SCOTTISH SALMON WATCH

WELFARE

Police Scotland
Wildlife Crime Liaison Officer
Tulliallan Castle
Kincardine
FK10 4BE
Contactus@scotland.pnn.police.uk

Animal & Plant Health Agency
Woodham Lane
Addlestone
Surrey
KT15 3NB
apha.corporatecorrespondence@apha.gsi.gov.uk and enquiries@apha.gsi.gov.uk

13 July 2018

Dear Sir/Madam,

Breaches of the Animal Health & Welfare (Scotland) Act 2006 by Salmon Farms

Scottish Salmon Watch would like to formally file a complaint against salmon farming companies in Scotland for systematic breaches of the Animal Health and Welfare (Scotland) Act 2006 - in particular in relation to Unnecessary Suffering (Section 19), Cruel Operations (Section 21) and Ensuring Welfare of Animals (Section 24).

Scottish Salmon Watch believe that there is a strong argument to be made for a case to be filed via the Procurator Fiscal. Please read a dossier of photographic and case evidence via: Hard Evidence - Photos of Diseased & Deformed Scottish Salmon

The horrific images reveal severe lice infestation eating into the heads of farmed salmon, deformed spines, lesions, adhesions, deformed hearts, anorexia, petechial haemorrhages, enlarged spleens, diseased gills, cataracts and even salmon with no eyes.

Diseases, viruses, bacteria and pathogens reported alongside the photos include Salmonid Alpha Virus, Bacterial Kidney Disease, Pancreas Disease, Cardiomyopathy Syndrome, Heart & Skeletal Muscle Inflammation, Salmon pox virus, Vibrio, Flavobacterium, Moritella viscosa (Winter ulcer), Amoebic Gill Disease, Neoparamoeba perurans, Paranucleospora theridon (syn. Desmozoon lepeophtherii), Parvicapsula pseudobranchicola, Ichthobodo species, Branchiomonas, Costia, Candidatus Syngnamydia salmonis and Pasteurella skyensis.

Scottish Salmon Watch understands that Police Scotland's Wildlife Crime Unit has the authority to investigate this complaint with a view to passing evidence for a potential prosecution to the Procurator Fiscal.

A letter from Jill Barber, Aquaculture Health, Welfare and Innovation Manager, at the Scottish Government dated 9 July 2018 also identifies the Animal and Plant Health Agency (APHA) as the statutory agency responsible for overseeing the requirements of the Animal Health and Welfare (Scotland) Act 2006:

> Fish Health Inspectors will report any significant case of poor welfare to Animal and Plant Health Agency (APHA) veterinarians, responsible for overseeing the requirements of the Animal Health and Welfare (Scotland) Act 2006. If APHA suspect that an offence may have been committed under the Act, there are various enforcement options including issuing advice, warning letters and care notices, and the option of passing evidence for a potential prosecution to the Procurator Fiscal to consider.

It is also noted via the Scottish Government's web-page Animal Welfare In Scotland that "Scottish Ministers have the responsibility for, and the powers to deal with, animal welfare in Scotland".

Hence Scottish Salmon Watch have directed various letters to Scottish Ministers and to the Cross-Party Group on Animal Welfare but it appears that the Scottish Government has failed to report welfare abuse at salmon farms to APHA (Scottish Salmon Watch filed FOIs on this issue earlier this week):

Read letters via:
Letter to Scottish Ministers re. Welfare Abuses at Scottish Salmon Farms
Deaths, Deformities & Welfare Abuse at Scottish Salmon Farms - Breach of the Animal Health & Welfare (Scotland) Act?
Letter to the Cross-Party Group on Animal Welfare: Thermoliced to Death

In summary, Scottish Salmon Watch cites the following as evidence of systematic breaches of the Animal Health and Welfare (Scotland) Act 2006 by Marine Harvest, Scottish Sea Farms, the Scottish Salmon Company, Grieg Seafood, Cooke Aquaculture and Loch Duart in relation to Unnecessary Suffering (Section 19) and Cruel Operations (Section 21):

1) Photographs via Fish Health Inspectorate inspections

2) Disease reports obtained via Freedom of Information & FHI Case Information

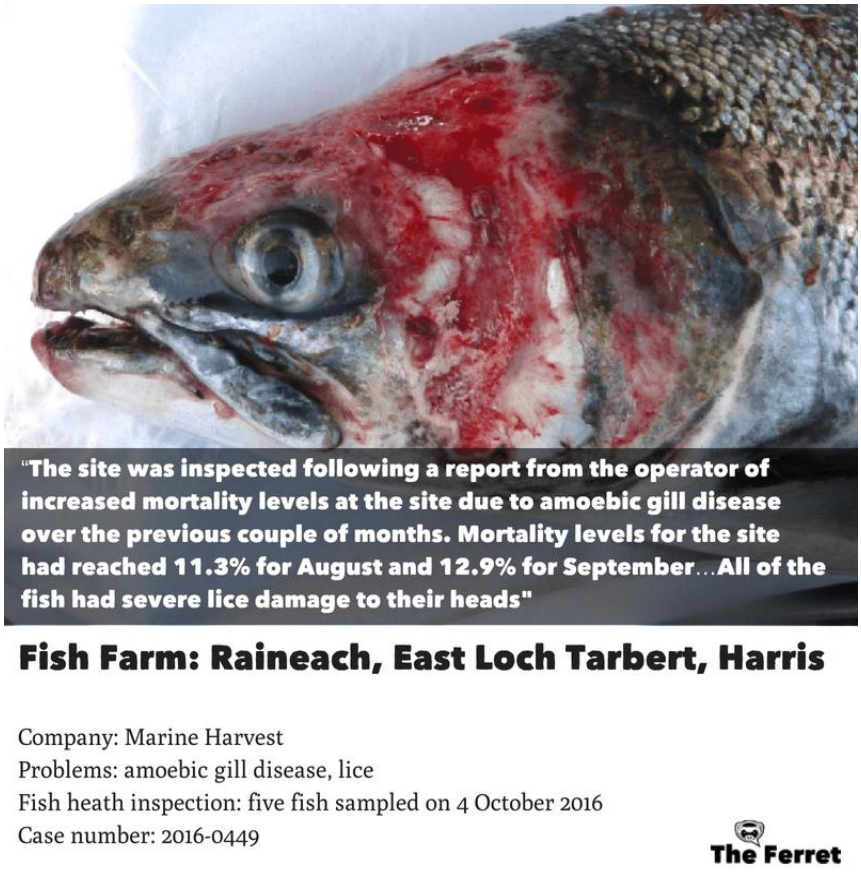
3) Mass mortality reports obtained via Freedom of Information & SEPA data

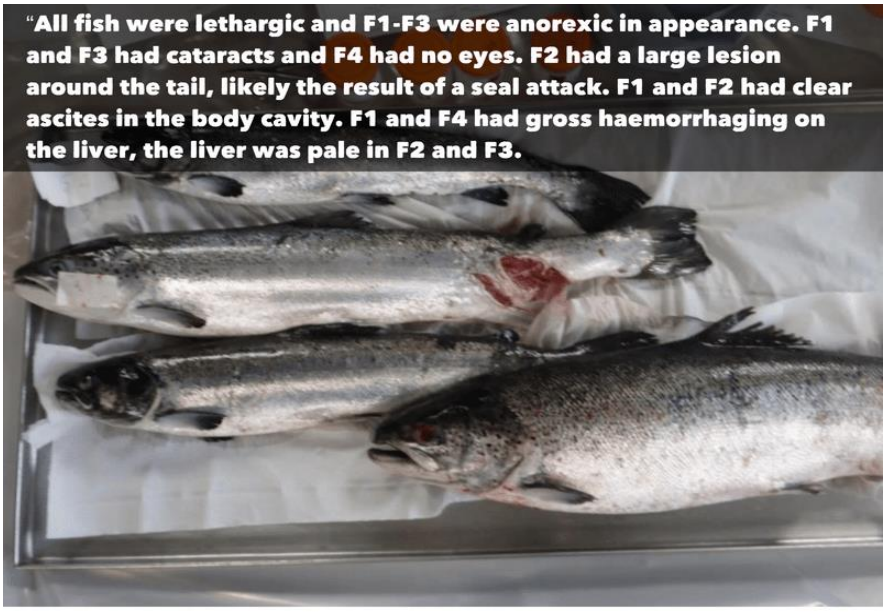
For further details of the welfare nightmare on Scottish salmon farms please read:
Hard Evidence - The Welfare Nightmare of Scottish Salmon Farming
Campaign group to file legal challenge against Scottish salmon farms' use of Thermolicer
Daily Mail: "Calls to ban salmon farms' lice treatment"
Press Release: "Ban Water Torture on Scottish Salmon Farms"
EXPOSED: Gruesome Photos of Deformed & Diseased Scottish Salmon

Hard Evidence - Photos of Diseased & Deformed Scottish Salmon
Horror photos of farmed salmon spark legal threat
GRAPHIC: More Proof That Fish Are Suffering in Food Industry (Photos)
New photos expose shocking welfare issues on Scottish salmon farms
Letter to Scottish Ministers re. Welfare Abuses at Scottish Salmon Farms
Deaths, Deformities & Welfare Abuse at Scottish Salmon Farms - Breach of the Animal Health & Welfare (Scotland) Act?
EXPOSED: Early Harvesting at Scottish Salmon Farms Due to Disease & Mortalities
Hard Evidence: Fast-Tracking Disease-Ridden Scottish Salmon
Letter to the Cross-Party Group on Animal Welfare: Thermoliced to Death
Hard Evidence: Dossier of Data on Lice, Diseases & Mortalities at Scottish Salmon Farms
The Herald: "Video: Disease concern as Scots salmon farmers' produce "stomach-churning" record levels of fish deaths"
Scottish Salmon's Mort Mountain Leaps Over 10 Million - FOI reveals 2.3 million dead salmon at Marine Harvest farms in 2017

1) Photographs via Fish Health Inspectorate inspections

Gruesome photos published exclusively via The Ferret in June 2018 included:





Fish Farm: Leinish, Isle of Skye

Company: Grieg Seafood
Problems: amoebic gill disease
Fish heath inspection: four fish sampled on 16 May 2017
Case number: 2017-0184

The Ferret

Fish Farm: Meall Mhor, Loch Fyne

Company: Scottish Salmon Company
Problems: unknown
Fish heath inspection: unknown
Case number: 2018-0113

The Ferret

Following The Ferret publication in June 2018 the Scottish Government published on 29 June 2018 new Fisheries Health Inspectorate Case Information for January to March 2018 including specific details on the Meall Mhor case identified above.

The Fisheries Health Inspectorate Case Information (p124 onwards) for the Scottish Salmon Company's Meall Mhor salmon farm inspection in March 2018 included:

marinescotland science

Scottish Government
Riaghaltas na h-Alba
gov.scot

[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	26/03/2018
SITE NO	FS0091	SITE NAME	Meall Mhor Loch Fyne
INSPECTOR	Svenja Elwenn	CASE NO	20180113

Section 1: Summary

During a routine site inspection moribund fish were observed on site and five fish were removed for diagnostic sampling. Histopathological examination revealed skin lesions with high numbers of mixed bacteria and mild skeletal muscle necrosis, which is consistent with the physical damage observed on site.

Two *Vibrio* sp. and *Moritella viscosa* were isolated. The mixed growth would not suggest to be the primary source of morbidity however the level of growth was significant.

Section 2: Case Detail

Observations

At the time of inspection slightly elevated mortalities were occurring on site due to physical damage, suspected to have been caused by sustained bad weather in conjunction with strong tidal flows. Mortality levels appeared to peak at 4,589 for the site in the week prior to inspection. A large number of fish with physical damage were observed on the site with a number of moribund fish near the surface in some cages. The damage consistently appeared as large lesions on the flanks. This appears consistent with the fish being rubbed on the nets.
All five fish sampled were lethargic and moribund with a large lesion on the flank and with the caudal fin in poor condition. F4 was missing part of the upper jaw and F5 was missing an eye. Internally all fish had bloody ascites and an enlarged spleen, with some tissue breakdown evident in the liver in F3-F5 and haemorrhaging on the liver and pyloric caeca in F2.

Another 2018 case where further information is now available is Marine Harvest's salmon farm at Groatay which was inspected in March 2018.

Fish Farm: Groatay, Sound of Harris

Company: Marine Harvest
Problems: unknown
Fish heath inspection: unknown (report due July 2018)
Case number: 2018-0111

The Ferret

The Fisheries Health Inspectorate Case Information (p83 onwards) for Marine Harvest's Groatay salmon farm inspection in March 2018 included:

marinescotland science

Scottish Government
Riaghaltas na h-Alba
gov.scot

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

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

Business No	FB0119	**Date of Visit**	28/03/2018
Site No	FS1083	**Site Name**	Groatay
Inspector	Andrea Warwick	**Case No**	20180111

Section 1: Summary

During a routine inspection of the above site, four lethargic fish with lesions were observed. The fish were removed for further examination and subsequent diagnostic sampling.

Histopathology examination revealed skin lesions with high numbers of mixed bacteria and mild skeletal muscle necrosis which may be associated with predation or other physical damage. In addition, mild gill hyperplasia and some circulatory disturbances were also observed by histopathology examination. One fish showed marked hepatic necrosis.

