

THE RELATIONSHIP BETWEEN CODED WIRE
TAGGING AND BACTERIAL KIDNEY DISEASE
IN COHO AT LOWER ELWHA HATCHERY

by

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ABSTRACT

The coded wire tag (CWT) process has been suspected of being a vehicle for the spread of disease between fish in tagged groups. During a coho tagging program at the Lower Elwha hatchery in 1983, bacterial kidney disease (BKD) was diagnosed in all of the tagged groups. Initial testing showed the disease incidence to be lowest in the first tagged, first released group and highest in the last tagged, last released group. The next year a study was conducted to determine the cause of the increase. Fluorescent antibody tests on samples of tagged and untagged fish from the second year showed increasing BKD prevalence over time but no significant difference in prevalence between the tagged and untagged groups. These results indicate the increase of BKD was related to time and not to the CWT process.

INTRODUCTION

The Lower Elwha hatchery is located near the Elwha River on the Lower Elwha Indian Reservation in Washington State (Figure 1). The hatchery is operated by the tribe and raises coho, fall chinook and chum salmon and steelhead trout.

A study to determine the optimum time and size of coho releases from the hatchery was initiated with the 1981 brood year using the coded wire tag (CWT) system manufactured by Northwest Marine Technology, Inc. of Shaw Island, Washington. Bacterial kidney disease (BKD) was diagnosed in the tagged groups several months after tagging. Subsequent testing showed the prevalence of BKD to be lowest in the first tagged, first released group and highest in the last tagged, last released group.

Some biologists suspect that the CWT process may be responsible for spreading disease between fish within a group (Leek, FWS, personal communication). It is suspected that this can happen in two ways. First, pathogens on the needle of the tag machine enter each fish as it is injected. Second, the injection wound allows pathogens to enter from the water.

A study was initiated in 1984 to monitor changes in the incidence of BKD and determine any possible relationship to the coded wire tagging program. This report presents the results of that study.

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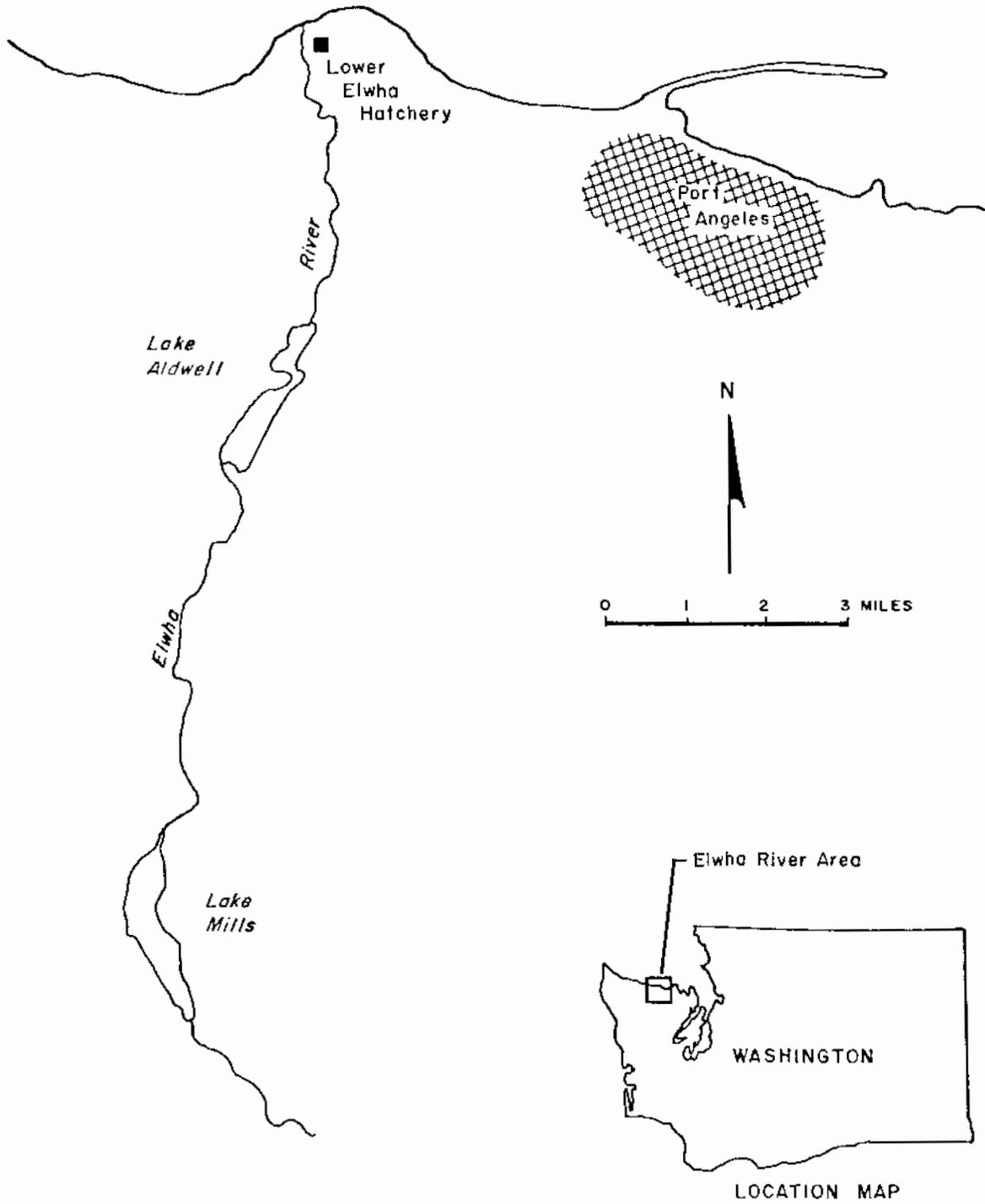


