Infectious Salmon Anaemia virus (ISAv) Enhanced Surveillance

N. O'Brien and D. Whelan

Abstract

Infectious Salmon Anaemia virus (ISAv), an orthomyxovirus, causes the disease Infectious Salmon Anaemia (ISA) in Atlantic salmon (*Salmo salar*). The disease will cause varying degrees of morbidity and mortality depending on the genotype. ISA virus occurs globally with periodic or regular outbreaks. Surveillance at the marine cage site is crucial for early detection and to prevent spread of the pathogen. Combined targeted and passive surveillance are used to determine ISAv status in Newfoundland and Labrador, Canada. The objective of the surveillance system is primarily for early detection. A stochastic simulation model was used to simulate the pathway for detection of ISAv through active surveillance. Active surveillance showed that the mean probability of freedom from disease exceeded 95% after 4 months if sampling occurred every 30 days. This information was then utilized to refine the surveillance program to incorporate varying probability of introduction. The probability of introduction was impacted by components such as oceanographic/hydrographic data and Bay Management Areas. This information was then used to evaluate the overall system surveillance. Preliminary data shows that factors such as sample size, sample frequency and diagnostic tests can have an impact on surveillance and therefore can be utilized to develop a surveillance program that is risk based. In conclusion, ISAv surveillance can utilize relative risk to enhance early detection of ISAv at marine cage sites.

Newfoundland and Labrador ISAv Surveillance Program

Active pathogen specific surveillance occurs every 30-45 days weather and logistics permitting. 5-20 moribund fish per site necropsied and kidneys submitted for ISAv diagnostics which include: RT-PCR, IFATS and cell culture.

Enhanced ISAv Surveillance

Active pathogen specific surveillance every 2 weeks. 2 moribund fish per cage necropsied and kidneys submitted for ISAv diagnostics.

2017 – 2018 ISAv outbreak in Newfoundland and Labrador (NL)

- In the fall of 2017 a marine cage site, located on the South Coast of NL tested positive for pathogenic ISAv.
- Neighbouring sites, owned by the same company and located within the same BMA, tested positive for the same strain of ISAv within the 7 months. All of these sites were depopulated using approved biosecure Standard Operating Procedures.
- In the Spring of 2017 another marine cage site, located in another BMA tested positive for a different strain of pathogenic ISAv and the affected cages were removed using approved biosecure Standard Operating Procedures.
- In the Spring of 2017 a marine cage site located within another BMA and owned by a different company tested positive for a different strain of pathogenic ISAv. One neighbouring site later became positive for this same strain. Both sites have been depopulated using approved biosecure Standard Operating Procedures.

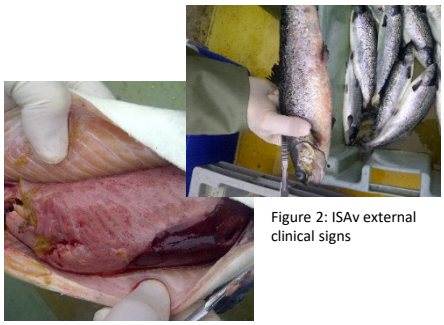

Figure 2: ISAv external clinical signs

Figure 1: ISAv internal clinical signs

Methods

- Previous data showed that the Newfoundland and Labrador ISAv surveillance program would provide 95% confidence of freedom from disease after 4 months of negative surveillance (*O'Brien, N., Sergeant, E. and Whelan, D. 2015*).
- The stochastic model previously used was utilized to evaluate enhanced surveillance currently being used in an ISAv outbreak in Newfoundland and Labrador.
- Probability of Introduction varied over the year (0.02 – 0.05)

Parameter	Distribution
P(moribund or fresh dead fish present)	Pert(0.7,0.8,0.99)
P(sick/dead fish observed)	Pert(0.8,0.9,0.99)
P(sampled and tested for ISA)	Pert(0.97,0.98,0.99)
P(sampled fish infected)	Beta(60.6,1.1)
Test sensitivity	Beta(28,3.7)
Number of samples submitted	Discrete distribution from submissions
Design prevalence (fish)	0.1 fish/cage
Design prevalence (cages)	1 cage/site
Design prevalence (sites)	1 site
Prior confidence of freedom	0.5

Preliminary Results

- Increased sample size and sampling frequency using moribund fish increased site sensitivity when compared to regular surveillance.
- Time to provide 95% confidence of freedom from disease was decreased to 2 months when compared to regular surveillance.

Conclusions

During an ISAv event or outbreak increased sample size and frequency of moribund fish can be utilized to improve surveillance of neighbouring sites. This will result in early detection of disease, accurate ISAv status for the region and early mitigation to prevent further spread.

Figure 3: ISAv in Newfoundland and Labrador 2017 - 2018

Thank-you

- Department of Fisheries and Land Resources – Aquatic Animal Health Division
- NL Aquaculture Industry