Moritella viscosa and a *Vibrio* spp. were isolated by bacteriology. The level and purity of growth are not consistent with these bacteria being a primary cause of morbidity.

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

Another 2018 case where further information is now available is Marine Harvest's salmon farm at Grey Horse Channel which was inspected in March 2018:

Fish Farm: Grey Horse Channel, Sound of Harris

Company: Marine Harvest
Problems: unknown
Fish heath inspection: unknown (Full report due in July 2018)
Case number: 2018-0112

The Ferret

The Fisheries Health Inspectorate Case Information (p103 onwards) for Marine Harvest's Grey Horse Channel salmon farm inspection in March 2018 included:

marinescotland science

Scottish Governme
Riaghaltas na h-Alt
gov.scot

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

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	28/03/2018
SITE NO	FS1122	SITE NAME	Grey Horse Channel
INSPECTOR	Andrea Warwick	CASE NO	20180112

Section 1: Summary

During a routine inspection, one moribund and four lethargic fish were observed. The fish were removed for further examination and subsequent diagnostic sampling.

Histopathology examination revealed mild complex gill health with presence of amoeboid-like cells suggestive of amoebic gill disease (AGD) and samples tested positive by QPCR for *Neoparamoeba perurans*. Epitheliocystis was also observed and samples tested positive by QPCR for *Candidatus* Branchiomonas cysticola and *Candidatus* Syngnamydia salmonis. Some vascular damage in the gills and mild hepatic necrosis was also noted.

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

Vibrio sp. and *Moritella viscosa* were isolated. The level and purity of growth would not suggest these bacteria are implicated in current fish morbidity.

Section 2: Case Detail

Observations

During a routine inspection, one moribund and four lethargic fish were observed. The site was stocked with 537,743 2017 Q3 Atlantic salmon at 1.8kg average weight, ~20,000 mixed wrasse species and 27,500 lumpsuckers.

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

Amoebic gill disease (AGD) had been diagnosed on the site in autumn 2017 and several treatments had been carried out. Following a treatment in late November 2017, mortality levels had risen in December and health surveillance carried out by the business reported infection with *Pasteurella skyensis*. From the start of December 2017 through to March 2018, there had been a total mortality of 2.48% with decreasing mortality levels each month.

The five fish were removed for further examination and subsequent diagnostic sampling. Fish 1 and 3 were dark and fish 4 had exophthalmia. There were lesions on fish 2, 3 and 4.

Internally fish 1 had a pale heart and no food present in the gut. Fish 3 and 4 had clear ascites. Fish 4 had petechial haemorrhaging on the liver, pyloric caeca and swim bladder. Fish 5 had yellow pseudo-faeces in the gut and a grey kidney.

Results

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

The following bacteria were isolated:

Moritella viscosa (kidney and lesion of fish 3, lesion of fish 2, 4 and 5)

Vibrio sp. (gill of fish 1-5, kidney of fish 2-5, lesion of fish 2, 3 and 5)

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)
F1	22.91	30.92	31.07	31.05	POSITIVE
F2	22.23	28.20	28.24	28.20	POSITIVE
F3	22.58	30.86	30.94	30.84	POSITIVE
F4	21.95	26.61	26.59	26.65	POSITIVE
F5	22.15	27.70	27.52	27.58	POSITIVE

Candidatus Syngnamydia salmonis

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.91	38.72	37.86	39.3	POSITIVE
F2	22.23	36.95	38.38	>40	POSITIVE
F3	-	-	-	-	Negative
F4	21.95	28.51	28.51	28.61	POSITIVE
F5	22.15	32.27	32.15	32.6	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)
F1-4	-	-	-	-	Negative
F5	19.83	35.76	35.90	34.91	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	20.61	36.56	37.31	36.23	POSITIVE
F2	20.07	35.22	37.43	38.51	POSITIVE
F3	-	-	-	-	Negative
F4	22.01	31.10	31.15	31.12	POSITIVE
F5	19.83	32.24	32.09	31.60	POSITIVE

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	20.61	33.45	34.39	33.65	POSITIVE
F2	20.07	34.03	34.13	33.82	POSITIVE
F3	20.21	33.51	33.70	33.40	POSITIVE
F4	22.01	29.76	29.74	29.79	POSITIVE
F5	19.83	33.05	32.96	32.73	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.

Histopathological examination revealed the following:

Gill: Mild multifocal interlamellar hyperplasia with spaces (lacunae) occasionally filled with cell debris and lamellar fusion (F4) and F2 and F3 noted mainly distally, few to several basophilic epithelial inclusions (likely epitheliocystis) noted in all fish, amoeboid-like cells resembling Neoparamoeba perurans were noted in F4, several scattered aneurysmal dilation/telangiectasia and congested secondary lamellae and few lamellar thrombi also noted.

Skin & Muscle: Lesions (F2, F3 & F5) showed absence of epidermal layer, dermal oedema with high numbers of mixed bacteria which were also noted on the skeletal muscle, skeletal muscle necrosis with mild haemorrhage and mild leukocyte cell infiltration.

Heart: Mild pericarditis (F3, F4).

Gut and pyloric caeca: Some cell sloughing (F5), folds slightly congested noted in hindgut (F2 & F3).

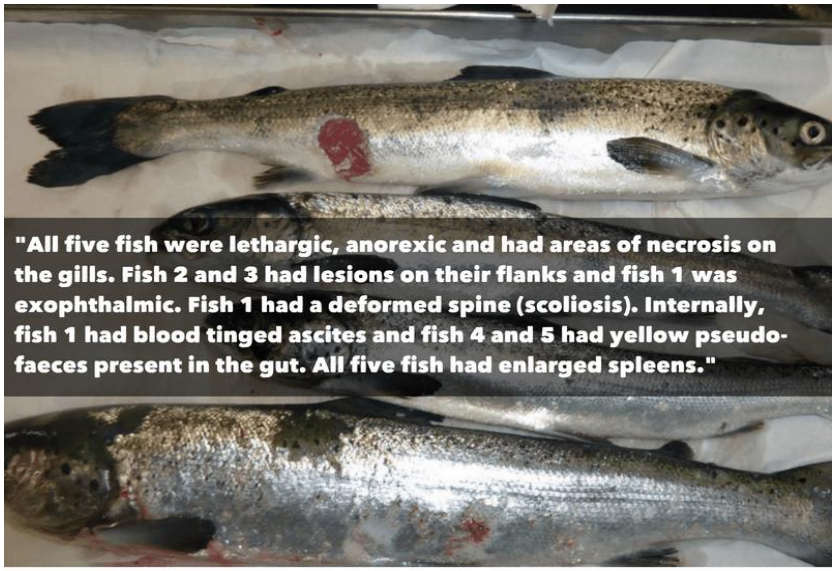
Pancreas: Within normal range.

Liver: Multifocal to coalescence hepatic necrosis (F1, F3, F4 & F5), mild diffuse hepatocyte vacuolation (F1, F5) and multiple foci sinusoidal congestion (F3, F4).

Kidney: Few shrunken glomeruli (F4).

Spleen: Slightly congested (F4).

The Fisheries Health Inspectorate Case Information (p26 onwards) for the Scottish Salmon Company's salmon farm at Vuiabeag on the Isle of Lewis was particularly damning with various infectious diseases, necrosis on the gills, lesions and a deformed spine reported.



Fish Farm: Vuiabeag, Isle of Lewis

Company: Scottish Salmon Company
Problems: amoebic gill disease, poxvirus
Fish heath inspection: five fish sampled on 19 October 2017
Case number: 2017-0467

The Ferret

marinescotland science

The Scottish Government
Riaghaltas na h-Alba

[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.

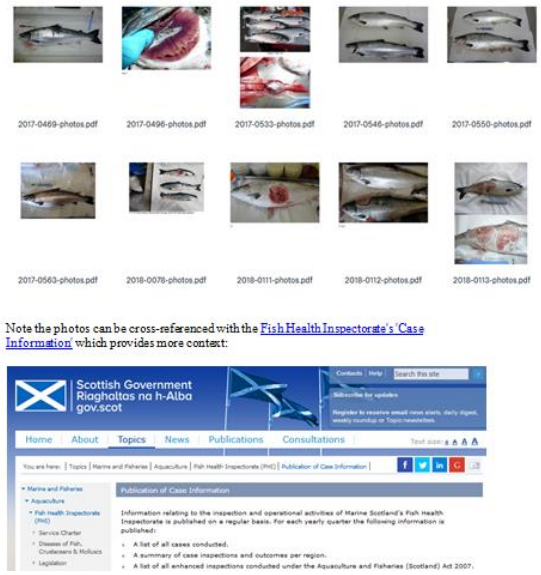
Kidney: Increase number of melanomacrophage aggregates noted in all individuals and occasional proteinaceous fluid within bowman's space (F5).

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

Read thirty FHI case reports (15 at Marine Harvest, 5 at The Scottish Salmon Company, 3 at Scottish Sea Farms, 3 at Cooke Aquaculture, 2 at Grieg Seafood and 2 at Loch Duart) with photos via: Hard Evidence - Photos of Diseased & Deformed Scottish Salmon

The public interest in the photographs was significant - with [The Ferret Tweeting in July 2018]:

The photos and Fisheries Health Inspectorate Case Information has been catalogued online by Scottish Salmon Watch via [Hard Evidence - Photos of Diseased & Deformed Scottish Salmon]



Further photos have been requested via FOI and Case Information for April to June 2018 will not be available until perhaps October 2018.

2) Disease reports obtained via Freedom of Information & FHI Case Information

In May 2018, Scottish Salmon Watch compiled a dossier of evidence detailing how salmon farms were harvesting early due to problems with infectious diseases and mortalities: [EXPOSED: Early Harvesting at Scottish Salmon Farms Due to Disease & Mortalities]

A Media Backgrounder - "[Hard Evidence: Fast-Tracking Disease-Ridden Scottish Salmon]" - detailed early harvesting by at least 25 salmon farms during 2017 including:

Marine Harvest (11): Poll Na Gille (Sound of Jura); Linnhe; North Shore (Loch Erisort); Port Na Cro (Shuna Sound); Loch Alsh; MacLean's Nose (Sound of Mull); Invasion Bay (Loch Sunart); Caolas A Deas (Loch Shell); Soay (West Loch Tarbert); Loch Hourn; Ardintoul (Loch Alsh)

The Scottish Salmon Company (5): Loch Odhairn/Gravir; Loch Tuath; Druimyeon Bay (Sound of Gigha); Inch Kenneth (Loch na Keal); Vuia Beag (Loch Roag)
Scottish Sea Farms (4): Kishorn A (South); Kishorn B (North); Kishorn B (South) and Kishorn West (all Loch Kishorn)

Cooke Aquaculture (3): Stead of Aithness (Aith Voe); Bay of Vady (Rousay Sound); Carness Bay

Kames Fish Farming (1): Shuna SW/Rubh'an Trilleachain (Shuna Sound)

Loch Duart (1): Calva Bay/Calbha Beag (Eddrachillis Bay)

"Harvesting worst affected cages" and "Harvested worse cages, reducing biomass" reported Marine Harvest for Poll Na Gille (Sound of Jura) in November 2017 following problems with "complex gill issues", anaemia, "severe PGD pathology and extensive haemorrhaging". "Harvested worst affected cages first" reported Marine Harvest for Linnhe in June 2017.

"Decision taken quickly to empty site" and "Issues with gills and anaemia have lead to decision to harvest," reported Marine Harvest for Port Na Cro (Shuna Sound) in November 2017

Marine Harvest reported increases in mortality from nine sites in late October 2017 citing "Anaemia issues", "CMS" and "complex gill issue" which "are being managed through harvesting and treatment". "Some fish treated with antibiotics with some positive effect, plan to harvest out ASAP once below MRL [Maximum Residue Limit]," reported Marine Harvest in relation to North Shore (Loch Erisort).

"Site partially harvested to remove worst affected fish - remainder of site due to fallow by end of January 2018"; "Harvesting to reduce biomass" and "Harvesting worst affected cages and accelerated harvest of site" reported the Scottish Salmon Company in relation to Druimyeon Bay (Sound of Gigha) in December 2017.

"Planning to harvest out soon" and "worst effected cages (sic) harvested and reducing biomass" reported the Scottish Salmon Company in relation to Loch Tuath.

"Accelerated harvests"; "Biomass has been lowered but gill issues continuing" and "Site has harvested largest grade cages to lower biomass, gill health issues ongoing" reported the Scottish Salmon Company in relation to Loch Odhairn/Gravir. "Hoping to grade out poor doers to reduce biomass" reported the Scottish Salmon Company in relation to Inch Kenneth (Loch na Keal).

"Plans to move all fish to Eughlam in December," reported The Scottish Salmon Company in October 2017 following "complex disease issues" including Amoebic Gill Disease, Paranucleospora theridon, Salmon gill pox, Microsporidia, Salmonid Alphavirus and Epitheliocystis at Vuia Beag (Loch Roag).

"Harvesting is underway at affected cages to reduce risk"; "Five affected cages to be harvested out, harvesting underway" and "Site being harvested to reduce risk" reported Scottish Sea Farms in relation to Kishorn West in August and October 2017. "Site to begin harvesting early" reported Scottish Sea Farms in relation to Kishorn A (South) and Kishorn North in October 2017.

