

# Evaluation of an Experimental Re-introduction of Sockeye Salmon into Skaha Lake; Year 3 of 3

## Addendum to the Disease Risk Assessment Section of the 2002 Technical Report

Technical Report  
2003



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**Addendum to the Disease Risk  
Assessment Section of the Report  
Entitled “Evaluation of an Experimental  
Introduction of Sockeye into Skaha Lake:  
Year 3 of 3,” May 31, 2003**

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FINAL

# OBJECTIVE 1

## Disease Risk Assessment

Addendum to the disease risk assessment section of the report entitled  
"Evaluation of an experimental introduction of sockeye into Skaha Lake: Year 3  
of 3," May 31, 2003

Presented to: Colville Confederated Tribes

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## TABLE OF CONTENTS

1.0 Introduction.....	1
2.0 Methods.....	1
3.0 Results .....	2
4.0 Discussion and Recommendations.....	2
5.0 Literature Cited.....	4

## LIST OF APPENDICES

- APPENDIX A. *M. cerebralis* and *C. shasta* results spring 2002 exposure
- APPENDIX B. Water temperatures during spring 2003 exposure
- APPENDIX C. *M. cerebralis* and *C. shasta* results spring 2003 exposure

## 1.0 Introduction

The purpose of this addendum is, first, to provide and discuss disease agent survey results that were not available for inclusion in the Disease Risk Assessment portion of the YEAR 3 report at the time of its writing, and second, to make recommendations stemming from these results. The first set of results deals with live box exposure tests conducted using juvenile sentinel rainbow trout in the spring of 2002 to detect *Myxosoma cerebralis* and *Ceratomyxa shasta*. The second set of results deals with similar exposure tests conducted in the spring of 2003. The latter tests were initially intended to occur in the fall of 2002 but had to be re-scheduled to the spring of 2003 because suitably aged sentinel rainbow trout for the exposures were not available in the fall of 2002.

## 2.0 Methods

The methods used for the live box exposure tests were essentially the same as those described in the YEAR 3 report. Fish were again exposed at the same four sites above McIntyre Dam and at the same four sites below the dam. As mentioned in the YEAR 3 report, the spring 2002 exposure lasted for 21 days (May 6 to 27). The spring 2003 exposure also lasted for 21 days (April 22 to May 13). The number of fish in the spring 2003 tests was, however, reduced to approximately half the number used in previous tests in order to reduce the chances of dissolved oxygen problems, suspected to have occurred in earlier tests in some of the live boxes. As before, fish that survived the live box exposures were transferred to Skaha Hatchery where they were held for sufficient time to permit any infections with *M. cerebralis* and *C. shasta* to develop and to permit for spore development in these pathogens. Assays for the pathogens were carried out as previously described. Detection of *M. cerebralis* was based on detecting its spores following the trypsin/pepsin digestion method. Detection of *C. shasta* was based on a polymerase chain reaction (PCR) test, but smears of fresh intestinal tissues (one fish per smear) were also prepared so that positive PCR findings could be confirmed by the microscopic observation of *C. shasta* spores. Except as just mentioned, appropriate tissues from the fish were in most cases pooled (maximum of five fish per pool) for the assays.

### 3.0 Results

Water temperatures experienced in the live boxes during the spring 2002 exposure have already been presented in Appendix B of the main YEAR 3 report. Temperatures at sites 1 and 2 (below the dam) and at site 6 (above the dam) were higher than the upper limit reported for permitting infections with *M. cerebralis* during most of the exposure period, perhaps compromising, to some extent, tests for *M. cerebralis* at these sites (see Appendix B, main YEAR 3 report). However, temperatures at the remaining sites above and below the dam were within the range reported for permitting infections with *M. cerebralis* during the entire exposure period. The findings for *M. cerebralis* and *C. shasta* resulting from the spring 2002 exposure are detailed in Appendix A of this addendum. No infections with either of these pathogens were detected in fish from any of the spring 2002 exposure sites.

Water temperatures experienced during the spring 2003 exposures are given in Appendix B of this addendum. Temperatures at sites 1 and 2 (above the dam) and at sites 5 and 6 (below the dam) were only within the range reported for permitting *M. cerebralis* infections for 5 to 8 days of the 21-day exposure period, once again perhaps compromising, to some extent, tests for *M. cerebralis* at these sites. However, temperatures at the remaining sites above and below the dam were within the range reported as permitting *M. cerebralis* infections for most or all of the exposure period (i.e., for 18 to 21 days of the 21-day exposure period). The findings for *M. cerebralis* and *C. shasta* during the spring 2003 exposure are presented in Appendix C of this addendum. The findings also include all fish that died during the exposure phase while still in the live boxes (these were made up primarily of site 1 fish, which all died suddenly during the last day of exposure). Again, no infections with either of these pathogens were detected in fish from any of the spring 2003 exposure sites.

