

Aquaculture – Disease / Fish Health

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- Currently employed as Fish Health Manager, Grieg Seafoods BC since 2003 – residence Campbell River.
- Farmed fish disease / parasite transfer has been discussed as a potential factor impacting sockeye survival. The purpose of this presentation is to provide my personal view of the current disease situation and commercial fish health practices.
 - Broodstock disease screening / importation
 - Freshwater disease screening / vaccination / entry
 - Saltwater disease screening / treatment
 - Saltwater lice monitoring / treatment
 - Summary / Looking forward

Broodstock screening / importation – fish health

- The vast majority of farmed salmon eggs in BC are produced individually by each company. Broodstock populations are extensively screened for disease – virology, bacteriology. Individual fish are screened for *Renibacterium salmoninarum* (Bacterial Kidney Disease or BKD a very common disease in pacific salmon) via ELISA, IFAT, PCR (different molecular techniques) with all positive females discarded.
- Eggs are disinfected with iodine at the eyed stage to further reduce the chance of horizontal disease transmission (versus vertical which would be from parent to offspring).
- A very small number of eggs has been imported from Iceland (Stofnfiskur - specific pathogen free facility on land with treated water and multiple generations of test results all negative for diseases of concern). Nothing this decade has been imported from Norway. Eggs if imported must reside in a quarantine facility with serial testing / numerous DFO visits before fish are free to enter traditional facilities.
- NO salmon intended for human consumption are treated with hormones.

Freshwater screening / vaccination / entry

- Incoming water is treated (ultraviolet, ozone) to reduce chance of acquiring significant pathogens.
- Disease spread in fresh and saltwater maintained through strict biosecurity (coordinated stocking, site specific staff, clothing, equipment, etc...).
- Vaccination occurs with efficacious vaccines for common endemic (naturally occurring) diseases:
 - *Vibrio Anguillarum* or Vibriosis – intraperitoneal
 - *Aeromonas salmonicida* or Furunculosis – intraperitoneal
 - Infectious Haematopoietic Necrosis Virus or Sockeye disease – intramuscular vaccine (recent years only – gaining industry acceptance)
- Prior to saltwater entry all fish populations are tested for pathogens of concern - No populations leave the hatchery with ongoing health concerns or need for treatment.
- All farmed salmon are entered into salt water 100% free of sea lice.
- Testing occurs prior to salt water entry to ensure adequate preparedness for Salt water (blood chlorides, gill atpase to ensure appropriate smoltification).

Saltwater Disease screening / treatment

- All populations visited at least monthly for routine health sampling of fresh mortalities or moribund fish (virology, bacteriology etc...). These latter populations are targeted due to an increased likelihood of disease.
- Vast amount of data (Grieg alone – roughly 3500 fish sampled annually with approximately 1800 samples confirmed through independent laboratories). Since 2003 I have NOT found one case of IHNV or exotic disease. Disease prevalence has been low, of endemic nature, and in my personal opinion managed effectively through either treatment or husbandry change.
- Unique amongst the food-producing industries – all antibiotics are administered by veterinary prescription only to treat disease only.
- Mortality, fish health events, treatments, and sea lice information are reported to a database made available to provincial authorities in a summarized format by area.
- 2003 to 2010 (2nd quarter) fish health was audited by the province.
- Veterinarians are required to report suspect or confirmed cases of diseases of concern (eg IHNV, or exotic diseases) to provincial and federal authorities.
- Less than 1% of feed has antibiotics is medicated – majority of that before the fish are 500g (ie before fish are considered large enough to eat).

Sea Lice monitoring / treatment

- All populations monitored for sea lice (*Lepeophtheirus* and *Caligus*) at least monthly (3 pens X 20 fish / pen).
- On-farm sea lice levels below 3 motile lice / fish trigger established by Province during wild smolt out-migration. Above that level either treatment or harvesting is required.
- In BC, the louse primarily found on farmed fish is *Lepeophtheirus salmonis*. Management of lice on farmed fish populations is based largely on reducing lice levels during the wild smolt outmigration. Damage due to lice grazing as seen in other jurisdictions is less – possibly due to subspecies differences. Sea lice population dynamics are also different from other jurisdictions with adult wild salmon carrying a significant lice load (as opposed to other areas such as Eastern Canada, Norway, or Chile with no or very low numbers of wild salmonids).
- 2004 to 2010 (2nd quarter) sea lice counting was audited by provincial fish health technicians. Balance of 2010 has been audited by third party (Centre for Aquatic Health Sciences).
- In BC there is only one therapeutant available (emamectin benzoate or SLICE). A drug in the avermectin class of drugs – extremely common class of drugs for treating parasites in both humans, pet animals, and food animals. Approved by Health Canada with a zero day withdrawal in Canada (withdrawal time varies with jurisdiction).

Fish Health / Sea lice auditing results 2003 to 2008

Year	2003	2004	2005	2006	2007	2008
Fish Health Event Agreement btw BCSFA and MAL	Yes	Yes	Yes	Yes	Yes	Yes
Sea Lice Agreement btw BCSFA and MAL	Yes	Yes	Yes	Yes	Yes	Yes
Motile lice levels in Second Quarter	N/A	0.69	0.76	1.05	0.83	0.59
# sea lice audits (# fish sampled)	N/A	36 (2160)	52 (3120)	47 (2764)	57 (3380)	71 (4240)
# fish health audits (# fish sampled)	110 (648)	116 (675)	113 (586)	108 (644)	118 (763)	119 (588)
IHN detected	yes	No	No	No	No	No

http://www.agf.gov.bc.ca/ahc/fish_health/

- Over 3,904 fish sampled for disease and 15,644 fish sampled for sea lice.
- No reports of IHNv or exotic disease since 2003 – individual companies and Provincial program.
- Agreement between fish health audit program and company reporting.
- On-farm sea lice levels below 3 motile lice / fish trigger established by Province during wild smolt out-migration.
- Agreement between sea lice audit program and company reporting.

Summary / Looking forward

- Since my introduction to the industry (2003) I believe that fish health has been managed extremely well and is a gold standard for other Canadian food producing industries. However, I believe there is room for improvement in certain areas:
 - Wild-farmed interactions (sea lice, disease) in an ecological based analysis looking at numerous factors (aquaculture, forestry, power generation, commercial fishing, development, global warming, etc...)
 - Improvements to existing technology – examples would be oxygen supplementation, phytoplankton mitigation, improvements to land-based rearing systems to improve fish health and reduce time at sea. For example, existing industry plans to scale up existing recirculation facilities for particular applications (broodstock facilities to remove brood from sea; larger smolt to minimize time at sea)
 - Alternate sea lice treatments to provide an alternative – good integrated pest management practice requires alternating treatment methods.
 - A review of existing siting criteria to allow for:
 - Better coordinated management areas
 - Potential for better disease or parasite management (eg consideration of alternate criteria such as salinity – freshwater kills sea lice).