"Site is harvesting early" reported Scottish Sea Farms in relation to Kishorn B (North), Kishorn West and Kishorn B (South) in October 2017. "Harvesting out site, advised to avoid crowding" wrote Scottish Sea Farms as an action response to increased mortalities at Kishorn A (Loch Kishorn) in October 2017. "Harvesting worst affected cages first and site should be empty in next six weeks" and "Advised to accelerate harvest" reported Scottish Sea Farms in relation to Kishorn B (North) in October 2017.

"Advice from vets to accelerate harvests and not to attempted mechanical delousing in worst affected cages"; "Harvested out worst affected cages and should be empty within six weeks" and "Company may look at using Thermolicer/Hydrolicer to reduce lice levels while

harvesting ongoing" reported Scottish Sea Farms in relation to Kishorn West in October 2017.

"Harvest has been accelerated by 1 months (sic) due to increased morts" and "Top sweep is being harvest first (sic) from the worst affected cages" reported Cooke Aquaculture in relation to Stead of Aithness (Aith Voe) in November 2017.

"Reports of increased mortality due to gill issues, site is being harvest out" and "Ongoing monitoring and harvesting of stocks" reported Cooke Aquaculture in relation to Bay of Vady (Rousay Sound) in August 2017 after over 10,000 mortalities in a four-week period.

"Site is being harvested" reported Cooke Aquaculture in relation to Carness Bay in August 2017 after over 20,000 mortalities in a six-week period due to gill issues.

"Biomass has been reduced with worst affected stock having been harvested," reported Kames Fish Farming in relation to Shuna SW (Rubh'an Trilleachain) in November 2017 following "complex gill issues", anaemia, salmon gill poxvirus, epitheliocystis, cardiomyopathy syndrome, piscine myocarditis virus, Paranucleospora theridon and Neoparamoeba perurans (AGD). "Harvest have been both live haul to Mallaig and dead haul."

"Worst affected cages are being harvested out" and "Worst affected will be harvested by next Monday (pens 22, 23, 25, 27, and 28 already harvested out)" reported Loch Duart's for Calva Bay/Calbha Beag (Eddrachillis Bay) in August 2017 following a mortality rate of 45.64% since input in some cages and disease problems including AGD, Candidatus Branchiomonas cysticola, Candidatus Syngnamydia salmonis, Salmon gill poxvirus and Paranucleospora theridon.

FOI disclosures by the Scottish Government in December 2017 and January 2018 revealed that Marine Harvest, Scottish Sea Farms and the Scottish Salmon Company experienced serious problems at various sites in 2017. The top twenty mortality events reported by Marine Harvest in 2017 (up to November) were:

Site Name	Start date	End date	Size of fish	Average weight of affected population	Mortality rate recorded (%)	If explained, select reason(s)	If unexplained, select observations:	Total mortality during event (if applicable)	Additional information (e.g. action taken)
Ardintoul	23/10/2017	29/10/2017	≥750g	2Kg	5.63	CMS, Complex gill issues	General Anaemia	51592	Observed a decrease in appetite prior to increase in mortality levels. Combination of factors - fish have tested positive to CMS, PRV and complex gill issues. Cause recorded as anaemia by company
Soay	09/10/2017	15/10/2017	<750g	0.4Kg	5.7	Treatment		31705	Disease samples taken, but all negative. Oxygen saturation issue on wellboat during freshwater treatment
Port Na Cro	30/10/2017	05/11/2017	≥750g	4kg	29.66	Complex gill issues, Gill issues, Anemia		24400	Site harvested out 6/11/17
MacLean's Nose	27/02/2017	05/03/2017	≥750g	1128.6g	3.86	CMS		22774	Monitoring situation closely. Health personnel on site frequently.
Ardintoul	30/10/2017	05/11/2017	≥750g	2Kg	2.58	CMS, Complex gill issues	General Anaemia	22330	Observed a decrease in appetite prior to increase in mortality levels. Combination of factors - fish have tested positive to CMS, PRV and complex gill issues. Cause recorded as anaemia by company

MacLean's Nose	06/03/2017	12/03/2017	≥750g	1199.1g	2.7	CMS		21460	Monitoring situation closely. Health personnel on site frequently.
MacLean's Nose	20/02/2017	26/02/2017	≥750g	1059.9g	3.4	CMS		20801	Monitoring situation closely. Health personnel on site frequently.
MacLean's Nose	13/03/2017	19/03/2017	≥750g	1255.1	2.7	CMS		20249	Monitoring situation closely. Health personnel on site frequently.
Poll Na Gille	23/10/2017	29/10/2017	≥750g	3.3kg	3.2	Complex gill issues, Gill issues,		20053	Harvesting worst affected cages.
Creag an T'Sagairt (Loch	26/06/2017	02/07/2017	≥750g	2.75Kg	2.31	Treatment		19633	Salmosan treatment
MacLean's Nose	22/03/2017	26/03/2017	≥750g	1323.9g	2.61	CMS		19056	Monitoring situation closely. Health personnel on site frequently.
MacLean's Nose	13/02/2017	19/02/2017	≥750g	992.7g	2.97	CMS		18740	Monitoring situation closely. Health personnel on site frequently.
Port Na Cro	23/10/2017	29/10/2017	≥750g	4kg	8.15	Complex gill issues, Gill issues, Anemia		17651	Site harvested out 6/11/17
MacLean's Nose	06/02/2017	12/02/2017	≥750g	922.0g	2.69	CMS		17428	Monitoring situation closely. Health personnel on site frequently.
Poll Na Gille	16/10/2017	22/10/2017	≥750g	3.3kg	2.6	Complex gill issues, Gill issues, Anemia		15861	Harvesting worst affected cages.
MacLean's Nose	27/03/2017	02/04/2017	≥750g	1393.7g	2.07	CMS		14719	Monitoring situation closely. Health personnel on site frequently.
Poll Na Gille	30/10/2017	05/11/2017	≥750g	3.3kg	2.7	Complex gill issues, Gill issues, Anemia		13830	Harvesting worst affected cages.
Loch Alsh (Sron)	23/10/2017	29/10/2017	≥750g	3.6 kg	2.44	CMS, Handling (harvest and treatment - salmosan)		12680	Site has begun harvesting, company vet monitoring mortality levels. Salmosan treatment conducted, increase in mortality due to backlog of mort removal during previous week due to logistics issues.
Ardintoul	13/11/2017	19/11/2017	≥750g	2Kg	1.5	CMS, Complex gill issues	General Anaemia	12502	Observed a decrease in appetite prior to increase in mortality levels. Combination of factors - fish have tested positive to CMS, PRV and complex gill issues. Cause recorded as anaemia by company
Creag an T'Sagairt (Loch Hourn)	12/06/2017	18/06/2017	≥750g	2.75Kg	1.39	Treatment		12082	Freshwater treatment on wellboat

"Harvesting worst affected cages" reported Marine Harvest for Poll Na Gille in November 2017 and "Harvested worst affected cages first" reported Marine Harvest for Linnhe in June 2017.

Download the Excel spreadsheet online here.

The top ten mortality events reported by Scottish Sea Farms in 2017 (up to November) included several farms which were described as "site is harvesting early":

Site Name	Start date:	End date:	Mortality rate recorded (%):	If explained, select reason(s):	Total mortality during event	Additional information (e.g. action taken):
Kishorn B (North)	02/10/2017	08/10/2017	6.44	Gill pathology, anaemia	24345	Site is harvesting early.
South Sound	26/12/2016	08/01/2017	4.58	Physical damage	23657	Visit from fish vet group and samples showed no further action required. Attributed to bad weather.
Kishorn A (South)	18/09/2017	24/09/2017	6.27	Gill pathology, anaemia, CMS	18854	Site to begin harvesting early
Kishorn B (North)	09/10/2017	15/10/2017	5.35	Gill pathology, anaemia	16300	Site is harvesting early.
Kishorn A (South)	02/10/2017	08/10/2017	6.02	Gill pathology, anaemia, CMS	15490	Site is harvesting early.
Kishorn B (North)	16/10/2017	22/10/2017	4.58	Gill pathology, anaemia	13050	Site is harvesting early.
Kishorn West	02/10/2017	08/10/2017	6.35	Gill pathology, anaemia	12500	Site is harvesting early.
Loura Voe	02/01/2017	15/01/2017	1.41	Physical damage, Seal damage	11450	Light were turned off as thought on this occasion that it was attracting seals. Physical damage also attributed to bad weather.
Kishorn B (North)	24/07/2017	30/07/2017	2.63	AGD, PGD, Treatment	11442	H2O2 treatment (wellboat) carried out during week 30. Mortalities attributed to post-treatment losses and underlying gill pathology, likely exacerbated due to the additional handling when using the wellboat for treatment. Treatments are now being conducted using tarps and mortalities have fallen below 1%. Vets have attended site.
Kishorn West	11/09/2017	17/09/2017	4.09	Gill pathology, anaemia	11314	Ongoing losses at site. Site being harvested to reduce risk Site was visited by FHI on 05/06/2017. Diagnostic results showed fish were positive for gill pathology including Salmon Gill poxvirus, Paranucleospora theridion and AGD.

"Harvesting is underway at affected cages to reduce risk"; "Five affected cages to be harvested out, harvesting underway" and "Site being harvested to reduce risk" reported Scottish Sea Farms in relation to Kishorn West. "Site to begin harvesting early" reported Scottish Sea Farms in relation to Kishorn A (South) and Kishorn B (North). "Site is harvesting early" reported Scottish Sea Farms in relation to Kishorn B (North), Kishorn West and Kishorn B (South).

Download the Excel spreadsheet online here.

The top ten mortality events reported by the Scottish Salmon Company in 2017 (up to November) included Loch Tuath which was described as "worst effected cages (sic) harvested and reducing biomass":

Site Name	Start date:	End date:	Mortality rate recorded(%):	If explained, select reason(s):	Total mortality during event	Additional information (e.g. action taken):
Vuiabeag	04/09/2017	10/09/2017	10.37	AGD, PD, Treatment	97534	
Loch Odhairn(Gravir)	24/07/2017	30/07/2017	9.64	AGD, Complex gill issues, Treatment	64872	Severe gill issues with high levels of AGD present. H2O2 treatment at end of week 29. FW treatment planned for 12/08/17. Vet has been attending weekly and will attend FW treatment.
Loch Odhairn(Gravir)	24/07/2017	30/07/2017	9.64	AGD, Complex gill issues, Treatment	64872	Severe gill issues with high levels of AGD present. H2O2 treatment at end of week 29. FW treatment planned for 12/08/17. Vet has been attending weekly and will attend FW treatment.
Druimyeon Bay	13/11/2017	19/11/2017	8.69	post treatment hydrolicer losses,	45089	further hydroliser treatment planned, fish on functional feed, harvesting.
Russel Burn	17/07/2017	27/07/2017	4.42	Fungus	40873	Mortality event attributed to fungus post vaccination. Affected stock were treated with formalin and numbers have dropped.
Strone Point	23/10/2017	29/10/2017	6.27	Ongoing bacterial challenge. Vibrio anguillarum identified as primary pathogen	38,694	FVG Visited site and provided advise on increasing biosecurity. Awaiting antibiotic sensitivity results.
Loch Odhairn(Gravir)	31/07/2017	04/08/2017	6.34	AGD, Complex gill issues, Treatment	38530	Severe gill issues with high levels of AGD present. H2O2 treatment at end of week 29. FW treatment planned for 12/08/17. Vet has been attending weekly and will attend FW treatment.
Loch Odhairn(Gravir)	31/07/2017	04/08/2017	6.34	AGD, Complex gill issues, Treatment	38530	Severe gill issues with high levels of AGD present. H2O2 treatment at end of week 29. FW treatment planned for 12/08/17. Vet has been attending weekly and will attend FW treatment.
Loch Tuath	04/09/2017	10/09/2017	14.2	AGD, Algal bloom, Complex gill issues, Jellyfish	36422	FHI informed, company biologists notified. Worst effected cages harvested and reducing biomass
Vuia Mor	11/09/2017	17/09/2017	4.13	AGD, Complex gill issues, Treatment	32487	

"Site partially harvested to remove worst affected fish - remainder of site due to fallow by end of January 2018" and "Harvesting to reduce biomass" reported the Scottish Salmon Company in relation to Druimyeon Bay. "Planning to harvest out soon" reported the Scottish Salmon Company in relation to Loch Tuath. "Accelerated harvests"; "Biomass has been lowered but gill issues continuing" and "Site has harvested largest grade cages to lower biomass, gill health issues ongoing" reported the Scottish Salmon Company in relation to Loch Odhairn/Gravir. "Hoping to grade out poor doers to reduce biomass" reported the Scottish Salmon Company in relation to Inch Kenneth.

Download an Excel spreadsheet online here.

An email obtained via FOI from the Scottish Government revealed that Marine Harvest was experiencing increases in mortality from nine sites in late October 2017 citing "Anaemia issues", "CMS" and "complex gill issue" which "are being managed through harvesting and treatment". "Some fish treated with antibiotics with some positive effect, plan to harvest out ASAP once below MRL," reported Marine Harvest in relation to North Shore (Loch Erisort).