### 4.0 Discussion and Recommendations

The results obtained from the Spring 2002 and 2003 exposures were negative for both *M. cerebralis* and for *C. shasta*. Thus, on the surface of it, the results do nothing to change the conclusions drawn in the main YEAR 3 report (Disease Risk Assessment portion) with respect to the distribution of these pathogens in the Okanagan system above and below McIntyre Dam. However, as will be discussed shortly, the earlier positive PCR findings for *C. shasta* above and below the dam have not been confirmed by the finding of *C. shasta* spores, and this has implications on how the results should be interpreted, as they will affect disease management in the watershed.

As pointed out in the Results section, temperatures at certain sites may have exceeded the upper limit reported as permitting infections with *M. cerebralis* and may thus have compromised, to some extent, the chances for detecting *M. cerebralis* at these sites. Attempts to avoid this in the spring 2003 exposures by starting the exposures almost two weeks earlier than in the spring 2002 exposure were unsuccessful. Despite this, the negative findings for these pathogens are almost certainly meaningful. To begin with, at two sites above and two sites below the dam, temperatures were within the range

reported as permitting *M. cerebralis* infections for most or all of the exposure period. Secondly, the exposure period chosen for the present myxosporean studies was far more liberal than those used in many other studies. Exposure periods of 10 days or less have routinely been considered adequate for determining the infectivity of waterways with respect to *M. cerebralis* (Hedrick, R. P., personal communication), and exposure periods for detecting *C. shasta* in waterways are typically of the order of three or four days (Foott et al. 2003).

In connection with the foregoing, and unlike with *M. cerebralis*, no formal studies have been done to determine the lower and upper temperature limits for establishing infections with *C. shasta*. It had long been considered that infections occurred only above 10 °C, but it is now recognized that infections can occur at temperatures as low as 4 to 6 °C (Ratliff 1983, Ching and Munday 1984) and as high as 23.6 °C (Foott, J. S., personal communication).

It is also relevant and important to point out once again that earlier findings of *C. shasta* at sites above and below McIntyre Dam using the PCR technique were not confirmed by the observation of spores typical of the organism. While the failure to observe *C. shasta* spores may have been due to spore numbers too low to be detected or to the destruction of spores during the freezing and thawing of suspect samples, one cannot rule out the possibility that the PCR findings for *C. shasta* above and below McIntyre Dam were false-positives. False positive results could be a consequence of the presence in the samples of an organism sharing nucleotide sequences in common with the *C. shasta* primers used in the PCR test. If the positive PCR results were indeed false-positives, one would have to conclude that *C. shasta*, like *M. cerebralis*, does not occur in region of the Okanagan system tested. It was hoped that positive PCR findings of *C. shasta* during one or both of the spring 2002/2003 exposures would have been made and that the findings could have been confirmed by the detection of *C. shasta* spores. Unfortunately, with the data available, this question cannot be resolved. From the disease management perspective, therefore, it is probably safest to conclude that *C. shasta* is absent from both above and below McIntyre Dam, and to base any future disease agent surveys in the Okanagan system on this assumption.

Finally, based on data collected from sockeye for *M. cerebralis* and *C. shasta* during three years of testing, it seems clear that sockeye, which are the only salmonids that migrate into the Okanagan system in any appreciable numbers, do not carry either of these two pathogens. Sockeye are thus not likely to be a means of introducing either of these two pathogens into the Okanagan system. If other salmonids, for example steelhead, are likely to migrate up the system into Skaha Lake (assuming that the barrier to their migration into Skaha Lake is taken down), consideration should also be given to testing such migrants for *M. cerebralis* and *C. shasta* as well as for the named viruses of concern (infectious pancreatic necrosis and infectious hematopoietic necrosis virus type II) to establish that they are not likely to be carriers of any of these pathogens. It would certainly be important to establish this before any decision is made to remove additional barriers that would prevent their migration into Okanagan Lake.

## 5.0 Literature Cited

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## **APPENDIX A**

***M. cerebralis* and *C. shasta* Results  
Spring 2002 Exposure**

## **APPENDIX B**

### **Water Temperatures During Spring 2003 Exposure**

## **APPENDIX C**

***M. cerebralis* and *C. shasta* Results  
Spring 2003 Exposure**