

[Scottish Salmon Watch, 27 June 2018](#)

HARD EVIDENCE

- PHOTOS OF DISEASED & DEFORMED SCOTTISH SALMON

Photos [disclosed by the Scottish Government via FOI \(FOI-18-01141\)](#) on 15 June 2018 -
[made available by the Scottish Government online via Dropbox](#)

Fol-18-01141

Sorted by name



2015-0336-photos.pdf



2015-0373-photos.pdf



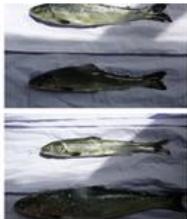
2016-0141-photos.pdf



2016-0187-photos.pdf



2016-0202-photos.pdf



2016-0231-photos.pdf



2016-0245-photos.pdf



2016-0441-photos.pdf



2016-0449-photos.pdf



2016-0450-photos.pdf



2017-0028-photos.pdf



2017-0064-photos.pdf



2017-0183-photos.pdf



2017-0184-photos.pdf



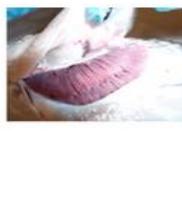
2017-0185-photos.pdf



2017-0188-photos.pdf



2017-0398-photos.pdf



2017-0431-photos.pdf



2017-0444-photos.pdf



2017-0467-photos.pdf



2017-0469-photos.pdf



2017-0496-photos.pdf



2017-0533-photos.pdf



2017-0546-photos.pdf



2017-0550-photos.pdf



2017-0563-photos.pdf



2018-0078-photos.pdf



2018-0111-photos.pdf



2018-0112-photos.pdf



2018-0113-photos.pdf

Note the photos can be cross-referenced with the [Fish Health Inspectorate's 'Case Information'](#) which provides more context:

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Publication of Case Information

Information relating to the inspection and operational activities of Marine Scotland's Fish Health Inspectorate is published on a regular basis. For each yearly quarter the following information is published:

- A list of all cases conducted.
- A summary of case inspections and outcomes per region.
- A list of all enhanced inspections conducted under the Aquaculture and Fisheries (Scotland) Act 2007.
- Individual case information, with each case referenced in the list of all cases conducted.

In addition to quarterly publications, the following reports are published annually.

- Annual summary of case inspections and outcomes per region.
- Annual report of operations and activities.

Please note that information relating to cases which have not been completed will only be published following completion. There may be some situations where completed cases will not be published. Where this is the case this will be detailed within the list of cases conducted.

- [2013](#)
- [2014](#)
- [2015](#)
- [2016](#)
- [2017](#)

A [letter from the Scottish Government dated 15 June 2018](#) included:

Response to your request

Please find the attached web links containing photographs which have been taken as part of the Fish Health Inspectorate's statutory inspection programme. The photographs are grouped according to their case number which is a unique number identifying any one particular FHI visit.

It is essential that these images are viewed in line with the following context:

The images should be viewed in line with the case inspection notes – available at <http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/CaseInformation> which provide additional context to the population of fish stocked on site at the point of inspection, as well as the findings and observations from the inspection and sampling undertaken. The case inspection notes for cases 20180078; 20180111; 20180112; and 20180113 are complete but are still awaiting publication which will take place in July 2018.

The Fish Health Inspectorate's (FHI) mission is to support the Scottish Government's vision of a sustainable, growing and diverse aquaculture industry whilst maintaining the high health status of farmed and wild fish and shellfish stocks in Scotland by preventing the introduction and spread of listed and emerging diseases. The FHI do this by undertaking statutory inspection and sampling programmes, providing advice to stakeholders and implementing regulatory functions in accordance with the current aquaculture and aquatic animal health regulations.

The attached images have been identified as within scope of this request. The majority show fish which have been removed and euthanised for post mortem analysis and investigative testing by the FHI.

Photographs are taken as they are a useful tool in the analytical process and it is important to view these photographs in context. The photographs attached have been taken as part of the Fish Health Inspectorate's risk based surveillance programme, which involved 160 inspections relating to fish farms in 2017.

In the wild, the reproductive strategy of fish, particularly salmon, is to produce a large number of offspring with the aim that a proportion will survive to adulthood. Fish are subject to a number of pressures in the environment, particularly naturally present pathogens and other environmental parameters, with farmed fish being no exception. It can therefore be expected that some fish will experience challenges to good health. Those fish which have been removed by the FHI represent a very small proportion of the total number of fish on an aquaculture site (for example 5 fish from sites holding between 250,000 to 1.8 million fish). The images attached do not present any human health concerns and are not a representation of the entire fish population on site.

In many cases these actions have been undertaken in support of on-going investigations which were being conducted by the farm veterinarian and in-house animal health professionals.

The photographs can be accessed through the following weblink:

<https://www.dropbox.com/sh/slya8qyh11vevo9/AAANuzeWp-wPSjYvluloVPHNa?dl=0>

The photos - together with an identification of the site and the company - have also been made available online via:

- [#1 2015-0336 Marine Harvest - Ardmaddy \(Seil Sound\)](#)
- [#2 2015-0373 Marine Harvest - Ardmaddy \(Seil Sound\)](#)
- [#3 2016-0141 Marine Harvest - Ardintoul \(Loch Alsh\)](#)
- [#4 2016-0187 Marine Harvest - Gorsten \(Loch Linnhe\)](#)
- [#5 2016-0202 Marine Harvest - Torridon \(Loch Torridon\)](#)
- [#6 2016-0231 Marine Harvest - Maol Ban \(Inner Sound, Isle of Skye\)](#)
- [#7 2016-0245 Marine Harvest - Scotasay \(East Loch Tarbert, Isle of Harris\)](#)
- [#8 2016-0441 Marine Harvest - Seaforth \(Loch Seaforth, Isle of Harris\)](#)
- [#9 2016-0449 Marine Harvest - Raineach \(East Loch Tarbert, Isle of Harris\)](#)
- [#10 2016-0450 Marine Harvest - Scotasay \(East Loch Tarbert, Isle of Harris\)](#)
- [#11 2017-0028 Scottish Sea Farms - Kishorn B \(Loch Kishorn\)](#)
- [#12 2017-0064 Scottish Salmon Company - Inch Kenneth \(Loch Na Keal, Isle of Mull\)](#)
- [#13 2017-0183 Loch Duart - Badcall Bay \(Eddrachillis Bay\)](#)
- [#14 2017-0184 Grieg Seafood - Leinish \(Loch Dunvegan, Isle of Skye\)](#)
- [#15 2017-0185 Grieg Seafood - Gob na Hoe \(Loch Dunvegan, Isle of Skye\)](#)



- [#16 2017-0188 Loch Duart - Calva Bay \(Calbha Beag\) \(Eddrachillis Bay\)](#)
- [#17 2017-0398 Scottish Sea Farms - Kishorn West \(Loch Kishorn\)](#)
- [#18 2017-0431 Marine Harvest - Port Na Cro \(Shuna Sound\)](#)
- [#19 2017-0444 Marine Harvest - Sron \(Loch Alsh\)](#)
- [#20 2017-0467 Scottish Salmon Company - Vuiabeag \(West Loch Roag, Isle of Lewis\)](#)
- [#21 2017-0469 Marine Harvest - North Shore \(Loch Erisort, Isle of Lewis\)](#)
- [#22 2017-0496 Scottish Sea Farms - Kishorn A \(South\) \(Loch Kishorn\)](#)
- [#23 2017-0533 Cooke Aquaculture Stead of Aithness \(Aith Voe Shetland\)](#)
- [#24 2017-0546 Cooke Aquaculture - East of Holm Heogland \(Burkwell\) \(Uyea Sound, Shetland\)](#)
- [#25 2017-0550 Cooke Aquaculture - Winna Ness \(Uyea Sound Shetland\)](#)
- [#26 2017-0563 Scottish Salmon Company - Strone Point \(Loch Striven\)](#)
- [#27 2018-0078 Unknown - data available in July 2018](#)
- [#28 2018-0111 Marine Harvest - Groatay \(Sound of Harris\)](#)
- [#29 2018-0112 Marine Harvest - Grey Horse Channel \(Sound of Harris\)](#)
- [#30 2018-0113 Scottish Salmon Company - Meall Mhor \(Loch Fyne\)](#)

#1 (2015-0336) - Marine Harvest: Ardmaddy (Seil Sound)

Photos [online here](#)

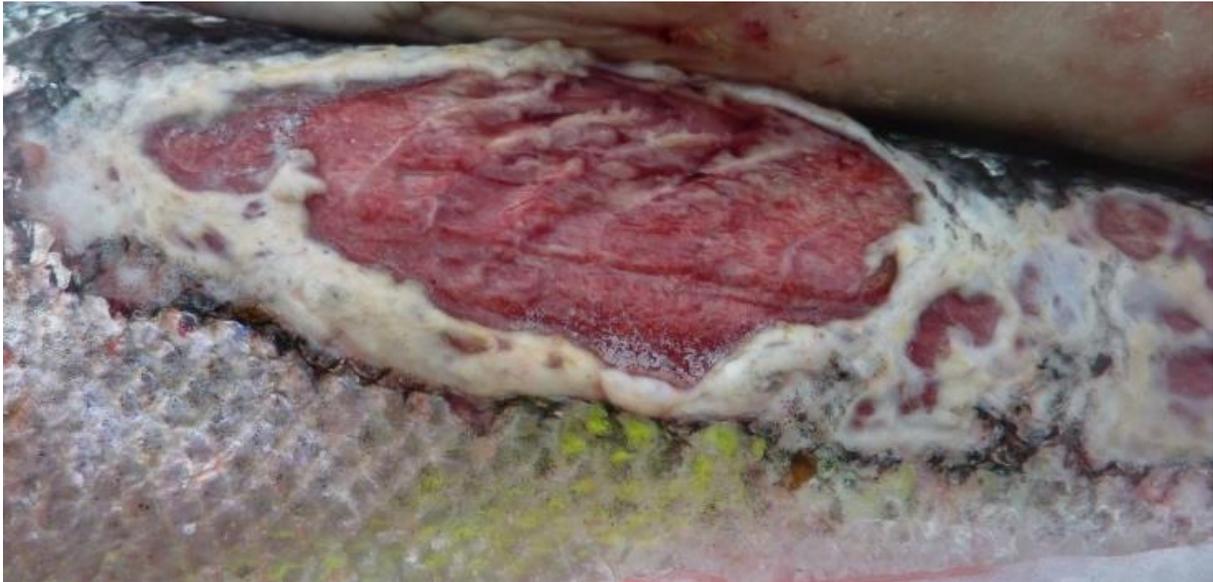
Case Information online via: <http://www.gov.scot/Resource/0050/00508596.pdf> (stand alone file)

[Photos include:](#)

2015-0336







Fish Health Inspectorate [Case Information](#) includes:

"Large numbers of lethargic fish with physical damage in each cage"

"Most recent health problems include lice, PD and physical damage"

Recent mortality (last 4 weeks) was described as: "50-5000/cage/day"

The final FHI visit report detailed "chronic or recovery phase pancreas disease (PD)" with a "positive PCR result for salmonid alpha virus (SAV)":

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FINAL FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	15/09/2015
SITE NO	FS0464	SITE NAME	Ardmaddy
INSPECTOR	Jeanna Sandilands & Sonia Duguid	CASE NO	20150336

Section 1: Summary

Five lethargic Atlantic salmon (*Salmo salar*) were sampled for diagnostic purposes. Histopathological analysis revealed skin pathology which was not associated with a bacterial infection and tissue changes indicative of chronic or recovery phase pancreas disease (PD). This was supported by a positive PCR result for salmonid alpha virus (SAV). The *Vibrio* spp. isolated are most likely to be secondary opportunistic infections as a result of the physical damage.

Observations included "a large number of fish were observed with lesions" with one fish described as "moribund and hanging vertical in the water column". Three fish were described with "extensive lesions across the flanks" and one fish "had a deformed heart":

Section 2: Case Detail

Observations

During an inspection of the above site, a large number of lethargic Atlantic salmon were observed in all cages across the site, five fish were taken for diagnostic investigation. At the time of the inspection the site was stocked with 764,821 Atlantic salmon of year class 2014 Q4 at ~2.2kg, 11200 wrasse (*Labridae* species) of mixed species and year class at ~35-50g and 24000 lumpstickers (*Cyclopterus lumpus*) of year class 2015 at ~10-40g. The site was experiencing increased mortality levels and pancreas disease had recently been diagnosed. A large number of fish were observed with lesions reportedly due to physical damage.

External: Fish 1,2,4 and 5 were lethargic, fish 3 was moribund and hanging vertical in the water column. Fish 1,3 and 4 had extensive lesions across the flanks.

Internal: Fish 1 had slight petechial haemorrhaging in the liver and fish 3 had a deformed heart. Pseudo-faeces were observed in the gut of fish 2 and fluid was observed in the swimbladder of fish 4. Adhesions were also observed in fish 2 and 4.

Histology revealed "some areas of epithelial hyperplasia with fusion" in the gills; "loss of epidermis, dermal oedema and loss of structure in red muscle, and widespread inflammation, mild degeneration and necrosis in white muscle"; "multifocal myocytic necrosis, endocardial cell proliferation, epicarditis and infiltration" in the heart and "limited acinar tissue with generalised fibrosis" in the pancreas:

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from five fish. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination revealed the following:

Gills: some areas of epithelial hyperplasia with fusion, some sloughing and few chronic aneurysms

Skin and skeletal muscle: loss of epidermis, dermal oedema and loss of structure in red muscle, and widespread inflammation, mild degeneration and necrosis in white muscle

Heart: multifocal myocytic necrosis, endocardial cell proliferation, epicarditis and infiltration

Pancreas: limited acinar tissue with generalised fibrosis

Liver: tissue within normal range

Kidney: diffuse necrosis with some capillary dilatation. Old adjuvant being resolved.

Spleen: within normal range

#2 (2015-0373) - Marine Harvest: Ardmaddy (Seil Sound)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0049/00493286.pdf> (p207 onwards)

[Photos include:](#)





F1 close up of lesion





F2 inflamed vent and yellow pseudo faeces



F3 close up of lesion



F3 deformed heart



F5 close up of lesion

Fish Health Inspectorate [Case Information](#) (p207 onwards) includes:

"All cages had moribund and lethargic fish with rubbed sides, which is thought to be caused by the strong tidal currents. The outer cages 10. 9. 8. 7 seemed worse than the inner cages."

"~30,000 morts over the last 3 weeks due to physical damage from the tides and then having treated. 20-3171 per cage. Morts done twice weekly. 3.77% mortality over the last 5 weeks."

"All cages have increased numbers due to physical damage caused by strong tidal currents on side. This combined with recent sealice treatments has cause a lot of mortalities. Cage 8 seems to be worst affected 9,288 morts for August."

"All fish had blood spotting on the ventral surface. Suspected Caligus damage. Low numbers of lice observed on all fish."

The final FHI visit report detailed "moribund fish with extensive physical damage were observed in all cages" with positive tests for salmonid alphavirus (SAV) the causative agent of pancreas disease in Atlantic salmon. "Secondary bacterial infections were observed in the kidney of *Vibrio* sp. and in the lesion of unidentified bacteria," stated the report.

"Histopathological examination suggests the bacterial infection of the lesions to be *Flavobacterium* sp. and changes associated with chronic pancreas disease."

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FINAL FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	02/09/2015
SITE NO	FS0464	SITE NAME	Ardmaddy
INSPECTOR	Svenja Elwenn	CASE NO	20150373

Section 1: Summary

At the time of inspection increased mortalities were being experienced on site and lethargic and moribund fish with extensive physical damage were observed in all cages. Five fish were removed for diagnostic sampling. The samples tested positive for salmonid alphavirus (SAV) the causative agent of pancreas disease in Atlantic salmon (*Salmo salar*). Sequencing of the SAV isolate determined it to be type I. Secondary bacterial infections were observed in the kidney of *Vibrio* sp. and in the lesions of unidentified bacteria. Histopathological examination suggests the bacterial infection of the lesions to be *Flavobacterium* sp. and changes associated with chronic pancreas disease.

Observations referenced "additional stress on the compromised fish" detailing "all cages had moribund and lethargic fish with large lesions predominantly on the flanks". One out of the five fish sampled was described as "anorexic" with a "deformed heart" reported in two fish.

Section 2: Case Detail

Observations

During a routine site inspection elevated mortalities attributed to physical damage from strong tidal currents on site were noted in all cages. Required sea lice treatments were adding additional stress on the compromised fish. Upon inspection all cages had moribund and lethargic fish with large lesions predominantly on the flanks. Five fish from three of the worst affected cages were removed for diagnostic sampling. All fish displayed moribund and lethargic behaviour and had a darkened body with light haemorrhaging on the ventral surface. All fish had lesions on the flank of varying sizes. The gills appeared to be compromised in all fish. F1, F4 and F5 had pale gills; F1-F3 had zoned gills and F3 had some necrotic gill tissue. F1 was also anorexic and the vent of F2 was inflamed. Internal examination revealed clear ascites in F1 and bloody ascites in F2-F3. The heart appeared deformed in F2-F3. Yellow pseudo-faeces were observed in F2-F4, while F5 had no food present in the gut. The kidney in F1-F2 and F5 appeared slightly grey and F1-F3 and F5 had a slightly granular kidney.

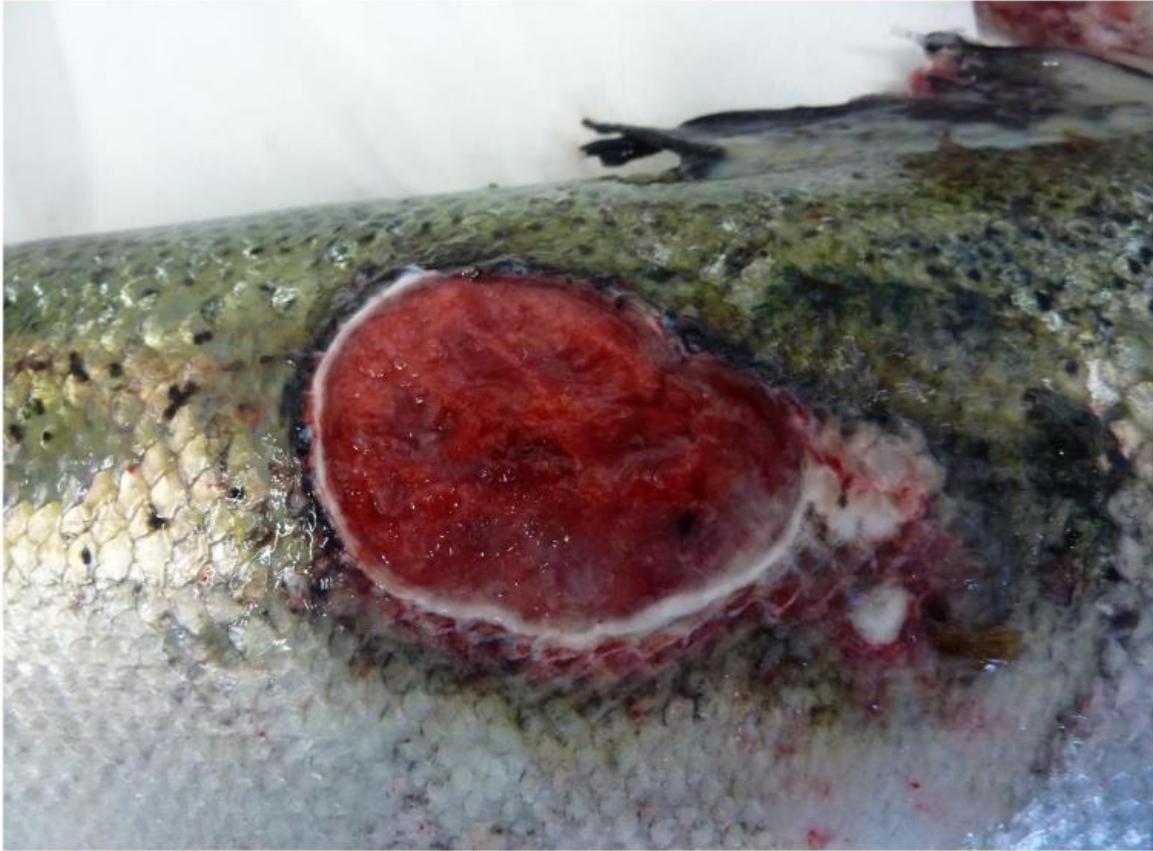
#3 (2016-0141) - Marine Harvest: Ardintoul (Loch Alsh)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0050/00508590.pdf> (p90 onwards)

Photos included:





Fish 6 lesion



Fish 6 – lice and skin loss on head

Fish Health Inspectorate [Case Information](#) (p90 onwards) included:

"A few moribund fish seen on site and 6 removed for sampling. All had high numbers of lice and two had lesions (see attached photos)."

"Total of 26,039 [mortalities] since 20 February. Mortality levels reducing to average of ~20-50 fish per pen every 3 days."

"Pen 1 - 5,956/35,744 (remaining today) Pen 4 - 8,476/37,401 (remaining today) Pen 7 - 3,712/25,601 (remaining today). Mainly due to PD."

"Fish 1 had physical damage to the tail and snout. Fish 2 had visible gill damage (white patches). Fish 4 had numerous lesions on the tail and tail very badly damaged. Fish 6 had a lesion on the flank and skin loss on the head. All fish had a lot of lice."

The final FHI visit report detailed a positive test for salmonid alphavirus (pool 2), the causative agent of PD with "evidence of heart pathology, skin lesions with bacterial infection". "Moritella viscosa was identified from the lesions and gills of two fish and a *Vibrio* species was identified from all fish," stated the report. *Moritella viscosa* [causes classic winter-ulcer disease in Atlantic salmon](#).



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FINAL FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	05/04/2016
SITE NO	FS0245	SITE NAME	Ardintoul
INSPECTOR	Andrea Warwick	CASE NO	20160141

Section 1: Summary

The site was inspected following a report of increased mortality levels attributed to pancreas disease (PD). Six moribund fish were removed for diagnostic sampling.

The PCR test was positive for salmonid alphavirus (pool 2), the causative agent of PD. There was evidence of heart pathology, skin lesions with bacterial infection and vaccine adjuvant reaction by histological examination. *Moritella viscosa* was identified from the lesions and gills of two fish and a *Vibrio* species was identified from all fish.

Histopathological examination revealed "a few scattered aneurysms and basal hyperplasia" and "lamellae fusion" in the gills; "haemorrhage in skeletal muscle"; "adhesions in all fish" and "pericarditis", "cell infiltration in the ventricle" and "some myofiber degeneratuin in the atrium" (heart).

Histopathological examination revealed the following:

Gill: Presence of few scattered aneurysms and basal hyperplasia. Fish 2 and 5 showed hyperplasia with lamellae fusion and some lamellae congestion.

Skin & Muscle: Absence of epidermis, thick dermis with oedema and presence of mixed bacteria, congested hypodermis, cell infiltration and haemorrhage in skeletal muscle (Fish 4 and 6).

Liver: Multifocal necrosis (Fish 1 and 4) with few apoptotic cells. Capillary dilation and minor vacuolation (Fish 3 and 6) and area of haemorrhage in Fish 6.

Kidney: Few tubules with dilated lumen (Fish 1, 4, 5 and 6)

Spleen: Congested in 3 fish (Fish 2, 3 and 4)

Gut and pyloric caeca: Adhesions in all fish and some cell sloughing noted in Fish 1, 3, 4 and 6.

Pancreas: Within the normal range.

Heart: Pericarditis noted in Fish 3 and 5. Fish 3 also showed presence of few trombi (ventricle) and eosinophilic granular cells in the bulbous. Fish 4 showed cell infiltration in the ventricle and trombi with some myofiber degeneration in the atrium noted in Fish 5.

#4 (2016-0187) - Marine Harvest: Gorsten (Loch Linnhe)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0050/00508591.pdf> (p32 onwards)

[Photos included:](#)



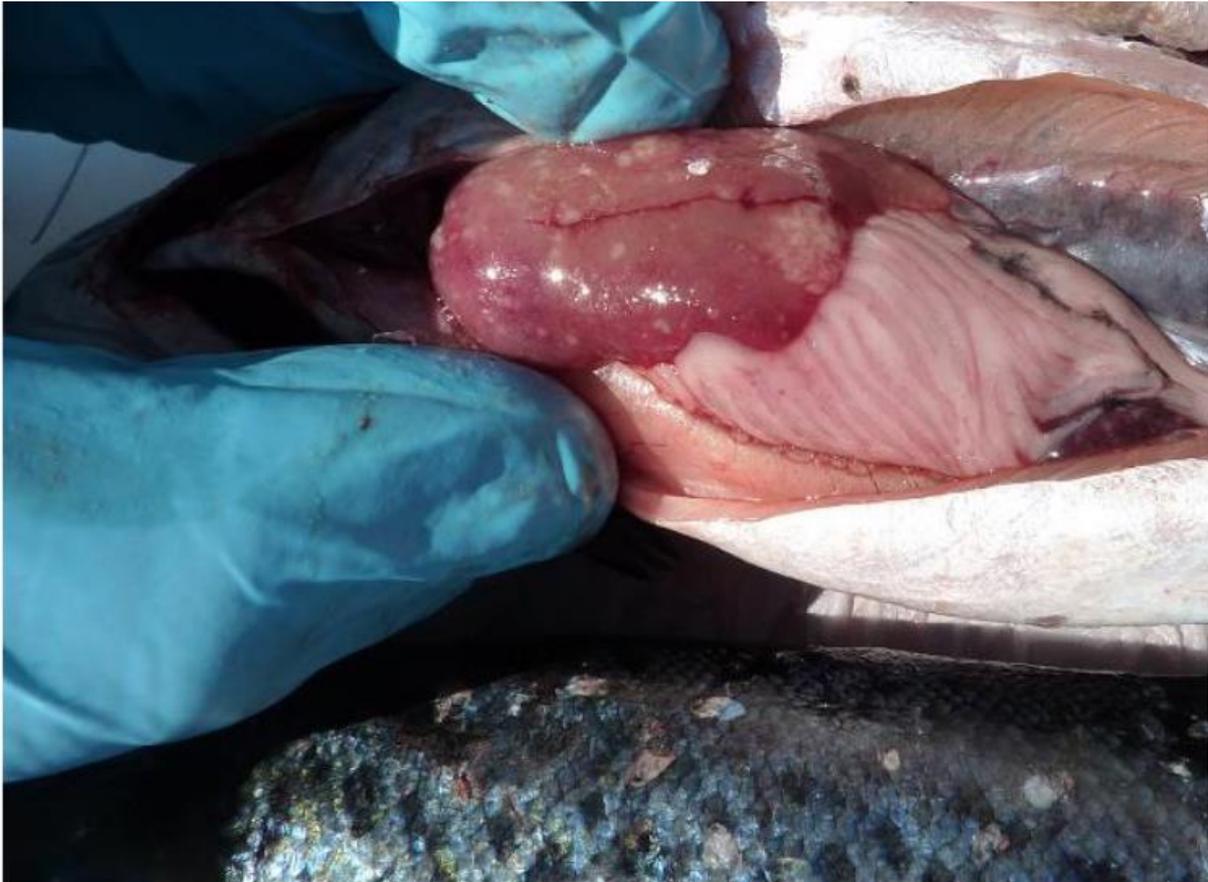


Photo 4: Fish 4

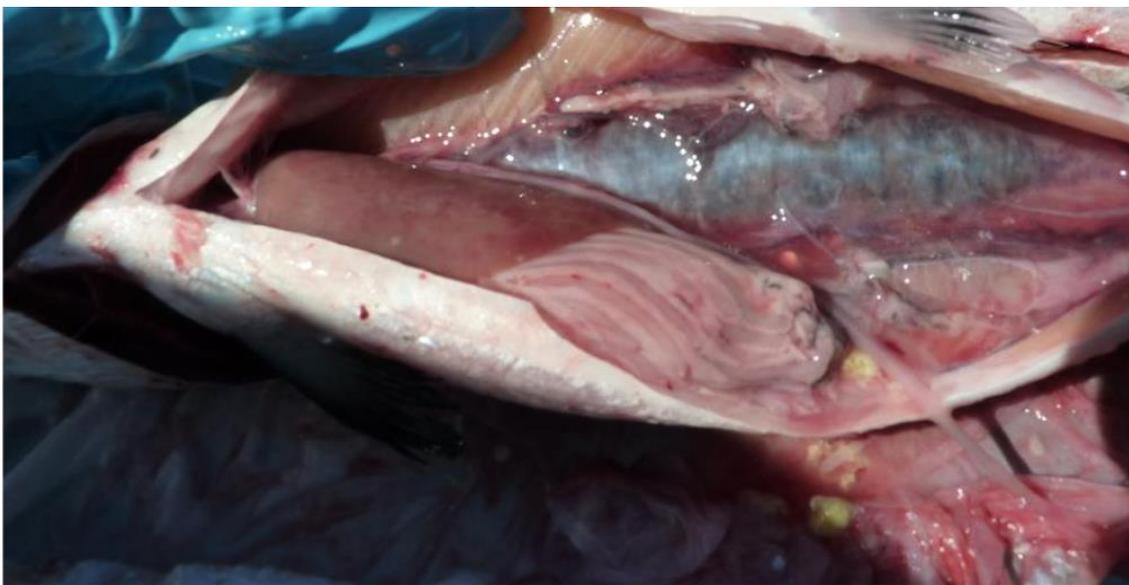


Photo 6: Fish 10

Fish Health Inspectorate [Case Information](#) (p32 onwards) included:

"Company biologist was on site earlier in the week and observed swollen, grey and granular kidneys. The senior biologist was on the site Friday (the day before the inspection) and confirmed the swollen kidneys and other signs of BKD. He called the FHI asap after

observations. About 20 moribund fish seen on the site during inspection by FHI. During necropsy 5 fish out of 10 had swollen, grey and granular kidneys (see photos)."