From: [redacted]
Sent: 30 October 2017 10:42
To: [redacted]
Cc: [redacted]

[redacted]

Subject: Mortality and sea lice issues, Marine Harvest

[redacted]

I received an update on Friday lunchtime last week from [redacted] at Marine Harvest concerning sea lice and mortality issues at a number of their sites.

In terms of sea lice, the latest figures have been sent to you. The company has gone from usually having 2-3 sites to report to 9 sites, three of these are sitting just below an average of 8 and are being managed through harvesting and treatment. All the details should be within the file submitted to [redacted]

From a mortality perspective, increases have been noted from a number of sites in the last week. Anaemia issues have been of concern, not suspected to be linked to ISA or any evidence of obvious haemorrhage, but may be a consequence of the complex gill issue. Mortality has also been attributed to CMS, but in many cases there are multifactorial causes. Many of these cases will need a follow up and I suggest contacting the site manager for further details as required.

- Invasion Bay – mortality >1% per week for weeks of 2nd, 9th, 16th October – attributed to CMS
- MacLean's Nose – historic CMS issues, but now fine that Q4s are out (Q1s only remaining on site)
- Loch Alsh – escalating morts in October up to 1% per week attributed to CMS
- Caolas A Deas (Loch Shell) – Last week 2.5% loss and 0.7% loss on east and west parts of site respectively, attributed to CMS
- Poll Na Gille – presently losing 1-2.1% per week (attributed to CMS, sea lice, anaemia)
- Soay (WLT) treatment (FW) associated mortality – 5.7% week of 9th October
- Loch Hourn (Creag an T'Sagairt) – anaemia since July but no mortality issues. Sea lice control through cleaner fish. Week of 18 September >1% mortality, last week 0.8% mortality
- Ardintoul – levels of anaemia in some pens, testing undertaken suggest no infective cause. Sea lice at 3.5 average for farm. Treatment underway but likely to result in mortality
- North Shore – over the last 4 weeks 2% mortality per week, on north shore east 3.9, 2.5, 4.1% mortality for the last 3 weeks. Some fish treated with antibiotics with some positive effect, plan to harvest out ASAP once below MRL. Extreme presentation of regenerative anaemia. Histology evidence of low grade challenge relating to the gills. No evidence of infectious cause (with respect to anaemia). Site also suffered/ suffering from AGD, PD and Pasturella.
- Port Na Cro – 1% mortality 25 September. Last week 6% mortality. Sea lice and anaemia listed as attributing factors
    - BDNC – one week in October 1% mortality

The company are trying to harvest appropriate stocks as quickly as possible. It was reported that there is no capacity to increase harvest rate within the company or across the wider industry.

Actions – we need to follow up on both the mortality reports for our records (I would suggest this would be best done through site managers) and agree on a strategy of visits going forward, where required, we have visited a number of these sites recently and are due to visit some in the near future.

Other data published monthly by Marine Harvest indicates that Cardiomyopathy Syndrome (CMS) started causing mortality problems at MacLean's Nose in February 2017 (10.79%

mortality) with problems continuing in March 2017 (11.17% mortality - with 4.02% mortality also reported at Loch Alsh); April 2017 (12.6% and 3.79% at Loch Alsh); May 2017 (13.96%); June 2017 (9.77%) and July 2017 (4.07%).

Case Information (October to December 2017) detail Cases 20170340-20170460 which includes reference to a "decision taken quickly to empty site" following a rapid rise in mortality reported as due to "gill issues, anaemia" at Marine Harvest's Port Na Cro salmon farm in November 2017. "Issues with gills and anaemia have lead to decision to harvest," concluded the Fish Health Inspectorate report.

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Case No:	2017-0431							Date of visit:	06/11/2017		
Time spent on site:	5hrs							Main Inspector:	SAE		
Site No:	FS0859		Site Name:	Port Na Cro							
Business No:	FB0119		Business Name:	Marine Harvest (Scotland) Ltd							
Case Types:	1	REP	2	DIA	3		4		5		6	
Water Temp (°C):	12.3		Thermometer No:	Site				FHI 045 completed			
Observations:			Region:	ST		Water type:	S		CoGP MA	M-40	
Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.									
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.									
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.									
Diagnostic samples taken?	Y										
UNI/REG only - if unable to carry out intended visit detail reason below:											

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Additional Case Information:

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.

9/10 October Peroxide for AGD

Recent (last 4 wks) disease problems?	
If yes, detail:	gill issues, anaemia

Mortality Records

1. Mortality records available for inspection?	Y
2. How are mortalities disposed of?	Whole fish - Dundas Chemicals
If other detail:	and some ensiled
3. Mortality records complete and correctly entered?	Y
4. Recent mortality (last 4 wks):	Pen 4 worst; see mort event report
5. Evidence of recent increased/atypical mortalities?	Y
If yes, facility nos/no mortality per facility/no stock per facility/reason:	
see mort event reports	
6. Any other peaks in mortality during period checked?	N
If yes, detail:	
7. Have increased (unexplained) mortalities been reported to vet or FHI?	Y
If yes, detail action:	site harvested out
8. Have 'mortality events' been reported to FHI? If no, add MRT case and enter on mortality events sheet.	Y

Results of Surveillance

1. Has any animal health surveillance been carried out by, or on behalf of, the business?	Y
2. If yes, are results available for inspection?	N
3. Any significant results?	Y
If yes, detail (if not detailed under recent disease problems).	gill issues
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	

Records checked between:	11/10/2017 - 06/11/2017

Mortality due to "complex gill issues" at Marine Harvest's Port Na Cro salmon farm was [recorded as high as 29.66%] in October 2017:

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Case No: 2017-0431 Site No: FS0859 Date of visit: 06/11/2017

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):
16/10/17	22/10/2017	≥750g	4kg	SAL	2016 Q4	Weekly	4.11	Explained	Complex gill issues, Gill issues
23/10/17	29/10/2017	≥750g	4kg	SAL	2016 Q4	Weekly	8.15	Explained	Complex gill issues, Gill issues
30/10/17	05/11/2017	≥750g	4kg	SAL	2016 Q4	Weekly	29.66	Explained	Complex gill issues, Gill issues

Over 50,000 morts were [reported citing "General Anaemia"]:

If unexplained, select observations:	Total mortality during event (if available):	Additional information (e.g. action taken by company):	Action taken by FHI (include case no where applicable):
General Anaemia	9,280	Site harvested out 6/11/17	Site visit 6/11/17
General Anaemia	17,651	Site harvested out 6/11/17	Site visit 6/11/17
General Anaemia	24400	Site harvested out 6/11/17	Site visit 6/11/17

The Scottish Government [reported in a letter to Marine Harvest] positive tests for proliferative gill pathology with lesions consistent with amoebic gill disease (AGD), epitheliocysts, Piscine myocarditis virus (PMCV) consistent with mild cardiomyopathy syndrome (CMS), Paranucleospora theridon and salmon gill poxvirus (SGPV).

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The Scottish Government
Riaghaltas na h-Alba

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

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.

Another FHI visit report dated October 2017 for The Scottish Salmon Company's Loch Tuath salmon farm "revealed complex gill pathology including the presence of amoebic cells suggestive of amoebic gill disease and evidence of gill poxvirus"; "Epitheliocystis were noted and tested positive to Canditus Branchiomonas cysticola" and "Vascular damage and mid hepatic necrosis was also noted". Farmed salmon also tested positive for Parvicapsula pseudobranchicola and Paranucleospora theridon.

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The Scottish Government
Riaghaltas na h-Alba

[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	11/10/2017
SITE NO	FS0617	SITE NAME	Loch Tuath
INSPECTOR	David Tomlinson	CASE NO	20170458

Section 1: Summary

Five lethargic Atlantic salmon (*Salmo salar*) were sampled for diagnostic purposes. Histopathology examination revealed complex gill pathology including the presence of amoebic cells suggestive of amoebic gill disease and evidence of salmon gill poxvirus. Both pathogens were confirmed by QPCR. Epitheliocystis were noted and tested positive to *Candidatus* Branchiomonas cysticola by QPCR. Vascular damage and mild hepatic necrosis was also noted.

Due to the gill health issues on site, samples were screened for *Parvicapsula pseudobranchicola* and *Paranucleospora theridion* by QPCR. Samples tested **positive** for both pathogens.

A FHI visit report from October 2017 reported disease problems:

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0467			Date of visit:	17/10/2017
Time spent on site:	4 hours			Main Inspector:	SJD
Site No:	FS0411	Site Name:	Vuiabeag		
Business No:	FB0169	Business Name:	The Scottish Salmon Company		
Case Types:	1 REP	2 DIA	3	4	5 6
Water Temp (°C):	12.5	Thermometer No:	Site	FHI 045 completed	
Observations:		Region: WI	Water type: S	CoGP MA	W-2

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

The report for The Scottish Salmon Company's salmon farm at Vuia Beag in Loch Roag detailed "complex disease issues" including "AGD, Para Ther, Salmon gill pox, Microsporidia, SAV and epitheliocystis" with "plans to move all fish to Eughlam in December":

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

Complex gill issues on site - AGD, Para Ther & Salmon gill pox. Microsporidia, SAV, epitheliocystis positive - by PCR from FVG.
This is the last cycle of fish for Vuia Beag - no plans to restock.
Morts started to rise in week 29 - 5002/site/wk.
Wk 30 - 14182, wk 31 - 14284, wk 32 - 14894, wk 33 - 13,974, wk 34 - 14861, wk 35 - 17449, wk 36 - 97524. First few weeks just below the reporting level of 1.5%.

Morts dropped again over last few weeks - wk 37 - 2061, wk 38 - 905, wk 39 - 1342, wk 40 - 2176, wk 41 - 2704, wk 42 - 1853.
Morts attributed to complex gill issues and associated treatments - H2O2.
Slice treatment - 25/09 -01/10 latest. 4 slice treatments since input. Lice levels low - <0.1.
No movements since last inspection. Plan to move all fish to Eughlam in December. Will wait until after move to stock with cleaner fish.

The report also detailed "deformed spine":

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional comments:

F1 - deformed spine.

As well as a "strong presence" of moribund, anorexic and lethargic farmed salmon in addition to lesions on the flank and a "medium presence" of necrotic gills.

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case no:	2017-0467		Site No:	FS0411		Method of killing:						
Date of visit:	17/10/2017		Inspector(s):	SJD		Sheet Relevant:	Y					

S for strong presence: **M** for medium presence: **W** for weak presence

Fish Number		1	2	3	4	5					
Time sampled after death (if > 45 minutes)				50	60	70					
External Signs											
Behaviour	Moribund	S	S	S	S	S					
	Lethargic	S	S	S	S	S					
	Hanging vertical										
	Spiralling										
	Flashing										
	Loss of equilibrium										
Body	Dark										
	Distended abdomen										
	Anorexic	W	S	S	S	W					
Gills	Pale										
	Zoned										
	Necrotic	M	M	M	M	M					
Lesions	Flank		S	W							

Marine Scotland Science's FHI visit report dated October 2017 included:

marine scotland science

The Scottish Government
Riaghaltas na h-Alba

[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.

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.

Results

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

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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

The samples tested negative for infectious haematopoietic necrosis virus (IHNV), infectious salmon anaemia virus (ISAV) and viral haemorrhagic septicemia virus (VHSV).

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

Neoparamoeba perurans (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

R09

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A FHI visit report from October 2017 for The Scottish Salmon Company's salmon farm at Vuia Mor in Loch Roag detailed a total mortality since input of 30.23% with 32,487 morts. Recent disease issues cited were PGD, AGD, Para Ther, Sal Gill pox, PD, HSMI, microsporidia and epitheliocystis.

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Additional Case Information:

Site contact to be updated - confirm with business correspondent.
Just started stocking with lumpfish - first load arrived yesterday.
Recent issues - PGD, AGD, Para Ther, Sal Gill pox, PD, HSMI, microsporidia, epitheliocystis
Stocked in January 2017.
Mortality since input - generally 0.08%-0.7% per week.
Recent mortality - wk 42 - 366, wk 41 - 577, wk 40 - 31536 (6.24%), 39 - 67435 (11.91%)
Total 30.23% mortality since input.
Ongoing Slice treatment.
Site specific sea lice strategy.
Check with biologist regarding harvest plans.

If unexplained, select observations:	Total mortality during event (if available):	Additional information (e.g. action taken by company):	Action taken by FHI (include case no where applicable):
	32487		

A FHI visit report from October 2017 for Marine Harvest's salmon farm at North Shore in Loch Erisort detailed a "presumptive Pasteurella skyensis diagnosis" and "pathology consistent with previous Pasteurella infections" as well as "some cadiomyopathy", Pancreas Disease, AGD (Amoebic Gill Disease), Salmon gill pox and ParaTher (Paranucleospora theridon):

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0469					Date of visit:	18/10/2017
Time spent on site:	5 hours				Main Inspector:		SJD
Site No:	FS1033	Site Name:	North Shore				
Business No:	FB0119	Business Name:	Marine Harvest (Scotland) Ltd				
Case Types:	1 REP	2 ESC	3 DIA	4	5	6	
Water Temp (°C):	11.5	Thermometer No:	Site		FHI 045 completed		
Observations:		Region:	WI	Water type:	S	CoGP MA	W-3

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

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.