Figure 1. Location of Lower Elwha Hatchery

METHODS AND MATERIALS

Eggs were taken from adult coho returning to the facility in 1982 and were incubated in Heath trays containing vexar substrate. The resulting fry were put into concrete raceways measuring 40' x 4' x 1.5' in March and April of 1983. In June the fish were moved from the raceways to circular fiberglass tanks measuring 24' x 3.5'. The water source for the Heath trays and raceways was infiltration water from the Elwha River while the circular tanks received water directly from the river.

A random sample of approximately 38,000 fish was removed from the production lot using seines and dipnets in September 1983 and placed into a single circular fiberglass tank. In October fish were removed randomly from this tank using seines and dipnets, divided into three groups of 10,000 each, and tagged for the time and size study. At this time the fish were suspected to be BKD carriers but were not showing visible signs of the disease. However parents of the study fish were documented as having BKD and vertical transmission of the disease to the progeny is believed to occur. Each 10,000 fish group was split into four groups of approximately 2,500 each and placed into four concrete raceways measuring 40' x 4' x 1.5'. Three untagged control groups of 2,500 fish were also removed randomly from the circular tank using seines and dipnets and placed into three more concrete raceways. In March 1984 each tagged group was moved back into a circular tank and the control groups were left in the raceways. These moves were necessary to accommodate other hatchery programs. All groups were fed Oregon Moist Pellets and rearing densities of .5 lb/cu ft were maintained in all raceways and circulars (Table 1). ^{1/}

Approximately one week before release of each tag group, samples of 100 tagged and 100 control fish were removed randomly from the rearing areas using seines and dipnets (Table 2). Trunk kidney (middle section of kidney) tissue from each fish was smeared onto 0.6mm spot slides and allowed to air dry. Slides were then fixed in Kirkpatrick's fixative for a minimum of 2 minutes and air dried. Two spots on each slide were stained for 10 minutes with a 1:20 dilution of goat anti - Renibacterium salmoninarum IgG labeled with fluorescein isothiocyanate. The stain preparation also contained a 1:200 dilution of rhodamine labeled bovine serum albumin as a counterstain to reduce background fluorescence. Slides were then rinsed in two changes of pH 7.2 phosphate buffered saline for 10 minutes, air dried and mounted with a coverslip using FAT mounting fluid obtained from BBL Laboratories. Both spots were examined for a total of 60 microscopic fields under 1000X magnification with an AO model H120 incident-light fluorescent microscope. Positive slides were identified by observing brightly fluorescent bacterial shapes of the correct size and morphology as R. salmoninarum. Slides of known BKD infected fish and R. salmoninarum cells obtained from the National Fisheries Research Lab, Seattle, were used periodically as controls for stain efficacy.

The hypothesis that the test and control populations have the same incidence of BKD was tested using analysis of variance. The statistical software package SYSTAT was used to perform the calculations.

