

# COMPARISON OF PFRCC REPORT ON AQUACULTURE (2003) TO SALMON AQUACULTURE REVIEW (1997)

Topic	Assessment of Environmental Risks			Work to-date	Upcoming work
	SAR, 1997	PFRCC, 2002	Analysis		
FISH HEALTH					
<i>sea lice</i>	The increased number of susceptible hosts found in the farm environment may cause increased numbers of lice in the area immediately around infested farms. Sea lice researchers have not yet been able to determine a spread of sea lice from farmed fish to wild fish; available evidence indicates that the original source of lice is wild fish.	No direct evidence of increased impacts on wild salmon; however, concerns are mounting as evidence emerges that the presence of farms <i>may</i> increase infestation in wild stocks. Farms may act as “disease reservoirs” and increase wild fish exposure to infectious agents. Survival time of lice may also be cause for concern.	Concerns have increased over time as information is presented of a link between fish farms and sea lice infestations in wild salmon. More research is needed, particularly in determining “natural” infestation rates in wild stocks not exposed to farms. Farm management can reduce numbers of lice (e.g. during migration events)  PFRCC INDICATES INCREASED RISK.	MAFF has introduced improved fish health monitoring, reporting and tracking standards and procedures. An industry-wide fish health database is now in place to assist with monitoring trends.  Fish Health Management Plans must be prepared and followed by all licensed facilities; farmers must maintain high standards for fish health and husbandry and must follow defined acceptable practices for aquaculture as prescribed in their Management Plans.	A workshop is planned for early 2003 to finalize an action plan for monitoring and reporting, management actions and research related to sea lice. Provincial and federal governments, the aquaculture industry and non-governmental organizations will be represented.  Ongoing monitoring of emerging information in all areas of fish health will inform future modifications to the provincial approach.
<i>bacteria (e.g. furunculosis, BKD)</i>	Furunculosis has historically been diagnosed in wild and cultured fish; no conclusive evidence that agents have been transmitted from farmed to wild fish in B.C.	Risk exists but is minor; wild salmon are generally well adapted to indigenous bacteria; no direct evidence of transfer from farmed to wild; effective use of antibiotics reduces risk.	Bacterial agents pose a minimal risk to wild stocks.  PFRCC INDICATES NO CHANGE FROM SAR.	A workshop involving veterinary experts and industry was conducted in June 2002 to identify risk factors associated with the IHN outbreak and potential management actions.  A follow up workshop involving veterinary experts and industry to prioritize research proposals regarding the IHN virus was completed in January 2003.	
<i>viruses (e.g. IHN, ISA)</i>	Conclusive evidence was not found that indigenous disease agents have been transmitted from farmed to wild fish. Noted that diseases of farmed salmon in B.C are indigenous to the area.	Pacific salmon have natural resistance to indigenous pathogens; however, migrating salmon could be exposed to higher levels than normal when passing an infected farm; survival time of some viruses is sufficient to pose a significant risk.	Risks to wild salmon of viruses from farms are present but are relatively low.  PFRCC INDICATES INCREASED RISK.		
<i>exotic diseases</i>	There is a very low probability that exotic disease will enter the province and cause measurable negative effects to indigenous fish populations; however, if it occurred, serious adverse effects.	Unlikely that exotic diseases would be introduced via farm fish due to effective disinfection measures; serious consequences if exotic diseases are introduced.	Risk is low; however, consequences would be serious if an exotic disease was introduced  PFRCC INDICATES NO CHANGE FROM SAR.		
<i>“new” diseases</i>	The greater intensity of observation and sampling on farms means it is more likely that previously unrecognized diseases will be found first in farmed salmon.	The probability of new strains of diseases developing through salmon aquaculture and negatively impacting wild salmon is minor.	Not a serious threat; continued monitoring is required.  PFRCC INDICATES NO CHANGE FROM SAR.		
<i>high fish densities on farms</i>	A wild population may be at increased risk of infection from pathogens as salmon farming may increase the exposure opportunities for wild fish to disease causing pathogens.	Conditions of high densities of fish on farms may increase susceptibility of farm fish to disease by increasing stress and will increase the probability of disease transfer among farm fish.	Possible health risks to wild fish associated with high stocking densities on farms; primary risk is to health of farm fish.  PFRCC HAS SIMILAR CONCLUSIONS TO SAR		