Original site plans to fallow in May/June 18 - but likely to be earlier now.
North Shore West - 287905@ 4.1kg
North Shore East - 289462 @ 3.9kg
Morts removed in tubs - collected by Gogar and transferred to Energen biogas.
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
Escape investigation
Seal spotted in pen, disappeared before action taken to remove. Divers on site within 2 hours - found and repaired hole net. Due to size of hole not thought to be caused by seal, but by hat of uplift system.
Site manager in discussion with production manager regarding modifications to uplift system which may be possible to prevent re-currence.
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.

Deformities such as a "shortened upper jaw" and "eyes damaged" were also reported:

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Additional comments:

F2 - shortened upper jaw, thickened membrane over kidney - gelatinous, adhesions.
F3 - shortened upper jaw, both eyes damaged, adhesions.
F4 - grilse
F5 - shortened upper jaw.

The FHI visit report for Marine Harvest's salmon farm at North Shore in Loch Erisort detailed:

marinescotland science

The Scottish Government
Riaghaltas na h-Alba

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

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.

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.

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.

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

R09

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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

Fish 3 tested negative for SGPV.

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

"About 125,000 salmon have died due to a disease outbreak at two fish farms on the Isle of Lewis," reported BBC Scotland in October 2017. "Marine Harvest confirmed that the sites in Loch Erisort have been hit by the bacterium Pasturella Skyensis". "Macleans Nose in Loch Sunart, where salmon have also been exposed to AGD, is believed to be infected by Pasteurella skyensis, too," reported Fish Update in October 2017.

"A staggering 177,000 were hauled out of one loch [Erisort] last autumn," reported The Daily Mail in January 2018.

Thousands of fish thrown in a truck – and troubling new questions for salmon farms

A staggering 177,000 were hauled out of one loch last autumn but that's a fraction of the 10m diseased salmon binned by the industry in a single year

SPECIAL INVESTIGATION
by Gavin Madeley

Download high res images via [Photo Gallery: Dead Salmon from Scotland's Disease-Ridden Salmon Farms]

A [FHI visit report from October 2017] for a salmon farm in Loch Kishorn (Kishorn A) operated by Scottish Sea Farms detailed disease problems including AGD, sea lice damage to the heads of farmed salmon, Paranucleospora theridon, salmon gillpox, Branchiomonas, lamellar bleeding of the gills, CMS and HSMI like pathology:

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0496							Date of visit:	25/10/2017		
Time spent on site:	4 hours							Main Inspector:	ALW		
Site No:	FS0709	Site Name:	Kishorn A (South)								
Business No:	FB0125	Business Name:	Scottish Sea Farms Ltd								
Case Types:	1 REP	2 DIA	3 VMD	4		5		6			
Water Temp (°C):	13.8	Thermometer No:	T148					FHI 045 completed			
Observations:		Region:	HI			Water type:	S		CoGP MA	M-19	

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

Recent (last 4 wks) disease problems?		Y	Any escapes (since last visit)?
If yes, detail:	CMS, AGD, Paranucleospora theridion, salmon gillpox and Branchiomonas		

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Additional comments:

Fish 2-5 sea lice damage to head

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Additional Case Information:

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.

The FHI visit report clearly states "harvesting out site, advised to avoid crowding" as an action response to increased mortalities:

7. Have increased (unexplained) mortalities been reported to vet or FHI?		Y
If yes, detail action:	Harvesting out site, advised to avoid crowding	
8. Have 'mortality events' been reported to FHI? If no, add MRT case and enter on mortality events sheet.		Y

Marine Scotland Science detailed in their FHI Visit Report for October 2017 "complex gill issues" - including pathology consistent with epitheliocystis, amoebic gill disease (AGD), evidence of salmon gill poxvirus, mild hepatic necrosis, mild cardiomyopathy, Paranucleospora theridon, Vibrio sp. and Pseudomonas fluorsecens:

marinescotland science

The Scottish Government
Riaghaltas na h-Alba

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

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 R09

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Website - www.gov.scot/Topics/marine/science

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.

Results

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

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 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).

The FHI visit report from October 2017 for another salmon farm in Loch Kishorn (Kishorn B) operated by Scottish Sea Farms detailed similar disease problems including AGD, Paranucleospora theridon, salmon gillpox and Branchiomonas, lamellar bleeding of the gills and sea lice damage to the heads of farmed salmon.

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0497					Date of visit:	25/10/2017		
Time spent on site:	4.5 hours					Main Inspector:	ALW		
Site No:	FS0804	Site Name:	Kishorn B (North)						
Business No:	FB0125	Business Name:	Scottish Sea Farms Ltd						
Case Types:	1 REP	2 DIA	3 VMD	4	5	6			
Water Temp (°C):	13.8	Thermometer No:	T148			FHI 045 completed			
Observations:		Region:	HI	Water type:	S	CoGP MA	M-19		

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

Recent (last 4 wks) disease problems?		Y	Any escapes (since last visit)?
If yes, detail:	AGD, Paranucleospora theridion, salmon gillpox and Branchiomonas		

The [FHI visit report] (October 2017) for the Kishorn B (North) salmon farm operated by Scottish Sea Farms in Loch Kishorn stated: "Harvesting worst affected cages first and site should be empty in next six weeks".

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

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.
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 16/10/17 - 5.95. No recent counts as harvesting out site). Treated 5 cages with Azamethiphos at end of Sept/early October, but high mortality level in two cages so did not continue treatment of remaining cages. May use thermolicer or hydolicer.
Harvesting worst affected cages first and site should be empty in next six weeks.
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 pumped from the skip into containers for collection by Billy Bowie.
A number of fish observed with sea lice damage to their heads (estimate 30-50 per cage). Removed 5 lethargic fish for diagnostic sampling. Two had slightly pale gills, no white patches. Fish sampled for VMD appeared healthy.

"Advised to accelerate harvest" stated the [FHI visit report] for October 2017:

Mortality Records

1. Mortality records available for inspection?		Y
2. How are mortalities disposed of?	Whole fish - Dundas Chemicals	
If other detail:	Normally incinerate at shorebase	
3. Mortality records complete and correctly entered?		Y
4. Recent mortality (last 4 wks):	wk 39 - 4,550 (1.17%), wk 40 - 24,345 (6.44%), wk 41 - 16,300 (5.35%), wk 42 - 13,050 (4.58%)	
5. Evidence of recent increased/atypical mortalities?		Y
If yes, facility nos/no mortality per facility/no stock per facility/reason:		
Across site due to gill issues		
6. Any other peaks in mortality during period checked?		N
If yes, detail:		
7. Have increased (unexplained) mortalities been reported to vet or FHI?		Y
If yes, detail action:	Advised to accelerate harvest	
8. Have 'mortality events' been reported to FHI? If no, add MRT case and enter on mortality events sheet.		Y

Marine Scotland Science detailed in their FHI Visit Report for October 2017 "complex gill issues" - including pathology consistent with amoebic gill disease (AGD), evidence of salmon gill poxvirus, epitheliocystis, hepatic necrosis, Paranucleospora theridon, Vibrio sp, Branchiomonas cysticola and Candidatus Syngamydia salmonis:

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The Scottish Government
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FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

Business No	FB0125	**Date of Visit**	25/10/2017
Site No	FS0804	**Site Name**	Kishorn B (North)
Inspector	Andrea Warwick	**Case No**	20170497

Section 1: Summary

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

Histopathology examination revealed complex gill issues. There was pathology consistent with amoebic gill disease (AGD) which was confirmed by QPCR, evidence of salmon gillpox virus which was confirmed by QPCR and epitheliocystis which tested positive for *Candidatus* Branchiomonas cysticola and *Candidatus* Syngnamydia salmonis by PCR. Hepatic necrosis was also noted, likely associated with hypoxia.

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

A *Vibrio* species was also isolated, but due to light growth it is 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 169,887 2016 S0 Atlantic salmon at an average weight of 3.9Kg, ~5,000 wrasse of mixed age and ~5,000 lumpsuckers of mixed age.

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Website - www.gov.scot/Topics/marine/science

Mortality levels had begun to rise at the end of September 2017, peaking at 6.44% in week 40 and were at 4.58% the week previous to the inspection. Harvesting was ongoing and the site was due to fallow by the end of the year. 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 five were sampled for diagnostic purposes.

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

Results

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

The following bacterium was isolated from fish 2-5:

- *Vibrio* species (kidney material from fish 2-5 and gill material from fish 2 and 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	F3	F4
Endogenous control Cp value	23.61	23.10
Cp Values	24.70	28.76
	24.77	28.97
	24.79	29.12
Reported Result	POSITIVE	POSITIVE

Candidatus Syngnamydia salmonis

Fish Number	F3	F4
Endogenous control Cp value	23.61	23.10
Cp Values	33.48	33.60
	33.62	33.71
	33.69	34.60
Reported Result	POSITIVE	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	F1	F2	F3	F4	F5
Endogenous control Cp value	22.33	23.58	23.94	23.58	24.18
Cp Values	32.38	31.53	31.79	31.80	35.10
	32.07	31.66	32.06	31.73	35.48
	32.01	31.63	31.79	31.84	35.13
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	F1	F2	F3	F4	F5
Endogenous control Cp value	22.33	23.58	23.94	23.58	24.18
Cp Values	34.87	32.70	33.91	30.20	31.05
	34.31	32.46	33.91	34.26	31.17
	35.00	32.69	34.32	34.45	31.30
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

Paranucleospora theridion

Fish Number	F1	F2	F3	F4	F5
Endogenous control Cp value	22.33	23.58	23.94	23.58	24.18
Cp Values	39.24	30.01	27.85	28.63	31.02
	40.00	29.98	28.02	28.52	31.19
	39.19	30.08	28.35	29.94	33.87
Reported Result	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE

Another FHI Fish Visit report dated October 2017 for the Kishorn West salmon farm operated by Scottish Sea Farms in Loch Kishorn included: "Advice from vets to accelerate harvests and not to attempted mechanical delousing in worst affected cages"; "Harvested out worst affected cages and should be empty within six weeks" and "Company may look at using Thermolicer/Hydrolicer to reduce lice levels while harvesting ongoing":

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Additional Case Information:

Visit to collect information for ongoing gill issue which has lead to increased mortality levels. Site inspected by FHI last month. Tests positive for presence of AGD, Paranucleospora theridion, salmon gillpox and Branchiomonas. Also observed lamellar bleeding of the gills. 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 17/10/17 - 5.62. Previous counts below Average Adult Female level of 3). Treated 3 cages with Azamethiphos at end of Sept/early October.
Harvested out worst affected cages and should be empty within six weeks. Company may look at using thermolicer/hydrolicer to reduce lice levels while harvesting ongoing.
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 for collection by Billy Bowie.

Recent (last 4 wks) disease problems?		Y	Any escapes (s
If yes, detail:	AGD, Paranucleospora theridion, salmon gillpox and Branchiomonas		

Mortality Records	
1. Mortality records available for inspection?	Y
2. How are mortalities disposed of?	Whole fish - Dundas Chemicals
If other detail:	Normally incinerate at shorebase
3. Mortality records complete and correctly entered?	Y
4. Recent mortality (last 4 wks):	wk 39 - 8,739 (4.17%), wk 40 - 12,500 (6.35%), wk 41 - 2,370 (1.34%), wk 42 - 5,360 (3.06%)
5. Evidence of recent increased/atypical mortalities?	Y
If yes, facility nos/no mortality per facility/no stock per facility/reason:	
Across site due to gill issues	
6. Any other peaks in mortality during period checked?	N
If yes, detail:	
7. Have increased (unexplained) mortalities been reported to vet or FHI?	Y
If yes, detail action:	Advised to accelarate harvest
8. Have 'mortality events' been reported to FHI? If no, add MRT case and enter on mortality events sheet.	Y

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

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

Due to finish harvest in a couple of weeks. Will then restock after 4 week fallow with ~450,000 part grown stock from Seaforth for approx 6 months. Next input after that will be late Q3/Q4s smolts in 2018.
CMS, PRV and PD have been confirmed on site. PGD is main cause of mortalities, particularly during treatments. Recent tests for AGD have been negative.
Fish were transferred to site from Tabhaigh and received a freshwater treatment in the wellboat during transfer. While on site fish have had treatments with Salmosan (June, August & September), Slice (July), freshwater (October) and the thermolicer (one cage only in August). Elevated mortality levels after treatment with thermolicer so no other cages treated. Recent freshwater treatment carried out on Intercaledonia. Fish treated on boat for 11 hours and some elevated mortality levels occurred due to PGD. Also experienced increased mortality levels in lumpfish during the treatment as they could not be removed from the pens prior to the treatment. Estimate approx 1,500-2,000 per pen.
Lumpfish worked well at controlling lice initially, but less so as they have grown. Also have sea lice skirts on all cages.
Fish on site feeding very deep and difficult to catch. Fish sampled for VMD appeared healthy. Only one lethargic fish removed for examination, but no gross pathology seen and no samples taken.