"Pseudo-membrane on the spleen of fish 1. Lesions on the PC of fish 2. All fish had loose scales."

The final FHI visit report "confirmed the presence of *Renibacterium salmoninarum*, the causative agent of BKD".



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FINAL FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	14/05/2016
SITE NO	FS0237	SITE NAME	Gorsten
INSPECTOR	Andy Mayes & David Bradley	CASE NO	20160187

Section 1: Summary

The site was inspected following reports of clinical signs and gross pathology associated with the presence of bacterial kidney disease (BKD). This was confirmed during inspection. Subsequent positive PCR results, as well as histological examination confirmed the presence of *Renibacterium salmoninarum*, the causative agent of BKD.

#5 (2016-0202) - Marine Harvest: Torrison (Loch Torrison)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0050/00508591.pdf> (p131 onwards)

[Photos included:](#)

20160202 suspect BKD Torridon 24/5/16



20160202 suspect BKD Torridon 24/5/16

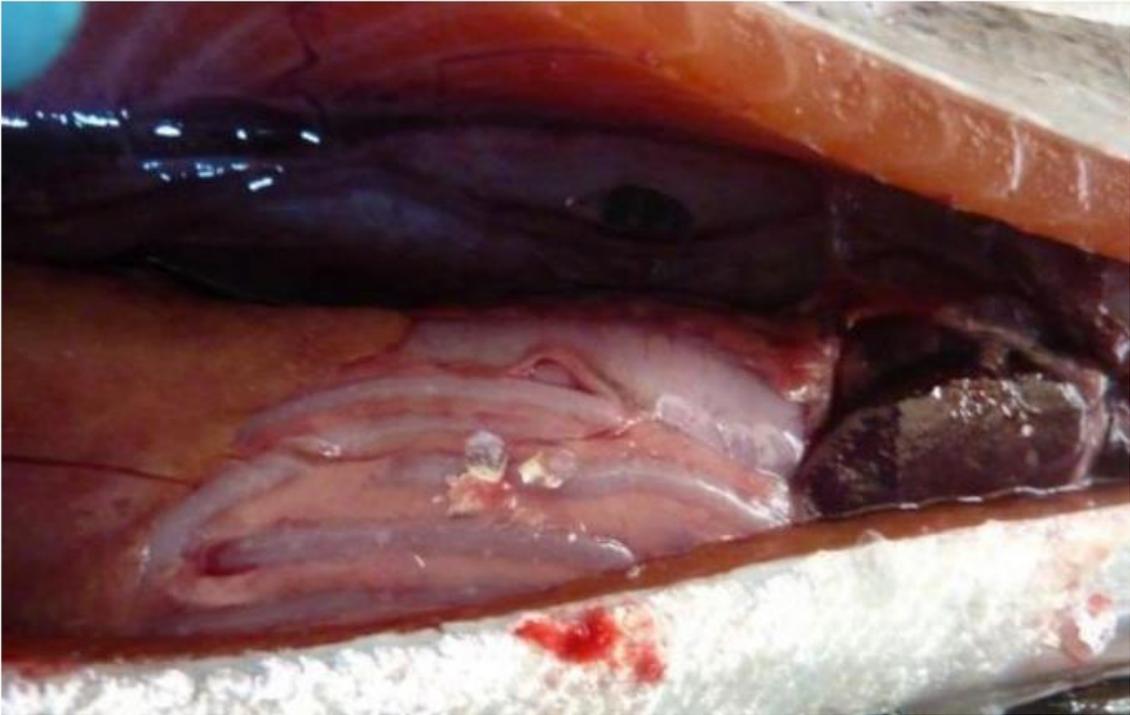




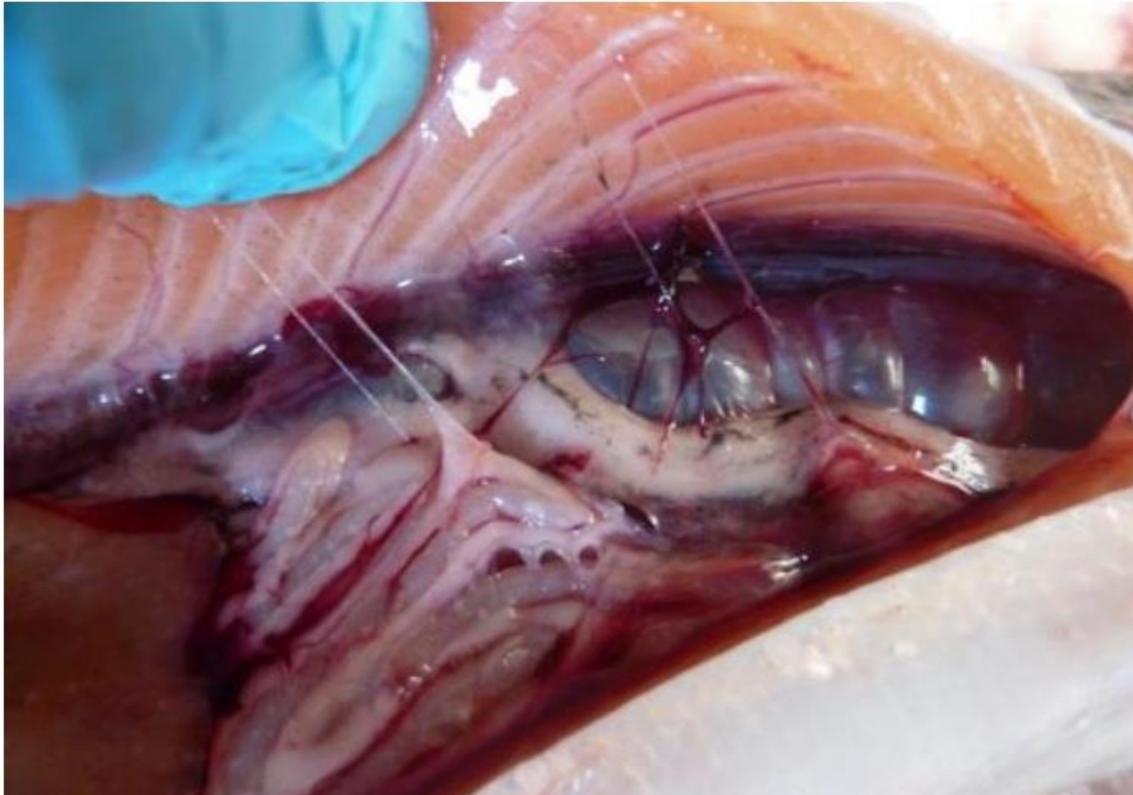
20160202 suspect BKD Torridon 24/5/16



20160202 suspect BKD Torridon 24/5/16



20160202 suspect BKD Torridon 24/5/16



Fish Health Inspectorate [Case Information](#) (p131 onwards) included:

"Site was inspected following a report from the company vet of suspected BKD, he had observed granulomas across all organs in fish from pens 1, 3 and 5. Ten lethargic fish were sampled by the FHI across cages 3 and 5. All fish had gross pathology consistent with BKD. One moribund fish was inspected from cage 1, there was an obvious injury to the head"

"Pens 3/1284/~140000/suspected BKD, Pen 5/639/~143000 - suspect BK"

The final FHI visit report detailed "clinical signs and gross pathology associated with the presence of bacterial kidney disease".

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FINAL FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	24/05/2016
SITE NO	FS0234	SITE NAME	Torridon
INSPECTOR	Jeanna Sandilands	CASE NO	20160202

Section 1: Summary

The site was inspected following a report of clinical signs and gross pathology associated with the presence of bacterial kidney disease (BKD). Clinical signs associated with BKD were observed by the inspector during the visit and subsequent positive PCR results, as well as histological examination, confirm the presence of *Renibacterium salmoninarum*, the causative agent of BKD.

#6 (2016-0231) - Marine Harvest: Maol Ban (Inner Sound, Isle of Skye)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0051/00517281.pdf> (p69 onwards)

[Photos included:](#)



Fish Health Inspectorate [Case Information](#) (p69 onwards) included reference to "poor doing fish" and "two separate strains of *Vibrio* spp.":



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FINAL FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	07/06/2016
SITE NO	FS0519	SITE NAME	Maol Ban
INSPECTOR	Joe Triscott	CASE NO	20160231

Section 1: Summary

During inspection of the above site, four lethargic fish were observed in two cages. All four fish were removed for further examination and subsequent diagnostic sampling. Bacteriological analysis identified two separate strains of *Vibrio* spp. Histological examination showed evidence of vaccine reaction and poor doing fish.

#7 (2016-0245) - Marine Harvest: Scotasay (East Loch Tarbert, Harris)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00530840.pdf> (stand-alone file)

[Photos include:](#)

2016-0245 - Scotasay



Fish 1 and 2



Fish 3 internal

Fisheries Health Inspectorate [Case Information](#) included:

"5 dead observed across site, not fresh dead"

"No moribund observed on site, 30-40 lethargic fish with physical damage observed in cage 1, some were deeper in the water column. The physical damage was attributed to handling during a recent FW treatment. 5 fish removed for diagnostic sampling."

Recent mortality was reported as "~18,000 for previous 4 weeks for site - attributed to post-treatment losses" with "Cage 1 - 4,947, cage 2 - 2,000 and cage 4 - 7,491 attributed to post treatment losses".

#8 (2016-0441) - Marine Harvest: Seaforth (Loch Seaforth, Harris)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0051/00517223.pdf> (p220 onwards)

[Photos included:](#)



Fish 5

Fish Health Inspectorate [Case Information](#) (p220 onwards) included:

"Mortalities began to increase at the end of September. Samples have indicated several gill issues including AGD, gill pox and gill parasites"

"Have been harvesting fish (live and dead haul, up to 45,000 per day) and hope to be fallow within two weeks. Have harvested over 500,000 fish so far. Targeting the worst cages first. Removed approximately 6,000 dead from cage currently being harvested on day of inspection (not included in mortality figures as not entered into records yet). Last lice count figures available for site (4/10/16) were 4.44 adult females. AGD score was 0.66 and PGD score was 0.92."

"Seven fish removed for diagnostic sampling. Six were from cage being harvested, fish were crowded and those sampled were moribund and had turned over onto their backs. Sea lice damage was evident and sea lice numbers appeared high on the fish sampled. Fish were very active and jumping in the non-crowded cages. All fish sampled had damaged gills and the majority had pale gills with multiple petechial haemorrhages."

"Fish 2-6 had pale gills with petechial haemorrhaging. Fish 1, 5 & 6 had white patches on gills. Fish 7 had severe lice damage to the head, fish 5 & 6 had slight lice damage to their heads."

The FHI visit report detailed "multiple gill issues" including "severely compromised gills with hyperplastic and hypertrophic response associated potentially with amoebic gill disease (AGD) plus post treatment effects" together with "hepatic necrosis and nephropathy". The fish sampled tested positive for *Neoparamoeba perurans* (the causative agent of AGD), salmon gill poxvirus (SGPV), *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) and *Parvicapsula pseudobranchicola*".



Marine Harvest (Scotland) Ltd
Stob Ban House
Glen Nevis Business Park
Fort William
PH33 6RX

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	17/10/2016
SITE NO	FS1042	SITE NAME	Seaforth
INSPECTOR	Andrea Warwick	CASE NO	20160441

Section 1: Summary

A report was received from the operator of increased mortality levels at the site due to multiple gill issues. Seven moribund fish were removed for diagnostic sampling.

Histopathology examination revealed severely compromised gills with hyperplastic and hypertrophic response associated potentially with amoebic gill disease (AGD) plus post treatment effects. Hepatic necrosis and nephropathy were also noted.

Due to gill health issues observed on site samples were screened for *Neoparamoeba perurans* (the causative agent of AGD), salmon gill poxvirus (SGPV), *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) and *Parvicapsula pseudobranchicola*. The samples tested positive for all four pathogens.

Observations reported that "all fish were unable to maintain equilibrium in the water" with "pale gills with petechial haemorrhaging" and one fish with "severe lice damage to its head":

Section 2: Case Detail

Observations

The site was inspected following a report from the operator of increased mortality levels over the previous couple of weeks due to multiple gill issues. Mortality levels for the site had reached 7.7% for the Seaforth group of cages and 8.4% for the Noster group of cages the previous week. The site was harvesting and due to be fallow by the end of the month.

Seven moribund fish were removed for diagnostic sampling. All fish were unable to maintain equilibrium in the water. Fish 1 had pale gills and fish 2 to 6 had pale gills with petechial haemorrhaging. Fish 1, 5 and 6 had white patches on their gills. Fish 5 & 6 had slight lice damage to their heads and fish 7 had severe lice damage to its head.

#9 (2016-0449) - Marine Harvest: Raineach (East Loch Tarbert, Harris)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0051/00517223.pdf> (p285 onwards)

[Photos included:](#)



Fish in cage 16



Fish 3

Fisheries Health Inspectorate [Case Information](#) (p285 onwards) includes:

"Company reported increased mortality levels due to AGD. Issue started in July 2016 following Salmosan treatment and have had significant losses following subsequent treatments. Current AGD score is 1.93 and PGD score is 1.57. Have started harvesting the fish and should be fallow within the next two weeks. Since July fish have been treated with Salmosan, Slice, hydrogen peroxide, freshwater and have used the hydroflusher system to reduce lice levels. Manager reported clearance using hydroflusher only 55-57%. Adult female lice levels are currently 16.29 average."

"Inspected two cages on site. Visibility good and a lot of fish with severe lice damage to their heads seen in both cages observed. Removed 5 fish for diagnostic sampling, all with severe lice damage."

Recent mortality (last 4 weeks) was reported as "54,512 (12.87%) for whole site".

"All fish had severe lice damage on their heads."

The FHI visit report included:



Marine Harvest (Scotland) Ltd
Stob Ban House
Glen Nevis Business Park
Fort William
PH33 6RX

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	04/10/2016
SITE NO	FS1263	SITE NAME	Raineach
INSPECTOR	Andrea Warwick	CASE NO	20160449

Section 1: Summary

A report was received from the operator of increased mortality levels at the site due to amoebic gill disease (AGD). Five lethargic fish were removed for diagnostic sampling.

Histopathology examination revealed a mixed condition with severely compromised gills which would impact on osmotic balance and oxygen transfer. Gill lesions were also suggestive of potential post treatment effects and historic AGD. Additionally, marked hepatic necrosis and renal tubular degeneration were also seen. The *Ichthobodo* species was likely living commensally on the gill.

Due to gill health issues observed on site samples were screened for *Neoparamoeba perurans* (the causative agent of AGD), salmon gill poxvirus (SGPV) and *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*). The samples tested positive for all three pathogens.

#10 (2016-0450) - Marine Harvest: Scotasay (East Loch Tarbert, Harris)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0051/00517223.pdf> (p303 onwards)

[Photos included:](#)



Fish 2 lesions

Fisheries Health Inspectorate [Case Information](#) (p302 onwards) includes:

"Site has experienced increased mortality levels due to AGD. Issue started in July 2016 following Salmosan treatment and have had significant losses following subsequent treatments, particularly in August. Current AGD score is 1.31 and PGD score is 1.44."

"Since July fish have been treated with Salmosan, Slice, hydrogen peroxide and freshwater to reduce lice levels. Adult female lice levels currently at 5.94."

Recent mortality (last 4 weeks) was reported as "25,210 (6.21%)" with "Across whole site. Jul - 6,977 (1.6%), Aug - 77,520 (18.42%), Sept - 25,210 (6.21%), Cages range from 9,310 to 21,074 in total for last three months".

The FHI visit report included:



Marine Harvest (Scotland) Ltd
Stob Ban House
Glen Nevis Business Park
Fort William
PH33 6RX

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	04/10/2016
SITE NO	FS0502	SITE NAME	Scotasay
INSPECTOR	Andrea Warwick	CASE NO	20160450

Section 1: Summary

A report was received from the operator of increased mortality levels at the site due to amoebic gill disease (AGD). Two moribund fish were removed for diagnostic sampling.

Histopathology examination revealed severely compromised gills with mixed pathology and a moderate hyperplastic response which can impact on osmotic balance and oxygen transfer. An open skin wound in Fish 2 would also impact on osmotic balance and was further compromised by a mixed bacterial infection. Bacteriology testing isolated a *Vibrio* species from the lesion.

Due to gill health issues observed on site samples were screened for *Neoparamoeba perurans* (the causative agent of AGD), salmon gill poxvirus (SGPV) and *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*). The samples tested positive for SGPV. In addition, the test for salmonid alphavirus was positive.

Section 2: Case Detail

Observations

The site was inspected following a report from the operator of increased mortality levels at the site due to amoebic gill disease (AGD) over the previous couple of months. Mortality levels for the site had reached 18.4% for August and 6.2% for September. The site was harvesting and due to be fallow by the end of the month.

Two moribund fish were removed for diagnostic sampling. Fish 2 had a lesion on the flank.

#11 (2017-0028) - Scottish Sea Farms: Kishorn B (Loch Kishorn)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0052/00523141.pdf> (p250 onwards)

[Photos included:](#)



F1-2



Fisheries Health Inspectorate [Case Information](#) (p250 onwards) includes:

"778 (0.18%) mortality across site from 19/01/2017 - 15/02/2017. Adult female lice rose above suggested criteria for treatment 18/02/2016 reaching max of 4.17 at 25/02/2016, site was harvesting out at this point, so no chemo therapeutant treatments administered. Numbers gradually fell but remained above suggested criteria for treatment until site harvested out by 25/05/2016."

The FHI visit report included:

Scottish Sea Farms Ltd
Laurel House
Laurelhill Business Park
Polmaise Road Stirling
FK7 9JQ

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0125	DATE OF VISIT	15/02/2017
SITE NO	FS0804	SITE NAME	Kishorn B (North)
INSPECTOR	Joe Triscott & Warren Murray	CASE NO	20170028

Section 1: Summary

During a routine inspection of the above site, a number of lethargic Atlantic salmon (*Salmo salar*) were observed. Four moribund fish were removed for diagnostic sampling.

Histopathological examination revealed a moderate level of proliferative gill pathology with mild to moderate degenerative changes; occasional amoebic cells were noted suggesting the presence of amoebic gill disease. Additionally, myositis and skin lesions associated with bacteria were noted in two fish which may impact in the osmotic balance. A mild nephrosis was also noted.

Due to gill health issues observed on site, samples were screened by QPCR and tested positive for salmon gill poxvirus (SGPV), *Paranucleospora theridion* (syn. *Desmozon lepeophtherii*) and *Neoparamoeba perurans* which was confirmed by histopathological examination.

Bacteriology examination identified the presence of *Moritella viscosa* in all fish, with very high levels present in fish 2.

From the tests conducted, we do not have evidence of resistance to amoxicillin, oxytetracycline, cotrimoxazole or florfenicol.

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from fish 1 - 4. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination revealed the following:

Gill: Mild to moderate interlamellar hyperplasia (F1 - 4) with small foci of lamellar fusion (F1), lamellar necrosis with apoptotic cells and some cell sloughing (F1 - 4), focal to diffuse lamellar congestion, scattered aneurysmal dilation/telangiectasia (F1 - 3) and in F4 was noted a severe diffuse presence of aneurysmal dilation/telangiectasia. Occasional cells resembling amoebic cells were seen in F1. Generalized epithelial lifting, likely post-mortem artefact.

Skin & Muscle: Absence of epidermal layer (F1, F2 & F3), mild dermal oedema with mild leucocyte infiltration and presence of mixed gram negative bacteria (F1 & F2), diffuse haemorrhagic necrosis of skeletal red muscle (F1), minor increase of cellularity in the skeletal red muscle (F2) and skeletal red muscle fibrosis and inflammation (myosite) (F3).

Heart: Pericarditis (F2) and one thrombus in spongy layer (ventricle) (F4).

Gut and pyloric caeca: Some cell sloughing (F1 - 4).

Pancreas: Within the normal range.

Liver: Some capillary dilation (F1 & F4), scattered apoptotic cells (F1) and occasional noted in F4, focal mild hepatocyte vacuolation (F4).

Kidney: Focal congestion of hematopoietic tissue (F4, probable sampling artefact), scattered glomeruli with pink debris (resembling proteinaceous/flocculent material) at the Bowman space and rare thickness of Bowman capsule (F2).

Spleen: Mild to moderate congestion (F2, F3 & F4).

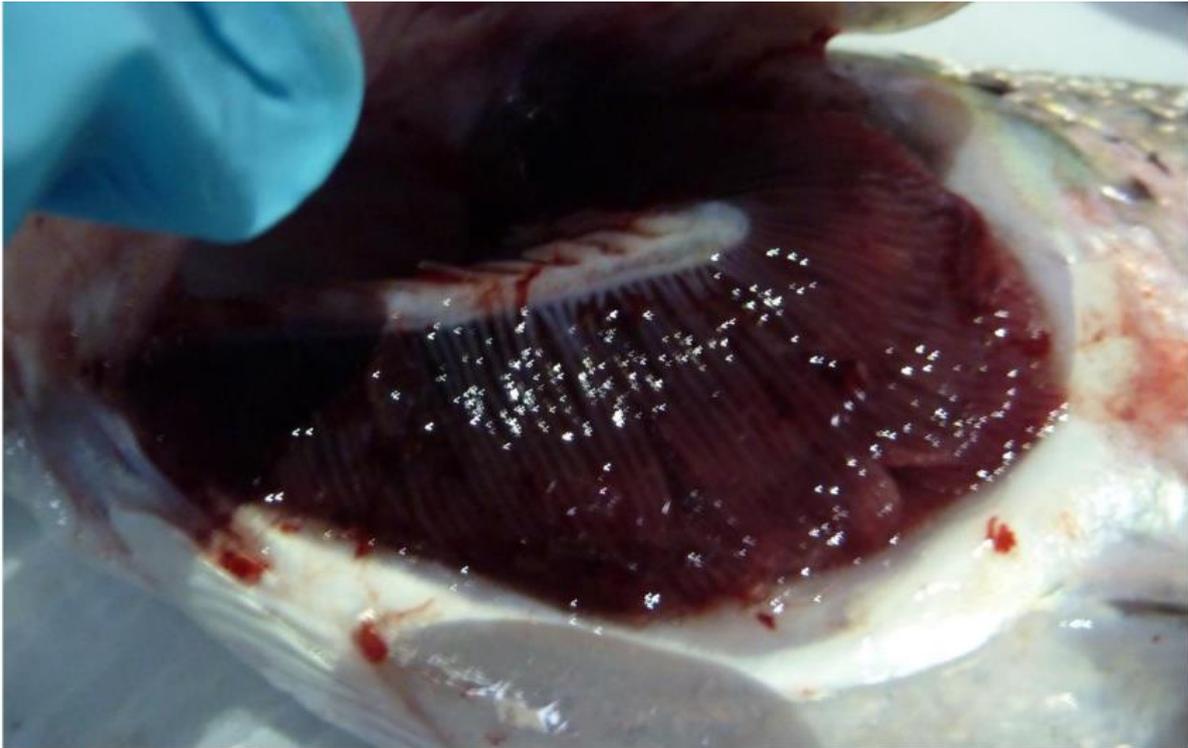
#12 (2017-0064) - Scottish Salmon Company: Inch Kenneth (Loch Na Keal, Isle of Mull)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0052/00523142.pdf> (p121 onwards)

[Photos included:](#)





F2 gills

Fisheries Health Inspectorate [Case Information](#) (p121 onwards) includes:

"Moribund and lethargic fish seen in all cages. 4 fish removed for diagnostic sample."

"Since input 6,343 morts, this is higher than expected. A large number is attributed to production (PD morts would have been classed as this prior to confirmation last week), some also attributed to failed smolts and seals."

"Histopathology indicative of PD in 3/4 fish."

"F1 & F3 physical damage to snout/mouth."

The FHI visit report included:

██████████
The Scottish Salmon Company
Ashville
Main Street Tarbert
Isle of Harris
HS3 3DJ
████████████████████

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0169	DATE OF VISIT	07/03/2017
SITE NO	FS0593	SITE NAME	Inch Kenneth
INSPECTOR	Svenja Elwenn	CASE NO	20170064

Section 1: Summary

During a routine site inspection moribund fish were observed and removed for diagnostic sampling. Histopathological examination revealed mild proliferative changes to the gill tissue with presence of several amoebic cells suggestive of amoebic gill disease (AGD). The samples tested positive for *Neoparamoeba perurans* by qPCR. Additionally, features consistent with acute pancreas disease (PD) were also seen, confirmed by the detection of Salmonid alphavirus (SAV) by qPCR sequenced as subtype I.

Due to gill health issues observed on site, samples were screened by qPCR and tested positive for salmon gill poxvirus (SGPV) and *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*).

Section 2: Case Detail

Observations

The site was visited in accordance with the Aquatic Animal Health (Scotland) Regulations 2009, and to meet the requirements of European Community Council Directive 2006/88/EC. Mortality records indicated elevated mortality levels on site attributed to seal damage and a recently received positive result for PD. Upon inspection moribund and lethargic fish were observed in all cages. Four moribund and lethargic fish were removed for sampling. Externally, F1 and F3 had physical damage to the snout. F3 and F4 were found to be slightly anorexic with pale and zoned gills with F2 also having signs of necrotic gill tissue. Internally bloody ascites were observed in F2-F4, while F1 and F2 had some petechial haemorrhaging on the liver. F3 and F4 showed a lack of fat around the pyloric caeca and F2 and F3 showed an enlarged spleen. F3 had a slightly grey and granular kidney.

