Scottish Salmon Watch, 5 June 2019

**Virus-Laden Farmed Salmon**
- FOI reveals over half of samples test positive for Piscine Reovirus

A FOI reply by the Scottish Government published online yesterday reveals that over half of all farmed salmon from Scotland (and other unnamed countries) tested positive for Piscine Reovirus (PRV) during 2018 and 2019. In advance of today's Ministerial Statement on 'sustainable aquaculture' in the Scottish Parliament (1.30pm), campaigners are challenging Scottish Ministers to test all salmon farms and are calling on supermarkets to inform shoppers what infectious diseases, pathogens and viruses are hiding in 'healthy' Scottish salmon.

"Unsuspecting shoppers are getting more than they bargain for when buying farmed salmon," said Don Staniford, Director of Scottish Salmon Watch and author of 'The State of Scottish Salmon Farming'. "Hidden extras lurking in Scottish salmon include Piscine Reovirus, Cardiomyopathy Syndrome, Amoebic Gill Disease, Infectious Pancreatic Necrosis and a host of nasty viruses, pathogens and diseases. If consumers realised that over half of all farmed salmon tested was laden with Piscine Reovirus they would avoid it like the plague. Far from being 'healthy', Scottish salmon is a battery farmed, virus-ridden, disease hell."

Data disclosed via FOI/19/00882 reveals that during 2018 and 2019 there were 399 positive samples out of 774 samples tested (i.e. 52% of farmed salmon samples tested positive for PRV) [1] - including 63 tests out of 113 with 100% positive results:

<table>
<thead>
<tr>
<th>Date of Testing</th>
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</tr>
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<tr>
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<tr>
<td>21/05/2019</td>
<td>PRV</td>
<td>qPCR</td>
<td>9 of 9</td>
</tr>
</tbody>
</table>
According to the Scottish Government's [FOI reply to Scottish Salmon Watch dated 3 June](#), the results relate to Marine Scotland Science's "commercial testing service on behalf of third parties" and "the sources of these samples will relate to aquaculture sites both within and out with Scotland" but "from the records held by Marine Scotland Science they cannot be linked to any particular source." Scottish Salmon Watch today filed a further FOI request for more specific details.

PRV is highly contagious, causes fatal heart and skeletal muscle inflammation in salmon and a scientific study published in 2018 linked it to an equally deadly type of anemia in at least one species of wild salmon.

Shamefully, Scotland’s Aquatic Animal Health surveillance programme does not routinely test for Piscine Reovirus (also called Piscine orthoreovirus) and Heart & Skeletal Muscle Inflammation (HSMI). "Sampling for PRV is restricted to those inspections involving diagnostic investigations and only in such cases where histopathological analysis is indicative of pathology associated with PRV infection," explained the Scottish Government in a letter dated 3 June.

An analysis of the 'Case Information' published by the Scottish Government (data is available from [2013 through to March 2019](#)) details numerous positive tests for PRV and HSMI ([the causative agent of PRV](#)). In April 2019, Scottish Salmon Watch detailed the following case in a letter to Scottish Ministers:

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Scottish Salmon Watch
St. Andrew's House
Regent Road
Edinburgh:
EH1 3DG
scottish.ministers@gov.scot

5 April 2019

Dear Scottish Ministers,

**Surveillance of Salmon Farms, Hatcheries & Ova to Minimise Disease Risks**

Will Scottish Ministers commit to a program of increased testing and sampling of farmed salmon (including smolts and ova in hatcheries as well as in sea cages and processing plants) for infectious diseases, pathogens, bacteria, parasites and viruses?

In order to safeguard the health of wild fish (as well as farmed salmon), Scottish Salmon Watch challenges the Scottish Government to establish a strict surveillance regime which would test and report publicly on infectious diseases, pathogens, bacteria, parasites and viruses in the following:

a) Ova imports
b) Smolts in the hatchery prior to transfer to sea-cages
c) Harvest-ready farmed salmon immediately prior to slaughter
d) Market-ready farmed salmon in the processing plant

Scottish Salmon Watch is seriously concerned at the lack of monitoring and sampling of salmon farms, hatcheries and ova imports. The surveillance of emerging viruses and emerging diseases such as Piscine Orthoreovirus (Heart & Skeletal Muscle Inflammation), Anaerobic Gill Disease and Pasteurella salmonis appears woefully inadequate and even the surveillance of more established 'Notifiable Diseases' is seriously lacking.
Further information on the 'Risks of Piscine Reovirus' were detailed in Scottish Salmon Watch's letter to Scottish Ministers in April 2019 [2].

Other PRV cases were cited in Scottish Salmon Watch's FOI request dated 24 March 2019 including Scottish Sea Farms (Nevis C in Loch Nevis) in October 2018 and The Scottish Salmon Company (Ardcastle Bay in Loch Fyne) in May 2018 [3].
Cases of HSMI reported via the Scottish Government’s Fisheries Health Inspectorate include Cooke Aquaculture’s Lyrawa Bay farm in Scapa Flaw, Orkney, in 2019:

Cooke Aquaculture has experienced serious problems with PRV at their salmon farms in Washington (linked to infected eggs imported from Icelandic company StofnFiskur – a subsidiary of Benchmark Genetics) in the United States, leading to 800,000 infected fish being slaughtered in December 2018 and a ban on re-stocking PRV-infected farmed salmon.
In Scotland, there is still no statutory sampling of salmon farming wastes via either farms or processing plants for PRV or other diseases, pathogens and viruses (despite salmon farms increasing in size). “Sampling undertaken for aquatic animal disease analysis relates to fish and shellfish and does not presently include samples from seawater or sampling associated with processing plants,” explained the Scottish Government in a letter dated 3 June 2019.

In Canada, however, testing has detected PRV in salmon farming effluents with the Canadian Government forced by a court order in February 2019 to test for PRV in farmed salmon before transfer to sea cages (although earlier this week a four-month extension was granted by a judge). PRV was detected in farmed salmon on sale in supermarkets in Canada back in 2012.