^{1/} Approximately 3/4 of the control fish in raceway #7 were lost out the standpipe. A crowding screen was installed to create a density of .5 lb/cu.ft..

Table 1. Location of tagged and control groups.

<u>Group</u>	<u>Rearing Container Before Tagging</u>	<u>Rearing Container After Tagging</u>	<u>No.</u>	<u>Density (lb/cu ft)</u>	<u>Rearing Container Before Release</u>	<u>Density (lb/cu ft)</u>
Test 1	Circular 5	Raceway 9	2,500	.5	Circular 4	.5
	Circular 5	Raceway 10	2,500	.5	Circular 4	.5
	Circular 5	Raceway 11	2,500	.5	Circular 4	.5
	Circular 5	Raceway 12	2,500	.5	Circular 4	.5
Test 2	Circular 5	Raceway 13	2,500	.5	Circular 5	.5
	Circular 5	Raceway 14	2,500	.5	Circular 5	.5
	Circular 5	Raceway 15	2,500	.5	Circular 5	.5
	Circular 5	Raceway 16	2,500	.5	Circular 5	.5
Test 3	Circular 5	Raceway 17	2,500	.5	Circular 6	.5
	Circular 5	Raceway 18	2,500	.5	Circular 6	.5
	Circular 5	Raceway 19	2,500	.5	Circular 6	.5
	Circular 5	Raceway 20	2,500	.5	Circular 6	.5
Control 1	Circular 5	Raceway 6	2,500	.5	Raceway 6	.5
Control 2	Circular 5	Raceway 7	2,500	.5	Raceway 7	.5
Control 3	Circular 5	Raceway 8	2,500	.5	Raceway 8	.5

Table 2. Sample dates and sizes.

<u>Group</u>	<u>Rearing Containing</u>	<u>Date Sampled</u>	<u>Date Released</u>	<u>Number of BKD Positive in 100 Fish Sample</u>
Test 1	Circular 4	April 12	April 20	12
Control 1	Raceway 6	April 12	April 20	15
Test 2	Circular 5	May 7	May 15	26
Control 2	Raceway 7	May 7	May 15	24
Test 3	Circular 6	May 29	June 4	33 ^{1/}
Control 3	Raceway 8	May 29	June 4	30
Mean of tests	23.7			
Mean of Controls	23.0			

^{1/} This group contained one sample with a visible BKD lesion within the kidney.

ASSUMPTIONS

- 1) All tag and control groups were obtained randomly from the production lot.
- 2) The CWT process was consistent between tag groups.
- 3) The density among all groups was similar and did not significantly affect the results of the evaluation.
- 4) Moving the tagged groups into circulars in March and leaving the control groups in raceways did not significantly affect the evaluation.
- 5) All fish actually tested for BKD were obtained randomly from the tagged and control groups.

RESULTS AND DISCUSSION

The number of BKD positive slides observed within the samples is presented in Table 2. The differences between respective test and control groups is minimal and in the case of test 1 more BKD positive slides were observed for the control group than the test group. The hypothesis that the test and control populations have the same incidence of BKD was tested using analysis of variance. The results (Table 3) indicate that this hypothesis is not rejected at the alpha equal .05 level. If pathogens were spread between fish by the tag injection process a greater incidence of BKD should have been detected in the test groups than the control groups. This difference was not observed.

Our results indicate that the tagging process did not aggravate BKD at Lower Elwha. The increase of BKD appears to be related to length of time reared, not the coded wire tag operations. However, the fish were relatively healthy during tagging, that is, they were not suffering from a severe outbreak of the disease at the time. We generally believe, as do other biologists, that tagging during a disease outbreak will cause severe health and mortality problems (Zajac 1985).

Table 3. Systat Analysis of Variance

Number of Cases Processed : 6
Dependent Variable Mean : .233
Multiple Correlation : .985
Squared Multiple Correlation: .900

Analysis of Variance

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean-Square</u>	<u>F-Ratio</u>	<u>P</u>
Tag Group	.033	2	.017	32.161	.030
Control vs Test	.000	1	.000	.129	.754
Error	.001	2	.001		

REFERENCES CITED

- Zajac, David P. 1985 A cursory evaluation of the effects of coded wire tagging on salmonids. U. S. Fish and Wildlife Service. 33p.