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from F1 – F4. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination by light microscopy revealed the following:

Gill: Mild interlamellar hyperplasia (F1-F4), small foci of lamellar adhesions (F3) and two gill filaments with moderate lamellar hyperplasia and fusion (F4). Several amoebic cells were also seen in F4. Generalised epithelial lifting, likely artefact (F1-F4).

Skin & Muscle: Absence or partial absence of epidermal layer (likely, processing) (F1-F4), mild to moderate skeletal white muscle necrosis (F2, F3 & F4), severe skeletal red muscle necrosis (F4) and scattered round skeletal red fibres with increase in eosinophilia seen in F2 & F3.

Heart: Minor pericarditis (F2 & F4), focal myofiber vacuolation and increase in eosinophilia at the compact layer of ventricle (F2 & F3) and at the spongy layer of ventricle in F4. In F3 was also noted scattered shrunken myofibers.

Gut and pyloric caeca: Few adhesions (F1-F4), some cell sloughing (F2-F4).

Pancreas: Focal (F1) to diffuse necrosis of pancreatic acinar cells (F2 & F3) and absence in F4.

Liver: Some capillary dilation (F1 & F4), focal mild hepatocyte vacuolation and rare apoptotic cells (F1) and diffuse vacuolation noted in F3 & F4.

Kidney: Within normal range.

Spleen: Mild to moderate congestion (F1- F4), evidences of erythrophagocytosis (F2).

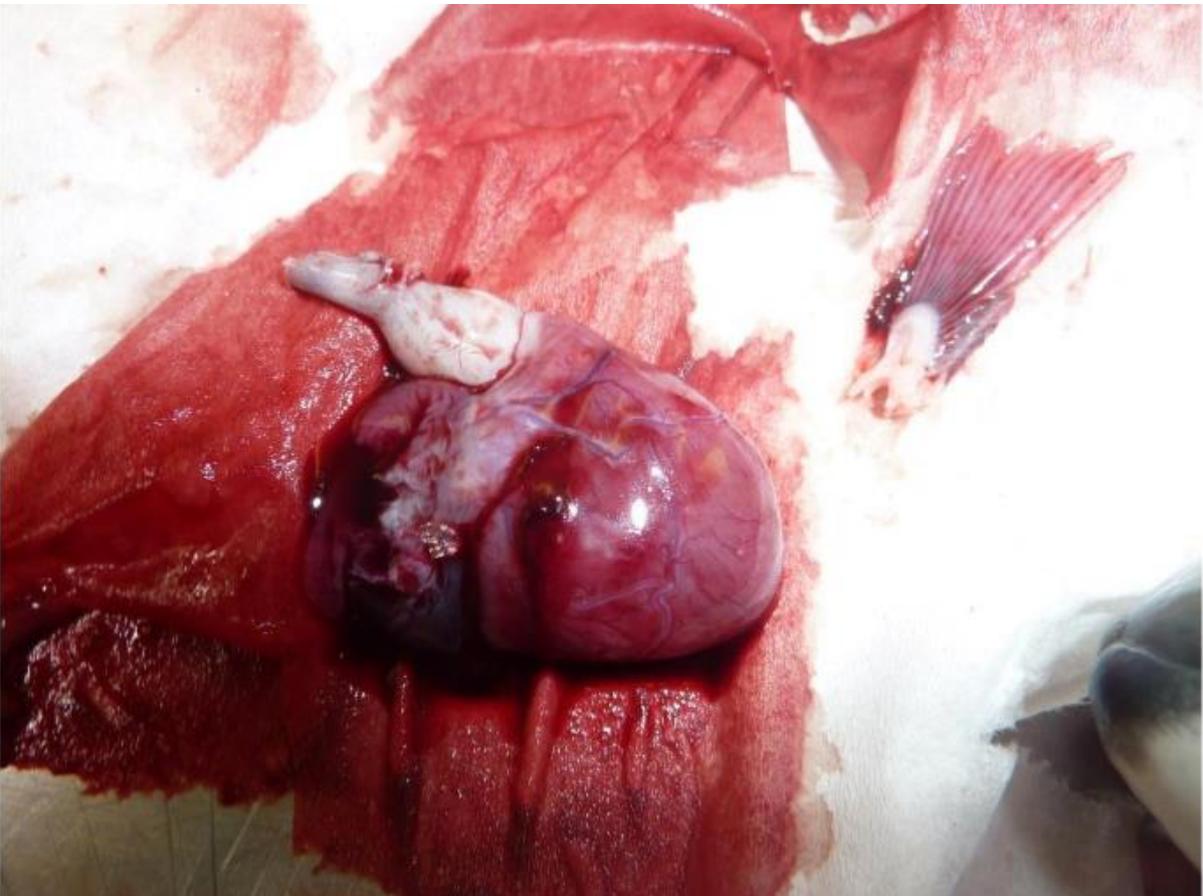
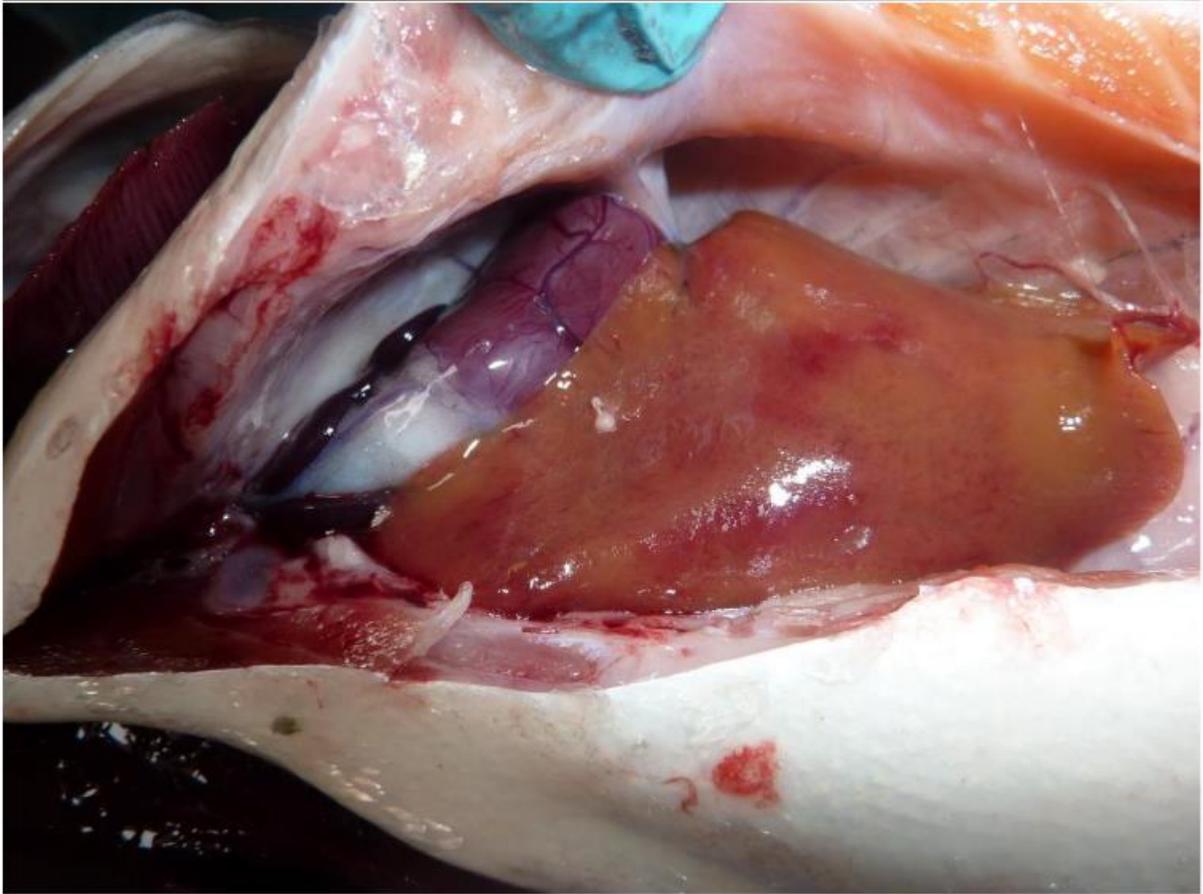
#13 (2017-0183) - Loch Duart: Badcall Bay (Eddrachillis Bay)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00530829.pdf> (p14 onwards)

[Photos included:](#)





Fisheries Health Inspectorate [Case Information](#) (p14 onwards) included:

"The site was inspected following a report from the business correspondent of increased mortality at the site since the end of July 2017. The mortality was attributed to complex gill issues and a potential water borne insult. Liver pathology had also been observed in samples taken by FVG. Summary of FVG findings: 4/8/17 - acute and chronic gill pathology, AGD lesions, evidence of water borne irritant, no clinical findings in external organs. AGD listed as a concern. 16/8/17 - mixed acute and chronic gill pathology, exposure to water borne irritant, liver pathology. 23/8/17 - Significant gill pathology (AGD, Branchiomonas, Desmazoon, SGPV) widespread inflammation and vascular damage, AGD ct values from PCR suggested a worse infection than was seen by histology. No evidence of SAV. Liver necrosis observed, Piscirickettsia suspected but not identified though staining."

"A number of lethargic fish were seen across the site, five were removed for diagnostic purposes."

"Ongoing complex gill issues and liver pathology."

"Hearts appeared flabby and were difficult to cut. Some atriums added to pots separately. F1 heart appeared flat. No membrane between heart and liver in F3. F1, 2, 5 had haemorrhaging at the base of the pelvic fins."

The FHI visit report included:

Loch Duart Ltd
Badcall Salmon House
Scourie, Lairg
Sutherland
IV27 4TH

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS No	FB0398	DATE OF VISIT	29/08/2017
SITE No	FS0067	SITE NAME	Badcall Bay
INSPECTOR	Jeanna Sandilands	CASE No	20170183

Section 1: Summary

Five lethargic Atlantic salmon (*Salmo salar*) were sampled for diagnostic purposes following reports of increased mortality at the above site. Histopathology examination revealed severe complex gill issues with chronic and acute pathology. Amoebic cells suggestive of amoebic gill disease (AGD) were noted and confirmed by QPCR. Epitheliocystis observed by histopathology was confirmed by QPCR for *Candidatus* Branchiomonas cysticola and *Candidatus* Syngnamydia salmonis. Vascular damage and pathology associated with treatment or water borne insult were also observed. Mild hepatic necrosis was noted.

Due to the gill health issues observed on site, samples were screened for salmon gill poxvirus and *Paranucleospora theridion* (syn, *Desmozoon lepeophtherii*) by QPCR. Samples tested positive for both pathogens.

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

Salmon gill poxvirus

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.11	23.66	22.60	22.25	22.38
Cp Values	30.83	28.27	35.89	29.57	27.28
	30.66	28.02	35.95	29.25	27.20
	30.72	28.07	36.17	29.36	27.05
Reported Result (PCR)	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

The samples tested negative for infectious haematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), infectious salmon anaemia virus (ISAV), salmonid alphavirus (SAV) and viral hemorrhagic septicemia virus (VHSV).

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

***Neoparamoeba perurans* (AGD)**

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.11	23.66	22.60	22.25	22.38
Cp Values	28.55	29.82	31.51	32.87	30.59
	28.68	29.72	31.53	32.57	30.71
	28.58	30.12	31.43	32.78	30.64
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

Paranucleospora theridion

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.11	23.66	22.60	22.25	22.38
Cp Values	25.32	26.67	26.01	32.94	24.75
	25.34	26.75	25.71	33.04	24.63
	25.37	26.72	25.80	33.16	24.54
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from F1-F5. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination revealed the following:

Gill: Free blood among gill filament, multifocal interlamellar hyperplasia with spaces (lacunae) occasionally filled with cell debris and lamellar fusion, diffuse adherence of secondary lamellae (synechia), diffuse lamellar thrombosis and lamellar necrosis with karyorhectic nuclei, epithelial spongiosis, high numbers of basophilic epithelial inclusions (likely epitheliocystis), several scattered aneurysmal dilation/telangiectasia, moderate displacement of chloride cells and hypertrophy, congested secondary lamellae. Amoebic cells resembling *Neoparamoeba perurans* were noted in all individuals. F3 also showed three gill filaments fused at the tip with loss of gill architecture, presence of leucocyte cells, mainly within the surrounded vessels, and presence of dark pink amorphous material (likely fibrin) surrounded by fibrous tissues, deposit of collagen and likely newly formed vessels and epithelial stratification at the edge of the gill. Cluster of bacteria among gill filament also noted in F1.

#14 (2017-0184) - Grieg Seafood: Leinish (Loch Dunvegan, Isle of Skye)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0052/00526951.pdf> (p122 onwards)

Photos included:

20170184



F4



F2

20170184



F1

Fisheries Health Inspectorate [Case Information](#) (p122 onwards) included:

"Four lethargic fish removed for diagnostic sampling physical/eye damage observed."

"22719 morts/site October 2016 highest in cage 9 10074 morts/cage November 2016 8458/site complex gill issues - continuation of mort event already notified to FHI."

"Complex gill pathology associated with an algal bloom in summer 2016, AGD has been an ongoing issue of varying severity since input."

"F2 had a large seal bite around the tail, pale liver, fluid around heart F3 pale liver F4 had no eyes, fluid around heart."

Mortality - Issues with PGD/AGD December 2016 into Jan/Feb 2017 peak 22/12/16 post treatment salmosan and H202.
Reason for not conducting a weekly count did not appear to be recorded - advice provided to manager
Some targeted treatments carried out
17/4/17 Salmosan cages 4/5/17 - didn't work as well as expected
7-9/5/17 All cages treated with combined salmosan/H202 treatments in wellboat - clearance reported to be much better with combined treatment.
October 2015 - slice/site
November 2015 - H202/site
January 2016 - H202/site
March 2016 - slice/site
End July into August 2016 - Salmosan/site
August 2016 - Salmosan/site
End September into October 2016 - H202/site
November 2016 - Salmosan/H202 site
January 2017 cages 2/4/8 -AMX/Salmosan
February 2017 cages 1/3/5/7/9 - Salmosan
February 2017 Slice - cage 9 feed used up from Corlarich
February 2017 - cage 2 Salmosan
March 2017 - Salmosan/H202 (cages 3 and 5) rest salmosan only
April 2017 - Salmosan/H202 - cages 7 & 9
April 2017 - Salmosan cages 4/5/1
May 2017 - Salmosan/H202/site
Treatments appear to be bringing levels down but resettlement appears quick some treatments better than others, efficacy % suggested that not all treatments bringing levels below 50% - follow up treatments conducted.
Average female counts above 3 from 25/10/16 but not reported until week one of 2017
Most recent count (12/5/17) average adult females 6.26/ out of 50 fish sampled/site
Average AF Lice levels peaked at 14.6 on count 2/4/17

The FHI visit report included:



[REDACTED]
Grieg Seafood Shetland Ltd
Gremista
Lerwick
Shetland
ZE1 OPX
[REDACTED]

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0440	DATE OF VISIT	16/05/2017
SITE NO	FS0800	SITE NAME	Leinish
INSPECTOR	Jeanna Sandilands & Alex Edridge	CASE NO	20170184

Section 1: Summary

During a routine inspection of the above site, four lethargic Atlantic salmon (*Salmo salar*) were sampled for diagnostic purposes. Histopathological examination revealed poor doing fish and mild gill pathology, which was potentially a consequence of an on-going amoebic gill disease condition. A skin lesion likely caused by predators was also noted. *Vibrio* sp. was identified, however the level and purity of growth would not suggest a current bacterial infection.

Observations included three "anorexic" fish, two fish with cataracts and one fish with "no eyes":

Section 2: Case Detail

Observations

During a routine inspection of the above site, four lethargic Atlantic salmon were removed for diagnostic sampling. At the time of the inspection the site was stocked with 82,523 2015 S0 Atlantic salmon at an average weight of 4.5kg. The site had previously experienced high mortality due to an algal bloom resulting in complex gill issues in the summer of 2016. Amoebic gill disease (AGD) was reported as an on-going issue of varying severity since input of the fish.

Externally: All fish were lethargic and F1-F3 were anorexic in appearance. F1 and F3 had cataracts and F4 had no eyes. F2 had a large lesion around the tail, likely the result of a seal attack.

Internally: F1 and F2 had clear ascites in the body cavity. F1 and F4 had gross haemorrhaging on the liver, the liver was pale in F2 and F3. F4 had fluid around the heart. There was a lack of fat on the pyloric caeca in all fish and F2-F4 had no food present in the gut.

#15 (2017-0185) - Grieg Seafood: Gob na Hoe (Loch Dunvegan, Isle of Skye)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0052/00526951.pdf> (p142 onwards)

[Photos included:](#)

20170185





Fisheries Health Inspectorate [Case Information](#) (p142 onwards) includes:

"Losses post Salmosan/H202 treatment in cage 11 (6750 morts) on 12/5/17 possibly due to CMS."

"A number of lethargic fish, some with eye damage and lesions were observed across the site."

Mortality was reported as "7374/site last four weeks" and "110598/site October 2016 15,934/site Nov 2016 - post treatment/complex gill issues - continuation of mortality event notified to the FHI in September 20".

"Sept 2016 gill issues/AGD/PGD Summer 2016 Significant gill pathology associated with algal bloom."

"F1 large lesion likely to be seal bite, F2 &3 had skinned flanks. F1 & 2 pale liver fluid around heart, F3 pale liver."

The FHI visit report included:

██████████
Grieg Seafood Shetland Ltd
Gremista
Lerwick
Shetland
ZE1 OPX
████████████████████

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0440	DATE OF VISIT	16/05/2017
SITE NO	FS1175	SITE NAME	Gob na Hoe
INSPECTOR	Jeanna Sandilands & Alex Edridge	CASE NO	20170185

Section 1: Summary

During a routine inspection of the above site, three lethargic Atlantic salmon (*Salmo salar*) were sampled for diagnostic purposes. Histopathological examination revealed poor doing fish with mild gill pathology and skin erosion. *Vibrio* sp. was identified, however the level and purity of growth did not suggest a significant bacterial infection in this case.

Section 2: Case Detail

Observations

During a routine inspection of the above site, a number of lethargic Atlantic salmon, some with eye damage and lesions, were observed. Three fish were removed for diagnostic sampling. At the time of the inspection the site was stocked with 151,196 2015 S0 Atlantic salmon at an average weight of 4.5kg. Cardiomyopathy syndrome was suspected at the site following increased mortality in cage 11 post treatment. Fish Vet Group were on site during the inspection to carry out sampling.

Externally: All three fish were lethargic. F1 had a large lesion near the tail which was likely to be a seal bite. F2 and F3 had scaled flanks.

Internally: F1 and F2 had clear ascites in the body cavity and fluid around the heart. All three fish had pale livers and no food present in the gut.

Bacteriology: Kidney and gill material from three fish and lesion material from two fish was inoculated onto appropriate media for the isolation of bacteria.

The following bacterium was isolated from F1-3:

- *Vibrio* sp.

Vibrio sp. was identified on plates taken from the kidney and gill material from F1-F3 and the lesion material from F1 and F2.

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from F1-F3. The tissue samples were fixed in 10% neutral buffered formalin.

The following histopathological changes were observed:

Gill: Few aneurysmal dilation/telangiectasia (F1-F3), some lamellar congestion (F1-F3) and scattered lamellar necrosis, foci of lamellar tip clubbing and mild multifocal hyperplasia (F2). Generalized epithelial lifting, likely post-mortem artefact.

Skin & Muscle: Absence of epidermal layer (likely associated with skin lesions - F2 and F3)

Heart: Scattered hypertrophic myofiber nuclei at the ventricle (F3).

Gut and pyloric caeca: Some cell sloughing (F1-F3) - likely post-mortem artefact.

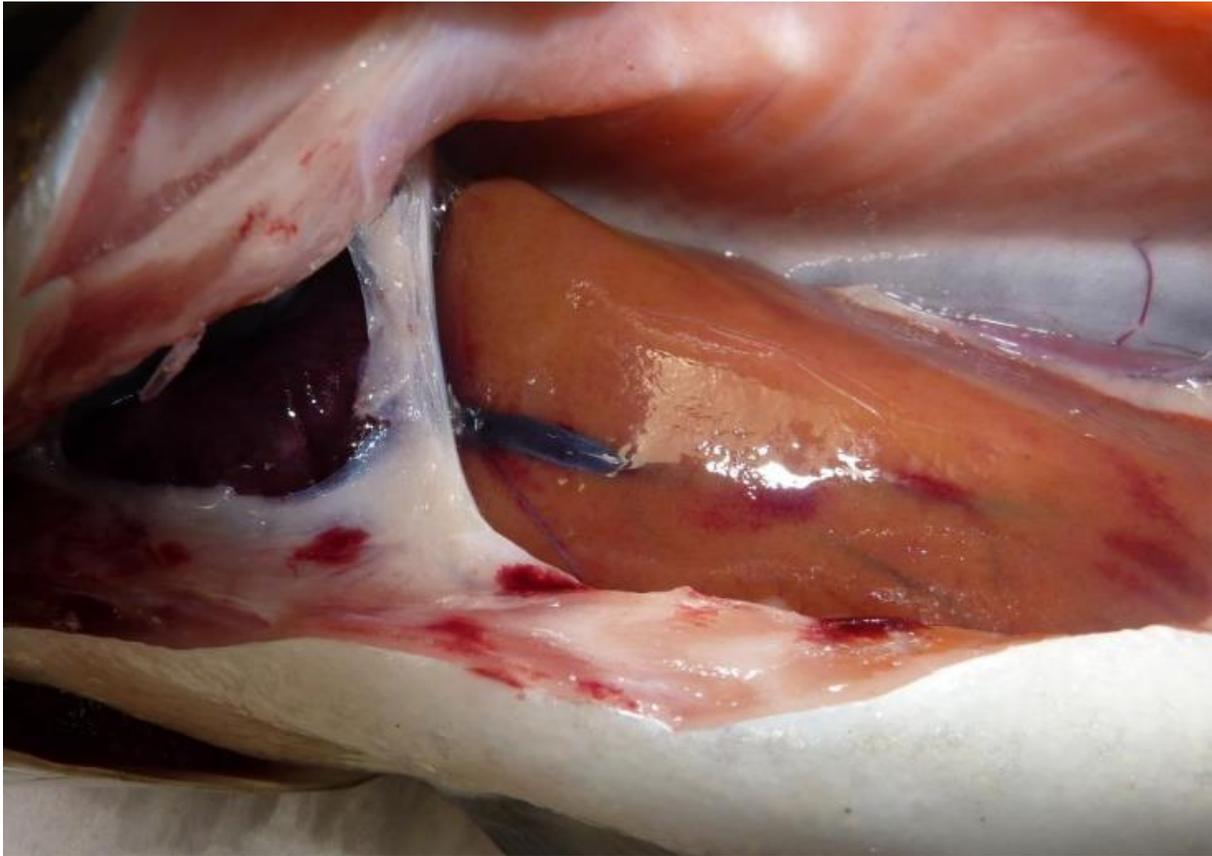
#16 (2017-0188) - Loch Duart: Calva Bay (Calbha Beag) (Eddrachillis Bay)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00530829.pdf> (p35 onwards)

[Photos included:](#)





Fisheries Health Inspectorate [Case Information](#) (p35 onwards):

"The site was inspected following a report from the business correspondent of increased mortality at the site since the end of July 2017. The mortality was attributed to complex gill issues and potential water borne insult. Reduced feeding over weekend 22/23rd July prompted samples to be taken in week 30. Summary of FVG findings: 4/8/17 - Complex gill disease and AGD, Branchiomonas infection, liver pathology. 17/8/17 - Significant complex gill pathology, AGD, Branchiomonas and liver pathology. Possible toxic algal effect observed. 28/8/17 - Complex gill disease and liver pathology. Results are pending for samples taken for Piscirickettsia PCR (did not show up on staining) and further histology including brain tissue. Pale gills have been routinely noted. CT values for AGD PCR suggests a more extensive infection than the histology and gross gill appearance indicates."

Morts A group - worst affected will be harvested by next Monday (pens 22,23,25,27 and 28 already harvested out)

Wk 29 1.39%

Wk 30 0.37%

Wk 31 1.3%

Wk 32 3.4%

Wk 33 25.31% - worst C21 28.28%, C23 72.5%, C22 45.96% - not related to treatment

Wk 34 15.57% - worst C16 31.55% (45.64% since input) C21 (42.76% since input)

Morts G group

Wk 29 0.37%

Wk 30 0.29%

Wk 31 0.35%

Wk 32 0.87%

Wk 33 4.02% - worst affected C31 7.14%, C39 9.43%

Wk 34 1.13%

"Hearts difficult to cut. Some atriums separate in pots. F1 heart - tried to cut back section of heart to allow fixative in but due to shape bottom of hear was cut instead, both sections added to."

"All fish had mottled livers. Haemorrhaging at the base of the pelvic fins in F1,2,3,5. All fish had swollen atrium. F1 had fluid round the heart."

The FHI visit report included:



Loch Duart Ltd
Badcall Salmon House
Scourie, Lairg
Sutherland
IV27 4TH

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0398	DATE OF VISIT	29/08/2017
SITE NO	FS0068	SITE NAME	Calva Bay (Calbha Beag)
INSPECTOR	Jeanna Sandilands	CASE NO	20170188

Section 1: Summary

Five lethargic Atlantic salmon (*Salmo salar*) were sampled for diagnostic purposes following reports of increased mortality at the above site. Histopathology examination revealed complex gill issues with evidence of amoebic gill disease (AGD), which was confirmed by QPCR and epiotheliocystis also confirmed by QPCR for *Candidatus Branchiomonas cysticola* and *Candidatus Syngnamydia salmonis*. Pathology suggestive of potential treatment effects or water borne insult was observed. Mild to moderate hepatic necrosis and kidney pathology was also noted.

Due to the gill health issues observed on site, samples were screened for salmon gill poxvirus and *Paranucleospora theridion* (syn, *Desmozoon lepeophtherii*) by QPCR. Samples tested positive for both pathogens.

Bacteriology reported positive tests for *Candidatus Branchiomonas cysticola* and *Candidatus Syngnamydia salmonis*:

Bacteriology: Kidney and gill material from F1-F5 was inoculated onto appropriate media for the isolation of bacteria.

No significant bacteria were isolated from plates.

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

Candidatus Branchiomonas cysticola

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.72	23.76	22.85	22.69	21.87
Cp Values	22.81	22.34	23.25	20.99	20.56
	22.79	22.4	23.07	20.97	20.39
	22.77	22.08	23.08	20.98	20.73
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

Candidatus Syngnamydia salmonis

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.72	23.76	22.85	22.69	21.87
Cp Values	31.97	28.81	30.31	30.38	31.13
	32.16	29.05	29.82	30.1	30.99
	31.96	28.91	30.26	30.13	31.5
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

Candidatus Branchiomonas cysticola is a [common agent of epitheliocysts](#) in seawater-farmed Atlantic salmon. *Candidatus Syngnamydia salmonis* is also [a bacterium associated with epitheliocystis](#).