Mortality Records

1. Mortality records available for inspection?	Y
2. How are mortalities disposed of?	Other (detail)
If other detail:	Normally ensile, but currently to landfill at Bennadrove due to volume
3. Mortality records complete and correctly entered?	Y
4. Recent mortality (last 4 wks):	w/b 8/10 - 2,920 (1.27%) CMS, w/b 15/10 - 6,943 (3.06%) PGD/treatment, w/b 22/10 - 5,788 (2.63%) PGD/treatment, w/b 29/10 - 1,377 (0.63%)
5. Evidence of recent increased/atypical mortalities?	Y
If yes, facility nos/no mortality per facility/no stock per facility/reason:	
Across site due to freshwater treatment (details above)	
6. Any other peaks in mortality during period checked?	Y
If yes, detail:	August - 14,091 (5.5%) following thermolicer and salmosan treatments. September - 11,282 (4.66%) following salmosan treatment)
7. Have increased (unexplained) mortalities been reported to vet or FHI?	Y
If yes, detail action:	No further treatments with thermolicer. Continue with harvest
8. Have 'mortality events' been reported to FHI? If no, add MRT case and enter on mortality events sheet.	N

Results of Surveillance

1. Has any animal health surveillance been carried out by, or on behalf of, the business?	Y
2. If yes, are results available for inspection?	Y
3. Any significant results?	Y
If yes, detail (if not detailed under recent disease problems).	CMS, PD, PRV

Records checked between: 14/10/15 - 7/11/17

A [FHI Fish Visit report dated November 2017] detailed disease problems at Cooke Aquaculture's salmon farm in the Stead of Aithness (Aith Voe) in Shetland.

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0533			Date of visit:	08/11/2017
Time spent on site:	5 hrs			Main Inspector:	ASM
Site No:	FS0637	Site Name:	Stead of Aithness		
Business No:	FB0095	Business Name:	Cooke Aquaculture Scotland Ltd		

Case Types:	1	REP	2	DIA	3		4		5		6	

Water Temp (°C):	N/A	Thermometer No:	T172	FHI 045 completed	

Observations: Region: SH Water type: S CoGP MA: S-8b

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

"Harvest has been accelerated by 1 months (sic) due to increased morts," detailed FHI Fish Visit report dated November 2017. "Top sweep is being harvest first (sic) from the worst affected cages."

"During the inspection of the stock on site there were many fish high in the water column," continued the FHI Fish Visit report dated November 2017. "Many fish were moribund and about 20-30 fish over the site were observed dead on the surface of the water."

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

Morts removed daily using mort socks
Waste collected by TWMA. They can cope with the volume produced.
Site stocked with lumpsuckers but these have died. This occurred shortly after the lumpsuckers were input in July. 15,000 input. Company biologist took samples and sent to FVG. Mortality attributed to a bacterial infection.
Lice skirts used on site. Skirts are 6m deep. These are thought to be effective against lice.
Cages aerated using compressed air.
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. All treatments were reportedly successful.
SLICE treatments conducted on 23/06/17, 22/02/17 and 02/11/16. These were taken after very slight rises in lice numbers. All treatments were reportedly successful.
Lice numbers have been on the rise in the past weeks leading up to the inspection (thought to be related to the increase in immunocompromised fish on site), especially numbers of pre-adult males. Still under 3 adult females per fish.

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.

The mortality rate was reported as 11.52%.

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

With total mortality of 58,590 farmed salmon.

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)

Marine Scotland Science detailed in their FHI Visit Report for November 2017 "pathology consistent with amoebic gill disease, presence of epitheliocystis and some features resembling salmon poxvirus" as well as mild hepatic necrosis and minor cardiomyopathy.

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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

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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.

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

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0542						Date of visit:	22/11/2017	
Time spent on site:	5 hours					Main Inspector:		ALW	
Site No:	FS0245	Site Name:	Ardintoul						
Business No:	FB0119	Business Name:	Marine Harvest (Scotland) Ltd						
Case Types:	1 REP	2 DIA	3	4	5	6			
Water Temp (°C):	11.5	Thermometer No:	T148				FHI 045 completed		
Observations:		Region:	HI	Water type:	S		CoGP MA	M-21	
Dead/weak/abnormally behaving fish present?			Y	If yes, see additional information/clinical score sheet.					
Clinical signs of disease observed?			Y	If yes, see additional information/clinical score sheet.					
Gross pathology observed?			Y	If yes, see additional information/clinical score sheet.					
Diagnostic samples taken?			Y						

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Additional Case Information:

Report received from company of increased mortality with observed anaemia. Details recorded on mortality events sheet. Increase in mortality observed following decrease in appetite 5 weeks ago. Daily feed dropped from 16 tonnes per day to 8 tonnes per day. Fish feeding deep in cages.
Regular samples how shown a decrease in packed cell volume in sampled fish. In August samples were 20% of fish at 1-20% PCV, 5% at 21-30% PCV, 45% at 31-40% PCV, 20% at 41-50% PCV and 10% at 50+% PCV. In September samples were 25% at 1-20% PCV, 25% at 21-30% PCV and 50% at 31-40% PCV. In October samples were 55% at 1-20% PCV, 20% at 21-30% PCV and 25% at 31-40% PCV.
Samples have tested positive for CMS, PRV, AGD, Branchiomonas, Paranucleospora theridion and salmon gill poxvirus, but negative for PD and piscichlamydia.
Site has wrasse stocked at 4.5%, lumpfish stocked at 11% and sea lice skirts in place to control lice. Company criteria for treatment is 0.5 average adult female lice per fish. Site has had regular treatments for lice and gills.
July - Slice and salmosan, August - hydrolicer, September - salmosan, hydrogen peroxide and hydrolicer, October - hydrolicer, November - hydrolicer and hydrogen peroxide. Due to use hydrolicer next week.
Very few lethargic fish observed, but five removed for diagnostic sampling. One had bilateral exophthalmia and one had very pale gills. See comments on clinical score sheet.

Results of Surveillance

1. Has any animal health surveillance been carried out by, or on behalf of, the business?	Y
2. If yes, are results available for inspection?	Y
3. Any significant results?	Y
If yes, detail (if not detailed under recent disease problems).	
Recent tests positive for CMS, AGD, PRV, Branchiomonas, Paranucleospora and salmon gill poxvirus	
Records checked between:	7/6/17 - 22/11/17

The FHI Fish Visit report dated November 2017 detailed a mortality rate of 5.63% and over 90,000 mortalities between late October 2017 and mid November 2017:

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Case No: 2017-0542 Site No: FS0245 Date of visit: 22/11/2017

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):
23/10/17	29/10/2017	≥750g	2Kg	SAL	2017 Q1	Weekly	5.63	Explained	CMS, Complex gill issues
30/10/17	05/11/2017	≥750g	2Kg	SAL	2017 Q1	Weekly	2.58	Explained	CMS, Complex gill issues
06/11/17	12/11/2017	≥750g	2Kg	SAL	2017 Q1	Weekly	1.40	Explained	CMS, Complex gill issues
13/11/17	19/11/2017	≥750g	2Kg	SAL	2017 Q1	Weekly	1.50	Explained	CMS, Complex gill issues

If unexplained, select observations:	Total mortality during event (if available):	Additional information (e.g. action taken by company):	Action taken by FHI (include case no where applicable):
General Anaemia	51,592	Observed a decrease in appetite prior to increase in mortality levels. Combination of factors - fish have tested positive to CMS, PRV and complex gill issues. Cause recorded as anaemia by company	Site visited 22/11/17 and diagnostic samples taken
General Anaemia	22,330	Observed a decrease in appetite prior to increase in mortality levels. Combination of factors - fish have tested positive to CMS, PRV and complex gill issues. Cause recorded as anaemia by company	Site visited 22/11/17 and diagnostic samples taken
General Anaemia	11,822	Observed a decrease in appetite prior to increase in mortality levels. Combination of factors - fish have tested positive to CMS, PRV and complex gill issues. Cause recorded as anaemia by company	Site visited 22/11/17 and diagnostic samples taken
General Anaemia	12,502	Observed a decrease in appetite prior to increase in mortality levels. Combination of factors - fish have tested positive to CMS, PRV and complex gill issues. Cause recorded as anaemia by company	Site visited 22/11/17 and diagnostic samples taken

Marine Scotland Science detailed in their FHI Visit Report for November 2017 "complex gill issues with mild proliferative gill pathology" and stated: "Lesions were consistent with amoebic gill disease (AGD) and mid salmon poxvirus pathology". Epitheliocystis, Candidatus Branchiomonas cysticola and Candidatus Syngnamydia salmonis were noted along with "pathology consistent with mild cardiomyopathy syndrome (DMS)", piscine myocarditis virus, piscine reovirus (PRV), hepatic necrosis, granulomatous inflammation and Paranucleospora theridon.

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FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	22/11/2017
SITE NO	FS0245	SITE NAME	Ardintoul
INSPECTOR	Andrea Warwick	CASE NO	20170542

Section 1: Summary

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

Histopathology examination revealed complex gill issues with mild proliferative gill pathology. Lesions were consistent with amoebic gill disease (AGD) and mild salmon poxvirus pathology. The presence of both pathogens was confirmed by QPCR. Epitheliocystis were noted. QPCR tests for *Candidatus* Branchiomonas cysticola and *Candidatus* Syngnamydia salmonis were positive. There was also pathology consistent with mild cardiomyopathy syndrome (CMS) and the QPCR test for piscine myocarditis virus was positive. The QPCR test for piscine reovirus (PRV) was positive, but there was no histopathology consistent with heart and skeletal muscle inflammation (HSMI). Hepatic necrosis (likely associated with hypoxia) and granulomatous inflammation was also noted.

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

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 817,600 2017 Q1 Atlantic salmon at an average weight of 2kg, ~47,000 wrasse of mixed age and ~70,000 lumpsuckers of mixed age.

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Mortality levels had risen sharply at the end of October 2017 from 0.9% in week 42 to 5.63% in week 43, but had decreased to 1.5% in the week previous to the inspection (week 46). Health surveillance carried out by the business reported complex gill issues (AGD, *Branchiomonas*, *Paranucleospora theridion* and salmon gill poxvirus), CMS and PRV. Anaemia had been observed with an increase in the proportion of fish with low packed cell volume from August through to October. Five lethargic or moribund salmon were observed across the site and were sampled for diagnostic purposes.

Fish 1, 2 and 4 were lethargic, fish 3 was moribund and unable to maintain equilibrium and fish 5 was anorexic. Fish 1 had severe bilateral exophthalmia, the opercula of fish 2 were shortened and fish 4 had pale gills.

Fish 4 had a pale heart. Fish 2, 4 and 5 had yellow pseudo-faeces present in their guts and there was no food in the gut of fish 1. There was a lack of fat around the pyloric caeca of fish 5 and the swim bladder of fish 2 was filled with fluid.

Candidatus Branchiomonas cysticola

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.30	27.20	27.12	27.05	POSITIVE
F2	23.71	29.70	29.36	29.49	POSITIVE
F3	22.73	29.95	29.60	29.84	POSITIVE
F4	23.28	26.05	26.04	25.89	POSITIVE
F5	22.29	23.31	23.48	23.54	POSITIVE

Candidatus Syngnamydia salmonis

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.30	36.31	36.52	39.26	POSITIVE
F2	23.71	34.76	34.61	35.32	POSITIVE
F3	22.73	31.55	31.54	31.79	POSITIVE
F4	23.28	34.50	34.17	34.97	POSITIVE
F5	22.29	33.00	33.12	32.89	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	23.34	24.53	24.62	24.68	POSITIVE
F2	23.80	25.33	25.50	25.38	POSITIVE
F3	23.10	30.11	29.86	29.91	POSITIVE
F4	23.21	32.04	31.91	31.89	POSITIVE
F5	22.62	24.24	24.18	24.08	POSITIVE

Piscine reovirus

Pool Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
P1	17.28	32.68	32.66	32.66	POSITIVE

Piscine myocarditis virus

Pool Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
P1	17.28	21.31	21.23	21.10	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	23.34	35.98	35.90	35.71	POSITIVE
F2	23.80	35.07	35.26	35.44	POSITIVE
F3	23.10	32.21	32.28	32.23	POSITIVE
F4	23.21	33.96	34.68	33.96	POSITIVE
F5	22.62	32.45	32.63	32.50	POSITIVE

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	23.34	30.09	30.03	30.04	POSITIVE
F2	23.80	31.55	31.53	31.28	POSITIVE
F3	23.10	31.40	31.43	31.40	POSITIVE
F4	23.21	28.57	28.44	28.33	POSITIVE
F5	22.62	23.95	23.83	24.01	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 multifocal hyperplasia and lamellar fusion noted in F3 and F5 and mainly distally in F1, some spongiosis noted in F3 and F5, small foci of necrosis on the hyperplasic plaque. Several amoebic cells resembling *Neoparamoeba perurans* were noted F3 and F5, diffuse irregular epithelium with prominent goblet cells in all individuals and mild cell infiltration in F1. Some nuclei karyorrhexis, some detaching apoptotic epithelial cells and some chloride cells displacement were also present. Occasional/few basophilic epithelial inclusions (epitheliocystis), few aneurysmal dilation/telangiectasia and lamellae thrombi noted in all individuals.

A FHI Fish Visit report dated November 2017 detailed disease problems at Cooke Aquaculture's Bow Hascosay salmon farm in Shetland - including AGD, PD, CMS and lice infestation.