Fish-farm critic and independent researcher Alexandra Morton has opened another debate about salmon diseases in British Columbia.

Ms. Morton says samples taken from salmon purchased in four Vancouver supermarkets have tested positive for a virus that is suspected of being the "causative agent" of a disease killing Atlantic salmon in European aquaculture operations.

The detection of the piscine reo virus (PRV), which researchers have associated with heart and skeletal muscle inflammation (HSMI) in fish, raises concerns that the disease could be in B.C. waters, where it would be a threat to both farmed Atlantic salmon and wild Pacific salmon.

In May 2018, Scottish Salmon Watch wrote to Scottish Ministers calling on the Scottish Government to test salmon farming effluents for infectious diseases, pathogens and viruses (including PRV and HSMI).
Cabinet Secretary for Environment, Climate Change and Land Reform
Cabinet Secretary for Rural Economy & Connectivity
The Scottish Government
St. Andrew's House
Regent Road
Edinburgh
EH1 3DG

Dear Cabinet Secretaries,

8 May 2018

Slipping Through the Net: Infectious Diseases, Viruses, Pathogens & Bacteria in Salmon Farm & Processing Plant Effluents

Further to previous correspondence (see Appendix 1), could you please explain why the Scottish Government does not test salmon farm and processing plant effluents for infectious diseases, viruses, pathogens, bacteria and contaminants?

In view of the problems plaguing Scottish salmon farming and positive tests for viruses in processing plant effluents in Canada the lack of Scottish Government testing is a serious oversight which must be corrected as a matter of urgency.

Data obtained via Freedom of Information from the Scottish Government has revealed that Scottish salmon farms during 2017 were not only riddled with lice but also disease-ridden.

A petition organised by SumOfUs signed by over 43,000 people called on the Scottish Government to "start routinely testing effluent from salmon farms and processing plants for deadly viruses that threaten wild salmon".
Scottish Salmon Watch revealed in May 2018 how Scottish salmon was being fast-tracked and harvested out early due to disease problems (including PRV and HSMI).

In February 2018, the Global Alliance Against Industrial Aquaculture (GAAIA) wrote to the Cabinet Secretary for the Environment, Climate Change and Land Reform calling for testing of processing plant effluents following positive PRV tests in Canada.

GAAIA cited a report - "Piscine Reovirus (PRV): An Underestimated Pathogen in the Scottish Salmon Industry?" - published by The Fish Site in 2015:
In the context of PRV being detected in salmon processing plant effluent in British Columbia, GAAIA also calls on the Scottish Government to test salmon processing plant effluent in Scotland (not just for PRV but other infectious diseases and viruses), urged GAAIA to the Cabinet Secretary for the Environment, Climate Change and Land Reform in February 2018.

Read news on PRV via:

- Fish-farm fight ends with mandated testing for highly contagious virus
- Ottawa spent $2.26 million fighting B.C. biologist and First Nation in court over fish farm virus
- DFO v Wild Salmon – Will a Second Court Win Make Any Difference?
- Federal court rules not screening B.C. farmed salmon for virus is unlawful
- Federal Court orders DFO to make new farmed salmon transfer policy - DFO policy was to skip testing for PRV virus when issuing licence for farmed fish transfers, releases
- PRV testing to be included in Canadian DFO policy
- Bloody effluent still spewing from B.C. fish processing plant, photographer finds - samples reveal PRV virus is still in discharged waste, says Tavish Campbell, more than year after initial find
- Protecting wild salmon from piscine reovirus
- Unmasking a salmon virus
- Something in the water: New salmon virus study stresses need to get fish farms out of ocean
- ‘Bloodwater’ Released into B.C.’s Coastal Water Contains Deadly Fish Virus, Government Tests Confirm
- Scottish waters flooded with salmon blood after food plant leaks
- Bloody sewage from Canada fish plant ‘threatens’ wild salmon
- New Viruses to British Columbia’s Coast: Piscine Reovirus
- Piscine Reovirus in Puget Sound
- Piscine Reovirus (PRV): An Underestimated Pathogen in the Scottish Salmon Industry?
Studies shed light on impact of PRV virus on farmed Atlantic salmon in B.C.
Piscine orthoreovirus demonstrates high infectivity but low virulence in Atlantic salmon of Pacific Canada
High-Load Reovirus Infections Do Not Imply Physiological Impairment in Salmon
Detection of piscine orthoreoviruses (PRV-1 and PRV-3) in Atlantic salmon and rainbow trout farmed in Germany
The same strain of Piscine orthoreovirus (PRV-1) is involved in the development of different, but related, diseases in Atlantic and Pacific Salmon in British Columbia
PRV virus may cause disease in Chinook salmon
Infection with purified Piscine orthoreovirus demonstrates a causal relationship with heart and skeletal muscle inflammation in Atlantic salmon
The effect of exposure to farmed salmon on piscine orthoreovirus infection and fitness in wild Pacific salmon in British Columbia, Canada
Piscine orthoreovirus (PRV) infects Atlantic salmon erythrocytes

"Disease-ridden Scottish salmon is slipping through the net and into the supermarket shopping basket," concluded Don Staniford. "Scottish salmon is inherently unsustainable, irresponsibly sourced and is riddled with parasites, infectious diseases, pathogens, bacteria and viruses. Shame on the Scottish Ministers for failing to test farmed salmon and for failing to curb the expansion of toxic salmon farming."

Contact:
Don Staniford: 07771 541826 (salmonfarmingkills@gmail.com)
Diary of Disease Disaster:

**June 2018** - Gruesome photos of disease-ridden Scottish salmon (sourced from Scottish Government inspections of salmon farms) were published by The Ferret and Scottish Salmon Watch.

**August 2018** - It was revealed that lawyers acting on behalf of The Scottish Salmon Company and Scottish Sea Farms threatened legal action if the Scottish Government disclosed damning photos of disease-ridden farmed salmon. Scottish Salmon Watch published further damning photos.
September 2018 - Scottish Salmon Watch published secret video footage of diseased and deformed farmed salmon (and cleaner fish).

Stomach-churning video footage of maggot-infested and diseased salmon was published.