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<p><b>ESCAPES</b></p> <p><i>survival &amp; spawning</i></p>	<p>Extensive recoveries of Atlantic salmon have been reported; No spawning of escaped Atlantic salmon has been documented in B.C. or Washington streams.</p>	<p>Farm fish adapt poorly to survival in the wild; small numbers have successfully spawned; over a greater period of time, spawning may meet with greater success. Recommends continued monitoring.</p>	<p>Atlantic salmon can survive in the wild and some have spawned, but no evidence to date of large-scale spawning success.</p> <p>PFRCC INDICATES NO EVIDENCE OF SERIOUS RISKS</p>	<p>New escape prevention standards were introduced in the provincial Aquaculture Regulation in April 2002. Farmers must exercise increased caution when conducting high-risk activities such as changing nets and transferring live fish.</p> <p>Escape numbers have declined and are in 2002 were among the lowest on record. Government has committed to a zero escape objective.</p>	<p>The province will continue to support monitoring efforts through programs such as Atlantic Salmon Watch.</p> <p>Ongoing monitoring of emerging information in all areas of fish escapes and farmed fish-wild fish interactions will inform future modifications to the provincial approach.</p>
	<p>Reproductive colonization of Atlantic salmon in British Columbia is unlikely, but cannot be ruled out with continued escapes from fish farms.</p>	<p>Only small numbers of feral Atlantic juveniles have been found to-date, suggesting a minimal possibility of colonization in the future.</p>	<p>Colonization has not occurred but a slight risk cannot be ruled out.</p> <p>PFRCC INDICATES NO CHANGE FROM SAR.</p>		
	<p>Hybridization between Atlantic and Pacific salmon is highly improbable; risk of genetic damage to wild stocks is potentially high if large numbers of Pacific salmon escape and successfully interbreed with wild stocks over a number of years.</p>	<p>Risks of escaped farm salmon inter-breeding with wild salmon (and reducing genetic diversity) are small when considering Atlantic salmon but are significant when considering Pacific salmon.</p>	<p>Genetic risks when farming Pacific species are the more serious potential consequence of escapes. Risks are much lower with Atlantic species.</p> <p>PFRCC INDICATES NO CHANGE FROM SAR.</p>		
	<p>At current levels of escapes, the inter- and intraspecific competition between farm and wild stocks (for food/habitat) is not considered to be a threat to wild populations.</p>	<p>Atlantic and Pacific escapees are both capable of disrupting wild salmon habitat and spawning behaviour and of competing with wild salmon for food and space.</p>	<p>Although habitat disruption by escapees is possible, the small numbers found in BC rivers to date is insufficient to warrant serious risk.</p> <p>PFRCC INDICATES NO EVIDENCE OF SERIOUS RISKS.</p>		
<p><b>OCEAN EFFECTS</b></p> <p><i>seabed impacts of farm wastes</i></p>	<p>Effects will vary depending on specific conditions at the site. Benthos would recover within 6-12 months for most sites. Review was unable to properly assess risks in absence of substantive data.</p>	<p>Effects of farm waste on some sea life are possible, but no evidence of direct impacts of wastes on wild salmon; indirect impacts are possible if changes occur lower in the food chain.</p>	<p>New modeling and waste monitoring data have shown the ocean bottom may be affected by farms, but that this effect is reversed when sites stop production or enter a fallowing period.</p> <p>PFRCC INDICATES NO EVIDENCE OF LONG-TERM EFFECTS</p>	<p>New regulations governing farm-generated wastes were introduced in Sept '02. If presence of specified indicator chemicals exceeds a defined level, farms will be required to alter production, operation or management practices.</p>	<p>The new regulation will be reviewed within three to five years to evaluate its effectiveness and consider if amendments are required.</p>
	<p>Fish offal and blood water are only associated with processing in British Columbia, an industry that operates under guidelines for waste disposal and handling.</p>	<p>Wild salmon could be negatively impacted if disposal of diseased morts or bloodwater coincides with migration past the site. Otherwise it is unlikely that diseases would be transmitted to wild fish from infected morts or blood water.</p>	<p>Morts and bloodwater must be disposed of in accordance with provincial and federal legislation. Risks are minimal if proper procedures are followed.</p> <p>PFRCC INDICATES NO EVIDENCE OF SERIOUS RISKS</p>		
<p><i>bloodwater &amp; mort disposal</i></p>				<p>Under new waste regulations, farmers must prepare a best management practices plan which lays out each farm's mort disposal procedures. Mort disposal must comply with the new regulations and the <i>Waste Management Act</i>.</p>	<p>BC Aquaculture R&amp;D Committee is preparing to issue funding for research into the management of bloodwater.</p>
<p><i>cumulative impacts</i></p>	<p>C.I. should be a factor in the selection of suitable farm sites. Recommends further studies of the cumulative effects of farm wastes and farm concentration.</p>	<p>Impacts from non-salmon farming activities, coupled with growth of fish farming, may have detrimental effects on wild fish. Insufficiently studied.</p>	<p>Cumulative impacts of salmon farming (combined with other activities) deserves consideration. RISKS IN THIS AREA ARE RELATIVELY UNKNOWN AND UNSTUDIED.</p>	<p>Farms are now sited in accordance with several resource buffers. The Aquaculture Opportunities Study has identified areas that are more (and less) suitable for aquaculture.</p>	<p>DFO has committed to studying cumulative effects as part of a review under the Canadian Environmental Assessment Act.</p> <p>A predictive model to assess potential cumulative effects is nearing completion.</p>