

British Columbia's Fish Audit and Surveillance Programs (FHAS)

The over-riding objectives of the provincial Fish Health Program are to monitor and minimise the risks of disease in farmed fish, and to facilitate public and agency confidence that aquaculture health management in BC occurs at a high standard. The cornerstone of this program is the Fish Health Management Plan (FHMP). These corporate management plans encompass all aspects of farming that can affect the health of the animals at the aquaculture facility. On-site health monitoring and reporting of disease status to a private database are requirements under the FHMP, and compliance monitoring is built-in to the system. For commercial salmon aquaculture the FHMP remains enforceable as a Term & Condition of a provincial aquaculture licence (2009).

A) The Fish Health Audit and Surveillance (FHAS) component of the Ministry's Fish Health Program consists of three main tasks:

- 1) Provincial fish health bio-technicians monitor activities and review health-related records at marine salmon farms, as outlined in FHMPs;
- 2) Provincial fish health bio-technicians collect samples from recently dead or moribund silvers to facilitate active surveillance for bacteria, viruses and parasites and to determine farm-level disease events; and,
- 3) The audit results are compared to reports generated through the BCSFA's private database.

The FHAS program audits industry's activities, searches for and reports specific diseases and pathogens of concern (i.e. pathogens recognised federally and internationally that may affect fish movement and trade), and identifies diseases at farms that are common to BC fish - wild and farmed - including indigenous pathogens that may emerge in farmed salmon populations.

Salmon Farm Selection:

BCMAL applies a multistage selection system within designated fish health zones of the coast. All farms within a zone are assigned a random number and a computer selection of the farms within a sub-zone is weighted (based on the fish species and the number of "active farms" operating in that sub-zone as a percentage of the total number of active farms in the province). In other words, if a zone contains 30% of the farms then 30% of the farms selected for audit would be randomly chosen from that area. This ensures equal probability of each farm being selected for sampling. For reasons of practicality and resources, the maximum sample size is 30 farms audited per quarter. The aim is to achieve 120 site audits each year which ensures at least all sites have equal opportunity to be sampled within a year. Farm audits are conducted in conjunction with the farm's regularly scheduled carcass removal, facilitating staff access to the dead fish. The approach of targeted disease sampling on recently dead fish increases the likelihood of finding disease (compared with random sampling of all live fish at the farm - most of which would be healthy).

Laboratory Samples:

A sub-set of the "fresh silver" carcasses is selected for standard histopathology, bacteriology, and molecular diagnostics (PCR) / virology. On average 5 to 10 carcasses per farm are collected. Sampling is aimed at achieving a 95% confidence of detection of 2% disease prevalence. Samples are sent to the BCMAL Animal Health Centre (AHC) in Abbotsford for evaluation. The Animal Health Centre is an AAVLD (American Association of Veterinary Laboratory Diagnosticians) accredited full-service diagnostic laboratory. The use of an accredited laboratory provides confidence in the diagnostic results due to high standards of quality assurance and quality control.

Tissues collected include: anterior kidney, posterior kidney, liver, spleen, gill and pyloric caeca. Additional samples of tissues with lesions that may aid diagnosis are taken as required. Virology samples are pooled to a maximum of five fish per sample and screened using conventional Polymerase Chain Reaction (PCR) technique for the following pathogens:

- Infectious Hematopoietic Necrosis Virus (IHNV)
- Infectious Pancreatic Necrosis Virus (IPNV)
- Infectious Salmon Anaemia Virus (ISAV)
- Viral Hemorrhagic Septicaemia (VHSV North American strain IVa)
- *Piscirickettsia salmonis*

If PCR screening is positive or a viral septicaemia is suspected, the samples are cultured on appropriate cell lines for diagnostic confirmation.

B) Sea Lice Monitoring and Audit Program: BCMAL has been actively monitoring the status of lice infections on BC salmon farms since 2003. A lice management strategy is integral to FHMPs and the lice audits target active Atlantic salmon farms of BC. As part of the reporting requirement of the FHMPs, industry's lice information is posted monthly to BCMAL's Animal Health Centre [website](#). In addition, the Ministry conducts audits of industry to verify the accuracy of the farm counts. For example, in 2008 Ministry bio-technicians conducted 71 random sea lice audits and assessed over 4,200 live Atlantic salmon using a standard operating procedure.

BCMAL uses the same multi-stage selection system for lice audits as is used for selecting fish health audits. At each farm, monthly assessments are conducted using three pens; 20 live fish per pen are anaesthetised and examined (farm total = 60 fish). Pens chosen for assessment include one reference or index pen (i.e. first pen stocked at the farm, or the pen with the highest likelihood of having lice, based on historical counts). The reference pen is sampled each month. Two additional pens may be selected by farm staff either by rotation or convenience. During the gathering procedure, hundreds of fish are typically captured using a seine net, box seine, or other methods that ensures representative sampling of the population. The method of capture is recorded by staff. Twenty fish are dip-netted into an anaesthetic bath although, on occasion when other tests are underway, farms choose to humanely euthanize the fish before examination. The fish are examined for the presence of lice regardless of the health status of the fish (i.e. robust or moribund).

To reiterate, this FHAS and sea lice activity is independent of industry's routine self-monitoring procedure. Further detail is available at BCMAL's Animal Health Centre [fish health pages](#) ; specifically, within the [2009 annual Fish Health Report](#).