



Sea Lice Report Based On Scientifically Questionable Assumptions

A report recently published in the magazine *Science* has suggested that sea lice from salmon farms are threatening pink salmon populations in BC's Broughton Archipelago region¹. In assessing the credibility of this report, it is important to recognize that the report is *simply an exercise in mathematics that is based upon scientifically dubious assumptions*.

The report's assumptions are challenged by many scientific studies that suggest that salmon farms have little impact on the sea lice levels that naturally occur on wild salmon. Moreover, the Department of Fisheries and Oceans (DFO) has clearly stated that its scientists have not found a close association between salmon farms, sea lice and wild salmon.

Natural Fluctuation in Pink Salmon Numbers

The report was initiated in response to what some environmental groups perceived as a "pink salmon population collapse in 2002" in the Broughton Archipelago. However – while 2002 pink salmon numbers were very low – these groups failed to recognize that Department of Fisheries and Oceans (DFO) records reveal that annual returns of pink salmon to this region have undergone natural cyclical fluctuations since recording began in 1954².

As a result of these natural fluctuations in pink salmon population size, the low 2002 numbers had been preceded in 2000 and 2001 by very high returns – and were followed in 2005 by returns that were higher than historic averages and higher than returns in 1987 – before there were salmon farms operating in the region.

The *Science* report's suggestion that Broughton pink salmon populations are on the verge of collapsing is also challenged by the work of the BC Pacific Salmon Forum³. Since 2005, the Pacific Salmon Forum has commissioned some \$2.5 million in field and laboratory research - most of it focused on the Broughton Archipelago and involving more than a dozen of the leading scientists in Canada. This research is taking place under the guidance of a Science Advisory Committee composed of many of Canada's leading fish biologists. Interim findings from this research - to be released in early January 2008 - do not support the *Science* report's prediction of rapidly declining pink salmon stocks in the Broughton. In fact, the marine survival of pink salmon to the Glendale River (the region's major producing river for pinks) has been equal or better than the survival rates for pinks in other coastal watersheds where there are no salmon farms. Pink salmon returns in the other Broughton watersheds in 2007 were as good as or better than those that occurred in 2005⁴.

Impact on Sea Lice Levels

The report relies upon the assumption that salmon farms increase sea lice numbers – and that these sea lice then cause higher mortalities among young wild pink salmon. However, this

¹ Krkošek, M., Ford, J.S., Morton, A., Lele, S., Myers, R.A., Lewis, M.A.. 2007. Declining Wild Salmon Populations in Relation to Parasites from Farm Salmon. *Science* 318: 1772-1775.

² http://www.pac.dfo-mpo.gc.ca/sci/mehsd/sea_lice/2006/Bulletins/Bulletin7/fig3graph.JPG
http://www.pac.dfo-mpo.gc.ca/sci/mehsd/sea_lice/2005/Final_Bulletin/figure3.JPG

³ <http://www.pacificsalmonforum.ca/>

⁴ <http://www.marketwire.com/mw/release.do?id=804432>

assumption is challenged by the many scientific studies that suggest that salmon farms have little impact on the sea lice levels that naturally occur on wild salmon. For example:

- One recent study conducted by DFO scientists found that wild salmon in an area where there were no farms had as many sea lice as wild salmon in BC's Broughton Archipelago where farming occurs⁵.
- A second recent study conducted by DFO scientists found exceptionally high returns of pink salmon in an area containing 16 active salmon farms – and concluded that pink salmon populations and farmed Atlantic salmon could coexist successfully⁶.
- The BC Pacific Salmon Forum December 18th 2007 press release states that *“all the field researchers noted that over 80 percent of the wild salmon smolts migrating out of the Broughton in the spring of 2007 had no lice whatsoever.”*⁷
- Studies by DFO scientists have shown that young pink salmon mount an effective immune response to sea lice infection⁸. This immune response causes the lice to be shed from the salmon – and thereby protects the young salmon from illness or death due to sea lice infection.

As a result, DFO clearly states on its website that:

"Some recent papers have...generated media reports stating that sea lice produced from salmon farms are a major cause of losses in wild salmon populations...DFO does not support the close association between salmon farms, sea lice, and loss of wild salmon reported by others"⁹.