Virology showed positive tests in all five fish sampled for Salmon gill poxvirus and parasitology showed positive tests in all five fish sampled for both *Neoparamoeba perurans* (AGD) and *Paranucleospora theridion*.

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

Salmon gill poxvirus

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.06	23.39	22.31	22.09	21.92
Cp Values	25.16	26.56	26.03	31.00	24.60
	25.24	26.50	26.10	31.14	24.47
	25.10	26.26	26.02	31.09	24.45
Reported Result (PCR)	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

The samples tested negative for infectious haematopoietic necrosis virus (IHNV), 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 DNA indicative of the presence of the parasites specified below using real-time PCR (QPCR).

Neoparamoeba perurans (AGD)

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.06	23.39	22.31	22.09	21.92
Cp Values	31.83	29.85	30.61	30.89	31.16
	31.64	29.65	30.57	31.27	31.17
	21.81	29.69	30.66	31.09	31.25
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

Paranucleospora theridion

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.06	23.39	22.31	22.09	21.92
Cp Values	27.71	26.00	28.58	25.51	29.86
	27.81	25.71	27.62	25.90	29.03
	27.49	25.94	28.38	25.44	30.09
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

#17 (2017-0398) - Scottish Sea Farms: Kishorn West (Loch Kishorn)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00530831.pdf> (p130 onwards)

[Photos included:](#)

20170398





20170398

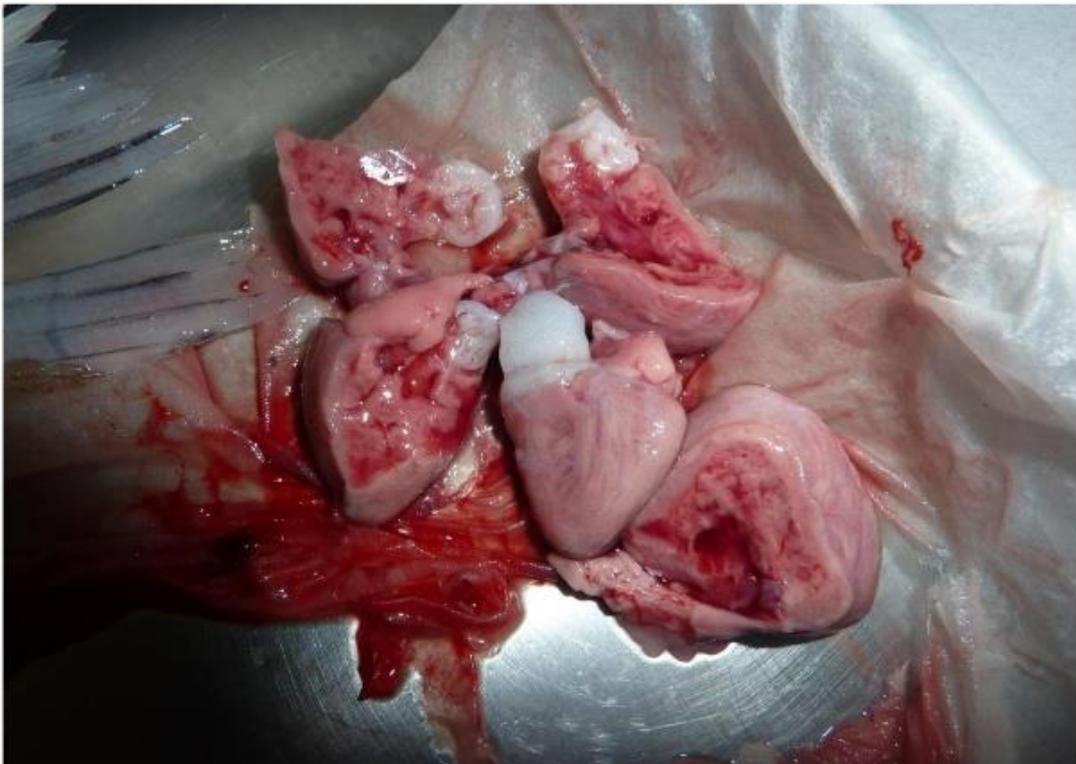


20170398





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Fisheries Health Inspectorate [Case Information](#) (p130 onwards) includes:

"Gill issues and associated mortality being experienced on site, which has been reported to the FHI. Mortality started to increase at the beginning of July accompanied with a drop in appetite."

Wk 33 2.08% site - worst affected pen 3 10.09% and pen 5 7.8%

Wk 34 3.36% site - worst affected pen 3 19.61%, pen 5 10.73%

Wk 35 1.62% site - worst affected pen 3 9.15% and pen 5 8.21%

Last four weeks = 18060/site odd numbered cages worst affected but the gill issues, cage 3 7800, cage 5 3450, cage 1 1900 cage 7 1700 cage 9 1300 cage. The odd numbered cages sit to the east of the feed barge. The site is stocked with fish from Ormsary smolt unit and Loch Damph, the LD fish are worst affected. ~40000 fish lost since incident began.

Wk 29 2.7% site - complex gill issues

Wk 31 2.04% site - complex gill issues

Wk 32 2.25% site - complex gill issues

2016 - Wk 43 1.64%, Wk 44 1.47% 2016 - post transfer

17.64% lost since input worst cage 3 40.99%, cage 5 32.64%, cage 7 22.02% - since input

Five healthy cages treated with H2O2 for gills, tried low dose on one of the compromised cages but the fish did not react well and the treatment was halted, decision made to harvest out the five compromised cages. Harvesting has started and it was reported that fish are coping well with the transport.

Two slice treatments since input - 20-26/5/17 and 22-28/11/16

Site currently above CoGP suggested criteria for treatment since 2/8/17, average adult female leps currently sitting at 2.91 for Wk 35 - planning to treat with salmosan and more wrasse have been deployed

FVG report 30/7/17 - mortality improved post H2O2 but appetite still low. Low grade HSMI previously diagnosed, lamellar aneurisms (bleeding) and AGD. Mentions symptoms associated with water borne irritant but water samples have not identified any blooms.

no evidence of CMS by PCR

FVG report 14/8/17 supports odd pens being most affected. Significant gill lamellar capillary damage of uncertain cause.

Slight to moderate proliferative gill path thought to be AGD. Possible parasitic gill organisms of uncertain identity, in relatively low numbers, associated anaemia.

"AGD, gill problems and associated anaemia."

"All fish had very pale gills with evidence of haemorrhaging. All fish had pale livers and pale hearts. F2 and F5 had deformed hearts which were difficult to cut. F1 had fluid round the heart."

The FHI visit report included:

Scottish Sea Farms Ltd
Laurel House
Laurelhill Business Park
Polmaise Road Stirling
FK7 9JQ

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0125	DATE OF VISIT	05/09/2017
SITE NO	FS1274	SITE NAME	Kishorn West
INSPECTOR	Jeanna Sandilands	CASE NO	20170398

Section 1: Summary

Five lethargic Atlantic salmon (*Salmo salar*) were sampled for diagnostic purposes. Histopathology examination revealed gill pathology, mainly lamellar capillary disturbances and damage. Multifocal hepatic necrosis was also noted.

Due to the gill health issues observed on site, samples were screened for salmon gill poxvirus (SGPV), *Neoparamoeba perurans* (AGD) and *Paranucleospora theridion* by QPCR. Samples tested positive for all three pathogens.

Section 2: Case Detail

Observations

The above site was inspected following a report from the business of increased mortality in the Atlantic salmon stocked on the site. At the time of the inspection the site was stocked with 277,466 2016 S0 Atlantic salmon at an average weight of 3.3kg and 2300 mixed year class wrasse at an average weight of 50g. Mortality started to increase at the beginning of July 2017 accompanied with a drop in appetite. The odd numbered cages located to the east of the feed barge were worst affected, with mortality peaking in week 34 at 19.61% in cage 3. Complex gill issues and low grade heart and skeletal muscle inflammation (HSMI) had been diagnosed at the site by Fish Vet Group. Five lethargic Atlantic salmon were sampled for diagnostic purposes.

External: All fish were lethargic and had pale gills with evidence of haemorrhaging. Lice (*Lepeophtheirus salmonis*) were also observed on all fish.

Internal: All five fish had pale livers and hearts. The hearts of F2 and F5 were deformed and were difficult to cut, F1 also had fluid accumulation in the pericardial cavity. F2 had bloody ascites in the body cavity. Yellow pseudo faeces were present in the gut of all fish.

Results

Bacteriology: Kidney and gill material from five fish was inoculated onto appropriate media for the isolation of bacteria.

The following bacterium was isolated:

- *Vibrio* sp. (Kidney F1 and F3)

Vibrio sp. was isolated by bacteriological testing, however the level and purity of growth would not suggest this as a factor in fish morbidity.

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

Salmon gill poxvirus (SGPV)

Fish Number	F1	F4
Endogenous control Cp value	22.60	23.02
Cp Values	31.10	36.90
	31.65	36.70
	31.54	36.72
Reported Result	POSITIVE	POSITIVE

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

Neoparamoeba perurans (AGD)

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	22.60	22.94	22.96	23.02	24.56
Cp Values	33.72	31.97	>35	33.57	>35
	33.67	32.00	>35	33.85	>35
	33.72	31.99	>35	33.66	>35
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

R09

Paranucleospora theridion

Fish Number	F3	F4	F5
Endogenous control Cp value	22.96	23.02	24.56
Cp Values	35.78	31.04	33.37
	35.57	31.26	33.50
	38.47	31.05	33.04
Reported Result	POSITIVE	POSITIVE	POSITIVE

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from five fish. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination revealed the following:

Gill: Mild interlamellar basal hyperplasia (F1-F5), several lamellae with circular disturbances, several scattered aneurysmal dilation/telangiectasia, widespread lamellar necrosis (F1-F5), multifocal lamellar epithelial hyperplasia and diffuse irregular epithelial surface, mild multifocal clubbing of lamellae tips (F1-F5).

Skin & Muscle: Partial absence of epidermal layer (F2 & F4).

Heart: Minor pericarditis, small thrombi in the atrium chamber (F2), occasional degeneration of myofiber (F2 & F3) and nests of basophilic nuclei (F3) at the junction of the spongy layer with the compact layer (Ventricle) (F2), presence of eosinophilic granular cells in bulbus (EGC).

Gut and pyloric caeca: Mixed bacteria within the gut lumen (F1), few fibrous adhesions associated with vaccine administration noted (F2).

Pancreas: Within the normal range.

Liver: Widespread multifocal haptic necrosis (F1, F3) and minor to moderate multifocal hepatocyte vacuolation (F1, F2).

Kidney: Within the normal range.

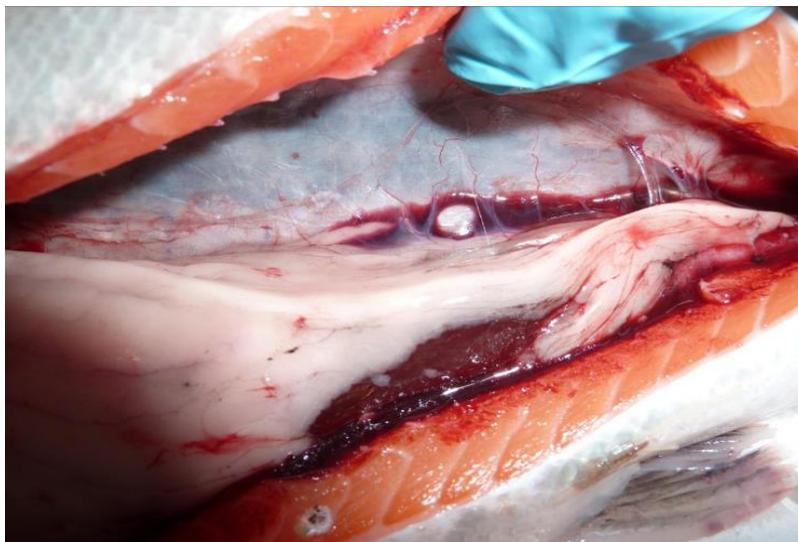
Spleen: Evidences of erythrophagocytosis (F2), empty sinusoids (F1-F5).

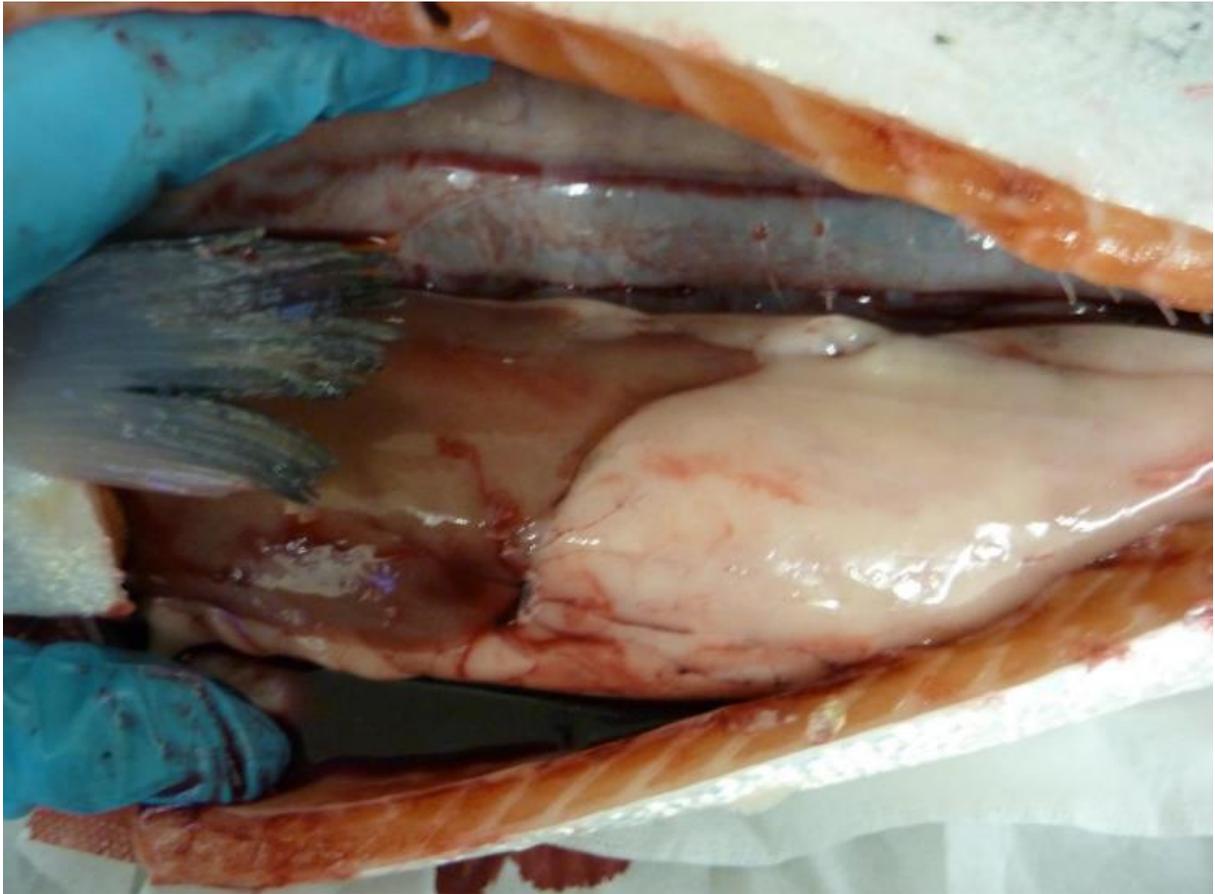
#18 (2017-0431) - Marine Harvest: Port Na Cro (Shuna Sound)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00534801.pdf> (p81 onwards)

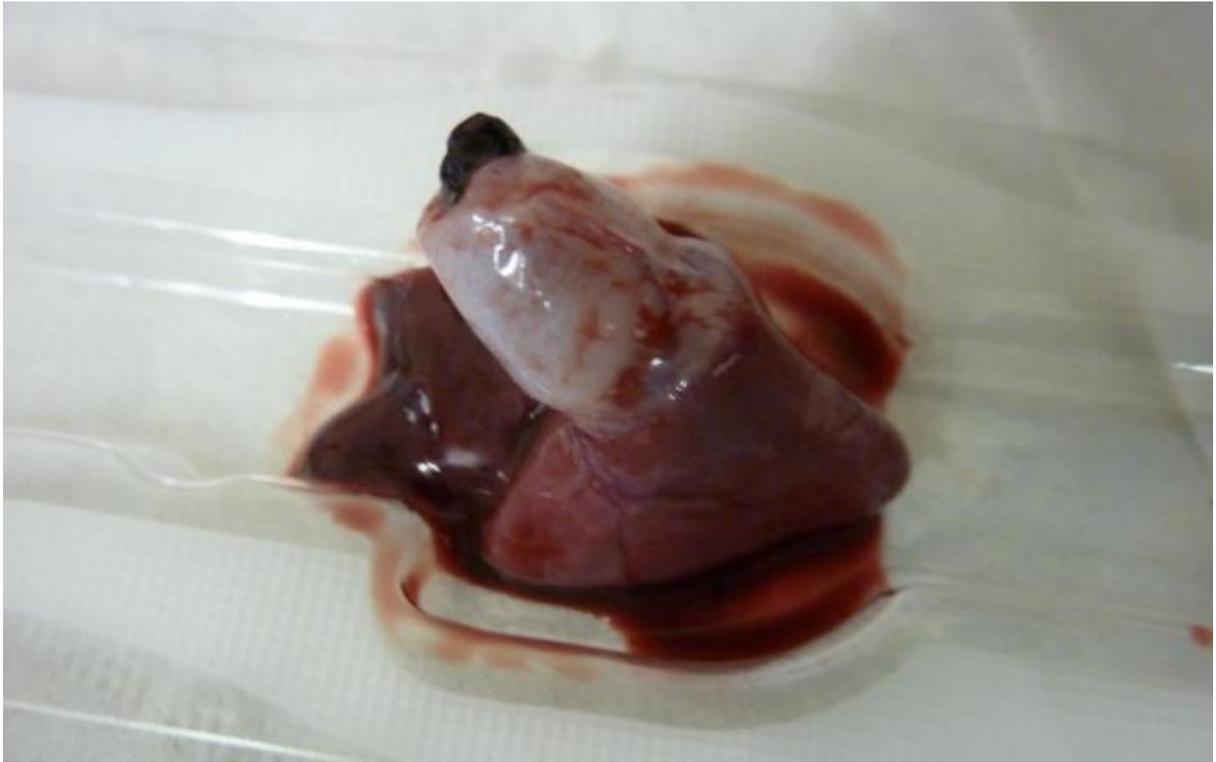
[Photos included:](#)



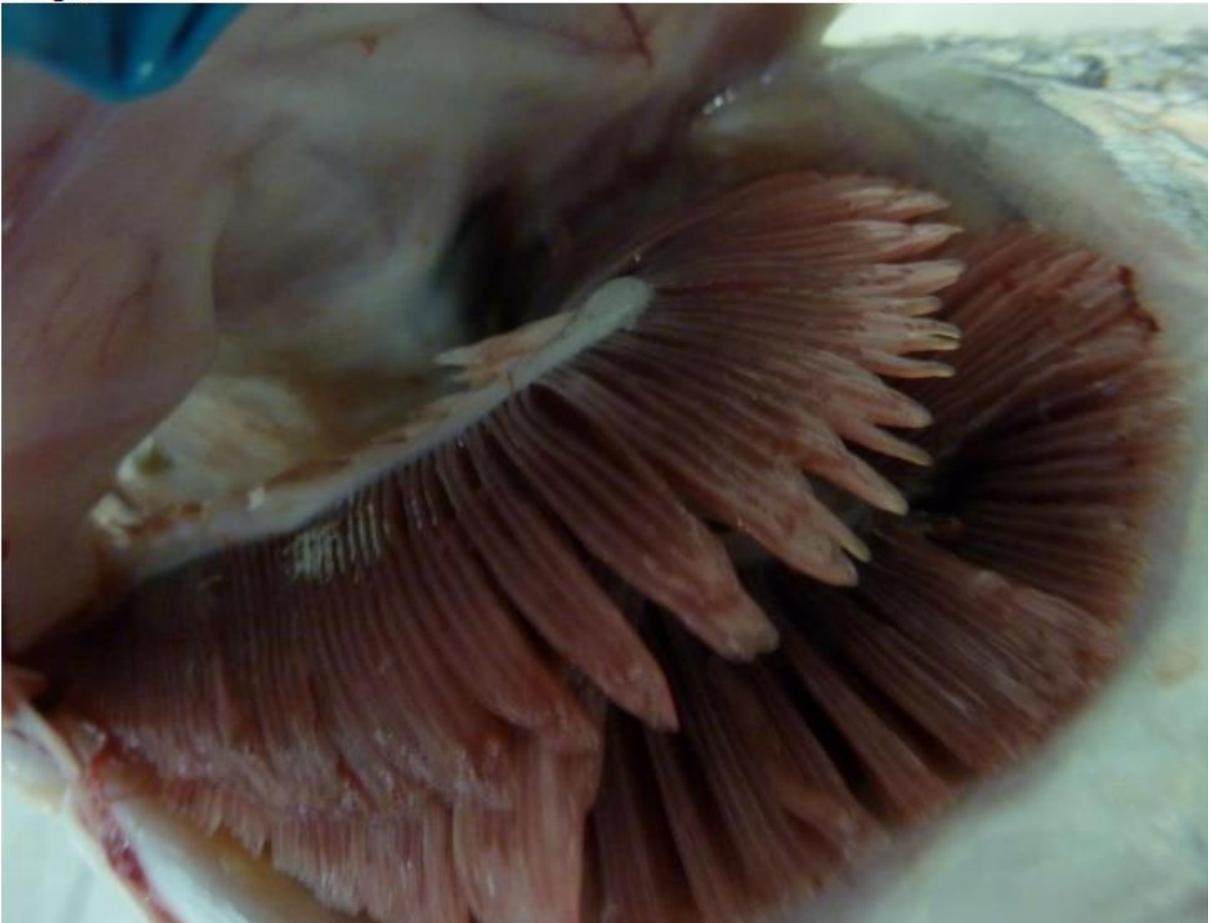


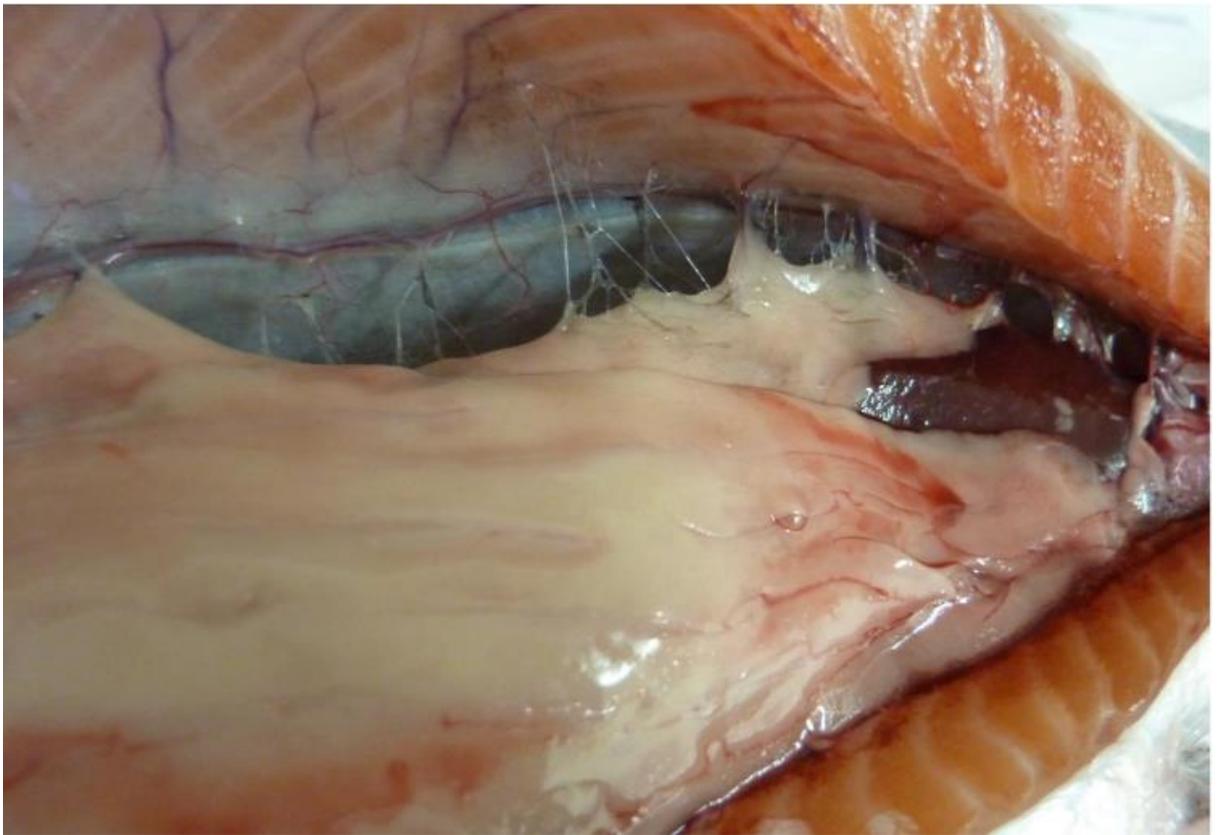
F3 raised scales





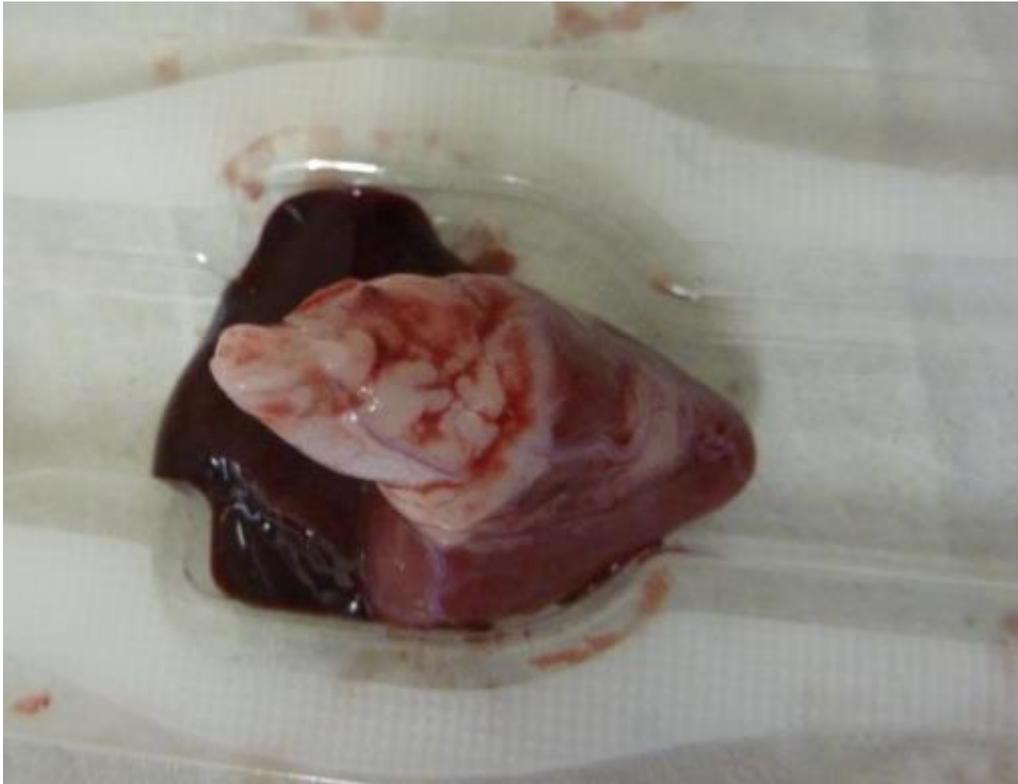
F4 gills





F5 external





Fisheries Health Inspectorate [Case Information](#) (p81 onwards) included:

"Site harvested out on day of inspection. 5 fish diagnostic taken of fish kept back from last cage. Mortality shot up from below 1% to 4.11% in wk 42. (see details on mort reports). Decision taken quickly to empty site."

