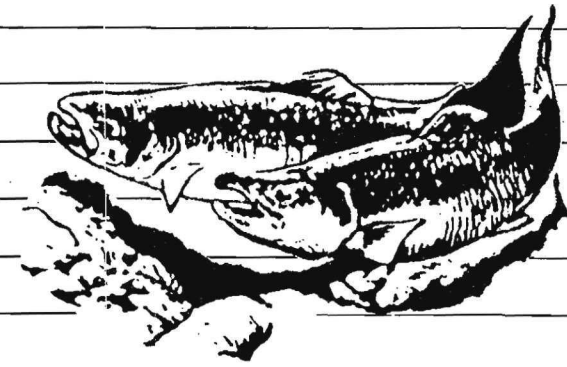
Research



Information bulletin

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL BIOLOGICAL SURVEY

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Decrease in Prevalence of Bacterial Kidney Disease in Columbia and Snake River Chinook Salmon Hatcheries, 1988–1992

Bacterial kidney disease (BKD) is the most serious health problem presently affecting wild and cultured salmonids in the Pacific northwest. The history of BKD and reports on the effects of hatchery rearing conditions suggest that anthropogenic activities, such as the addition of unpasteurized fish flesh and viscera to fish food and the unavoidably stressful conditions in the aquaculture environment have exacerbated all fish diseases.

The goal of this study was to describe the epidemiology of BKD in spring chinook salmon (*Oncoryhnchus tshawytscha*) in Columbia River basin hatcheries and during seaward migration. To achieve this goal, we defined two objectives: to determine if there were changes in prevalence or severity of BKD in spring chinook salmon before release from hatcheries and during seaward migration, and (if changes were detected) to determine if the changes were related to differences in hatchery practices or river environment.

BKD Monitoring: Eight Hatcheries, Three Dams, Five Years

Spleens and anterior kidneys were sampled from 60 to 100 chinook salmon just before release at four hatcheries in each of the Columbia River and Snake River basins during 1988–92. Freeze-branded fish from the same groups were collected as they migrated past Lower Granite, Rock Island, and McNary dams. Presence of BKD was determined by enzyme-linked immunosorbant assay (ELISA) and severity was based on the mean ELISA optical density of those samples that were positive for BKD.

In 1993, a four-page questionnaire was sent to each hatchery manager. We requested information about such aspects as the annual number of adult returns and spawners, hatchery practices such as the use of therapeutic agents, and water quality. Environmental data for the river systems was obtained from available publications.

Prevalence of BKD Decreased in Hatchery Fish

From 1988 to 1992, the prevalence of BKD decreased in six of the eight hatcheries (Fig. 1). The severity of infection in the BKD-positive fish in the hatcheries was not related to prevalence and did not change during the study (data not shown). All of the hatcheries showing improvement reported that they used various combinations of (1) culling eggs from severely infected females, (2) segregating progeny according to the severity of BKD in parents, or (3) reducing loading density in juvenile rearing ponds. We are concerned that culling eggs may remove genetic components from the populations that allow a severely infected adult to survive and reproduce.

The long-term efficacy of these practices will be tested by continued sampling at all the hatcheries. In addition, the two hatcheries that had not shown improvement began following some of these practices with their 1992–93 brood years.

BKD More Serious in the Snake River Than in the Columbia River

Freeze-branded fish from the Snake River collected at the Lower Granite and McNary dams had significantly higher mean prevalence of BKD than those sampled in the hatchery (Fig. 2). The severity of infection of the BKD-positive fish was also greater in 7 of 16 individual hatchery groups when collected at the Lower Granite or McNary dams than in the hatchery (data not shown). There were no significant changes in prevalence (Fig. 2) or severity of BKD in fish from hatcheries on the Columbia River collected at the Rock Island or McNary dams as compared with those sampled before release. Environmental conditions in the Snake River, such as longer migration distances and greater temperature changes, may account for the differences between the fish sampled from the two river origins.

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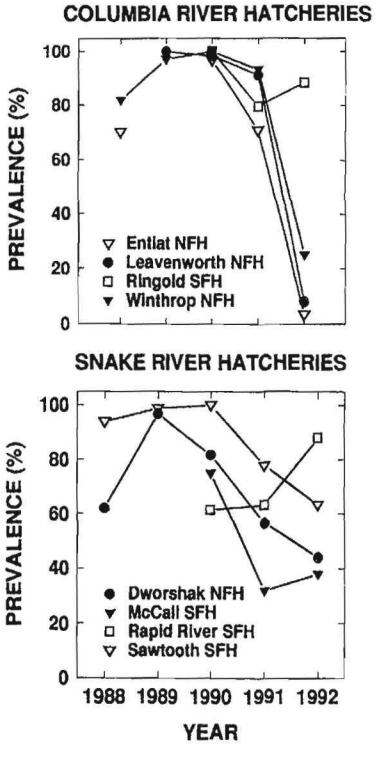

Fig. 1. Prevalence of bacterial kidney disease in chinook salmon at the time of their release from national (NFH) and state (SFH) fish hatcheries in the Columbia and Snake river basins from 1988 through 1992.

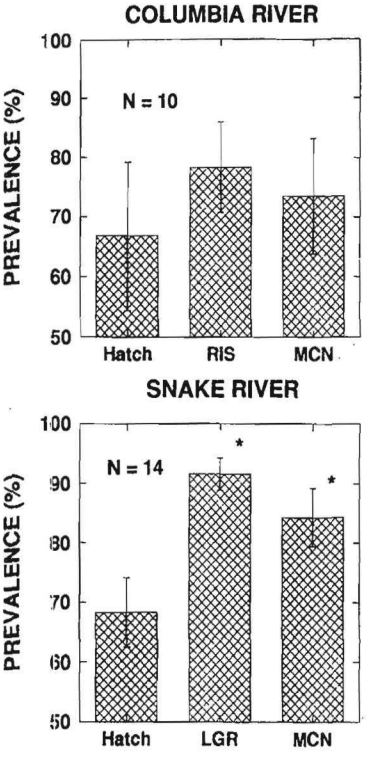

Fig. 2. Prevalence (mean ± SE) of BKD in groups of freeze-branded spring chinook salmon sampled at Snake River or Columbia River hatcheries (Hatch) before release and captured during their migration at Lower Granite (LGR), Rock Island (RIS) or McNary (MCN) dams during the years 1988–92. Bars marked (*) differ significantly from Hatch in the same panel ($P < 0.05$; general linear model test of arcsin-transformed percent).