Moreover, after reviewing the current scientific research on the interactions between salmon and sea lice, Dr. Kenneth Brooks, Senior scientist with Aquatic Environmental Sciences, has stated:

"To date, no direct 'cause and effect' relationship between sea lice, salmon farms and wild salmon in British Columbia has been identified by scientists who have studied the issue."

The finding that salmon farms have minimal impact on sea lice numbers should not be surprising. The BC provincial government demands that the numbers of sea lice found on salmon farms are tightly monitored and controlled – and has mandatory lice levels at which farmed salmon populations must be treated with anti-parasitic compounds. Monitoring data clearly shows that the number of lice found on salmon farms has been low with few treatments required¹⁰.

⁵ Beamish, R.J., Neville, C.M., Sweeting, R.M., and Ambers, N.J. 2005. Sea lice on adult Pacific salmon in the coastal waters of Central British Columbia, Canada. Fisheries Research 76: 198-208.

⁶ Beamish, R.J., S. Jones, C. Neville, R. Sweeting, G. Karreman, S. Saksida, and E. Gordon. 2006. Exceptional marine survival of pink salmon that entered the marine environment in 2003 suggests that farmed Atlantic salmon and Pacific salmon can coexist successfully in a marine ecosystem on the Pacific coast of Canada. ICES J. Mar. Sci. 63: 1326-1337.

⁷ <http://www.marketwire.com/mw/release.do?id=804432>

⁸ Jones, S., E. Kim, and S. Dawe. 2006. Experimental infections with *Lepeophtheirus salmonis* (Kroyer) on threespine sticklebacks, *Gasterosteus aculeatus* L., and juvenile Pacific salmon, *Oncorhynchus* spp. J. Fish Diseases 29: 489-495.

⁹ http://www.al.gov.bc.ca/ahc/fish_health/Sealice_monitoring_results.htm

¹⁰ http://www-sci.pac.dfo-mpo.gc.ca/aquaculture/sealice/statement_e.htm

Source of Sea Lice Unknown

The Science report also claims that it has assessed "...the impact of recurrent *aquaculture-induced* salmon lice infestations on wild pink salmon populations." However – to date – no scientific method has proven to be capable of determining whether the sea lice found on wild salmon came from farms – *or from other wild fish*. Lacking a method to determine the source of the lice, how could the authors of this report know where their lice came from?

One thing that scientists do agree upon is that wild salmon carrying sea lice can infect other wild salmon. In fact, this is an essential part of the natural life cycle of sea lice. This finding has led many scientists to conclude that new infections of wild stocks originate primarily from other previously infected wild stocks – rather than from farms.

"Since juvenile farmed salmon are free from sea lice when introduced into the marine environment, it looks like the sea lice are actually coming from the wild fish onto farmed fish," says Dr. Jim Brackett, President of Aquatic Life Sciences.

It therefore remains debatable whether the transfer of sea lice from the farmed salmon to the wild salmon could be on a sufficient scale to have an impact. "Because the wild fish have sea lice initially, we don't know whether there is a sufficient enough transfer of lice from farm fish to wild fish to make an impact on the levels of infection," says Dr. Kevin Butterworth, Director of Marine Research, BC Centre for Aquatic Health Sciences, "If there is not a significant transfer of sea lice, then this whole issue is a moot point."

The Way Forward

The Canadian aquaculture industry is committed to developing environmentally, socially, and economically sustainable salmon farming methods that measurably reduce or eliminate key impacts of salmon farming. The industry believes that to achieve this, all stakeholders must engage in constructive dialogue. Stakeholder dialogues would identify where existing science provides conflicting information related to the impacts of salmon aquaculture. Rather than fostering disagreement between scientists, the dialogues could focus on these areas of uncertainty - and then support scientific research to help resolve this uncertainty.

For Further Information, please see:

- Fisheries and Oceans Canada *Pink Salmon Action Plan*. http://www.pac.dfo-mpo.gc.ca/sci/aquaculture/sealice/statement_e.htm
- BC Pacific Salmon Forum. <http://www.pacificsalmonforum.ca/>

- Information Provided by the Canadian Aquaculture Industry Alliance

The Canadian Aquaculture Industry Alliance (CAIA) is a national industry association, headquartered in Ottawa. It represents the interests of Canadian aquaculture operators, feed companies and suppliers as well as provincial finfish and shellfish aquaculture associations. CAIA is dedicated to promoting a responsible and healthy Canadian aquaculture industry that follows sound environmental practices.