The Ferret published scarred, frayed and lice-infested salmon caught on film by Corin Smith and broadcast by the BBC's 'One Show'.

![BBC Logo](image)
November 2018 - The Sunday Mail reported on the "disease hell" of Scottish salmon farms followed up by French and Latvian TV.

March 2019 - Scottish Salmon Watch published a report - 'The State of Scottish Salmon Farming' - cataloguing the disease nightmare on Scottish salmon farms including sites operated by The Scottish Salmon Company and Mowi (formerly Marine Harvest).
May 2019 - BBC Panorama exposed the dirty secrets of salmon farming in Scotland.

Read more via:

BBC Panorama: "Salmon Farming Exposed" (20 May)
Herald: "Polluting Lochaber salmon hatchery 'should close' after sewage leak endangers pearls"
Salmon Eggsclusive: Scotland's 'King of Fish' is Now Viking Not Scottish!
The Ferret: "Mass deaths: nine million fish killed by diseases at Scottish salmon farms"
Easter Egg Ban for 'Scottish' Salmon?
Loch Duart drops "sustainable" claim after advertising ruling
Disease-Ridden Scottish Salmon
Mail On Sunday: "Sir David: Fish farms may kill all wild salmon"
Mowi's Disease-Ridden Mortalities - 1.6 million+ in 101 incidents (2017-2018)
"The Sorry State of Scottish Salmon Farming in 2018"

Watch video reports online here
Notes to Editors:


The FOI letter from the Scottish Government dated 3 June 2019 included:
Dear Mr Stanford

Thank you for your request dated 24 March 2019 under the Environmental Information (Scotland) Regulations 2004 (the EIRs).

Your request

You asked for information on Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI) since 1 January 2018, to include:

- Data on sampling and testing for Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI) in farmed salmon, seawater and processing plant effluent (and any other sampling and testing).
- How many samples of farmed salmon and water samples have been tested for Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI).
- Any photos, emails, letters, copies of scientific papers and other information to and from the Marine Laboratory, salmon farming companies, veterinarians (e.g. Fish Vet Group), other Governments and other parties in relation to Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI).

And:
Response to your request

Sampling and testing is undertaken as part of Scotland’s Aquatic Animal Health surveillance programme in line with the current regulations concerning aquatic animal health in Scotland. The results and outcomes of this surveillance is made publicly available through an active publication plan:-

https://www2.gov.scot/Topics/marine/Fish-Shellfish/FIIV/CaseInformation.

In accordance with the current programme, sampling undertaken for aquatic animal disease analysis relates to fish and shellfish and does not presently include samples from seawater or sampling associated with processing plants.

In addition to results relating to statutory surveillance, Marine Scotland Science also performs a commercial testing service on behalf of third parties. The results of this testing are provided to you in Annex 1 of this reply and must be considered in association with the following context:

Commercial testing results relate to samples submitted from third parties and from the records held by Marine Scotland Science they cannot be linked to any particular source. The sources of these samples will relate to aquaculture sites both within and out with Scotland. The results will also include samples from transmission trials concerning experimental animals and facilities. Therefore, there are severe limitations with this data in terms of how it can be interpreted and portrayed. In summary the commercial testing data represents a number of test results from a number of samples which relate to a multitude of unidentifiable sources all of which have been submitted by third parties.

You also asked ‘How many samples of farmed salmon and water samples have been tested for Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI)’. As explained above, Marine Scotland does not analyse water samples for aquatic animal pathogens as part of our statutory sampling programme. You can find details on the number of fish sampled as part of the statutory surveillance programme within the case information released through our active publication plan. For your information, sampling for PRV is restricted to those inspections involving diagnostic investigations and only in such cases where histopathological analysis is indicative of pathology associated with PRV infection. In those circumstances further screening using the molecular genetic method RT PCR is undertaken. In general, tissues from several fish (usually between 1-5 animals) are pooled together for testing. You can calculate the number of fish sampled by analysing the sample sheet associated with the case which will detail the number of fish per pool and the tests associated with those samples taken.

Read the letter in full online here

An Excel spreadsheet disclosed with the FOI reply (Appendix 1) detailed 67 positive test results and 38 negative test results for PRV during 2018. Of the 67 positive test results 41 tested 100% positive for PRV during 2018.
In total in 2018, there were 265 positive samples out of 479 samples tested (i.e. 55% of samples tested positive for PRV).

In 2019 (up to 22 May) there were 22 negative test results and 36 positive test results for PRV. Of the 36 positive test results 22 tested 100% positive for PRV during 2019.
In total in 2019, there were 134 positive samples out of 295 samples tested (i.e. 45% of samples tested positive for PRV).

In total during 2018 and 2019 (up to 22 May) there were 399 positive samples out of 774 samples tested (i.e. 52% of samples tested positive for PRV).

Download Excel spreadsheet online here

[2] Excerpt from Scottish Salmon Watch's letter to Scottish Ministers dated 5 April 2019:

Risks of Piscine Reovirus

Vertical transmission of PRV (Piscine Reovirus) via infected eggs also appears a distinct possibility. Scottish Salmon Watch Tweeted in December 2018:
Don Staniford
@TheGAAIA

Replying to @wheelsmithUK

Piscine Reovirus is already here infecting Scottish farmed salmon - officially reported by @marinescotland via Fish Health Inspectorate case information bit.ly/2GwbxWx bit.ly/2A0hVQ3 @MHScotland

12:32 PM - 19 Dec 2018

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A FHI Fish Visit report dated November 2017 for Marine Harvest's salmon farm at Caolas A Deas in Loch Shell detailed disease problems including PGD (Proliferative Gill Disease), CMS (Cardiomyopathy Syndrome), PRV (Piscine Reovirus) and PD (Pancreas Disease).

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A FHI Fish Visit report dated November 2017 detailed disease problems at Marine Harvest's salmon farm at Ardintoul in Loch Alsh (a Special Area of Conservation protected via the EC Habitats Directive) - including CMS, PRV, AGD, Branchiomonas, Paranucleospora theridon and salmon gill poxvirus.

