



Invitational Scientists' Think Tank

Managing for Uncertainty: Pathogens and Diseases in Pacific Salmon

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THINK TANK CONSENSUS STATEMENT

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Wild salmon are an integral part of British Columbia's cultures, economies and ecosystems, and the abundance and diversity of wild salmon in BC are a treasure. There is significant concern about the potentially fragile state of these populations on our coast. Several previous expert panels have suggested disease organisms may be contributing to declining wild salmon populations in British Columbia. While disease in wild salmon has been a controversial topic, there appears to be clear shared interest among all parties in the debate to sustain the welfare of wild salmon. We convened a group of veterinarians, pathologists, evolutionary biologists, ecologists, molecular biologists, wildlife biologists, statisticians, engineers, and resource managers from home and abroad to examine the state of knowledge of disease in wild salmon populations. While many stressors can compromise fish health alone or in concert, we focused our discussion on disease organisms and salmon health. Below, we share key points from our discussions over two days and highlight both barriers and opportunities for illuminating the role of disease organisms in wild salmon populations.

Wild salmon are host to a diversity of disease organisms

Salmon commonly host disease-causing bacteria, viruses, and fungi, as well as larger parasites like salmon lice and worms; some are native, while others may be introduced. Many can cause severe harm or death only under certain circumstances, such as when found with other disease organisms, or if the host becomes stressed. Thus, a salmon carrying a parasite or virus is not necessarily diseased and the identification of such a disease organism may represent only the first step in characterizing a threat to wild salmon populations. Critically and unfortunately, there is little information on disease organisms in, and their effects on, wild Pacific salmon.

Disease organism dynamics are complex

A given disease organism can come in different varieties; some may cause death, some may cause little harm – the level of harm can be characterized as the virulence in its host. Virulence can evolve rapidly, and certain conditions can favour the evolution of increased virulence, including high density of hosts, high host mortality, low genetic diversity of hosts, and co-infection with the same or other disease organisms. Several of these conditions are characteristic of aquaculture facilities. Facility management, careful husbandry and good breeding may reduce disease propagation, but evolution and disease emergence can occur rapidly and unpredictably. Environmental conditions such as temperature and water quality can also influence impacts. In addition, the same disease organism may have different virulence levels in different hosts—one that is virulent in Atlantic salmon may have less severe impacts in Pacific salmon, or may even be benign. Conversely, a disease organism can be more virulent in new host populations.

Barriers & Opportunities

We urgently need to integrate multiple scientific approaches in order to tackle the current concerns over disease in wild salmon. We feel a lack of open dialogue (and data) has hindered progress, as has the lack of integration among complementary scientific approaches.

At present, we lack key information on the major disease risk factors for wild salmon. Greater scientific cooperation concerning BC salmon diseases would be one step towards understanding and addressing the effects of salmon disease. However, transparency alone is not enough. We also worry about a lack of capacity and resources to quantify and address the potential risks.

New technologies are providing means to discover and describe new disease organisms. However, it has proven more difficult to link specific disease organisms to health and disease, and even harder to link particular disease organisms to salmon population dynamics. Furthermore, it has proven challenging to move beyond the study of individual disease organisms to managing for multiple risk factors that can collectively compromise the resilience of salmon populations. Combining modern methods, such as molecular assays and telemetry, with classic pathology, on-the-ground population monitoring and large-scale experiments can provide the needed insight into the risk factors associated with disease in wild fish. It is time to develop new collaborative and independent infrastructures for addressing these challenges.

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SPONSORS:

- Canadian Fisheries, Oceans and Aquaculture Management (C-FOAM)
- Liber Ero Foundation
- Save Our Salmon Foundation
- SFU Faculties of Science and Environment
- Watershed Watch Salmon Society
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