater salmonid species as well as cool water mixed species lakes where recreationally important sport fish will be tested. A total of 183 waters across the state have been identified for testing (Figure 2). Up to 60 fish from each water will be tested by three methods; enzyme-linked immunosorbent assay (ELISA), polymerase chain reaction (PCR) and direct fluorescent antibody test (DFAT). Using all three methods will allow CPW to evaluate the specificity and sensitivity of the tests and give recommendations on their applications.

As of November 2017, 155 waters have been sampled and testing has been completed by at least one of the three methods for 52 waters (35 stocked waters and 17 wild trout). Additional samples will be collected and analyzed. Those results are expected to be available in 2018.

Results and Solutions

Results from this work will provide managers and biologists current information on the prevalence and distribution of this bacterial pathogen throughout the state of Colorado, which can inform management decisions on fish stocking. After the study is complete, positive waters will be identified for further investigation and to guide future work.

As part of this ongoing research, the CPW Aquatic Animal Health Lab has developed in-house capability to complete both ELISA testing and real time PCR. Work is ongoing to use these tools to optimize the screening of wild broodstock fish populations for the bacterium. Broader use of these two sensitive and specific tests will minimize the introduction of BKD into the state fish hatchery system and the spread of *R. salmoninarum* within the state.

Results of this work will be also be used as part of a broader nationwide effort to compile fish health information. The National Wild Fish Health Survey is a collaborative effort between the U.S. Fish and Wildlife Service, various states, tribes, and other stakeholders. More information on the larger collaborative effort can be found at www.fws.gov/wildfishsurvey.

While the recent outbreaks of bacterial kidney disease pose significant challenges to fish management in Colorado, ongoing research will provide managers better information in making critical resource management decisions and could provide new solutions to emerging fish disease challenges.

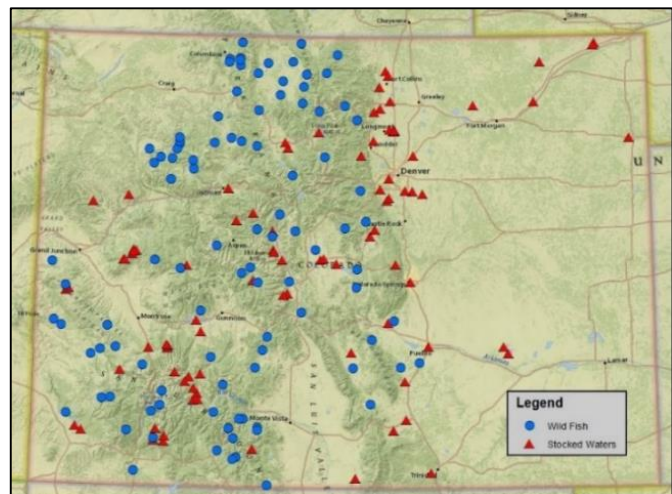


Figure 2. Waters selected for *Renibacterium salmoninarum* testing to investigate the distribution of the bacterium in the sport fisheries across Colorado.