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Fish Health Inspectorate Visit Report

Summary for Information of Site Operator

Business No: FB0095  Date of Visit: 28/06/2016
Site No: FS0802  Site Name: Kirkabister
Inspector: Svenja Elwenn & David Bradley  Case No: 20160263

Section 1: Summary

Five moribund and lethargic fish were removed for diagnostic sampling. Histopathological examination revealed evidence of cardiomyopathy syndrome (CMS), which was confirmed by QPCR. This is thought to be the primary cause of morbidity.

Samples were also positive for infectious pancreatic necrosis virus by virology and piscine reovirus by QPCR, these are the causative agents of infectious pancreatic necrosis (IPN) and heart and skeletal muscle inflammation (HSMI) respectively. Two unidentified species of bacteria

This FHI Case Information was summarized in a Scottish Salmon Watch report - "Hard Evidence: Fast-Tracking Disease-Ridden Scottish Salmon" - published in May 2018. The report also included:

PRV (Piscine Reovirus) - which is linked to Heart & Skeletal Muscle Inflammation (HSMI) - has attracted significant media attention in Canada following the discovery in both wild and farmed salmon.

"The disease Heart and Skeletal Muscle Inflammation (HSMI) is causing substantial economic losses to the Norwegian salmon farming industry where the causative agent, piscine orthoreovirus (PRV), is reportedly spreading from farmed to wild Atlantic salmon (Salmo salar) with as yet undetermined impacts," reported a scientific paper published by PLOS in December 2017. "These results suggest that PRV transfer is occurring from farmed Atlantic salmon to wild Pacific salmon, that infection in farmed salmon may be influencing infection rates in wild salmon, and that this may pose a risk of reduced fitness in wild salmon impacting their survival and reproduction."

PRV has affected salmon farms in Norway, Chile, Ireland, Canada, United States and Scotland.

Read more via:
"Piscine Reovirus (PRV): An Underestimated Pathogen in the Scottish Salmon Industry?"
"The effect of exposure to farmed salmon on piscine orthoreovirus infection and fitness in wild Pacific salmon in British Columbia, Canada"
"Piscine Orthoreovirus (PRV) and Heart and Skeletal Muscle Inflammation (HSMI)"
"A novel Totivirus and Piscine Reovirus (PRV) in Atlantic Salmon (Salmo salar) with Cardiomyopathy Syndrome (CMS)"
"First description of clinical presentation of piscine orthoreovirus (PRV) infections in salmonid aquaculture in Chile and identification of a second genotype (Genotype II) of PRV"
"An outbreak of disease resembling Heart and Skeletal Muscle Inflammation in Scottish farmed salmon, Salmo salar L., with observations on myocardial regeneration"
"Piscine orthoreovirus (PRV) infects Atlantic salmon erythrocytes"
"Piscine reovirus (PRV) in wild Atlantic salmon, Salmo salar L., and sea-trout, Salmo trutta L., in Norway"

The Fish Site reported in 2015:

Scottish Ministers should be aware of reports of PRV in infected eggs imported from Iceland to the United States. Salmon Business reported in December 2018:

"What about PRV in eggs?"

"That's a good question and we have been arguing about true vertical transfer we think when it's inside the egg – not necessarily in the genome but at least inside the egg and more like the contamination problem carrying the virus with a shipment – not necessarily within the fish at all but the materials in the packaging might get contaminated – this is maybe a very prevalent virus. And we need to state that it has been infected before shipping that's also very difficult," Dale says and adds:

"We should be careful – you need a real good sequence data on that whole genome and need to have enough to compare with – and probably they don’t have either. To unravel where a virus comes from is a major job to do."

This followed a news report in The Seattle Times:
Fish farmer destroys 800,000 juvenile Atlantic salmon due to disease; second purge in past year

The Washington Department of Fish and Wildlife considers the exotic strain of PRV to be an unacceptable risk to native stocks of Pacific salmon. Under the conditions of its permit, Cooke Aquaculture Pacific was required to destroy the fish.

By Lynda V. Mapes  
Seattle Times environment reporter

For the second time, Cooke Aquaculture Pacific has destroyed 800,000 juvenile Atlantic salmon after testing required by the Washington Department of Fish and Wildlife (WDFW) determined the fish were infected with an exotic strain of Piscine Orthoreovirus (PRV).

The strain is essentially the same strain of virus found at the Iceland hatchery from which Cooke receives Atlantic salmon eggs.

Cooke had a similar problem last May. Tests on the most current batch recently came back, said Amy Windrope, Region 4 director for WDFW. Two of Cooke’s last three batches of Atlantic salmon in the past year have tested positive for PRV, Windrope said. The third was clean.

Salmon Business reported on 20 December 2018:
Egg supplier responds to Washington PRV salmon cull

By Owen Evans - 20 December 2018

Benchmark Genetics, which supplies eggs to Cooke Aquaculture Pacific, has responded to reports a US salmon cull was due to an "exotic" strain of Piscine Orthoreovirus (PRV).

As reported on SalmonBusiness yesterday, the salmon farmer Cooke Aquaculture Pacific had to cull 800,000 fish.

The Icelandic company StofnFiskur – a subsidiary of Benchmark Genetics – supplied the eggs to Cooke.

Divisional marketing director Birgitte Sarheim wrote in an email to SalmonBusiness that: "PRV is not a classified disease but a virus commonly found in Atlantic salmon. Fish that carry the virus are not sick but can, under certain circumstances (weak health status/gill status and other factors) develop heart and skeletal muscle inflammation and will then be diagnosed as sick. This was not the case with the juveniles that had to be destroyed in the US. These fish were healthy but were required to be destroyed by the WDFW."

Cooke's hatchery near Rochester tested positive for a form of the fish PRV piscine orthoreovirus virus that the WDFW (The Washington Department of Fish and Wildlife) classifies it as "exotic."

Sarheim added that "the total number of fish destroyed was 800,000. PRV was detected by routine sampling in April, and the entire batch of fish was required to be culled."