"Gill issues, anaemia"

"Site has not received reports from last samples sent off and last two health visits but issues with gills and anaemia have lead to decision to harvest."

"Fish were retained for sampling from last harvest in a shallowed net so it was difficult to tell if they were really moribund or lethargic. But staff said these were the last ones remaining in the net and so anticipated they were not in good health."

"F1 blood clots surrounding the heart; F3 thin, raised/lifted looking scales; haemorrhaging or lice grazing damage observed on the ventral surface of all fish to varying degrees. Suspected some of fish sampled had started maturing."

The FHI visit report included:

Marine Harvest (Scotland) Ltd
Stob Ban House
Glen Nevis Business Park
Fort William
PH33 6RX

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	06/11/2017
SITE NO	FS0859	SITE NAME	Port Na Cro
INSPECTOR	Svenja Elwenn	CASE NO	20170431

Section 1: Summary

A report of increased mortality at the site was received from the operator. Five fish were removed for diagnostic sampling.

Histopathology examination revealed mild to moderate proliferative gill pathology with lesions consistent with amoebic gill disease (AGD) which was confirmed by QPCR, and presence of epitheliocysts. Pathology consistent with mild cardiomyopathy syndrome (CMS) was noted which was confirmed by QPCR positive result for Piscine myocarditis virus (PMCV).

Due to gill health issues observed on site samples were screened for *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) and salmon gill poxvirus (SGPV) by QPCR and tested positive for both pathogens.

Section 2: Case Detail

Observations

The above site was inspected following a report from the operator of increased mortality in the Atlantic salmon stocked on the site. At the time of the inspection the last stock had been harvested from the site with only a few fish retained for diagnostic sampling. Fish were kept in a shallowed net and therefore it was not possible to establish natural behaviour but it was assumed these were lethargic and moribund as they were the last ones remaining in the cage from the harvest activity. Externally F1-F2 had shortened opercula. Pale and zoned gills were seen in F1-F2 and F4-F5, with F3 showing zoned and slightly necrotic appearing gills. The vent was slightly inflamed in F5. Lice loads between 5 and 15 were observed on F3-F5. Internally F1-F3 had bloody ascites, with F3 also having a slightly deformed heart. The liver in F1-F2 and F4 appeared very pale, while F3 and F5 showed a darker liver. The spleen was enlarged in F3 and F5. Yellow-pseudo faeces were observed in F1, F3-F5.

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 myocarditis virus (PMCV)

Pool Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
P1	19.54	28.66	28.63	28.63	POSITIVE

Salmon gill poxvirus (SGPV)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.65	31.20	31.06	31.22	POSITIVE
F3	22.95	38.92	38.21	39.34	POSITIVE
F5	22.66	40	38.69	40	POSITIVE

F2 and F4 tested negative for salmon gill poxvirus (SGPV)

The samples tested negative for infectious haematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), infectious salmon anaemia virus (ISAV), salmonid alphavirus (SAV) and viral haemorrhagic septicaemia 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 (AGD)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.65	35.16	33.97	34.49	POSITIVE
F2	22.59	34.68	34.52	34.76	POSITIVE
F3	22.95	33.67	33.61	33.30	POSITIVE

F4	23.07	34.48	34.79	34.71	POSITIVE
F5	22.66	35.04	35.52	35.86	POSITIVE

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.65	31.81	31.90	32.11	POSITIVE
F2	22.59	35.15	35.78	36.21	POSITIVE
F3	22.95	39.36	36.61	36.78	POSITIVE
F4	23.07	34.05	34.31	33.70	POSITIVE
F5	22.66	36.71	36.38	37.25	POSITIVE

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from five fish. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination by light microscopy revealed the following:

Gill: Mild to moderate, focal to multifocal, hyperplasia and lamellar fusion noted mainly distally, occasional spaces (lacunae) filled now and then with cell debris and goblet cells lined up (F1-F4). Occasional amoebic cells resembling *Neoparamoeba perurans* (F1, F4), few scattered aneurysmal dilation/telangiectasia and some epithelial hypertrophy and (F1, F2, F4 & F5), occasional epithelial basophilic inclusions (epitheliocystis) (F1, F3 & F4) were seen. Presence of some lamellar tip clubbing noted in all individuals.

Skin & Muscle: Within the normal range.

Heart: Presence of few nests of basophilic nuclei, indicative of inflammation, (F1-F5) and mild multifocal cardiac myofibre degeneration (F2, F4), mild multifocal myofibre necrosis, thickness of endocardium and leucocyte infiltration (mainly mononuclear inflammatory cells) at the spongy layer of ventricle (F3 & F4), mild pericarditis.

Gut and pyloric caeca: Few fibrous adhesions associated with vaccine administration noted (F2 & F3).

Pancreas: Within the normal range.

Liver: Minor to moderate diffuse hepatocyte vacuolation (F1-F5), few nests of hepatocyte showing pyknotic nuclei (F2).

Kidney: Some tubule with dilated lumen (F5).

Spleen: Mild to moderate, focal to diffuse, reduction of white pulp (F4, & F5), slightly congested (F5) and some fibrous adhesions associated with splenic capsule (F3).

#19 (2017-0444) - Marine Harvest: Sron (Loch Alsh)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00534801.pdf> (p206 onwards)

[Photos included:](#)







F3

Fish Health Inspectorate [Case Information](#) (p206 onwards) included:

"Approx 40 % of all cleaner fish lost since input, AGD has been detected."

"Lice numbers increased above suggested criteria for treatment during week 40 2017 (1.49 average adult females) and week 41 (1.65 average adult females). Salmosan treatment carried out week."

"1 mort observed on site. Moribund and lethargic fish observed in cages 8 and 9. 3 fish removed for diagnostic sampling."

"CMS - detected since January 2017, AGD and PGD in both salmon and cleanerfish stock."

Mortality was reported as "Week 40 - 8099 (1.49%) across site - CMS, post treatment (salmosan)" and "Week 11 - 7065 (1.04%). Week 14 - 6815 (1.03%). Week 15 - 6679 (1.02%). CMS, handling".

"Adhesions in F1."

FHI 059, Version 11

Issued by: FHI

Date of issue: 12/09/2017

Case No: 2017-0444 Site No: FS0016 Date of visit: 11/10/2017

Start date:	End date: (if applicable)	Size of fish:	Average weight of affected population:	Species:	Yearclass:	Timescale	Mortality rate recorded(%):	Explained/unexplained:	If explained, select reason(s):
13/03/17	19/03/2017	≥750g	1.5 kg	SAL	2016 Q4	Weekly	1.04	Explained	CMS
03/04/17	09/04/2017	≥750g	1.5 kg	SAL	2016 Q4	Weekly	1.03	Explained	CMS
10/04/17	16/04/2017	≥750g	1.5 kg	SAL	2016 Q4	Weekly	1.02	Explained	CMS
02/10/17	08/10/2017	≥750g	3.5 kg	SAL	2016 Q4	Weekly	1.49	Explained	CMS, Treatment

Total mortality during event (if available):	Additional information (e.g. action taken by company):	Action taken by FHI (include case no where applicable):
7065	Company vet informed	Picked up during EC inspection 2017-0444
6815	Company vet informed	Picked up during EC inspection 2017-0444
6679	Company vet informed	Picked up during EC inspection 2017-0444
8099	Company vet informed	Picked up during EC inspection 2017-0444

The FHI visit report included:

Marine Harvest (Scotland) Ltd
Stob Ban House
Glen Nevis Business Park
Fort William
PH33 6RX

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	11/10/2017
SITE NO	FS0016	SITE NAME	Loch Alsh (Sron)
INSPECTOR	Joe Triscott	CASE NO	20170444

Section 1: Summary

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

Histopathology examination revealed mild gill pathology, mainly lamellar capillary disturbances/damage. Mild multifocal hepatic necrosis was also noted (likely associated with hypoxia). Fish 3 was a poor doing individual and showed a low level of proliferative gill pathology and mild heart inflammation. A minor peritonitis likely associated with vaccine administration was also noted.

Tenacibaculum sp. was isolated by bacteriology testing as a single colony within mixed growth. The level and purity of growth would not suggest bacteria be implicated as primary pathogen.

Section 2: Case Detail

Observations

During a routine inspection, a number of lethargic and moribund fish were observed, one moribund fish was hanging vertically in the water column. Three moribund fish were able to be caught for examination and diagnostic sampling.

The site had recently experienced an increase in mortality, thought to be related to on-going issues with cardiomyopathy syndrome (CMS), first detected within the population in January 2017, and increased handling resulting from sea lice treatments.

External examination of the fish showed slightly pale gills in fish 2 and anorexia in fish 3.

Internal examination showed clear ascites present in fish 2 as well as a pale and deformed heart. Fluid was present in the swim bladder of fish 1 and 2. Yellow pseudo-faeces was observed in the gut of fish 1 and 3, fish 3 also showed a lack of fat on the pyloric caeca. All three fish sampled had enlarged spleens.

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

The following bacterium was isolated from fish 1:

- *Tenacibaculum* sp. (Gill)

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from fish 1-3. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination revealed the following:

Gill: Few scattered lamellar thrombi (F1, F2), few scattered lamellae with epithelial hyperplasia (F2), some lamellar tip clubbing (F1), minor diffuse interlamellar basal hyperplasia (F1), mild epithelial stratification of gill filament, seen mainly at the tip (F2), and free blood among gill filament (F1, F2). In F3 one gill filament showed hyperplasia and lamellar fusion, mainly distally. Some chloride cell displacement, few detaching apoptotic cells and several scattered aneurysmal dilation/telangiectasia were also noted in F3. Some epithelial lifting was noted in all individuals but might be related with post mortem artefacts.

Skin & Muscle: Rare skeletal white fibre degeneration (F2) and evidences of encysted parasite within the dermis (F3).

Heart: Multifocal cell infiltration and few shrunken cardiomyofibres at the spongy layer of ventricle noted in F3. Compact layer within normal range and spongy layer very limited tissue present (difficult to obtain information) (F1, F2).

Gut and pyloric caeca: Some fibrous adhesions (likely associated with vaccine administration), lack of abdominal adipose tissue and some cell sloughing noted in F3.

Pancreas: Some fibrous adhesions associated with peri pancreatic adipose tissue (likely associated with vaccine administration) (F1).

Liver: Few scattered nests of hepatocytes showing pyknotic nuclei (F1), mild multifocal hepatocyte necrosis (F2).

Kidney: Increase number of melanomacrophage aggregates (F3).

Spleen: Some fibrous adhesions associated with the splenic capsule (likely associated vaccine administration) (F1), empty ellipsoids noted in F2 and slightly congested in F3.

#20 (2017-0467) - Scottish Salmon Company: Vuiabeag (West Loch Roag, Isle of Lewis)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00534802.pdf> (p26 onwards)

[Photos included:](#)





Fisheries Health Inspectorate [Case Information](#) (p26 onwards) included:

"Complex gill issues on site - AGD, Para Ther & Salmon gill pox. Microsporidia, SAV, epitheliocystis positive - by PCR from FVG."

"F1 - deformed spine."

The FHI visit report included:

[REDACTED]
The Scottish Salmon Company
1 Smithy Lane
Lochgilphead
Argyll
PA31 8TA
[REDACTED]

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0169	DATE OF VISIT	19/10/2017
SITE NO	FS0411	SITE NAME	Vuiabeag
INSPECTOR	Sonia Duguid	CASE NO	20170467

Section 1: Summary

A report was received from the operator of increased mortality levels at the site due to complex gill issues. Five fish were selected for diagnostic sampling.

Histopathology examination revealed complex gill issues with pathology consistent with amoebic gill disease (AGD) which was confirmed by QPCR and evidence of salmon poxvirus which was also confirmed by QPCR. Epitheliocystis were also noted in fish 3 and 5 and tested positive for *Candidatus Branchiomonas cysticola* and *Candidatus Syngnamydia salmonis* by QPCR. Mild hepatic necrosis was also noted, likely associated with hypoxia. Fish 3 also showed a skin lesion which in association with gill issues may impact on osmotic balance.

Due to gill health issues observed on site samples were screened for *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) by QPCR and tested positive.

Several different bacteria were isolated as detailed below, however in this case the bacteria are not thought to be implicated as the primary cause of morbidity.

Section 2: Case Detail

Observations

The above site was inspected following a report from the operator of increased mortality in the Atlantic salmon stocked on the site. At the time of the inspection the site was stocked with 831,846 2017 S1 Atlantic salmon at an average weight of 1.17kg.

Mortality levels had begun to rise in July 2017, peaking at 10.37% in week 36 following a hydrogen peroxide treatment. Mortality had reduced below the reporting level of 1.5% the following week and the week prior to the visit was at approximately 0.2%. Health surveillance carried out by the company reported complex gill issues (AGD, *Paranucleospora theridion*, salmon gillpox and epitheliocystis). PCR results were also positive for salmonid alphavirus. A number of moribund salmon were observed across the site and five were sampled for diagnostic purposes.

All five fish were lethargic, anorexic and had areas of necrosis on the gills. Fish 2 and 3 had lesions on their flanks and fish one was exophthalmic. Fish 1 had a deformed spine (scoliosis). Internally, fish 1 had blood tinged ascites and fish 4 and 5 had yellow pseudo-faeces present in the gut. All five fish had enlarged spleens, no food present in the gut and very little fat was observed around the pyloric caeca.

Bacteriology: Kidney and gill material from fish 1-5 and lesion material from fish 2 and 3 were inoculated onto appropriate media for the isolation of bacteria. The following bacteria were isolated:

Moritella viscosa – fish 3 (lesion material)

Vibrio spp. – 2 separate isolates from fish 1-4 (kidney and gill material)

Moritella viscosa is a known fish pathogen and it was present at very high levels in the lesion of Fish 3.

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

Candidatus Branchiomonas cysticola

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F3	22.96	29.27	29.23	29.33	POSITIVE
F5	23.26	25.05	25.22	25.00	POSITIVE

Candidatus Syngnamydia salmonis

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F3	22.96	27.33	27.57	27.48	POSITIVE
F5	23.26	27.58	27.55	27.41	POSITIVE

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

Infectious pancreatic necrosis virus (IPNV)

Pool Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
P1	19.65	36.26	36.76	36.71	POSITIVE

Salmonid alphavirus (SAV)

Pool Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
P1	19.65	36.08	35.76	36.11	POSITIVE

Salmon gill poxvirus (SGPV)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.23	31.87	31.96	32.00	POSITIVE
F2	23.29	25.56	25.48	25.52	POSITIVE
F3	23.05	26.21	26.09	26.05	POSITIVE
F4	22.71	35.25	35.12	35.28	POSITIVE
F5	23.27	26.31	26.28	26.28	POSITIVE

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 (AGD)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.23	28.57	28.62	28.67	POSITIVE
F2	23.29	26.11	26.06	26.08	POSITIVE
F3	23.05	27.21	27.17	27.18	POSITIVE
F4	22.71	27.22	27.04	27.06	POSITIVE
F5	23.27	27.18	27.19	27.10	POSITIVE

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.23	29.54	29.40	29.51	POSITIVE
F2	23.29	26.41	26.35	26.36	POSITIVE
F3	23.05	29.46	29.28	29.38	POSITIVE
F4	22.71	32.94	33.18	33.11	POSITIVE
F5	23.27	28.23	28.31	28.31	POSITIVE

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: Moderate multifocal interlamellar hyperplasia with occasional spaces (lacunae) filled now and then with cell debris and small foci of necrosis, lamellar fusion and multifocal gill filament fusion and several amoebic cells resembling *Neoparamoeba perurans* were noted in all individuals. Diffuse displacement and hypertrophy of chloride cells and prominent goblet cells noted in all individuals and synechial structures also seen in F2. Few detaching apoptotic epithelial cells were noted in F2, F3 and F4. Several basophilic epithelial inclusions (epitheliocystis) noted in F3 and F5. Two aneurysmal dilation/telangiectasia (F3) and diffuse lamellar congestion also noted.

Skin & Muscle: Occasional degeneration of skeletal white fibres. F3 showed a lesion with absence of epidermal layer, dermal oedema with high numbers of bacteria associated, reaching the skeletal red muscle, and darkening of the basement membrane. Degeneration of skeletal red fibres and haemorrhage were also seen.

Heart: Within normal range.

Gut and pyloric caeca: Lack of abdominal adipose tissue in all individuals, some fibrous adhesions (likely associated with vaccine administration) (F1-F5) and more severe granuloma inflammation with presence of few giant cells noted in F4 and F5. Either hindgut or pyloric caeca with mixed bacteria within the lumen (F1, F3).

Pancreas: Within normal range.

Liver: Minor to moderate sinusoidal congestion (F1, F4, F5), mild multifocal hepatocyte necrosis (F3, F5). F5 also showed enlarged sinusoidal spaces.

Kidney: Increase number of melanomacrophage aggregates noted in all individuals and occasional proteinaceous fluid within bowman's space (F5).

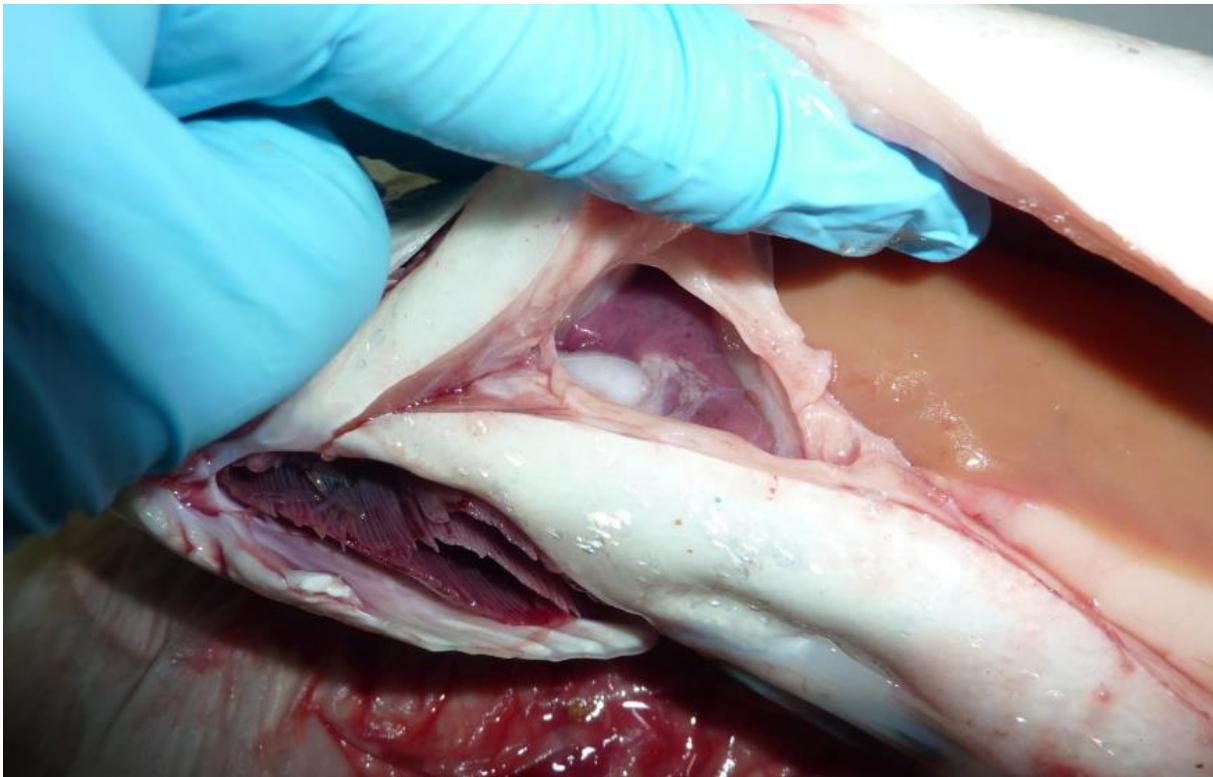
Spleen: Evidences of erythrophagocytosis and slight reduction of hematopoietic tissue (F5), congested (F4).

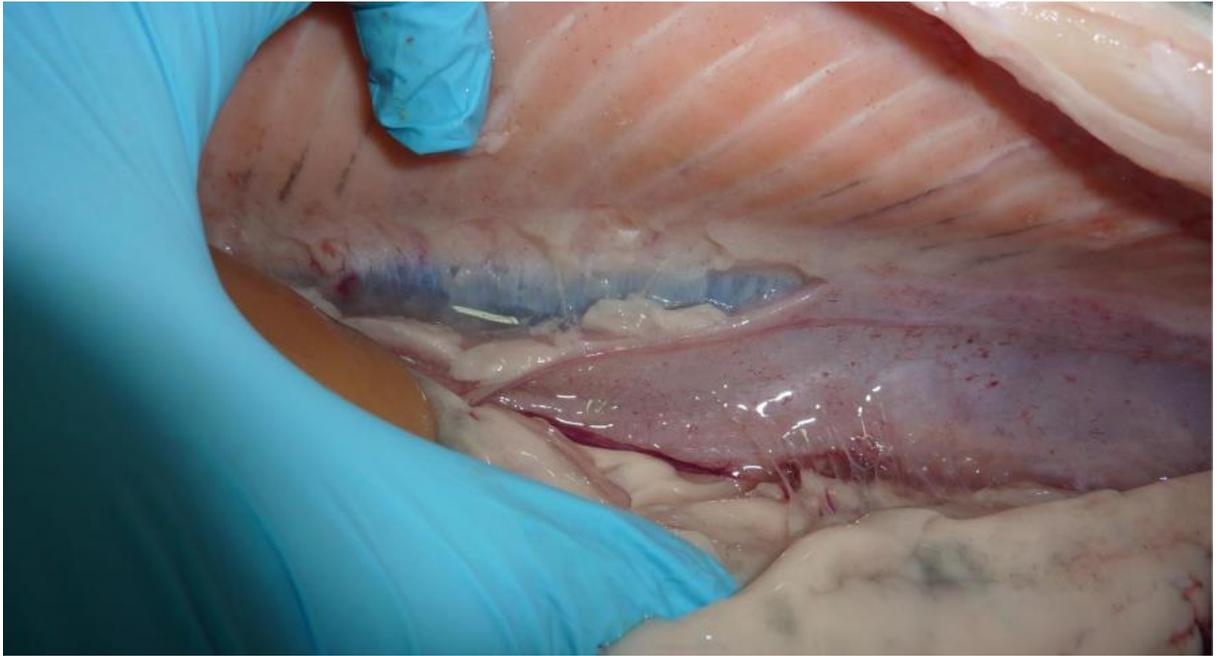
#21 (2017-0469) - Marine Harvest: North Shore (Loch Erisort, Isle of Lewis)

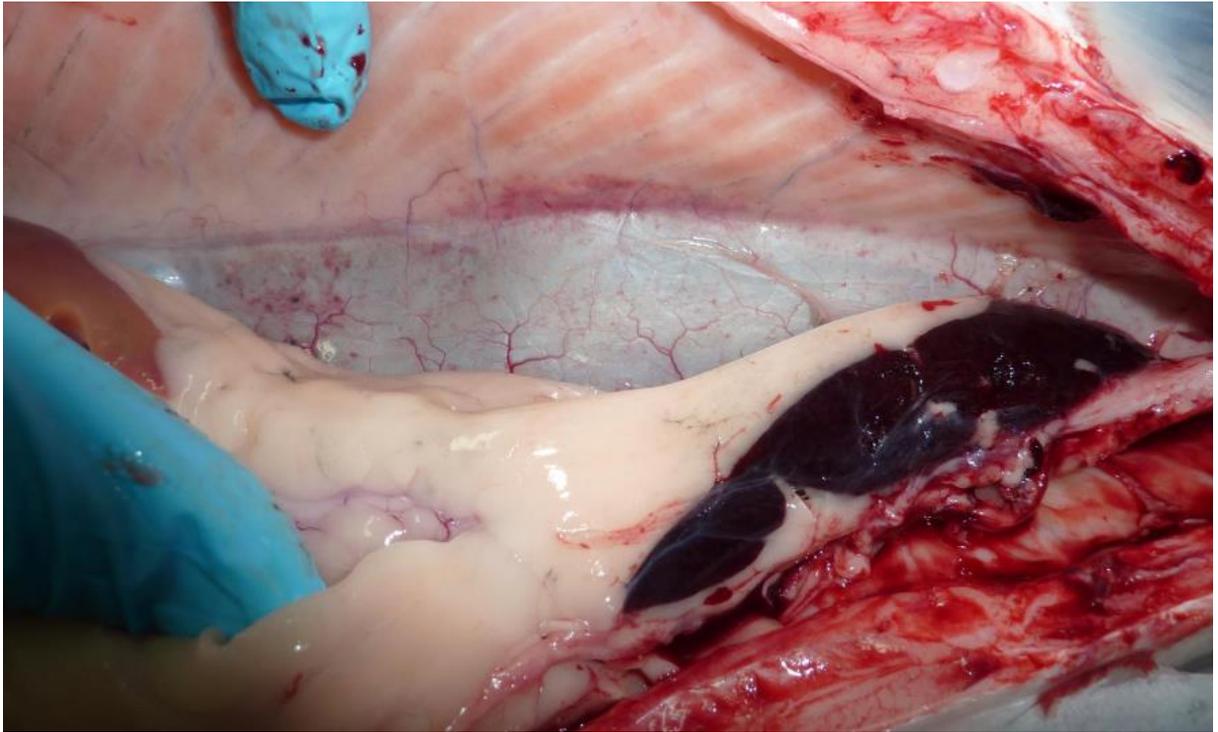
Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00534802.pdf> (p56 onwards)

[Photos included:](#)







Fisheries Health Inspectorate [Case Information](#) (p56 onwards) included:

"Presumptive *Pasteurella skyensis* diagnosis - based on histology results from FVG. Gram - ve bacteria seen in sections and pathology consistent with previous *Pasteurella* infections. Also, isolate submitted via FVG to MS for sequencing. Samples sent off to Ridgeway for isolation and confirmation - results expected at start of next week. Pen 16 worst affected.

Samples from end of September showed some cardiomyopathy - FVG.

PD diagnosed at end of May (sub-type 5) - recent blood PCRs negative, no longer active infection. Don't think contributing to current mortality event. However, additional PCRs positive from Patogen tests at end of September. Patogen also had positive PCRs for CMS in one fish. Salmon gill pox and ParaTher also positive.

Stocked with lumpfish but extended FW treatments killed majority - close to 100% mortality. PGD on site at present but not gross AGD lesions. PGD scores of 2-3 on moribunds but similar in un-affected fish.

Site vet reported - fluid being seen in pericardium - from clear to 'milky white'. Fluid in peritoneal cavity - blood tinged. Also some fluid on swim bladder. Mottled spleen in some with nodules. Adhesions present."