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0544							Date of visit:	07/11/2017		
Time spent on site:	4.5 hours					Main Inspector:		SJD			
Site No:	FS0477	Site Name:	Bow of Hascosay								
Business No:	FB0095	Business Name:	Cooke Aquaculture Scotland Ltd								
Case Types:	1 ECI	2 CNI	3 SLI	4 REP	5 VMD	6 DIA					
Water Temp (°C):	10.6	Thermometer No:	Site			FHI 045 completed					
Observations:		Region:	SH	Water type:	S	CoGP MA:	S-3				

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

PD early in cycle. Started in YoM fish - mainly stopped feeding, but no major mortality. Report available from FVG - August 2016.
Mortality - 123,261 total since input.
Latest health visit - 15/09/17 - CMS diagnosed by FVG.
AGD diagnosed by FVG in March 17.
Morts last month - 6519 - attributed to runts (2135) and production (CMS - 4384)

Lice treatments since input - Salmosan - June 17. H202 - May 17. Hydrolicer - March 17. H202 - January 17. Slice - Dec 16.
Lice levels above criteria for treatment since end of September - last count 2/11/17 - 1.55 average adult female. Site due to fallow in next few weeks.
Sea lice management plan not available - currently being drafted.

Lice levels above 3 at end of 2016 and start of 2017 - don't appear to have been reported to FHI.

Very few moribunds seen, although a few fish with physical damage.

Updated 16/01/18 SJD - Sea lice management plan submitted and meets current requirements. Company advised that plan may require updating in future once further guidance issued.

Marine Scotland Science's FHI Visit Report for November 2017 detailed "complex gill issues", cardiomyopathy syndrome, mild enteropathy and Tenacibaculum sp.

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The Scottish Government
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FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0095	DATE OF VISIT	07/11/2017
SITE NO	FS0477	SITE NAME	Bow of Hascosay
INSPECTOR	Sonia Duguid	CASE NO	20170544

Section 1: Summary

A report was received from the operator of increased mortality levels at the site due to complex gill issues, environmental issues and cardiomyopathy syndrome (CMS). Two fish were selected for diagnostic sampling.

Histopathology examination revealed pathology consistent with CMS, which was confirmed by QPCR. Mild gill pathology and mild enteropathy with presence of bacteria were also observed. The gill pathology may have been functionally insignificant and some features are within commonly seen background levels.

Tenacibaculum sp was isolated. The level and purity of growth may be significant however this can be hard to estimate as this bacterium is not easily cultured.

The following points were raised with the site representative with regards to parasites (sea lice) during the inspection:

On this occasion the site was found to have had average adult female *Lepeophtheirus salmonis* ('sea lice') per fish counts of 3 or above between week 48, 2016 and week 7, 2017. These counts had not been reported to the Fish Health Inspectorate as part of the required measures to demonstrate that satisfactory measures are in place for the control of sea lice. Where the average adult female sea lice per fish count reaches 3 or above this must be reported to the Fish Health Inspectorate within seven days of the date of the count. Please ensure that future counts that exceed the reporting level are reported to the Fish Health Inspectorate. It is noted however, that the site has been below the reporting level since week 8 2017 and that the company has implemented the reporting requirement on other sites. No further action is required in relation to these counts.

A FHI Fish Visit report dated November 2017 detailed disease problems at another Cooke Aquaculture salmon farm at East of Holm Heogland in Shetland - including "variable complex gill disease including PGD and lowlevel AGD"; "Low level HSMI type pathology" as well as Costia and branchiomonas.

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0546					Date of visit:	08/11/2017
Time spent on site:	2 hours					Main Inspector:	SJD
Site No:	FS0960	Site Name:	East of Holm Heogland (Burkwell)				
Business No:	FB0095	Business Name:	Cooke Aquaculture Scotland Ltd				
Case Types:	1 REP	2 DIA	3	4	5	6	
Water Temp (°C):	10.6	Thermometer No:	Site			FHI 045 completed	
Observations:		Region:	SH	Water type:	S	CoGP MA:	S-2

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

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.

The FHI Fish Visit report dated November 2017 noted a pale/anaemic spleen and stated that the "heart lost shape when removed".

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional comments:

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

The FHI Fish Visit report dated November 2017 noted positive tests for Salmon gill poxvirus (SGPV), Piscine myocarditis virus (PMCV), Neoparamoeba perurans (AGD) and Paranucleospora theridon:

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

A FHI Fish Visit report for November 2017 detailed disease problems at another Cooke Aquaculture salmon farm at Winna Ness in Shetland - with over 30% mortality and "acute gill pathology".

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

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

Time spent on site: 2.5 hours Main Inspector: SJD

Site No: FS0871 Site Name: Winna Ness
Business No: FB0095 Business Name: Cooke Aquaculture Scotland Ltd

Case Types: 1 REP 2 DIA 3 4 5 6

Water Temp (°C): 10.6 Thermometer No: Site FHI 045 completed

Observations: Region: SH Water type: S CoGP MA: S-2

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

FHI 059, Version 11 Issued by: FHI Date of issue: 12/09/2017

Additional Case Information:

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.

The FHI Fish Visit report for November 2017 detailed "complex gill issues", "pathology consistent with cardiomyopathy syndrome (CMS) and mild amoebic gill disease", "multifocal hepatic necrosis (likely associated with hypoxia)" and positive tests for Paranucleospora theridon (syn. Desmozoon lepeophtheri) and salmon gill poxvirus (SGPV).

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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.

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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

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

A FHI Fish Visit report dated November 2017 detailed disease problems at the Scottish Salmon Company's salmon farm at Portree on the Isle of Skye - including "complex gill issues", "anorexic and moribund fish", AGD, poxvirus and Desmozooan.

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0555							Date of visit:	07/11/2017		
Time spent on site:	7.5 hr							Main Inspector:	RJS		
Site No:	FS0708	Site Name:	Portree								
Business No:	FB0169	Business Name:	The Scottish Salmon Company								
Case Types:	1 ECI	2 CNI	3 SLI	4 VMD	5 DIA	6					
Water Temp (°C):	12.6	Thermometer No:	T213					FHI 045 completed			
Observations:		Region:	HI	Water type:	S			CoGP MA:	M-26		

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

The site has been suffering from complex gill issues this cycle. This is thought to have been exacerbated by an algal bloom recently. No problems this cycle with predation, lice or jellyfish. Morts are removed by lift-up systems, although one is out of action currently. Morts are incinerated on site when the fish are small but have been getting transferred for storage at Kenmore, Loch Torridon as larger fish have been getting lost. The morts are taken by boat to Kenmore and are then sent to Dundas Bros using Billy Bowie. This activity has resulted in the sites inspection frequency increasing. The BMP and FMS both require updating with regard to mortality disposal. Fish are normally harvested live through Stornoway. Due to the recent elevated number of mortalities there were signs of decomposed mortalities at the surface in 4 cages. Hydrolicer used successfully on site on some cages in May 2017. A number of anorexic and moribund fish were observed in most cages. The fish were active when trying to catch them however. 4 moribund fish caught, one of which was anorexic. 4 other fish also caught for VMD sampling. Diagnostic samples were taken. Of the 5 fish sampled for diagnostic tests, 2 had zoned gills and 3 had pale gills. The moribund fish has not been feeding. Diagnostic surveillance by veterinary services has identified AGD, poxvirus and Desmozooan. A FW treatment is to be conducted to combat the effects on the gills.

The FHI Fish Visit report for November 2017 detailed "complex gill issues with pathology consistent with amoebic gill disease, epitheliocystis, capillary disturbances and some evidences of salmon gill poxvirus" as well as positive tests for Neoparamoeba perurans, Paranucleospora theridon and salmon gill poxvirus.

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FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0169	DATE OF VISIT	07/11/2017
SITE NO	FS0708	SITE NAME	Portree
INSPECTOR	Ron Smith	CASE NO	20170555

Section 1: Summary

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

Histopathology examination revealed complex gill issues with pathology consistent with amoebic gill disease, epitheliocystis, capillary disturbances and some evidences of salmon gill poxvirus in F3. F1 is a poor doing fish.

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

A FHI Fish Visit report dated November 2017 detailed disease problems at Marine Harvest's salmon farm in Loch Greshornish on the Isle of Skye - including 20-30 Caligus (sea lice) with farmed salmon reported as "belly up as if concussed from banging":

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0558							Date of visit:	09/11/2017		
Time spent on site:	9 hr							Main Inspector:	RJS		
Site No:	FS0015	Site Name:	Loch Greshornish								
Business No:	FB0119	Business Name:	Marine Harvest (Scotland) Ltd								
Case Types:	1 ECI	2 CNA	3 SLI	4 VMD	5 DIA	6					
Water Temp (°C):	12.5	Thermometer No:	T213					FHI 045 completed	N/A		
Observations:		Region:	HI	Water type:	S	CoGP MA:	M-24				

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional comments:

All fish had ~20-30 Caligus on the body. Fish 1, 2 and 5 were belly up as if concussed from banging 2ry equipment in cage. Fish 1 and 2 had white plaques on the gills. Fish 3 had a slightly flaccid heart muscle.

Marine Scotland Science's FHI Visit Report for November 2017 detailed "moribund and lethargic fish", "mild proliferative gill pathology with features consistent with amoebic gill disease (AGD), epitheliocystis, "anorexic poor-doing indivuduals" and positive tests for Neoparamoeba perurans, Paranucleospora theriodon (syn. Desmozoon lepeophtheri) and salmon gill poxvirus.

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FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0119	DATE OF VISIT	09/11/2017
SITE NO	FS0015	SITE NAME	Loch Greshornish
INSPECTOR	Ron Smith	CASE NO	20170558

Section 1: Summary

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

Histopathology examination revealed marked to mild proliferative gill pathology with features consistent with amoebic gill disease (AGD). Epitheliocystis were also noted in F2. F3 and F4 were anorexic poor-doing individuals.

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

The report identified farmed salmon with cataracts and anorexia.

Section 2: Case Detail

Observations

During a routine inspection, a number of lethargic and moribund fish were observed. Five moribund and lethargic fish were caught for examination and diagnostic sampling.

External examination of the fish showed zonation in the gills of fish 1 – 5, cataracts and anorexia in fish 3 and 4.

Internal examination showed inflammation in the tubules of the pyloric caeca and no food in the gut of fish 3 & 4. Yellow pseudo-faeces was observed in the gut of fish 3 & 4, along with a lack of fat on the pyloric caeca. The heart of fish 3 also appeared to be slightly flaccid.

R09

Marine Laboratory, 375 Victoria Road, Aberdeen, AB11 9DB
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Website - www.gov.scot/Topics/marine/science

As well as positive tests for SGPV, AGD and Paranucleospora Theridon:

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)
1	23.24	36.71	37.81	36.70	POSITIVE
2	25.11	25.62	26.05	26.19	POSITIVE
3	21.91	39.22	39.26	38.81	POSITIVE
4	24.07	36.72	38.72	37.60	POSITIVE
5	22.74	36.81	37.95	36.21	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 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)
1	23.24	27.93	28.00	27.89	POSITIVE
2	25.11	28.02	27.66	27.62	POSITIVE
3	21.91	27.96	28.06	28.25	POSITIVE
4	24.07	28.38	28.18	28.50	POSITIVE
5	22.74	28.90	28.69	28.84	POSITIVE

Paranucleospora Theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
1	23.24	30.41	30.41	30.57	POSITIVE
2	25.11	31.92	31.89	31.91	POSITIVE
3	21.91	34.13	33.93	33.63	POSITIVE
4	24.07	32.45	32.41	32.12	POSITIVE
5	22.74	27.66	27.15	27.68	POSITIVE

A [FHI Fish Visit report dated November 2017] detailed disease problems at The Scottish Salmon Company's salmon farm at Strome Point in Loch Fyne - including AGD, gill issues and "large mortality" and "bacterial infection with V. anguillarum":

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Case No:	2017-0563								Date of visit:	09/11/2017	
Time spent on site:	5 hrs							Main Inspector:		SAE	
Site No:	FS1056	Site Name:	Strone Point								
Business No:	FB0169	Business Name:	The Scottish Salmon Company								
Case Types:	1 REP	2 DIA	3	4	5	6					
Water Temp (°C):	11.2	Thermometer No:	T205				FHI 045 completed				
Observations:		Region:	ST		Water type:	S		CoGP MA:	M-45		

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

FHI 059, Version 11 | Issued by: FHI | Date of issue: 12/09/2017

Additional Case Information:

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.

Recent (last 4 wks) disease problems?	Y	Any escapes (since last visit)?	N
If yes, detail:	complex gill issues exacerbated by environmental conditions and bacterial infection (thought to be secondary) Vibrio anguillarum isolated (5/11/17)		

Results of Surveillance

1. Has any animal health surveillance been carried out by, or on behalf of, the business?	Y
2. If yes, are results available for inspection?	Y
3. Any significant results?	Y
If yes, detail (if not detailed under recent disease problems).	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.