"The PRV at Cooke may have originated from the ova delivered from Iceland. We have, however, an optional service of screening against PRV that our customers may choose as an extra risk measure to avoid vertical transmission."

"PRV is found in both farmed and wild salmon and is not described as exotic in Europe. The virus is also not listed by OIE or European authorities," she wrote.

The Seattle Times reported in May 2018:

Washington state finds virus in Cooke Atlantic salmon, plans expanded testing

By Lynda V. Mapes

Washington state tested smolt in a Cooke Aquaculture incubator and found the Atlantic salmon had a strain of Icelandic virus. The state denied permission for the company to move the 800,000 fish to an open-water net pen.

After identifying an exotic virus in fish raised by Cooke Aquaculture, Washington state is planning to test at other sites where the pathogen from Atlantic salmon may have been spread.

The virus detected in Cooke’s fish is a strain of piscine orthoreovirus (PRV) from the northern Atlantic. Cooke hatched the fish from eggs the company imported from its supplier in Iceland. Those eggs are presumed to be the source of the virus, Warheit said.
In 2018, Wild Fish Conservancy and a coalition of other members of the Our Sound, Our Salmon coalition wrote to the Washington Department of Fish and Wildlife regarding the testing of salmon smolts:

Dear WDFW Acting Director Joe Stohr,

We, as members and partners of a coalition of businesses, organizations, commercial and recreational fishermen, and individuals under the name of Our Sound, Our Salmon, write to respectfully urge the Washington Department of Fish and Wildlife (WDFW) to reconsider the means by which farmed Atlantic salmon and ready-to-transport Atlantic salmon smolts in Washington state hatcheries are to be tested for Piscine Reovirus (PRV).

In the aftermath of the Cypress Island escape last August, PRV was found in every fish that was tested for the virus. Even more shocking were the results of the genetic sequencing, which revealed the origin of the virus to be sub-genotype 1a, or of Norwegian origin, and clustered tightly with a PRV-isolate from Iceland.

This is the first time the Icelandic PRV-isolate has been found in Pacific waters, but it raises a critical question— if the eggs used in Cooke Aquaculture’s Atlantic salmon hatchery in Rochester, WA come from Norwegian-born fish raised in Iceland, has the industry been allowed to import PRV-infected eggs and consequently plant infected fish into Washington’s public waters?

According to data disclosed via FOI by the Scottish Government in September 2018, Scottish salmon farmers imported at least 16.5 million salmon eggs from Stofnúskur in Iceland between January 2017 and July 2018 (information relating to Scottish Sea Farms was redacted leading to an appeal to the Scottish Information Commissioner in March 2019).
Between January 2017 and March 2018, The Scottish Salmon Company imported 10.3 million ova from Iceland and Norway (including *ISA*-infected *AquaGen* and *PRV*-infected *Stofnífiskur*):

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<td>918,750</td>
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<td>01/02/2018</td>
<td>Tullich Hatchery</td>
<td>The Scottish Salmon Company</td>
<td></td>
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<td>Salmobread</td>
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</table>

Between January 2017 and February 2018, Cooke Aquaculture imported 7.6 million ova from Iceland, Ireland and Norway (including *ISA*-infected *AquaGen* and *PRV*-infected *Stofnífiskur*):

<table>
<thead>
<tr>
<th>Date</th>
<th>Site of destination</th>
<th>Operator</th>
<th>Consignee on certificate (if different from operator)</th>
<th>Number</th>
<th>Source Country</th>
<th>Source Company</th>
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<tr>
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<td>Norway</td>
<td>AquaGen AS</td>
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<td>Cooke Aquaculture Freshwater</td>
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<td>Marine Harvest Ireland</td>
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<tr>
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<td>Norway</td>
<td>AquaGen AS</td>
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<tr>
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<td>Furnace Hatchery</td>
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<td></td>
<td>1,000,000</td>
<td>Iceland</td>
<td>Stofnífiskur</td>
</tr>
<tr>
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<td>Lakeland (Caismidow) Ltd</td>
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<tr>
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<td></td>
<td>350,000</td>
<td>Norway</td>
<td>Marine Harvest Norway</td>
</tr>
</tbody>
</table>

How many salmon eggs imported into Scotland were tested for PRV and other viruses, pathogens and infectious diseases such as ISA?
From: Don Staniford [mailto:salmonfarmingkills@gmail.com]
Sent: 24 March 2019 07:22
To: 'ceu@scotland.gsi.gov.uk'
Cc: 'Neil.Purvis@gov.scot'; 'Helen.McGregor@gov.scot'
Subject: FOI re. PRV/HSMI testing, sampling & data since 1 January 2018

Please provide information on Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI) since 1 January 2018.

Please include data on sampling and testing for Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI) in farmed salmon, seawater and processing plant effluent (and any other sampling and testing).

Please specify how many samples of farmed salmon and water samples have been tested for Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI).

Please include any photos, emails, letters, copies of scientific papers and other information to and from the Marine Laboratory, salmon farming companies, veterinarians (e.g. Fish Vet Group), other Governments and other parties in relation to Piscine Reovirus (PRV) and Heart & Skeletal Muscle Inflammation (HSMI).

As context, please find enclosed below five cases where Piscine Reovirus (PRV) and/or Heart & Skeletal Muscle Inflammation (HSMI) were cited in the Scottish Government's 2018 FHI Case Information (it seems that PRV was tested for in Case # 2018-0078 - The Scottish Salmon Company at Tarbert South - but may not have been tested for in all other cases):

1) October to December 2018: Cases 20180392-20180509 (PDF online here)

Scottish Sea Farms at Nevis C
Additional Case Information:

FHI notified of mortality on site post H2O2 treatment. There had been a drop in feed activity and gill scores between 2-3 so decision was made to carry out H2O2 treatment.

Site mortalities for weeks 35 - 39 averaged 0.37 for whole site per week. Pens 4, 9, 10, 11 & 12 treated on 05/10/2018. Pens 2, 6 & 8 treated on 06/10/2018. Pen 1 treated on 10/10/2018 and remaining 2 pens (3 & 5) treated on 11/10/2018.