"NSW - morts started rising in August. Prior to this approx. 200/8 cages/ every few days. Now 43-201/c/day. 49608 across NSW since 28/06/17. NSE - 95762 total mortality since 28/06/17. Similar to NSW - started rising in August. Now 12-311/c/day. Morts have dropped again over last few days - peaked at 7500 across NSE/day on 28 September, now 741/site/day. Staggered treatment with antibiotics (Florocol) - limited availability of antibiotic. 7 cages treated. Morts also above reporting levels at Tabhaigh - weeks 32 -34."

"Cage currently being treated with Florocol. Decision to be made following withdrawal period - either to harvest cage or carry out lice treatment. Fish will be counted at this time - don't want handling at present due to treatment. Multiple moribund fish seen in cages 16, 17 and 2. 5 sampled for diagnostic purposes. Didn't see as much gross pathology or clinical signs as had been seen by vet."

"F2 - shortened upper jaw, thickened membrane over kidney - gelatinous, adhesions.

F3 - shortened upper jaw, both eyes damaged, adhesions.

F4 - grilse

F5 - shortened upper jaw."

FHI 059, Version 11

Issued by: FHI

Date of issue: 12/09/2017

Case No: 2017-0469 Site No: FS1033 Date of visit: 18/10/2017

Start date:	End date: (if applicable)	Size of fish:	Average weight of affected population:	Species:	Yearclass:	Timescale	Mortality rate recorded(%):	Explained/unexplained:	If explained, select reason(s):
11/09/17	17/09/2017	≥750g	3.8	SAL	2016 Q4	Weekly	1.26	Explained	AGD, Complex gill issues, PD, PGD
18/09/17	24/09/2017	≥750g	3.9	SAL	2016 Q4	Weekly	1.77	Explained	AGD, Complex gill issues, PD, PGD
25/09/17	01/10/2017	≥750g	3.9	SAL	2016 Q4	Weekly	4.90	Explained	AGD, Complex gill issues, PD, PGD
02/10/17	08/10/2017	≥750g	4	SAL	2016 Q4	Weekly	2.87	Explained	AGD, Complex gill issues, PD, PGD
09/10/17	15/10/2017	≥750g	4.1	SAL	2016 Q4	Weekly	2.65	Explained	AGD, Complex gill issues, PD, PGD

The FHI visit report included:



Marine Harvest (Scotland) Ltd
Stob Ban House
Glen Nevis Business Park
Fort William
PH33 6RX

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	18/10/2017
SITE NO	FS1033	SITE NAME	North Shore
INSPECTOR	Sonia Duguid	CASE NO	20170469

Section 1: Summary

A report was received from the operator of increased mortality levels at the site due to infection with *Pasteurella skyensis*. Recent samples submitted to the Fish Vet Group had also shown some cardiomyopathy. Proliferative gill disease was also being observed on site. The site was inspected and five fish were removed for diagnostic sampling.

Histopathology examination revealed mild gill pathology, mainly lamellar capillary disturbances/damage. Some of the lesions are commonly seen as background levels. Fish 3 showed mild pathology resembling *Pasteurella*-like infections and gram negative bacteria were observed in sections of fish 4. Myositis and mild myocardial inflammation were also noted in fish 1, fish 2 and fish 3.

Pasteurella skyensis was isolated, this is a known fish pathogen and the purity and growth level suggest it is likely to be implicated in morbidity.

Due to gill health issues observed on site, samples were screened for *Neoparamoeba perurans* (AGD), *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) and salmon gill poxvirus by QPCR and tested positive for all three pathogens. Results for individual fish are detailed below.

Section 2: Case Detail

Observations

The above site was inspected following a report from the operator of increased mortality in the Atlantic salmon stocked on the site. At the time of the inspection the site was stocked with

577,367 2016 Q4 Atlantic salmon at an average weight of 3.9kg. The site had stocked with lumpfish, but very few remained on site following extended freshwater treatments.

Mortality levels had begun to rise in August 2017, peaking at 4.9% in week 39. Mortality had reduced to 2.65% the week prior to the inspection. Seven cages were being treated with Florocol as insufficient antibiotic was available to treat the whole site. The most recent health surveillance carried out by the company reported a *Pasteurella skyensis* infection. PCR results at the end of September 2017 were positive for salmonid alphavirus, piscine myocardiopathic virus (1 fish), salmon gill poxvirus and *Paranucleospora theridion*. A number of moribund salmon were observed across the site and five were sampled for diagnostic purposes.

Fish 1, 2 and 5 had pale gills, with the gills of fish 2 having necrotic areas. Fish 2 and 5 were exophthalmic and both eyes of fish 3 were damaged. Fish 2, 3 and 5 all had a shortened upper jaw and fish 4 was a grilse. Internally none of the fish had food present in the gut and fish 4 had yellow pseudo-faeces. Fish 1, 2 and 3 all had enlarged spleens with fish 1 and 2 also exhibiting haemorrhaging on the swim bladder. Fish 2 had blood tinged ascites, adhesions and a thickened, gelatinous membrane over the kidney. The kidney of fish 2 was slightly grey and the liver was quite pale. Fish 3 also had adhesions in the body cavity.

Bacteriology: Kidney and gill material from fish 1-5 and heart material from fish 2 were inoculated onto appropriate media for the isolation of bacteria.

The following bacteria were isolated:

Pasteurella skyensis – Fish 1-4 (kidney material)

Tenacibaculum sp. – Fish 4 (gill material)

Vibrio sp. – Fish 1 (kidney material)

Tenacibaculum sp. was isolated by bacteriology testing as a single colony within mixed growth and *Vibrio* sp. was also isolated. The level and purity of growth would not suggest these bacteria be implicated as primary pathogen.

From the tests conducted on the *Pasteurella skyensis* isolate, we do not have evidence of resistance to amoxycillin, oxytetracycline or florfenicol, however we have evidence which may indicate resistance to cotrimoxazole.

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)

Pool Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
P1	19.37	37.09	36.76	36.95	POSITIVE

Salmon gill poxvirus (SGPV)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.87	37.15	36.93	38.29	POSITIVE
F2	23.27	38.34	37.99	37.99	POSITIVE
F4	23.38	29.71	29.62	29.75	POSITIVE
F5	23.05	36.83	36.48	36.93	POSITIVE

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* (AGD)**

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F2	23.27	32.09	32.49	32.26	POSITIVE
F3	23.15	32.61	32.58	32.61	POSITIVE
F4	23.38	33.92	33.90	34.27	POSITIVE

Fish 1 and 5 tested negative for AGD.

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.87	33.22	33.38	33.07	POSITIVE
F3	23.15	35.17	35.05	35.50	POSITIVE
F5	23.05	32.06	32.12	32.01	POSITIVE

Histopathological examination revealed the following:

Gill: Multifocal lamellar tip clubbing (F1-F5), several scattered aneurysmal dilation/telangiectasia (F1-F5), minor multifocal lamellar thickness (F1-F4) and more moderate noted in F5. Scattered lamellar thrombi also noted in all individuals. F3 showed one gill filament with hyperplasia and lamellae fusion distally and in F5 the gill filaments showed some bluntness on the tips. Bacteria stained gram negative were noted in F4 associated with lamellar epithelium.

Skin & Muscle: Mild to moderate multifocal inflammation and fibrosis of endomysium with recovering red muscle fibres (F1-F3) and occasional degeneration of red fibres were noted in F1 and F2.

Heart: Mild multifocal cell infiltration (F1-F2) at the spongy layer of ventricle, mild to moderate pericarditis (F1-F5) with deposits of amorphous eosinophilic material resembling fibrin (F4-F5) and presence of bacteria (stained gram negative) (F4). F3 showed scattered small foci of cell infiltration with degeneration of adjacent myocardial fibres. Presence of eosinophilic granular cells (EGC) in bulbous of F5.

Gut and pyloric caeca: Some fibrous adhesions (likely associated with vaccine administration) (F1-F5) and some cell sloughing noted in F1. Mixed bacteria within the lumen of the hindgut (F4).

Pancreas: Few scattered apoptotic cells noted in F3. Some fibrous adhesions associated with peri-pancreatic tissue (likely associated with vaccine administration) (F2).

Liver: Mild focal to diffuse dilation of the sinusoidal space (F2 & F4) and small foci of hepatocyte necrosis (F2). Fibrous adhesion noted on the capsule (F3-F5). Mild diffuse hepatocyte vacuolation noted in F4.

Kidney: Within normal range.

Spleen: Some fibrous adhesions likely associated with vaccine administration (F1-F5), several small distinct structures resembling small granulomas and one or two giant cells associated.

#22 (2017-0496) - Scottish Sea Farms: Kishorn A (South) (Loch Kishorn)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00534802.pdf> (p224 onwards)

[Photos included:](#)



Fish 1

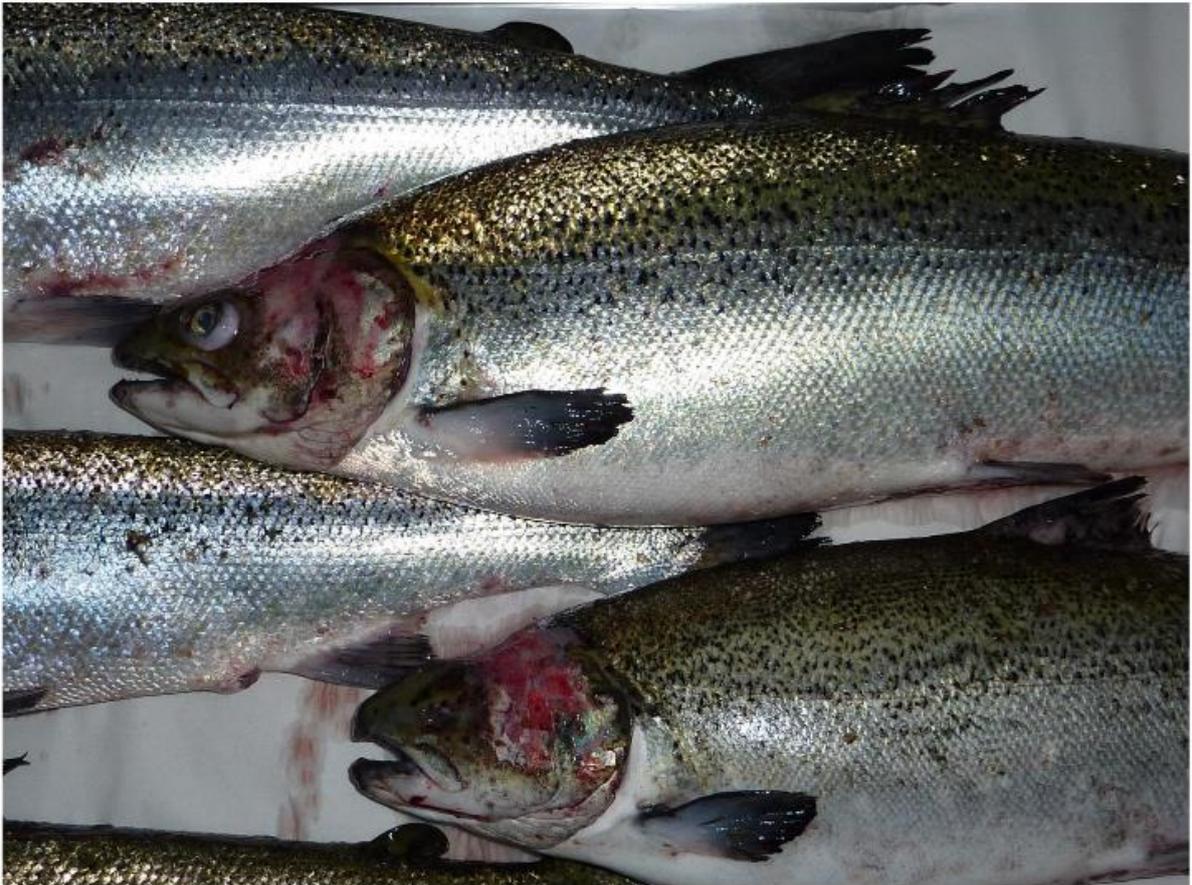


Fish 2



Fish 2 & 3





Fish 4 & 5



Fisheries Health Inspectorate [Case Information](#) (p224 onwards) included:

"Ongoing health issue on site. Company reported weekly mortality levels above 1%. Tests positive for presence of AGD, *Paranucleospora theridion*, salmon gillpox and *Branchiomonas*. Also observed lamellar bleeding of the gills. CMS was detected earlier in the cycle (fish ~500g) and HSMI like pathology in more recent tests. Advice from vets to accelerate harvests and not to attempt mechanical delousing in worst affected cages, bath only. Sea lice levels have increased (Most recent count on 27/9/17 - 5.67. No recent counts as harvesting out site). Treated all cages with Azamethiphos at end of Sept/early October. Harvesting worst affected cages first and site should be empty over the weekend.

Mortalities being sent to Dundas for disposal. Due to volume of fish using a dedicated workboat operated by Fergusons Transport (Carly) who are organising the removal. Mortalities removed using uplift, transferred to tubs on site workboat and then pumped into sealed skips on boat. Boat moors at Kyle of Lochalsh each day and morts are collection by Billy Bowie.

A number of fish seen on site with lice damage to the head (estimate ~100 per cage visible). Removed 4 moribund fish and one apparently healthy fish for VMD. The gills of the fish removed for VMD had numerous pale patches so was included in the diagnostic sample. The four moribund fish had extensive lice damage to their heads, but gills appeared ok. Internally the heart of fish four was pale. Photos attached."

"CMS, AGD, *Paranucleospora theridion*, salmon gillpox and *Branchiom.*"

"Fish 2-5 sea lice damage to head."

The FHI visit report included:



Scottish Sea Farms Ltd
Laurel House
Laurelhill Business Park
Polmaise Road Stirling
FK7 9JQ

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0125	DATE OF VISIT	25/10/2017
SITE NO	FS0709	SITE NAME	Kishorn A (South)
INSPECTOR	Andrea Warwick	CASE NO	20170496

Section 1: Summary

A report was received from the operator of increased mortality levels at the site due to complex gill issues. Five fish were removed for diagnostic sampling.

Histopathology examination revealed complex gill issues. There was pathology consistent with epitheliocystis, amoebic gill disease (AGD) which was confirmed by QPCR and evidence of salmon gill poxvirus which was confirmed by QPCR. Mild hepatic necrosis was noted, likely associated with hypoxia. Mild cardiomyopathy noted in all individuals.

Due to gill health issues observed on site samples were screened for *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) by QPCR and tested positive.

A *Vibrio* sp. and *Pseudomonas fluorescens* were isolated but are not thought to be the primary source of morbidity.

Section 2: Case Detail

Observations

The above site was inspected following a report from the operator of increased mortality in the Atlantic salmon stocked on the site. At the time of the inspection the site was stocked with 59,933 2016 S0 Atlantic salmon at an average weight of 3.38Kg.

Mortality levels had begun to rise at the start of September 2017, peaking at 6.27% in week 38 and were at 2% the week previous to the inspection. Harvesting was ongoing and the site was due to fallow by the end of the month. Health surveillance carried out by the business reported

complex gill issues (AGD, *Branchiomonas*, *Paranucleospora theridion* and salmon gill poxvirus) with lamellar bleeding of the gills. A number of lethargic salmon were observed across the site and four were sampled for diagnostic purposes along with a fish that appeared to be healthy.

Fish 1 had pale gills and fish 2-5 had sea lice damage to their heads. Internally the heart of fish 4 was pale, there was no food in the guts of fish 3, 4 and 5 and there was yellow pseudo-faeces present in the gut of fish 2.

Bacteriology: Kidney and gill material from fish 1-5 was inoculated onto appropriate media for the isolation of bacteria.

The following bacteria were isolated from fish 1-5:

- *Pseudomonas fluorescens* (gill material from fish 1-5)
- *Vibrio* sp. (kidney material from fish 2 and 5)

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

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	23.03	24.28	24.85	24.09	23.34
Cp Values	38.79	29.98	33.47	28.86	32.90
	38.34	29.83	33.37	27.92	31.01
	>40	29.82	33.28	27.92	33.09
Reported Result (PCR)	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

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 (AGD)

Fish Number	F3	F4	F5
Endogenous control Cp value	24.85	24.09	23.34
Cp Values	>35	31.82	31.72
	>35	32.15	31.82
	>35	31.91	31.67
Reported Result	POSITIVE	POSITIVE	POSITIVE

Paranucleospora theridion

Fish Number	F1	F3	F4	F5
Endogenous control Cp value	23.03	24.85	24.09	23.34
Cp Values	32.86	30.95	31.07	35.00
	33.14	31.01	31.60	35.35
	33.73	30.93	31.00	35.38
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE

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: Mild to moderate multifocal interlamellar hyperplasia with occasional spaces (lacunae) filled now and then with cell debris, mainly distally, and lamellar fusion were noted in all individuals and several amoebic cells resembling *Neoparamoeba perurans* noted in all individuals. Diffuse irregular lamellar epithelial surface, diffuse displacement and hypertrophy of chloride cells, epithelial cell hypertrophy and prominent goblet cells noted in all individuals and few detaching apoptotic epithelial cells noted in fish 2, 3 and 4. Some gill filament bluntness also noted in fish 1 and 4. Occasional epithelial basophilic inclusions (epitheliocystis) noted in fish 1 and 3. One aneurysmal dilation/telangiectasia (fish 4) and focal lamellar epithelial lifting filled with proteinaceous fluid (fish 4).

Skin & Muscle: Within normal range.

Heart: Multiple small foci of cell infiltration and myocardial fibre degeneration noted all individuals but very minor in fish 3 and 5. Nests of basophilic nuclei at the junction spongy-compact layer of ventricle noted in fish 2. Mild pericarditis noted in fish 2 and 4.

Gut and pyloric caeca: Within normal range.

Pancreas: Within normal range.

Liver: Mild focal hepatocyte necrosis (fish 4) and occasional apoptotic cells (fish 2 & 4).

Kidney: Some shrunken glomeruli (fish 2) and some tubules with dilated lumen (fish 4).

Spleen: Slightly congested (fish 1 & 3).

#23 (2017-0533) - Cooke Aquaculture: Stead of Aithness (Aith Voe, Shetland)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00534803.pdf> (p145 onwards)

[Photos included:](#)

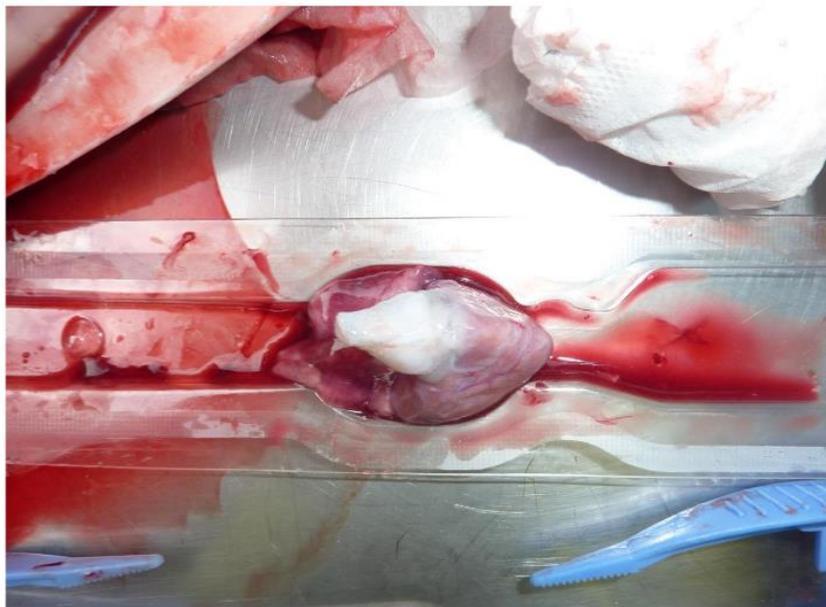


Photo 2: F5 heart

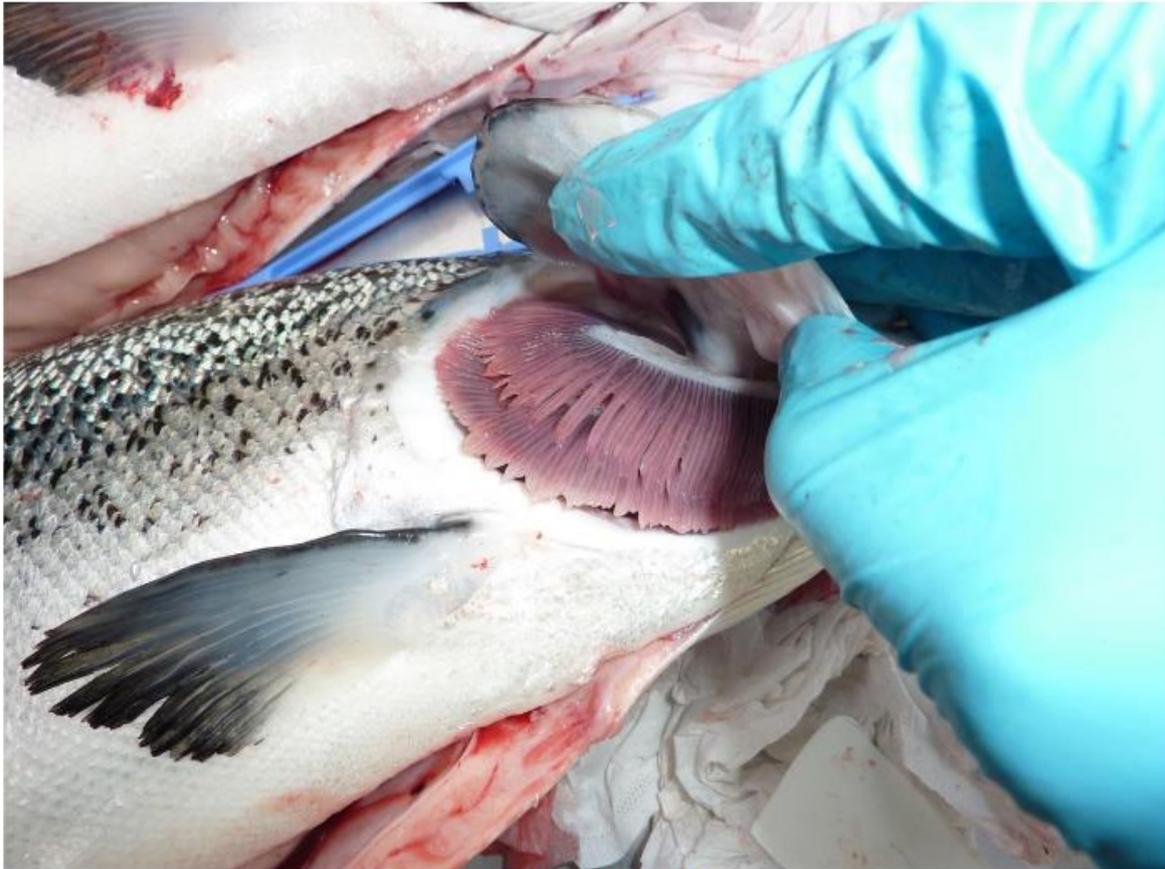


Photo 3: F4 gills

Fisheries Health Inspectorate [Case Information](#) (p onwards) included:

"Harvest has been accelerated by 1 months due to increased morts. Top sweep is being harvest first from the worst affected cages. FVG have been contacted and have conducted two site visit. Last report observed, another report is expected soon. The site representative agreed to contact ASM once the report has been received. Site staff did not directly observe macroscopic jellyfish, however, FVG did suggest mortality was consistent with harmful microscopic zooplankton, either Muggiaea or Solmaris. AGD treatments carried out earlier in 2017. Treated on 22/09/17, 09/08/17, 11/07/17."

"Updated by SJD 19/12/17 - mortality percentage in Mortality events sheet updated to same as on master sheet. Master sheet entry was updated following a phone call on 24/11/17 as percentage recorded was incorrect. Updated by ASM 21/12/17 - During the inspection of the stock on site there were many fish high in the water column. Many fish were moribund and about 20-30 fish over the site were observed dead on the surface of the water."

"All cages effected, 4,000-5,000 morts per cage per week, thought to be caused by harmful microscopic plankton (FVG)."

"Fish 4 and 5 both had a slightly swollen heart atrium (see photo 2). This observation was also made in the FVG report."

Case No: 2017-0533 Site No: FS0637 Date of visit: 08/11/2017

Start date:	End date: (if applicable)	Size of fish:	Average weight of affected population:	Species:	Yearclass:	Timescale	Mortality rate recorded(%)	Explained/unexplained:	If explained, select reason(s):
30/10/17	05/11/2017	≥750g	3.5kg	SAL	2016 S0	Weekly	11.52	Explained	Complex gill issues

Total mortality during event (if available):	Additional information (e.g. action taken by company):	Action taken by FHI (include case no where applicable):
58590	Additional samples submitted to FVG	Inspection undertaken (2017-0533)

The FHI visit report included:

marinescotland
science



██████████
Cooke Aquaculture Scotland Ltd
Crowness Road
Hatston Kirkwall
Orkney
KW15 1RJ
████████████████████

FINAL FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0095	DATE OF VISIT	08/11/2017
SITE NO	FS0637	SITE NAME	Stead of Aithness
INSPECTOR	Andy Mayes	CASE NO	20170533

Section 1: Summary

The fish health inspectorate were contacted by a representative for the above site during a mortality event. A site inspection was organised. During the inspection five fish were removed for diagnostic sampling.

Histopathology examination revealed complex gill issues with pathology consistent with amoebic gill disease, presence of epitheliocystis and some features resembling salmon poxvirus. Mild hepatic necrosis, likely associated with hypoxia, marked lamellar capillary disturbances or damage and minor cardiomyopathy were also noted.

Section 2: Case Detail

Observations

The fish health inspectorate were contacted on 31/10/17 regarding an increase in mortality over the level of reporting criteria. The mortality event started on 09/10/17 with a mortality rate of 1.9% (11,932 fish) over the week. This mortality rate peaked at 13.69% (81,698 fish) per week two weeks after the start of the event. The mortality event was attributed to complex gill issues by the business representative. A veterinarian had been called and samples had been taken.

During the inspection the preliminary results of the veterinarian investigation were observed. The pathology observed by the veterinarian was consistent with harmful microscopic zooplankton, most likely from the genus *Muggiaea* or *Solmaris*. Inspection of the treatment records showed the fish were treated three times for amoebic gill disease (AGD) since input starting on 11/07/17, 09/08/17 and 22/09/17. All treatments were reportedly successful. Three successful SLICE treatments were also carried out starting on 02/11/16, 22/02/17 and 23/06/17. These were reportedly successful. Lice numbers the week before the inspection were increasing (thought to be related to the increase in the immunocompromised fish on site). The levels were below 3 adult female lice per fish.

During the inspection of the stock on site there were many fish high in the water column. Many fish were moribund and about 20-30 fish over the site were observed dead on the surface of the water. Five live fish were removed for diagnostic sampling.

All fish removed were lethargic and moribund, while fish 3 also had a cataract in one eye. The gills of fish 3-5 were pale, and in fish 4 and 5, were necrotic. All fish had a high lice burden, between 9 and 16 (all life stages). Internally all fish had yellow pseudo-faeces, fish 2, 4 and 5 had bloody ascites. Fish 2 and 4 also had a slightly grey kidney and fish 4 and 5 had a slightly swollen heart atrium.

