

**Technical Report Project 1 – Infectious diseases and potential impacts on survival of Fraser River sockeye salmon**

**Project description:** A veterinary scientist will take a broad view of sockeye diseases and parasites that span the life cycle from egg to adult, and will evaluate the full spectrum of diseases that occur at all life history stages.

**Researcher:** Dr. Michael Kent is a Professor in the Departments of Microbiology and Biomedical Sciences, College of Veterinary Medicine at Oregon State University where he studies diseases of importance to wild and cultured fishes. He has previously worked in aquaculture, veterinary medicine, fish health and genetics. His current interests and areas of study are the pathological and physiological effects of transcontinental air pollution on salmonid fishes in high mountain lakes in U.S. National Parks, the impacts of parasites on wild coho salmon from coastal watersheds in Oregon, and effects of pathogens associated with pre-spawning mortality in Chinook salmon.

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This report reviews five viral, six bacterial, four fungal, and 19 parasitic pathogens, and two diseases of unknown cause that are known to or could potentially infect sockeye salmon. The risk of each is assessed based on:

- the known or suspected virulence of the pathogen to Pacific salmon in general, and specifically to sockeye salmon
- the likelihood that the pathogen would be prevalent in the Fraser River or British Columbia

Six pathogens were designated as potential high risk:

- IHN virus
- three bacteria (*Vibrio anguillarum*, *Aeromonas salmonicida*, *Renibacterium salmoninarum*)
- two parasites (Ich - *Ichthyophtheirus multifillis* and the myxozoan *Parvicapsula minibicornis*)

The IHN virus is a lethal pathogen to sockeye fry in freshwater. It also occurs in marine waters in BC, and has caused several outbreaks in pen-reared Atlantic salmon. Post-smolt sockeye are less susceptible, but some strains may present more risk to sockeye in the ocean. The three high risk bacterial pathogens are virulent pathogens in both hatcheries and netpens, however BC has not seen outbreaks of these pathogens in wild salmon, including sockeye salmon. In contrast, the two parasites are associated with pre-spawning mortality in sockeye salmon, and the myxozoan *Parvicapsula* also infects outmigrant smolts.

Six pathogens were designated as potential moderate risk:

- *Flavobacterium* spp.
- fungi belonging to the genus *Saprolegnia*
- the fungus-like pathogen *Ichthyophonus hoferi*
- the PKX myxozoan
- *Eubothrium* spp. Tapeworms
- sea lice (*Lepeophtheirus salmonis* and *Caligus clemensi*)

*Flavobacterium* and *Saprolegnia* spp. could cause severe disease if the Fraser River system or marine environment is compromised. *Ichthyophonus hoferi* is of concern as it recently has been increasing in Chinook salmon in the Yukon River. *Eubothrium* is a tapeworm parasite that has been already shown to compromise wild sockeye when infections are heavy. Recent claims of sea lice killing wild pink salmon in British Columbia warrant investigations on the impact of these pathogens on post-smolt sockeye salmon.

All of these pathogens are endemic to British Columbia and most likely have been present in this area for centuries. Fish are very closely tied to their environment, and thus water quality and other environmental parameters play an important role in their susceptibility and severity of diseases.

There are no firm links between these pathogens and significant declines in wild sockeye populations overall, but some of these pathogens are clearly associated with prespawning mortality in freshwater.

The report recommends more research to obtain better information on the impacts of pathogens on Fraser River sockeye salmon, including surveys for pathogens and diseases in wild sockeye salmon that include proper identification of pathogens, their geographic and host distribution, and their abundance or severity of infection in sockeye salmon and other salmon species.