Mortalities for each pen from 05/10 - 11/10/2018 as follows:
1 - 1375, 2 - 102, 3 - 96, 4 - 56, 5 - 38, 6 - 14,862, 8 - 12,713, 9 - 18,520, 10 - 1675, 11 - 8081, 12 - 1139.

Site confused why only certain pens showed such a jump in mortalities post treatment while others didn’t. Fish on site appeared in good health and feeding well on inspection. A few fish appeared slightly lethargic in pen 1 but had just been treated 24 hrs earlier. No external damage and no internal signs of disease. Gills on fish 1 slightly pale. Sea lice levels at 0.03/fish of all stages.

Histos samples taken on 27/09/2018 by FVG. Report noted variable gill disease ranging from mild to severe, suggesting previous AGD. Heart disease of an inflammatory nature from fish from pen 1. Low grade HSMI possible. PCR samples collected 10/10/2018 by FVG.

2 batches of H2O2 used on 05/10/2018. Company having it checked for any potential issues.

Recent (last 4 wks) disease problems? [ ] Y
If yes, detail: [ ] AGD/gill issues present.

Mortality Records
1. Mortality records available for inspection? [ ] Y
If other detail [ ]
2. How are mortalities disposed of? [ ] Y
If other detail [ ] Incinerated - on site
3. Mortality records complete and correctly entered? [ ] Y
4. Recent mortality (last 4 wks): [ ]
   Weeks 38 - 41: 0.06%, 0.31%, 10.45%, 11.14%
5. Evidence of recent increased atypical mortalities? [ ] Y
If yes, facility ncs/no mortality per facility/no stock per facility/reason [ ]
   Pens B (14,892), 8 (12,713), 9 (18,520) & 11 (8,081) post H2O2 treatment 05/10 - 11/10/2018
6. Any other peaks in mortality during period checked? [ ] N
If yes, detail [ ]
7. Have increased (unexplained) mortalities been reported to vet or FHI? [ ] Y
If yes, detail action: [ ] FHI notified, site inspected
8. Have ‘mortality events’ been reported to FHI? If no, add MRT1 case and enter on mortality events sheet [ ] Y
<table>
<thead>
<tr>
<th>Results Summary</th>
<th>Freq.</th>
<th>Database</th>
<th>Insp</th>
<th>Phone</th>
<th>Insp</th>
<th>Writing</th>
<th>Insp</th>
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<td>0/1</td>
<td>13/10/2018</td>
<td>WJM</td>
<td>22/10/2018</td>
<td>ALW</td>
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<td>WJM</td>
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<td>02/11/2018</td>
<td>WJM</td>
<td>SAE</td>
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<td>ALW</td>
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<td>WJM</td>
<td>SAE</td>
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<tr>
<td>AGD QPCR</td>
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<td>22/10/2018</td>
<td>ALW</td>
<td>02/11/2018</td>
<td>WJM</td>
<td>SAE</td>
</tr>
<tr>
<td>P. theridion QPCR</td>
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<td>22/10/2018</td>
<td>ALW</td>
<td>22/10/2018</td>
<td>ALW</td>
<td>02/11/2018</td>
<td>WJM</td>
<td>SAE</td>
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<tr>
<td>Salmon gill pox QPCR</td>
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<td>Complex gill disease histo</td>
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<td>AGD histo</td>
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<td>SAE</td>
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<td>ALW</td>
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<td>WJM</td>
<td>02/11/2018</td>
<td>WJM</td>
<td>SAE</td>
</tr>
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</table>
FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO. F80125
SITE NO. FS0548
INSPECTOR Warren Murray

DATE OF VISIT 11/10/2018
SITE NAME Novis C (Ardintigh)
CASE NO. 20180507

Section 1: Summary

The above site was inspected following a report from Scottish Sea Farms of a recent increase in mortalities. On inspection of the site, a small number of fish appeared lethargic. Two lethargic fish were removed for examination and subsequent diagnostic sampling.

Histopathology examination revealed mild to moderate complex gill pathology with mild to moderate proliferative gill hyperplasia along with evidence of amoebic cells (the causative agent of amoebic gill disease) and samples tested positive for Paranucleospora thendidon (syn. Desmococcus lepeophtherii) by qPCR.

Due to the gill health issues reported on site, samples were screened for salmon gill poxvirus and Paranucleospora thendidon (syn. Desmococcus lepeophtherii). Samples tested positive for all two pathogens.

Pseudomonas fluorescens was isolated. The light growth would not suggest bacteria to be the primary source of morbidity.

Section 2: Case Detail

Observations

The site was stocked with 237,723 2018 S1 Atlantic salmon at an average weight of 1.04 kg. Mortality rate had jumped from 0.31% in week 39 to 10.45% in week 40. The increase in mortality occurred post treatment but was confined to only four of the pens treated. Samples had been taken prior to the event with gill disease being confirmed.

During the inspection a number of lethargic Atlantic salmon were observed. Two lethargic fish were removed from the pens for further examination and subsequent diagnostic sampling. The gills of fish 1 and 2 were pale.
Bacteriology: Kidney and gill material from fish 1 and 2 were inoculated onto appropriate media for the isolation of bacteria.

The following bacteria were isolated:

- *Pseudomonas fluorescens* (F1 gills)

Virology: Tissue samples were tested for segments of nucleic acid indicative of the presence of the pathogens specified below using real-time PCR (QPCR).

Salmon gill poxvirus (SGPV)

<table>
<thead>
<tr>
<th>Fish Number</th>
<th>Endogenous control Cp value</th>
<th>Cp Values</th>
<th>Reported Result (PCR)</th>
</tr>
</thead>
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<tr>
<td>F1</td>
<td>21.36</td>
<td>35.02</td>
<td>34.47</td>
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<tr>
<td>F2</td>
<td>22.14</td>
<td>28.83</td>
<td>28.89</td>
</tr>
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</table>

The samples tested negative for infectious haematopoietic necrosis virus (HNV), infectious pancreatic necrosis virus (iPNV), infectious salmon anaemia virus (iSAV), salmonid alphavirus (SAV) and viral haemorrhagic septicemia virus (VHSV).