Histopathological examination revealed the following:

Gill: Mild multifocal interlamellar hyperplasia with occasional spaces (lacunae) filled now and then with cell debris, spongiosis, prominent goblet cells, some lamellar epithelial thickness, adjacent adherence of secondary lamellae, small foci of lamellar necrosis noted in all individuals and several amoebic cells resembling *Neoparamoeba perurans* noted in F1, F4 and F5. Circulatory disturbance and several aneurysmal dilation/telangiectasia were noted in all individuals but more markedly seen in F2. Some chloride cells displacement and presence of nuclei karyorrhexis and occasional apoptotic cells shedding off and few basophilic epithelial inclusions (epitheliocystis) were also noted. Generalized epithelial lifting noted in F4 but likely associated with post-mortem artefact.

Skin & Muscle: Within normal range.

Heart: Few nests of basophilic nuclei (F1 & F3) and myofibre degeneration, occasional small thrombi (F2). Minor pericarditis (F2)

Gut and pyloric caeca: Mild granulomatous reaction (likely associated with vaccine administration) noted in F2 and mixed bacteria noted within the lumen of the hindgut of F3. Marked cell sloughing noted in F4 but likely associated with post-mortem artefact.

Pancreas: Within normal range.

Liver: Mild multifocal hepatocyte necrosis (F2, F4 & F5)

Kidney: Within normal range.

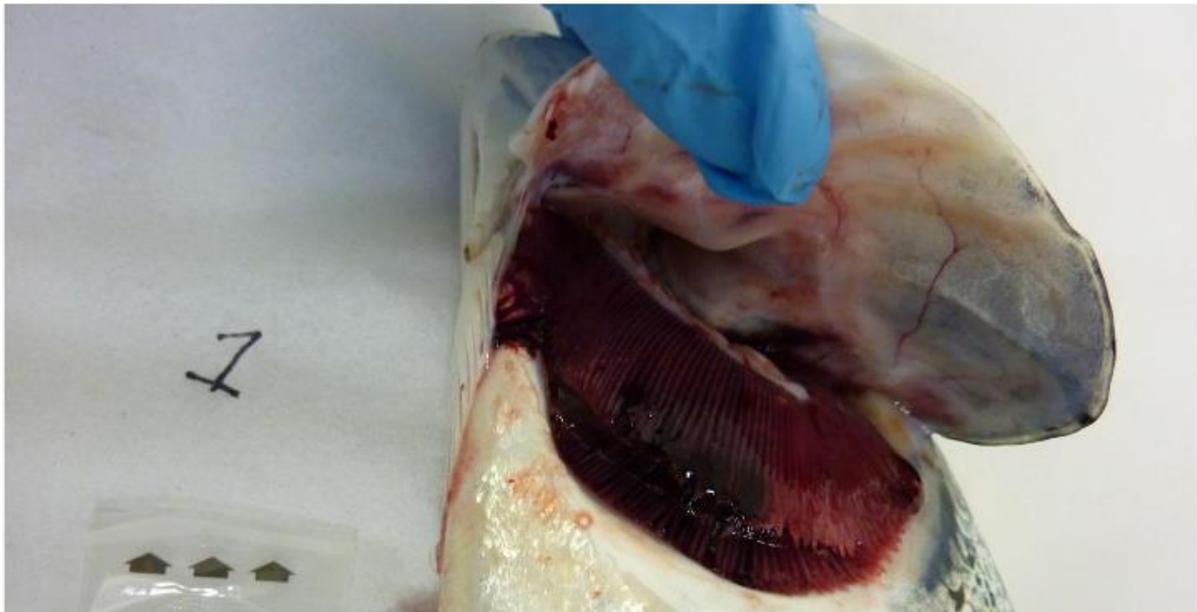
Spleen: Slightly congested (F3).

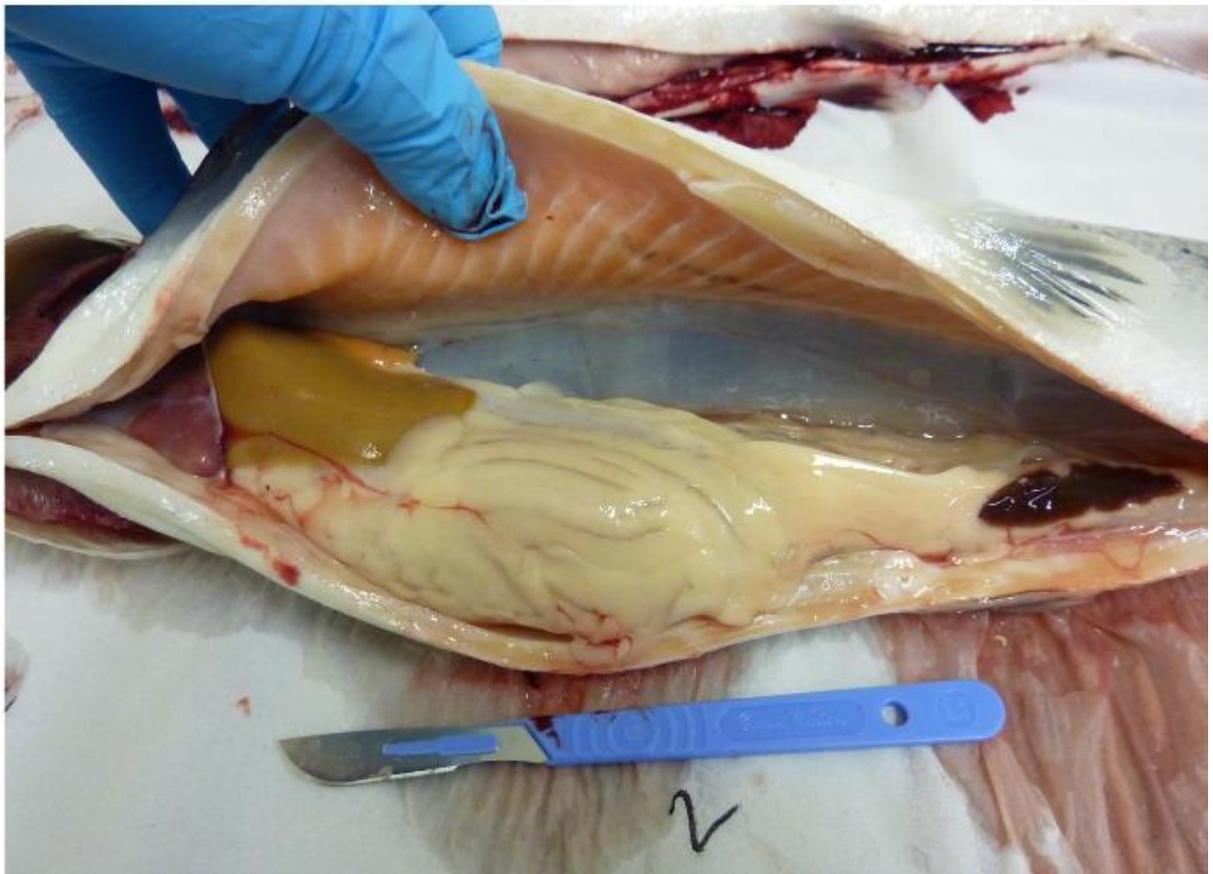
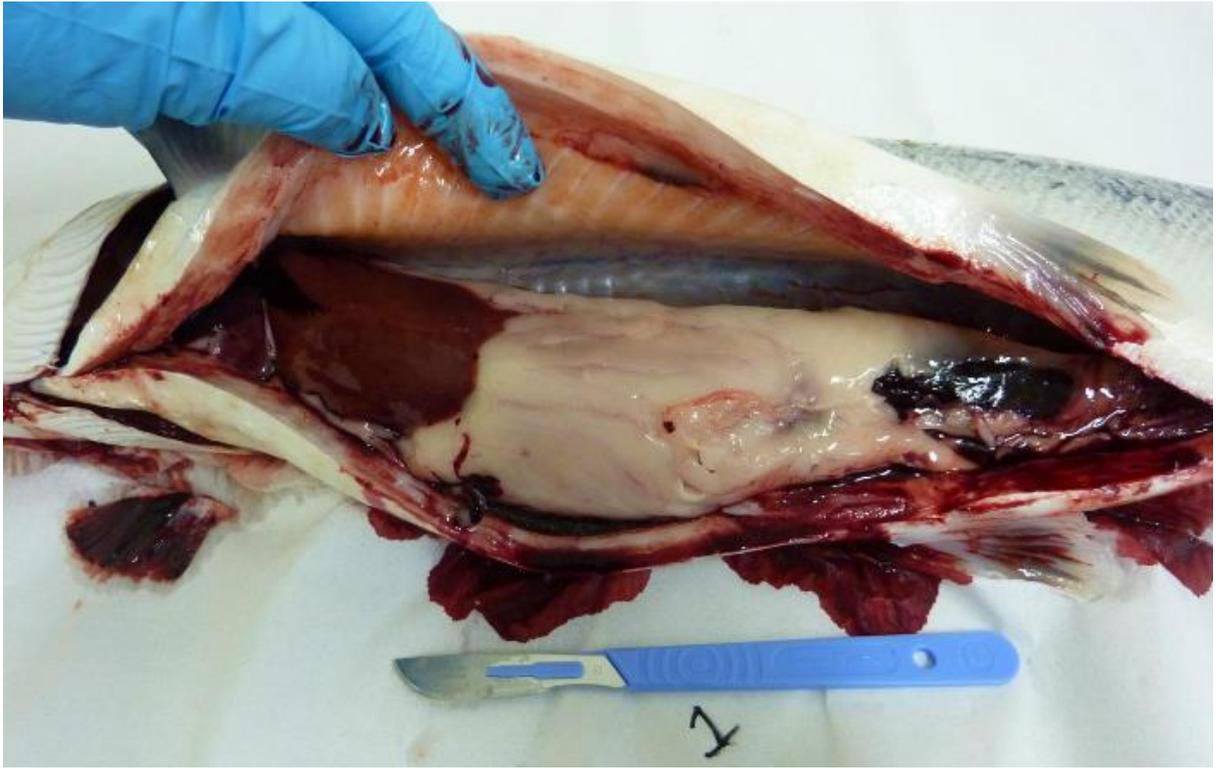
#24 (2017-0546) - Cooke Aquaculture: East of Holm Heogland (Burkwell) (Uyea Sound, Shetland)

Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00534803.pdf> (p287 onwards)

[Photos included:](#)







Fisheries Health Inspectorate [Case Information](#) (p287 onwards) included:

"Morts - October - 28,096 (7.14%) across site - Higher in cages 2 (4573 - 16.03%) and 3 (4310 - 15.35%). 9/10 - total 6675, 16/10 - total 5373 - to add to previously reported mortality events. Week 30/10 - 1895 (0.52%) - below reporting levels. FVG report - samples 11/09 - variable complex gill disease including PGD and low-level AGD. Low level HSMI type pathology. FVG report - read date 26/10 - acute waterborne irritant, AGD, Costia, branchiomonas. Movement records not checked as EC inspection last month. Weather poor during visit - focussed on cages 2 and 3 - only two moribunds, both removed and sampled."

"F2 spleen pale/anaemic, pale mustard coloured liver. Heart lost shape when removed."

The FHI visit report included:

██████████
Cooke Aquaculture Scotland Ltd
Crowness Road
Hatston Kirkwall
Orkney
KW15 1RJ
██████████

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0095	DATE OF VISIT	08/11/2017
SITE NO	FS0960	SITE NAME	East of Holm Heogland (Burkwell)
INSPECTOR	Sonia Duguid	CASE NO	20170546

Section 1: Summary

A report was received from the operator of increased mortality levels at the site being attributed to complex gill issues. Two fish were selected for diagnostic sampling.

Histopathology examination revealed marked proliferative gill pathology with lesions consistent with amoebic gill disease (AGD) in F2, which was confirmed by QPCR and mild pathology consistent with cardiomyopathy syndrome in F1, which was also confirmed by QPCR.

Due to gill health issues observed on site samples were screened for *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) and salmon gill poxvirus (SGPV) by QPCR and tested positive for both pathogens.

Section 2: Case Detail

Observations

The above site was inspected following a report from the operator of increased mortality in the Atlantic salmon stocked on the site. At the time of the inspection the site was stocked with 365,478 2016 S0 Atlantic salmon at an average weight of 4.1kg.

Mortality levels had begun to rise in September 2017, with a total mortality of 28,096 (7.14%) across the site for the month of October. Mortality was higher in cages 2 (16.03%) and 3 (15.35%) during October. Weekly mortality percentage had peaked at 2.58% across the site in week 40. Mortality had reduced below the reporting level the week prior to the visit to approximately 0.52%.

Health surveillance carried out in September 2017 reported complex gill issues (proliferative gill disease (PGD) and low level AGD) and low level heart and skeletal muscle inflammation (HSMI) type pathology. Further surveillance carried out in October 2016 reported an acute waterborne irritant, AGD, *Costia* and *Branchiomonas*. Due to adverse weather conditions the inspection focussed on cages 2 and 3, where only 2 moribund fish were observed. Both were sampled for diagnostic purposes.

Both fish were lethargic with areas of gill necrosis. Fish 2 had shortened opercula and pale gills. Internally, both fish had enlarged spleens and fish 2 was anaemic.

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)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.00	33.26	33.11	33.03	POSITIVE
F2	24.12	29.70	30.26	30.12	POSITIVE

Piscine myocarditis virus (PMCV)

Pool Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
P1	18.40	26.91	27.15	27.19	POSITIVE

Neoparamoeba perurans (AGD)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.00	>35	>35	>35	POSITIVE
F2	24.12	29.02	28.84	28.63	POSITIVE

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.00	37.25	38.74	39.03	POSITIVE
F2	24.12	32.80	32.53	32.86	POSITIVE

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from fish 1 and 2. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination revealed the following:

Gill: Marked diffuse hyperplasia and lamellar fusion, occasional spaces (lacunae) filled now and then with cell debris, presence of nuclei karyorrhexis, focal fusion of two gill filaments and goblet cells lined up and several amoebic cells resembling *Neoparamoeba perurans* and occasional clusters of filamentous bacteria among gill filaments noted F2. Presence of some lamellar tip clubbing and few scattered aneurysmal dilation/telangiectasia noted in all individuals

Skin & Muscle: Within the normal range.

Heart: Mild multifocal myofibre necrosis, mild multifocal thickness of endocardium and leucocyte infiltration (mainly mononuclear inflammatory cells) noted at the spongy layer of ventricle (F1), few two small thrombi in atrium (F1), mild pericarditis and rare nest of basophilic nuclei noted in ventricle of F2.

Gut and pyloric caeca: Some fibrous adhesions associated with vaccine administration noted in F1.

Pancreas: Within the normal range.

Liver: Multiple small foci of hepatocyte necrosis (F2) and minor diffuse hepatocyte vacuolation (F2).

Kidney: Some thickness of kidney capsule (F1).

Spleen: Evidences of erythrophagocytosis and empty ellipsoids (F2).

#25 (2017-0550) - Cooke Aquaculture: Winna Ness (Uyea Sound, Shetland)

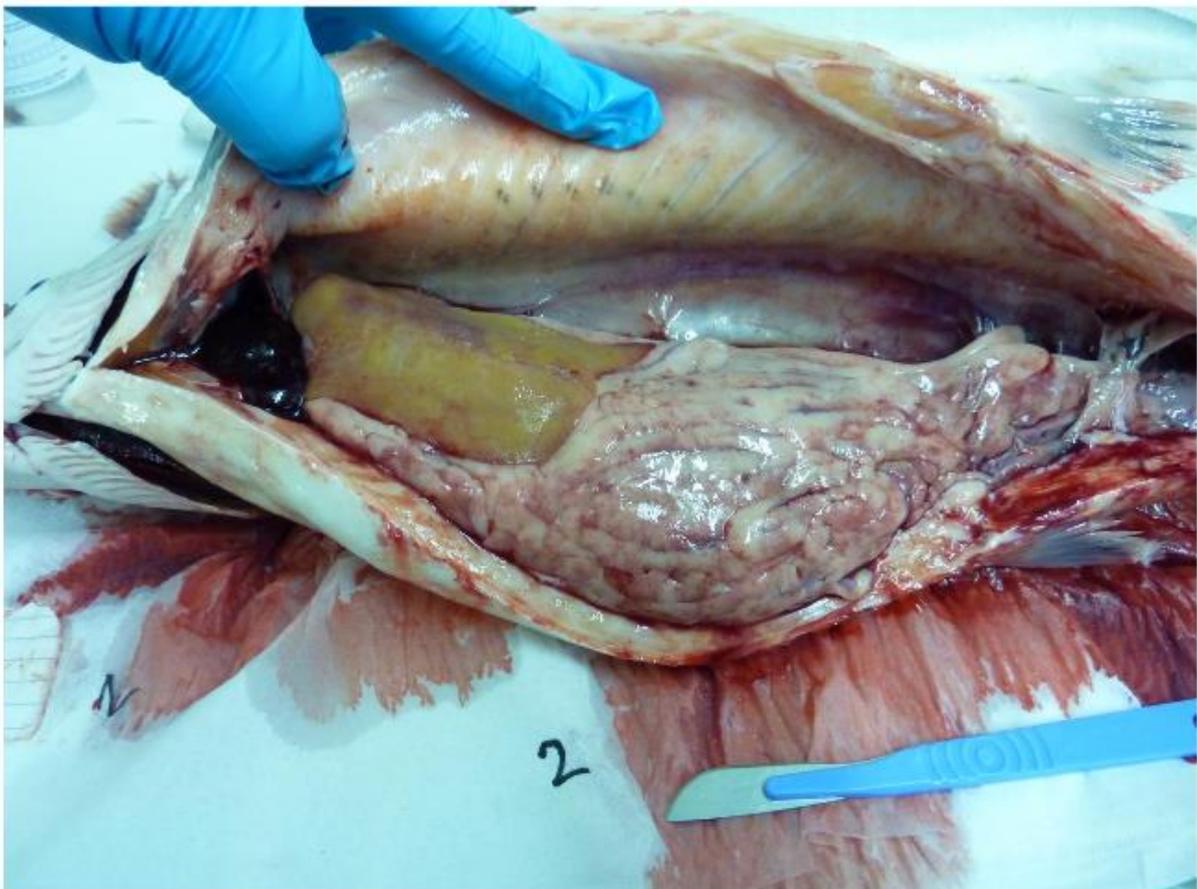
Photos [online here](#)

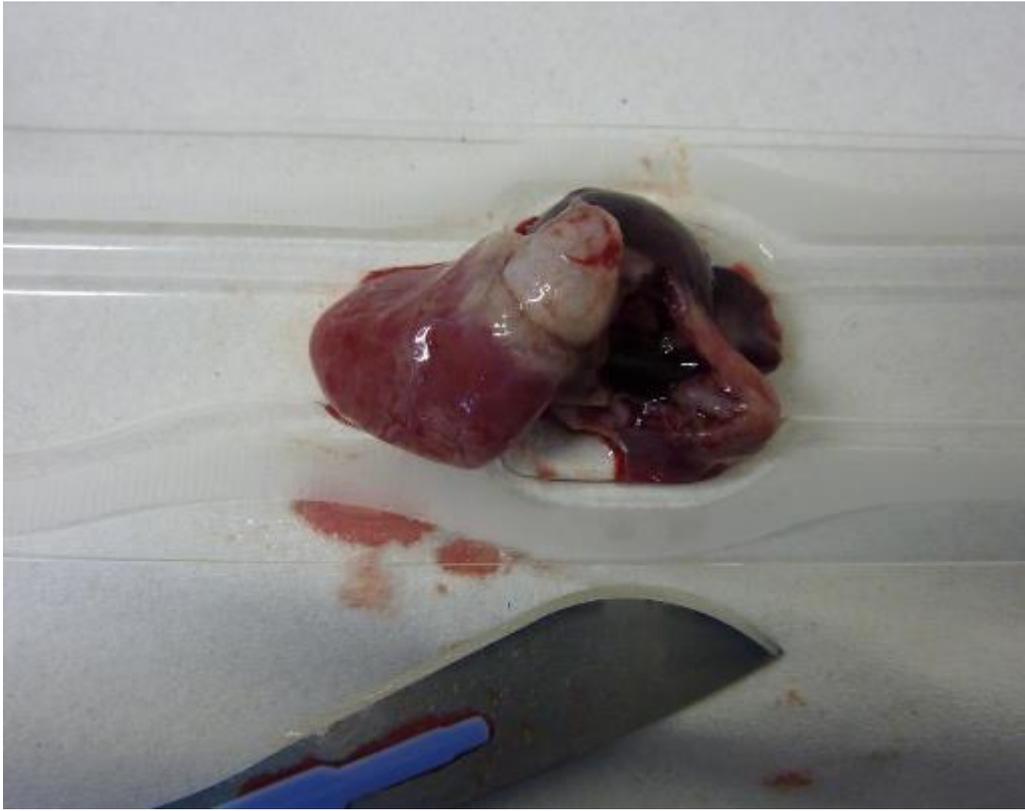
Case Information online via <http://www.gov.scot/Resource/0053/00534803.pdf> (p332 onwards)

[Photos included:](#)









Fisheries Health Inspectorate [Case Information](#) (p332 onwards) included:

"Morts - October- 36028 (10.11%) across site. Higher in cages 7 (5798 - 16.85%), 8(7869 - 26.31%) & 9 (8353 - 30.96%).

Week 23/10 - below reporting level - 3109 morts (0.96%).

FVG report - sampled 09/10 - acute gill pathology - waterborne irritant such as plankton.

Mild AGD.

Weather poor during visit - focussed on cages with higher mortality. Only two moribunds in cages 8 & 9 - both sampled.

Movement records not checked - ECI last month.

Updated 14/11/17 - SJD - mortality events for weeks 40, 41 & 42 had previously been reported - number of fish during mortality event confirmed."

"Complex gill issues - but improving."

"F1 pale liver.

F2 heart - large blot clot in pericardial cavity, atrium solid and similar size to ventricle."

FHI 059, Version 11

Issued by: FHI

Date of issue: 12/09/2017

Case No: 2017-0550 Site No: FS0871 Date of visit: 08/11/2017

Start date:	End date: (if applicable)	Size of fish:	Average weight of affected population:	Species:	Yearclass:	Timescale	Mortality rate recorded(%):	Explained/unexplained:	If explained, select reason(s):
02/10/17	08/10/2017	≥750g	3kg	SAL	2016 S0	Weekly	4.73	Explained	Complex gill issues
09/10/17	15/10/2017	≥750g	3kg	SAL	2016 S0	Weekly	2.78	Explained	Complex gill issues
16/10/17	22/10/2017	≥750g	3kg	SAL	2016 S0	Weekly	2.00	Explained	Complex gill issues
30/10/17	05/11/2017	≥750g	3kg	SAL	2016 S0	Weekly	1.51	Explained	Complex gill issues

Total mortality during event (if available):	Additional information (e.g. action taken by company):	Action taken by FHI (include case no where applicable):
16869	Samples submitted to FVG	Visit 08/11/17
9456	Samples submitted to FVG	Visit 08/11/17
6594	Samples submitted to FVG	Visit 08/11/17
4834	Samples submitted to FVG	Visit 08/11/17

The FHI visit report included:

██████████
Cooke Aquaculture Scotland Ltd
Crowness Road
Hatston Kirkwall
Orkney
KW15 1RJ
██████████

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0095	DATE OF VISIT	08/11/2017
SITE NO	FS0871	SITE NAME	Winna Ness
INSPECTOR	Sonia Duguid	CASE NO	20170550

Section 1: Summary

A report was received from the operator of increased mortality levels at the site being attributed to complex gill issues and environmental issues. Two fish were selected for diagnostic sampling.

Histopathology examination revealed pathology consistent with cardiomyopathy syndrome (CMS) and mild amoebic gill disease (AGD), both of which were confirmed by QPCR. Multifocal hepatic necrosis (likely associated with hypoxia) was also noted.

Due to gill health issues observed on site samples were screened for *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) and salmon gill poxvirus (SGPV) by QPCR and fish 2 tested positive for both pathogens.

Section 2: Case Detail

Observations

The above site was inspected following a report from the operator of increased mortality in the Atlantic salmon stocked on the site. At the time of the inspection the site was stocked with 315,647 2016 S0 Atlantic salmon at an average weight of 4kg.

Mortality levels had begun to rise in August 2017 and continued to be elevated during September and October. A total mortality of 36,028 (10.11%) was reported across the site for the month of October. Mortality was higher in cages 7 (16.85%), 8 (26.31%) and 9 (30.96%) during October. Weekly mortality percentage had peaked at 4.73% across the site in week 40. Mortality had reduced prior to the visit to 0.96% in week 43 and 1.51% in week 44.

R09

Marine Laboratory, 375 Victoria Road, Aberdeen, AB11 9DB
Tel - 0131 244 3498 Fax - 01224 295620 Email - ms.fishhealth@gov.scot
Website - www.gov.scot/Topics/marine/science

Health surveillance carried out in October 2017 reported acute gill pathology attributed to a waterborne irritant. Mild AGD was also observed. Due to adverse weather conditions the inspection focussed on cages 7, 8 and 9, where only 2 moribund fish were observed. Both were sampled for diagnostic purposes.

Both fish were lethargic and had areas of necrosis on the gills. The gills of fish 1 were pale and zoned. Fish 2 had extensive haemorrhaging across the ventrum, throat and base of fins, an inflamed vent and areas of scale oedema. Fish 2 also had shortened opercula.

Internally, fish 1 was generally anaemic with a pale liver. Fish 2 had bloody ascites and a deformed heart with a large blood clot present in the pericardial cavity. Petechial haemorrhaging was observed on pyloric caeca, liver and swim bladder of fish 2.

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)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F2	24.66	30.51	30.51	30.30	POSITIVE

F1 tested negative for salmon gill poxvirus.

Piscine myocarditis virus (PMCV)

Pool Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
P1	19.91	20.48	20.68	20.70	POSITIVE

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* (AGD)**

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.27	29.61	29.45	29.68	POSITIVE
F2	24.66	27.65	29.08	29.04	POSITIVE

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F2	24.66	39.42	>40	39.00	POSITIVE

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from fish 1 and 2. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination revealed the following:

Gill: Mild multifocal interlamellar hyperplasia with occasional spaces (lacunae), lamellar fusion and several amoebic cells resembling *Neoparamoeba perurans* noted in F2. Few old aneurysms surrounded by lamellar epithelial hyperplasia and focal lamellar congestion (F1 & F2), multifocal lamellar tip clubbing and irregular epithelial surface (F1) were also noted.

Skin & Muscle: Within the normal range.

Heart: Marked diffuse endocarditis and myofibre necrosis at the spongy layer of ventricle and atrium and moderate leucocyte infiltration (mainly mononuclear inflammatory cells) and focal deposit of melanin pigment in the spongy layer of ventricle (F2). Presence of big thrombi at the atrium and mild pericarditis were noted in F2.

Gut and pyloric caeca: Some haemorrhage in the abdominal adipose tissue (F2)

Pancreas: Within the normal range.

Liver: Marked thickness of liver capsule with deposits of eosinophilic amorphous material resembling fibrin deposits, sinusoidal disarray with enlarged sinusoidal spaces filled with proteinaceous fluid (F2), also noted in the sinusoids surrounding the hepatic vessels, and multifocal hepatocyte necrosis (F2). Moderate diffuse hepatocyte vacuolation noted in F1.

Kidney: Thickness of capsule and some vacuolation of the epithelium of renal tubules.

Spleen: Marked congestion. F2: not in section.

