

## Technical Report Project 8 – Predation

**Project description:** The researchers will prepare a description of predation on sockeye salmon across the geographical range of the population. The contractor will evaluate freshwater fish predation on alevins, fry and smolts; marine fish predation on smolts, sub-adults and adults; and marine mammal predation on smolts and adults.

### Researchers:

Dr. Andrew Trites is a Professor and Director of the Marine Mammal Research Unit, Fisheries Centre, University of British Columbia (UBC), and Research Director for the North Pacific Universities Marine Mammal Research Consortium, Fisheries Centre, UBC. His main area of research is the interaction between marine mammals and commercial fisheries. This includes the population biology and bioenergetics of seals, sea lions and whales, and involves a combination of field, captive and computer studies (data analysis and simulation modeling).

Dr. Villy Christensen is Professor at the UBC Fisheries Centre, and Director of the NF-UBC Nereus – Predicting the Future Ocean program. He works with ecosystem-based management and has a background in fisheries research. His research since 1990 has centered on understanding how human exploitation impacts marine ecosystems, and utilizes ecosystem modeling as the main tool. Dr. Christensen is a specialist on predator-prey interactions and dynamics, and is the key developer of the Ecopath with Ecosim food web modeling approach, which is the most-widely ecosystem modeling approach for fisheries management throughout the world.

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The report provides an overview of the current knowledge about potential predators of sockeye salmon and their impact across all Fraser River sockeye salmon stocks. The report also summarizes what is currently known about the role of predation by fish, birds and mammals on sockeye eggs, alevins, fry, and smolt in freshwater as well as on smolt, immature and maturing sockeye in marine systems.

### Potential predators

The report evaluated the risk from suspected predators that Fraser River sockeye salmon may have come across as they moved from streams, lakes and rivers to the Strait of Georgia, north to Queen Charlotte Sound and out to the open North Pacific Ocean.

### Examples of potential predators on Fraser River sockeye:

#### Avian Predators

Caspian Terns  
Double-crested Cormorants

#### Marine Fish Predators

Sablefish  
Daggertooth  
Lamprey (Fraser River and Estuary)  
Spiny dogfish  
Salmon shark

#### Invertebrates

Humboldt squid

#### Freshwater Fish Predators

Coastal cutthroat trout  
Rainbow trout  
Coho salmon  
Chinook salmon  
Yellow perch

#### Marine Mammals

Seals (Harbour and Northern fur)  
Sea lions (California)  
Killer whales  
Pacific white-sided dolphins

Previously abundant non-salmonid (fish other than salmon or trout) prey species such as walleye pollock and Pacific cod in the Gulf of Alaska, Pacific mackerel, and Pacific hake have declined. This change could have led to increased predation pressure on sockeye, but there is a lack of data to prove this possibility.

Seal and sea lion populations have increased significantly in British Columbia and southeast Alaska since the late 1970s, but existing data indicates that sockeye salmon is not a preferred prey species for these marine mammals.

There was no indication that any individual mammal predator targeted sockeye or that any of them consumed sufficient numbers to pose a threat to the population. The report concludes that there was no single predator that may have caused the decline of the Fraser River sockeye. Instead, predation is more likely to be part of the cumulative threats facing sockeye.

### **Cumulative predation effects**

Cumulative threats are far more difficult to evaluate than a single factor. Stress from higher water temperatures and running the gauntlet through predators, whose alternative prey may have diminished, may all have had cumulative effects. Assessing the cumulative effects of these and other stresses will require integrated evaluation, but information about ecosystem resources and interactions is not available. The report concludes that there is little to no information to evaluate the cumulative effect of predation on Fraser River sockeye salmon with certainty.