Parasitology: Tissue samples were tested for segments of nucleic acid indicative of the presence of the parasites specified below using real-time PCR (QPCR).

*Neoparamoeba perurans* (AGO)

<table>
<thead>
<tr>
<th>Fish Number</th>
<th>Endogenous control Cp value</th>
<th>Cp Values</th>
<th>Reported Result (PCR)</th>
</tr>
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<tr>
<td>F1</td>
<td>21.36</td>
<td>35.26</td>
<td>35.34</td>
</tr>
<tr>
<td>F2</td>
<td>22.14</td>
<td>30.29</td>
<td>30.16</td>
</tr>
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</table>

*Peranucleospora theridion* (syn. Desmozoon lepeophtherii)

2) **July to September 2018: Cases 20180276-20180338 (PDF online here)**
Scottish Sea Farms at Lismore North

**Additional Case Information:**

Cleaner fish on site; Bateen wrasse from Otterferry and Machirthanish. Vaccination ridgeway biological

Morts generally incinerated on site but recent increase in morts has required collection by Billy Bowie for disposal.

Peak in morts; 5/9/18 - 1421 morts for day/site - wb/3/9/18 - 6904 morts/week - 3.08%

Cages 10, 12 and 14 worst affected by morts and loss of apatite. Over summer morts for site had been about 200/site/week. Increased; 3/9/18; 739, 4/9; 882, 5/9; 1421, 6/9; 1341, 7/9; 1267, 8/9; 1047, 9/9; 946 10/9; 1047

Gill scores have been high but are improving - increase thought to be in part due to net cleaning. Currently scores are 1 or 2. vet report AGD, Branchinomies, Peranucleospora theridion, salmon gill pox, complex gill pathology

mortalita toxinemia - report 4/9/18 Piscine reovirus (HSMI) in report 4/9/18 - CMS negative - SAV negative - IFN negative; results from MS via fish vet group.

SLICE for caligus, finished 2 days ago. 31/8-9/9. 500 degree day withdrawal

Previous crop had issues with lice. This crop wrasse on site. 4 slice treatments since input and lice skirts. Getting more wrasse from Machirthanish this month. Lice levels current 1.4 adult female. Just treated with slice. Caligus 1.83 average. 10/9/19.
3) April - June 2018: Cases 20180166-20180240 (PDF online here - p60)

The Scottish Salmon Company at Ardcastle Bay

Additional Case Information:

Site stocked September 2017 from Russel Burn. Mortalities staying below 0.05%/week for whole site. Slight increase in mortalities during weeks 13 & 14 2018, this was down to increased seal activity. Extra anti-predator measures deployed and numbers quickly reduced. Sea lice levels have been below CoGP criteria since input. Lumpfish to be put onto site June 2018.

Recent veterinary reports suggest signs of pancreas disease and pcr results positive for piscine reovirus but no increase in mortalities. Fish sampled for VMD looked healthy.

4) April - June 2018: Cases 20180166-20180240 (PDF online here)
Loch Duart at Lochmaddy:

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<th>Case No:</th>
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<th>Date of visit:</th>
<th>06/06/2018</th>
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<td>4 hours</td>
<td>Main Inspector:</td>
<td>JET</td>
</tr>
<tr>
<td>Site No:</td>
<td>FS0853</td>
<td>Site Name:</td>
<td>Lochmaddy</td>
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<tr>
<td>Business No:</td>
<td>FB0398</td>
<td>Business Name:</td>
<td>Loch Duart Ltd</td>
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<td>Case Types:</td>
<td>1 REP</td>
<td>2 DIA</td>
<td>3 4 5 6</td>
</tr>
<tr>
<td>Water Temp (°C):</td>
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<td>Thermometer No:</td>
<td>T147</td>
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<tr>
<td>FHI 045 completed</td>
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</table>

Observations:

- Dead/weak/abnormally behaving fish present?: Y
- Clinical signs of disease observed?: Y
- Gross pathology observed?: Y
- Diagnostic samples taken?: Y

Additional Case Information:

Locally caught wild wrasse on site
No movements on or off site since last inspection.
Fish graded 31/05 and 01/06. No increased mortality following grade.
During inspection a number of lethargic fish were observed, 5 fish were removed for diagnostic sampling.
Fish sampled for VMD appeared healthy.

Recent (last 4 wks) disease problems?: Y
If yes, detail: PD (SAV 4) - first confirmed on site February 2018

Mortality Records

1. Mortality records available for inspection?: Y
2. How are mortalities disposed of?: White shore cockles
   Other (detail): 
3. Mortality records complete and correctly entered?: Y
4. Recent mortality (last 4 wks): w/b 07/05 - 6/07 (1.76%), w/b 14/05 - 26/06 (0.58%), w/b 21/05 - 36/06 (1.09%), w/b 28/05 - 9/06 (0.32%)
5. Evidence of recent increased/atypical mortalities?: Y
If yes, facility nos/no mortality per facility/no stock per facility/reason: 
See above details. PD thought to be main cause of increased mortality
6. Any other peaks in mortality during period checked?: N
If yes, detail: 
7. Have increased (unexplained) mortalities been reported to vet or FHI?: Y
If yes, detail action: FVG visited site and took samples
8. Have 'mortality events' been reported to FHI? If no, add MRT case and enter on mortality events sheet: Y
5) January to March 2018: Cases 20180064-20180100 (PDF online here - p98-117)

The Scottish Salmon Company at Tarbert South

Additional Case Information:

Harvesting strategy - live haul to Ardyne harvest station, then dead haul to Cairndow processing plant. Adult female sea lice numbers below suggested criteria for treatment throughout this production cycle, prephylactic slice treatments carried out 04/12/2017 and 05/02/2018.

Input of wild caught wrasse due in April 2018.

Several moribund fish with lesions on flank observed during inspection of cages. 5 fish removed and diagnostic samples taken. Fish sampled for VMD appeared healthy.