#26 (2017-0563) - Scottish Salmon Company: Strone Point (Loch Striven)

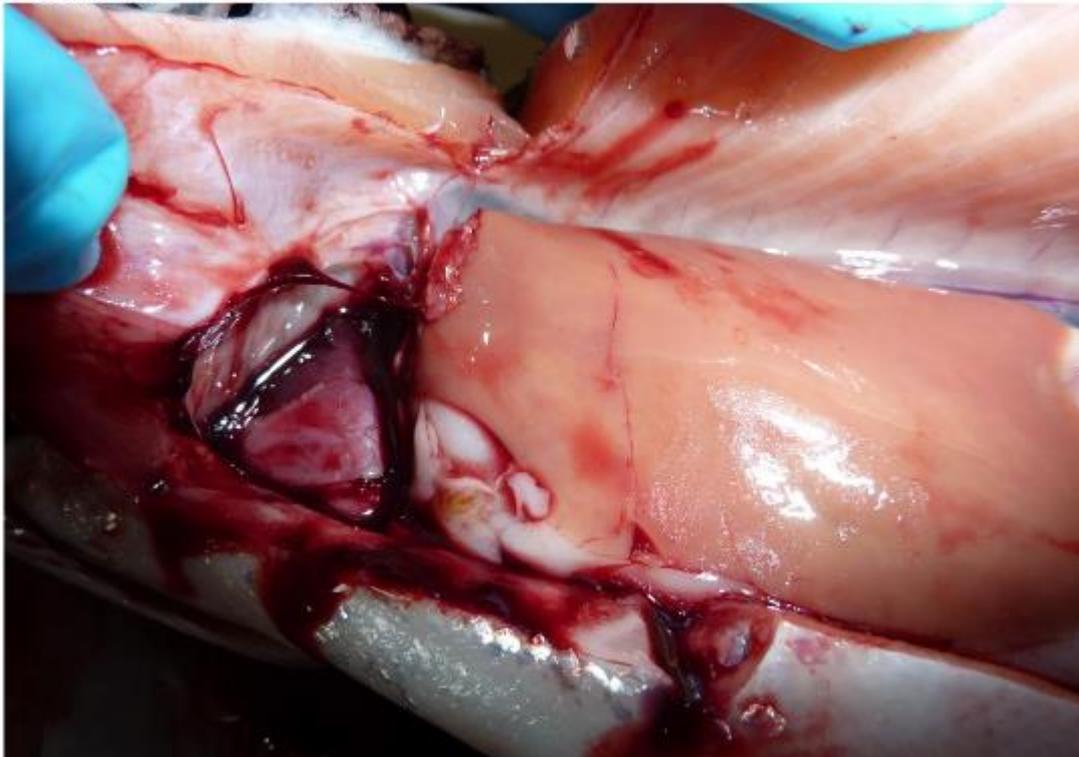
Photos [online here](#)

Case Information online via <http://www.gov.scot/Resource/0053/00534804.pdf> (p76 onwards)

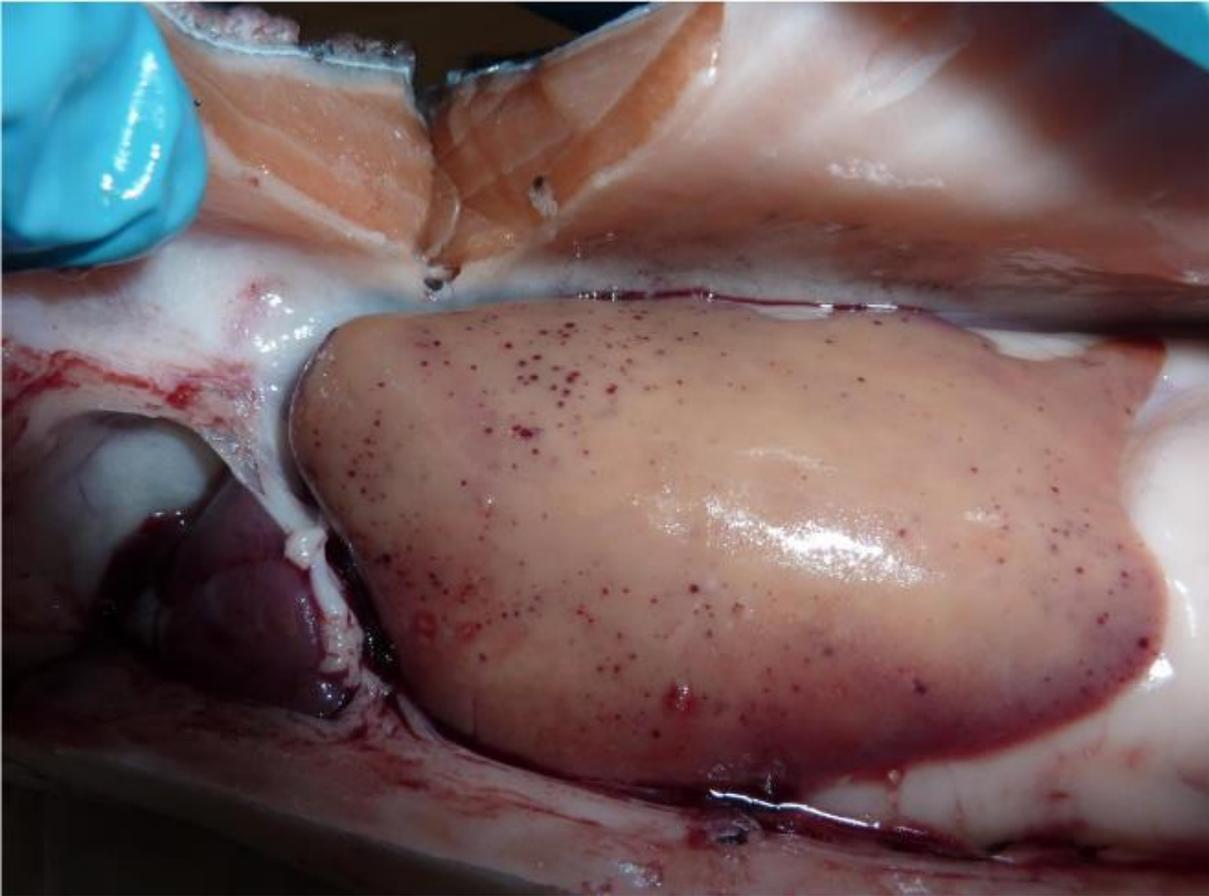
Photos included:



F1 internal



F2 internal



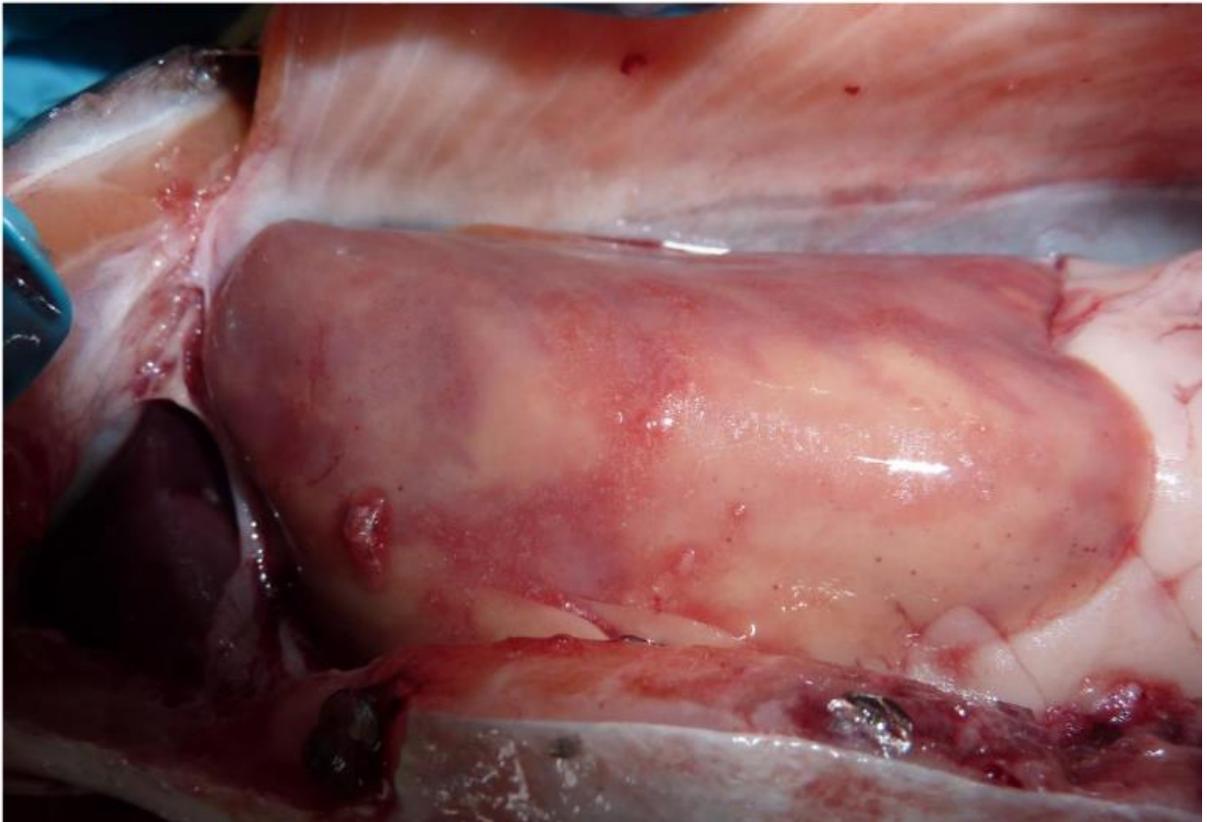


F3 haemorrhage/damage to muscle tissue



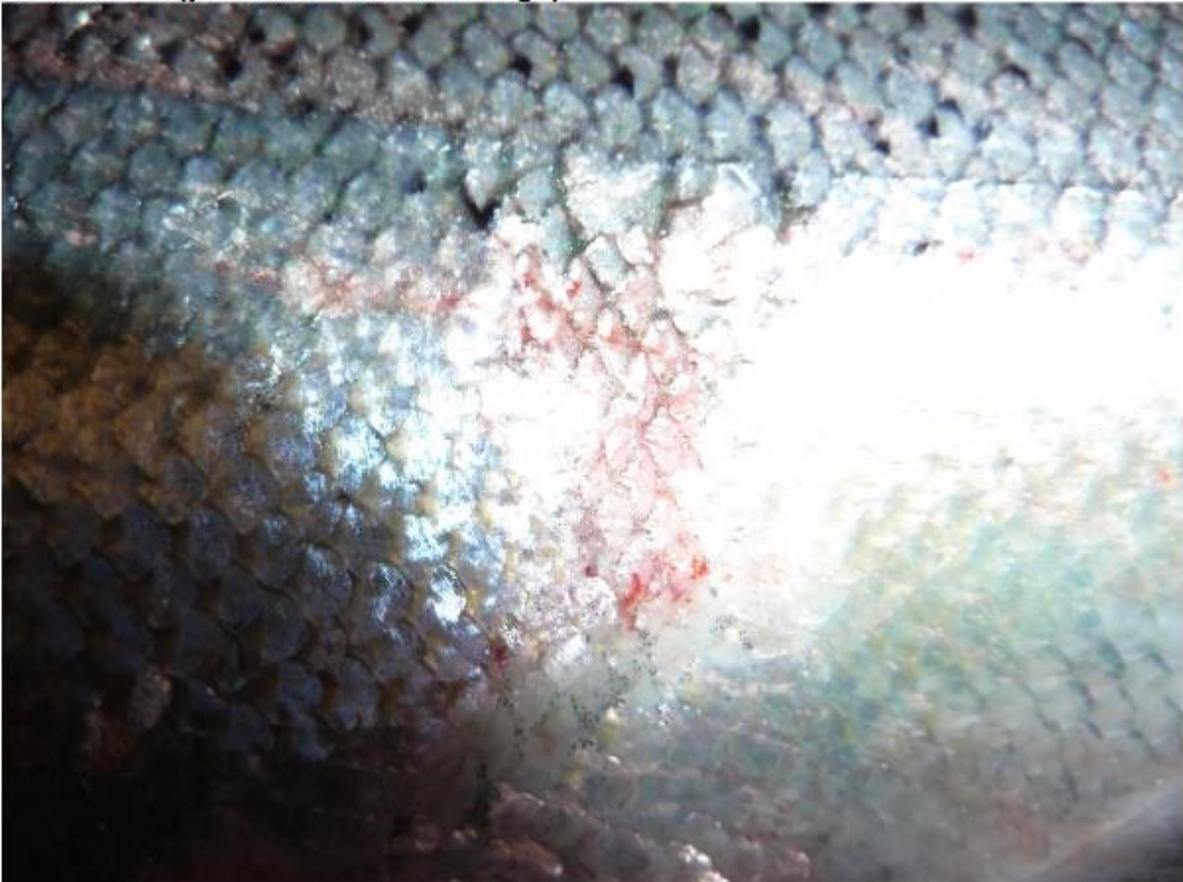


F3 internal

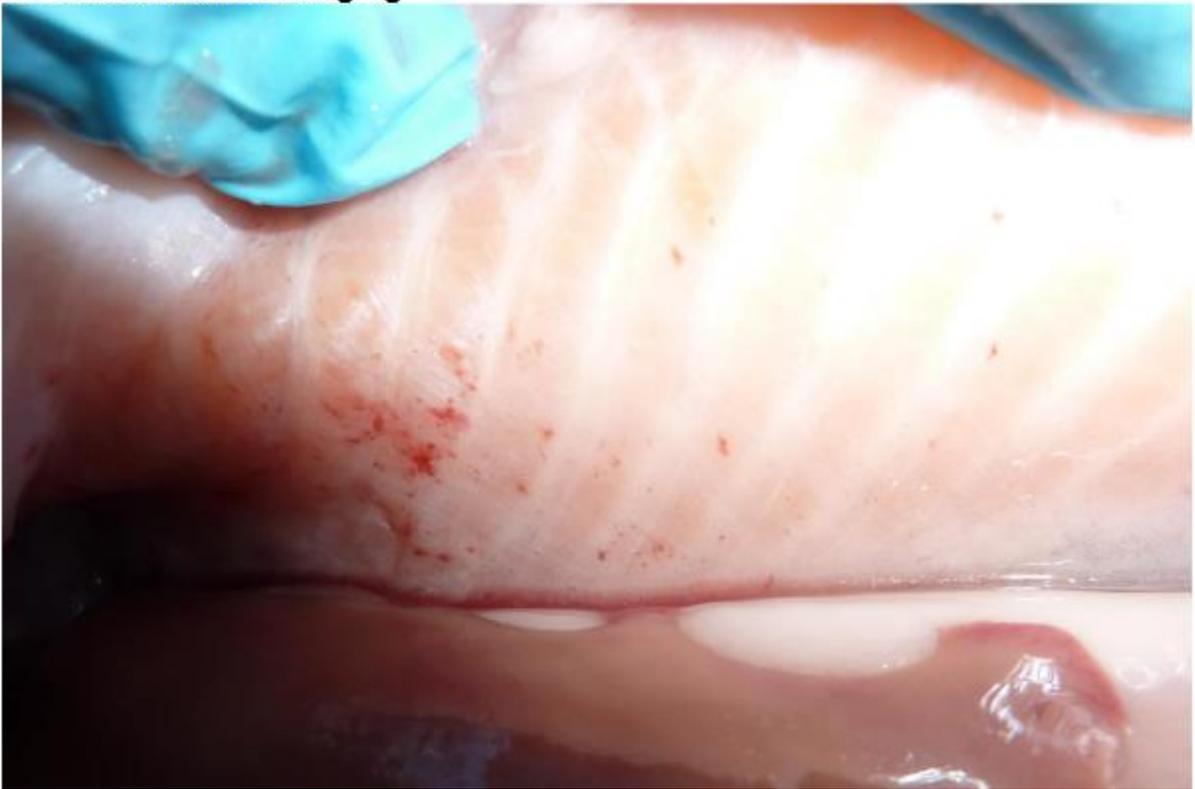




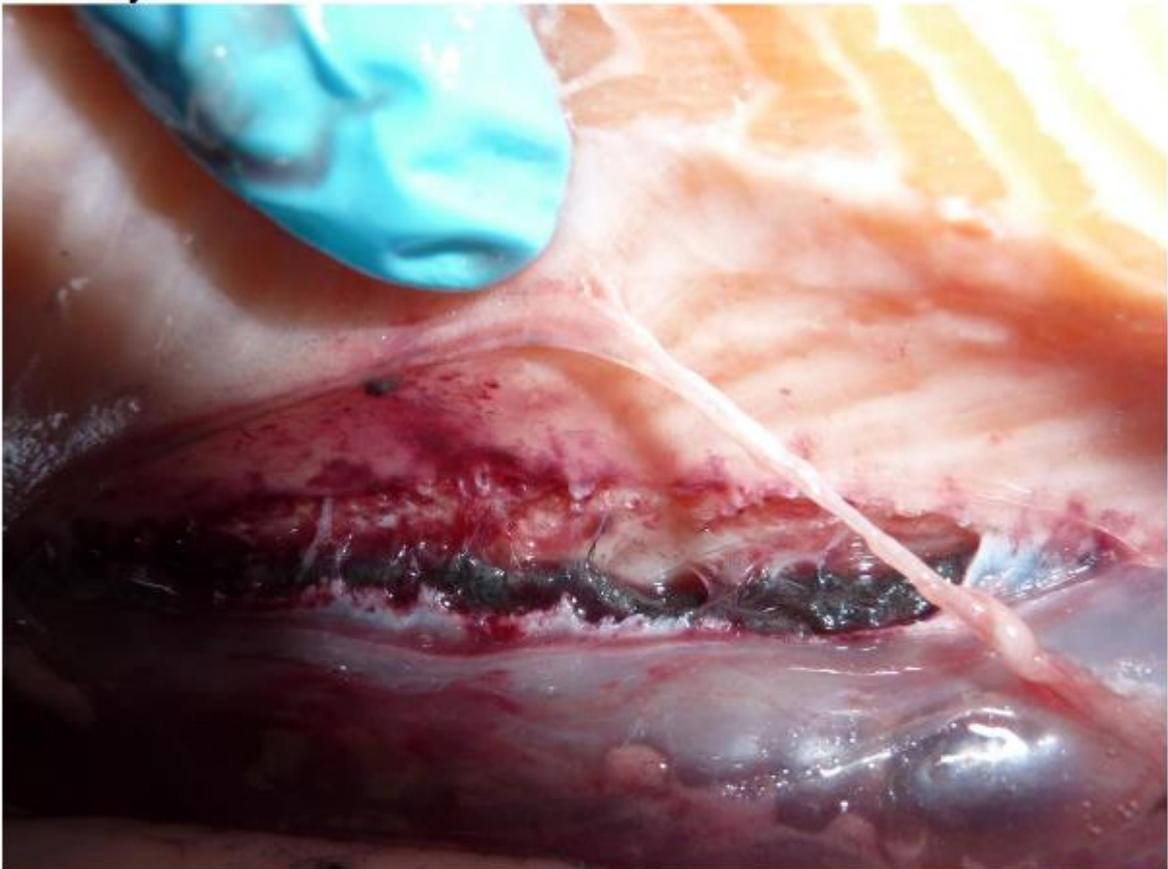
F4 external (possible healed damage)



F4 internal haemorrhaging



F4 kidney





Fisheries Health Inspectorate [Case Information](#) (p76 onwards) included:

"July 2017 issues with plankton blooms start. August 2017 Peroxide treatment for AGD, gill issues post treatment are mostly environmental (histology), PCR still positive for AGD. Gill issues continuing on into September with fortnightly gill swabs. Histology confirms mostly environmental insult (plankton blooms). October 2017 low dissolved oxygen on top of issues with gills causing large mortality and bacterial infection with *V. anguillarum*."

"Complex gill issues exacerbated by environmental conditions and bacterial infection (thought to be secondary) *Vibrio anguillarum* isolated (5/11/17)."

"Mortalities start to increase in the beginning of October, some cages worse affected than others. Environmental issues with plankton blooms in October and some low dips in dissolved oxygen in mid October. Fish unable to cope with compromised gills and low oxygen. Some of the lower mort cages 20-70 morts per day per cage."

"August 2017 2.66% [mortality] for the month for the entire site some issues with AGD. AGD continuing on into September with numbers slightly decreasing."

"Gill issues and *V. anguillarum* FVG report (5/11/17) Secondary infection with *V. anguillarum* 6/6. Fish have compromised gills with reduced function and low dissolved oxygen has been experienced on site since wk 37 which is exacerbating the issue. FVG (sample 18/10/17; report 20/10/17) AGD PCR (6/6), *Branchiomonas cysticola* (*Epitheliocystis*) 6/6, *Paranucleospora theridion* 6/6, SGPV 6/6."

"F3 black spherical objects observed on the gills (see photos) and haemorrhage/ damage in the muscle tissue on the ventral surface internally (sample collected for histology).
F4 kidney unusual (see photos)."

The FHI visit report included:

marinescotland
science



[REDACTED]
The Scottish Salmon Company
1 Smithy Lane
Lochgilphead
Argyll
PA31 8TA
[REDACTED]

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0169	DATE OF VISIT	09/11/2017
SITE NO	FS1056	SITE NAME	Strone Point
INSPECTOR	Svenja Elwenn	CASE NO	20170563

Section 1: Summary

A report of increased mortality at the site was received from the operator. Five fish were removed for diagnostic sampling.

Histopathology examination revealed complex gill issues and some circulatory disturbance. Pathology was consistent with mild amoebic gill disease and showed evidences of salmon poxvirus, both pathogens were confirmed by QPCR. Epitheliocysts were noted and confirmed by positive QPCR for *Candidatus Branchiomonas cysticola*. The skeletal muscle necrosis noted in F3 was likely associated with a lesion.

Due to gill health issues observed on site samples were screened for *Paranucleospora theridion* (syn. *Desmozoon lepeophtherii*) by QPCR and tested positive.

Vibrio anguillarum was identified from three fish, with the level and purity of growth from the kidney material of F5 deemed significant.

Section 2: Case Detail

Observations

The above site was inspected following a report from the operator of increased mortality in the Atlantic salmon stocked on the site. At the time of the inspection the site was stocked with 541,963 2017 S1 Atlantic salmon at an average weight of 1.6kg; 47,274 wild wrasse of mixed age and 26,888 hatchery reared 2017 lumpsuckers at an average weight of 30g.

R09

Marine Laboratory, 375 Victoria Road, Aberdeen, AB11 9DB
Tel - 0131 244 3498 Fax - 01224 295620 Email - ms.fishhealth@gov.scot
Website - www.gov.scot/Topics/marine/science

Mortalities started to increase in October 2017, with sustained increased mortalities continued through the month peaking in week 43 at 6.27%. At the time of inspection *Vibrio anguillarum* had been identified in stocks on site and complex gill issues had been experienced on site since an algal bloom in August 2017. Complex gill issues were exacerbated by sustained levels of low dissolved oxygen on site at the time of inspection.

Lethargic and moribund behaviour, as well as bilateral exophthalmia was observed in a number of fish on site. Five fish from the two worst affected cages were removed for sampling.

All five fish sampled showed moribund and lethargic behaviour. F1, F2 and F5 had bilateral exophthalmia. All five had pale gills, with the gills of F2-F5 also having a zoned appearance. Internally, bloody ascites was evident in F1-F4, with petechial haemorrhaging observed on the livers in F2 and F3. Pale livers were observed in F1, F4 and F5 and an enlarged spleen was observed in F3-F5. Yellow pseudo-faeces were observed in the gut of F2 and F5, with F5 also showing a grey and granular kidney. Internally in F3 damage to the muscle tissue on the ventral surface was observed and sampled for histology.

Bacteriology: Kidney and gill material from five fish was inoculated onto appropriate media for the isolation of bacteria.

The following bacteria were isolated:

- *Vibrio anguillarum* (kidney and gill material F3-F5).

The level and purity of growth from the kidney material of fish 5 was significant.

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

Candidatus Branchiomonas cysticola

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F3	23.15	28.21	28.47	28.47	POSITIVE
F4	23.78	25.77	25.75	25.78	POSITIVE
F5	22.69	25.15	25.13	25.06	POSITIVE

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

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.82	38.16	38.64	38.71	POSITIVE
F2	24.00	34.81	34.77	34.94	POSITIVE
F3	23.15	27.23	27.37	27.50	POSITIVE
F4	23.78	31.10	31.24	30.69	POSITIVE
F5	22.69	30.15	30.17	30.14	POSITIVE

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 (AGD)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F2	24.00	30.71	30.91	30.90	POSITIVE
F3	23.15	30.01	30.21	30.14	POSITIVE
F4	23.78	30.87	30.93	30.66	POSITIVE
F5	22.69	29.88	30.02	30.14	POSITIVE

F1 tested negative for *Neoparamoeba perurans*.

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.82	34.97	34.64	34.67	POSITIVE
F2	24.00	31.32	31.41	31.24	POSITIVE
F3	23.15	31.57	31.22	31.24	POSITIVE
F4	23.78	29.21	29.53	29.31	POSITIVE
F5	22.69	29.04	28.87	29.35	POSITIVE

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from five fish. The tissue samples were fixed in 10% neutral buffered formalin.

Histopathological examination by light microscopy revealed the following:

Gill: Mild multifocal interlamellar hyperplasia with occasional spaces (lacunae), lamellar fusion (F1, F3) and amoebic cells resembling *Neoparamoeba perurans* (F3), irregular epithelial surface with hypertrophic epithelial cells, prominent goblet cells and some chloride cells displacement and presence of nuclei karyorrhexis and apoptotic cells shedding off which was marked in F3 (F1-F5). Free blood among gill filaments noted in all individuals, few aneurysmal dilation/telangiectasia and R09

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some lamellar thrombi (F3-F5) and rare to few epitheliocystis noted in F3-F5 and some epithelial lifting with proteinaceous fluid noted in F4.

Skin & Muscle: Occasional degeneration of skeletal muscle noted in F1 and marked focal degeneration of skeletal muscle and haemorrhage noted in F3, an encysted parasite in the dermal layer of F2.

Heart: Presence of few multiple small nests of basophilic nuclei (F1) and minor pericarditis (F2-F5).

Gut and pyloric caeca: Some fibrous adhesions (likely associated with vaccine administration) (F3)

Pancreas: Within the normal range.

Liver: Scattered small foci of sinusoidal congestion (F2).

Kidney: Minor increase of melanomacrophage aggregates (F1).

Spleen: Slightly congested (F4 & F5).

#27 (2018-0078) - Unknown

Photos [online here](#)

Case Information published in July via <http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/CaseInformation>

[Photos included:](#)



F1-3. F3 had anterior ventral lesion through which the heart was exposed.







F4 – Enlarged gall bladder observed underneath liver.

#28 (2018-0111) - Marine Harvest: Groatay (Sound of Harris)

Photos [online here](#)

Case Information published in July via <http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/CaseInformation>

[Photos include:](#)

Groatay 2018-0111



Groatay 2018-0111



Groatay 2018-0111



Groatay 2018-0111



#29 (2018-0112) - Marine Harvest: Grey Horse Channel (Sound of Harris)

Photos [online here](#)

Case Information published in July via <http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/CaseInformation>

Photos include:







F1

#30 (2018-0113) - Scottish Salmon Company: Meall Mhor (Loch Fyne)

Photos [online here](#)

Case Information published in July via <http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/CaseInformation>

[Photos include:](#)

2018-0113 Meall Mhor Loch Fyne
F1 external



F2 external



F4 external



F5 external



Read more [online via Scottish Salmon Watch's web-page 'Welfare'](#)