Additional comments:

F3 - anterior ventral lesion through which the heart was exposed. F4 – Heart was not identified within cavity, no heart sample taken. Enlarged gall bladder observed underneath liver, see attached photos.
F1-3. F3 had anterior ventral lesion through which the heart was exposed.

Read more via "EXPOSED: Gruesome Photos of Deformed & Diseased Scottish Salmon"
**FISH HEALTH INSPECTORATE VISIT REPORT**

**SUMMARY FOR INFORMATION OF SITE OPERATOR**

**BUSINESS NO** FB0169  **DATE OF VISIT** 21/03/2018  
**SITE NO** FS0767  **SITE NAME** Tarbert South  
**INSPECTOR** Joe Triscott  **CASE NO** 20180078

**Section 1: Summary**

During a routine inspection of the above site, several moribund fish were observed. Five fish were removed for further examination and subsequent diagnostic sampling.

Histopathology examination revealed dermatitis, ulcers, marked presence of bacteria and skeletal muscle haemorrhagic necrosis (likely associated with *Moritella* sp.). *Moritella viscosa* was isolated by bacteriology testing from kidney and gill material of 5/5 fish and lesions material of 3/4 fish. *Moritella viscosa* is a known fish pathogen and the level and purity of growth, along with the histopathology observations would suggest that it is implicated in fish morbidity.

Fish 5 also showed marked myocarditis and red skeletal myositis resembling heart and skeletal muscle inflammation (HSMI) and the presence of the causative agent, piscine reovirus (PRV), was confirmed by real-time PCR (GPCR). Mild hepatic degeneration and necrosis also noted. Fish were generally poor doing.
Section 2: Case Detail

Observations

During a routine inspection, several lethargic and moribund fish were observed across all stocked cages. The majority of these fish also had visible lesions. Five moribund fish were removed for further examination and subsequent diagnostic sampling.

There had been no recent significant or unexplained mortality recorded at the site, inspection of the site mortality records showed 0.2% mortality for the previous four weeks. Those mortalities had been attributed to poor doing fish.

Marine Laboratory, 275 Victoria Road, Aberdeen, AB11 9OB
Tel – 0131 244 2498  Fax – 01224 295620  Email – marinehealth@gov.scot
Website - www.gov.scot/Topics/marine/science

External examination of the fish showed lesions on the flanks of fish 1, 3 and 4. Fish 3 also had a lesion on the ventral surface through which the heart was exposed. Fish 5 had a lesion on the head. The eyes of fish 2 were exophthalmic.

Internal examination showed clear ascites present in fish 1. Petechial haemorrhaging of the liver was observed in fish 2 and 4. Moderate liver tissue breakdown was apparent in fish 3 and 4. The kidney tissue of fish 2 and 5 appeared slightly liquefied. The gall bladder of fish 4 was enlarged.

Results

Bacteriology: Kidney and gill material from fish 1-5 and lesion material from fish 1, 3, 4 and 5 were inoculated onto appropriate media for the isolation of bacteria.

The following bacteria were isolated:

*Montella viscosa* (gill and kidney of fish 1-5, lesion of fish 3-5)

*Vibrio sp.* (gill of fish 1 and 2, kidney of fish 1-3, lesion of fish 1 and 4)

From the tests conducted, we do not have evidence of resistance to amoxicillin, oxytetracycline, cotrimoxazole or florenicol for *Montella viscosa*.

Virology: Tissue samples were tested for segments of nucleic acid indicative of the presence of the pathogens specified below using real-time PCR (QPCR).

Piscine reovirus (PRV)

<table>
<thead>
<tr>
<th>Pool Number</th>
<th>Endogenous control Cp value</th>
<th>Cp Values</th>
<th>Reported Result (PCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>18.18</td>
<td>26.13</td>
<td>25.93</td>
</tr>
</tbody>
</table>
Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from fish 1-5. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination revealed the following:

**Gill:** Some lamellar congestion and lamellar epithelial hypertrophy (F1 and F4), mild to moderate, focal to diffuse presence of aneurysmal dilation/teleangectasia (F1-F5) and generalized epithelial lining (likely post mortem artefact).

**Skin & Muscle:** Partial to absence of epidermal and dermal layer (F1, F3-F5), mild dermal oedema with mild leucocyte infiltration and presence of mixed bacteria that stained gram negative (F1, F3-F5), haemorrhagic necrosis of skeletal muscle (F1, F3-F5). F5 also showed marked red skeletal muscle degeneration and infiltration of inflammatory cells (myositis).

**Heart:** Moderate pericarditis (F5) and marked myocardial degeneration and cell infiltration of the compact and spongy layer of ventricle (F5).

**Gut and pyloric caeca:** Adipose tissue showed fibrous adhesions likely associated with vaccine administration (F1-F5), mild to moderate cell sloughing (F1-F5) (likely post mortem artefact).

**Pancreas:** Fibrous adhesions associated with peripancreatic tissue (likely vaccine administration).

**Liver:** Mild to moderate multifocal sinusoidal congestion (F2, F4 and F5) surrounded by some melanin deposits (F2), one small foci of hepatocyte necrosis (F4) and marked presence of hepatic apoptotic cells and pyknotic nuclei noted in F5.

**Kidney:** Slight increase of melanomacrophages aggregates (MMA) (F1), few renal tubules with dilated lumen and few shrunken glomeruli (F1).

**Spleen:** Slightly congested (F1, F3 and F5).

Signed: [Redacted] Date: 12/04/2016

Please consider this a request for information under the relevant Freedom of Information and Environmental Information Regulations including both the Freedom of Information (Scotland) Act 2002 and the Environmental Information (Scotland) Regulations 2004 (as well as any other new or other regulations which may be appropriate).

Please provide this information electronically via email.

Please acknowledge receipt of this FOI request.

Many thanks and I look forward to a response shortly.

Best fishes,

Don

Don Staniford
Director, Scottish Salmon Watch: [https://scottishsalmonwatch.org/](https://scottishsalmonwatch.org/)

Scottish Scamon: [https://scottishscamon.co.uk/](https://scottishscamon.co.uk/)

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