Records checked between: 02/05/2017 - 9/11/17

Read more via "[Hard Evidence: Fast-Tracking Disease-Ridden Scottish Salmon]"

3) Mass mortality reports obtained via Freedom of Information & SEPA data

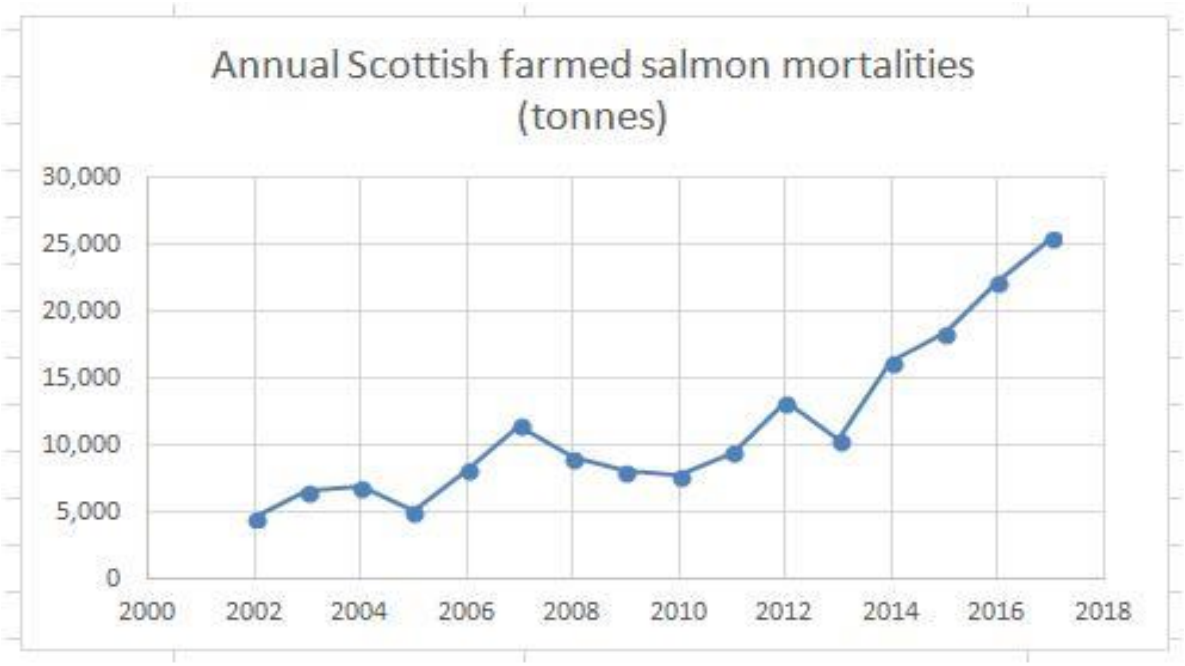
There was a record level mortalities on Scottish salmon farms in 2017 with over 25,000 tonnes (up from 5,000 tonnes in 2002 and 10,000 tonnes in 2011) and estimated losses of 15-20 million farmed salmon at a staggering mortality rate of 26.7%.

Shamefully, the Scottish Environment Protect Agency (SEPA) stopped collecting data on the numbers of dead farmed salmon following lobbying from the Scottish Salmon Producers Organisation in 2013 who claimed publication would be "commercially damaging".

Read more via:
Scottish watchdog labelled 'lapdog' after agreeing to keep fish farm deaths secret
Public denied info on full scale of salmon deaths
Environment watchdog 'gave in to industry' over dead salmon
Farmed salmon killed by disease leaps to 8.5 million

However, data published by SEPA via the Scotland's Aquaculture database in March 2018 reveals a huge increase in mortalities (by weight). A review of the data reveals:

Mortalities at Scottish Salmon Farms	
Year	Mortalities (Tonnes)
2017	25,435
2016	22,232
2015	18,373
2014	16,245
2013	10,424
2012	13,234
2011	9,475
2010	7,713
2009	8,064
2008	9,088
2007	11,495
2006	8,183
2005	5,100
2004	6,907
2003	6,537
2002	4,578



Joe Crowley (who exposed leaking wastes from diseased farmed salmon on The One Show's 'Dead Salmon Run' in December 2017) Tweeted:

Marine Harvest reported the most mortalities in 2017 followed by the Scottish Salmon Company, Cooke Aquaculture, Scottish Sea Farms, Grieg Seafood and Loch Duart all with over 1,000 tonnes of dead farmed salmon:

Scottish Farmed Salmon Mortalities in 2017 (Tonnes)	
Marine Harvest	7,066
Scottish Salmon Company	6,029
Cooke Aquaculture	4,552
Scottish Sea Farms	4,328
Grieg Seafood	2,191
Loch Duart	1,066
Kames	187
Wester Ross	15
Total	25,435

The worst monthly mortalities during 2017 were reported at the following salmon farming sites with Gravir Outer (Scottish Salmon Company) and Poll na Gille (Marine Harvest) featuring twice and most morts appearing in October/November:

Year	Mortalities (Kg)	Submitted By	Site Name	Local Authority
01-Oct-17	527936	Cooke Aquaculture Scotland	Stead of Aithness	Shetland Islands
01-Nov-17	487622	The Scottish Salmon Company Ltd	Druimyeon Bay	Argyll and Bute
01-Nov-17	422946	Cooke Aquaculture Scotland	Stead of Aithness	Shetland Islands
01-Sep-17	319615	The Scottish Salmon Company Ltd	Tuath (Rubha na Gall)	Argyll and Bute
01-Jul-17	272236	The Scottish Salmon Company Ltd	Gravir Outer	Eilean Siar
01-Aug-17	265069.1243	Marine Harvest (Scotland) Ltd	Tabhaigh	Eilean Siar
01-Aug-17	256601	The Scottish Salmon Company Ltd	Gravir Outer	Eilean Siar
01-Sep-17	244634	Scottish Sea Farms Ltd	Snarraness Voe	Shetland Islands
01-Oct-17	223889	Scottish Sea Farms Ltd	Allt a Chois (Kishorn North Shore)	Highland
01-Sep-17	214813.5376	Marine Harvest (Scotland) Ltd	Erisort, North Shore East	Eilean Siar
01-Oct-17	175884	The Scottish Salmon Company Ltd	Druimyeon Bay	Argyll and Bute
01-Oct-17	175161.7139	Marine Harvest (Scotland) Ltd	Sron	Highland
01-Oct-17	173967	Scottish Sea Farms Ltd	Kishorn Outer, Offshore of Airigh-drishaig	Highland
01-Oct-17	171645.0592	Marine Harvest (Scotland) Ltd	Poll na Gille	Argyll and Bute
01-Nov-17	159141.0419	Marine Harvest (Scotland) Ltd	Poll na Gille	Argyll and Bute
01-May-17	156754.0857	Marine Harvest (Scotland) Ltd	MacLeans Nose	Highland
01-Nov-17	153826	The Scottish Salmon Company Ltd	Strone Point	Argyll and Bute
01-Nov-17	144124.9417	Marine Harvest (Scotland) Ltd	Sron	Highland
01-Oct-17	143399.9967	Marine Harvest (Scotland) Ltd	Erisort, North Shore West	Eilean Siar
01-Oct-17	139634.3207	Marine Harvest (Scotland) Ltd	Port na Cro	Argyll and Bute

An Excel spreadsheet of the data for mortalities during 2017 and back to 2002 - including graphs summarising the data - is available online here

Read more via: The Herald: "Video: Disease concern as Scots salmon farmers' produce "stomach-churning" record levels of fish deaths"

FOI data obtained from SEPA in January 2018 reveals that the ten biggest monthly losses at Marine Harvest salmon farms during 2017 (up to September) were as follows:

149,949 at Colonsay in August (reported via Scotland's Aquaculture as 12,439kg)
97,235 at MacLeans Nose in March (reported via Scotland's Aquaculture as 107,760 kg)
87,914 at MacLeans Nose in April (reported via Scotland's Aquaculture as 135,641kg)
85,147 at MacLeans Nose in May (reported via Scotland's Aquaculture as 156,754kg)
76,913 at Tabhaigh in August (reported via Scotland's Aquaculture as 265,069kg)
70,627 at MacLeans Nose in February (reported via Scotland's Aquaculture as 67,757kg)
62,747 at Erisort (North Shore East) in September (reported via Scotland's Aquaculture as 214,813kg)
48,620 at Soay Sound in August (reported via Scotland's Aquaculture as 3,645kg)
41,946 at Creag an Sagairt West in June (reported via Scotland's Aquaculture as 116,536kg)
41,615 at Ardintoul in February (reported via Scotland's Aquaculture as 4599kg)

Marine Harvest mort events in 2017 - The Excel spreadsheet details 572,488 mortalities in 56 separate reports/incidents during 2017 - including:

24 reported as CMS
22 reported as Gill Diseases (Gill Pathology, AGD, PGD, gill issues and complex gill issues)
18 reported as Treatment
13 reported as Anaemia
4 reported as PD

Scottish Salmon Company mort events in 2017 - The Excel spreadsheet details 1,512,077 mortalities in 131 separate reports/incidents during 2017 - including:

85 reported as Gill Diseases (Gill Pathology, AGD, PGD, gill issues and complex gill issues)
41 reported as Treatment
14 reported as CMS
11 reported as PD (Pancreas Disease)

Scottish Sea Farms mort events in 2017 - The Excel spreadsheet details 356,082 mortalities in 46 separate reports/incidents during 2017 - including:

27 reported as Gill Diseases (Gill Pathology, AGD, PGD, gill issues and complex gill issues)
18 reported as Anaemia
14 reported as Treatment
7 reported as CMS

Another FOI reply by the Scottish Government to journalist Rob Edwards in October 2017 included the disease and mortality data for Scottish salmon farms in 2016 and 2017.

FoI -17-02089 - Salmon mortality data caused by sea lice.pdf

7 page PDF | 142.4kB

Download

The data included:

Site Name	Site No	Average weight of affected population	Reason for mortality	Total mortality during event (if available):
Kinlochmoidart Hatchery	FS0146	80g	Power cut	140886
Kinlochmoidart Hatchery	FS0146	eggs	Power cut	224047
Furnace (FW)	FS0339	0.2g	RTFS	331235 between 06/02 - 28/02. 23,854 from 29/2/16 to 21/3/16
Ardintoul	FS0245	3.5Kg	PD, Treatment	5991
Loch Duich	FS0248	3.4Kg	Treatment	17226, 26/2/16 to 29/2/16
Soay	FS0646	750g	Treatment	1210
MacLean's Nose	FS0599	5.2Kg	Transport (harvest)	2.00%
Torridon	FS0234	900g	Physical damage	1.80%
Russel Burn	FS0500	≤ 750g	Unexplained	4435
Kirkabister	FS0802	2.3Kg	CMS	7816
Meil Bay	FS0597	140g	Transport	2274/site/week
Carness Bay	FS0390	2.598Kg	Seal damage	556 over 2 weeks
Fara West	FS1017	harvest size	Seal damage	2250 over 5 weeks
Ouseness	FS1209	4Kg	Seal damage	6366
Djubawick	FS0656	2.5Kg	Algal bloom, Seal damage	10698
Djubawick	FS0656	2.5Kg	Algal bloom, Seal damage	39195
East of Holm Heogland (Burkwell)	FS0960	3.726Kg	CMS	5007
Stead of Aithness	FS0637	2.76Kg	Treatment	5762
Stead of Aithness	FS0637	3.247Kg	Seal damage, Treatment	2209
Sandwick	FS0710	6.2Kg	Seal damage	1029
Bastaness	FS1279	3.211Kg	CMS	68265
Winna Ness	FS0871	3.746Kg	CMS	5351
Vee Taing	FS1057	4.1Kg	CMS	2719
Vee Taing	FS1057	4.1Kg	CMS	97704
Girlsta Hatchery	FS0504	7.2g	Water quality - heavy metal poisoning	25447
Leinish	FS0800	2.5Kg	Algal bloom	520000
Cliff Site	FS1095	20g	Cyanobacteria bloom	~60000
Kenmore Loch Torridon	FS0050	800g	AGD	

Ardgadden	FS0851	2.2Kg	AGD, Algal bloom	221922
Glenan Bay	FS0590	1.3 Kg	AGD, Algal bloom, PD	48544
Furnace Quarry	FS0567	2.9 Kg	AGD, Algal bloom	18310
Seaforth	FS1042	3.7Kg	AGD	9988
Seaforth	FS1042	3.7Kg	AGD	53183
Loura Voe	FS0699	~1Kg	Seal damage	9142 for last 4 weeks
Gob na Hoe	FS1175	2.2Kg	Gill issues, Treatment	93695
Burrastow	FS0666	3.8Kg	Treatment	2.67%
Djubawick	FS0656	5Kg	CMS	1.26%
Djubawick	FS0656	5Kg	CMS	1.05%
Djubawick	FS0656	5Kg	CMS	1.25%
Meil Bay	FS0597	≥ 750g	AGD, PGD	1.54%
Meil Bay	FS0597	≥ 750g	AGD, PGD	2%
Cole Deep	FS0489	600g	Algal bloom, Treatment	67317
Winna Ness	FS0871	3.8Kg	AGD	2.01%
Winna Ness	FS0871	3.8Kg	AGD	1.07%
Girlsta Hatchery	FS0504	40g	Fungus	122225
Carness Bay	FS0390	5Kg	Production	1.09%
Carness Bay	FS0390	5Kg	Production	1.08%
Loch Garasdale	FS0866	40-90g	Fungus	2.14%
Loch Garasdale	FS0866	40-90g	Fungus	2.25%
North Havra	FS0674	1.4Kg	Treatment	5794
Uyea Isle	FS0382	3.4Kg	AGD	15669
Flaeshins	FS1275	7.8Kg	CMS	2684
Machrihanish Hanger	FS1306	~250g	Water quality	6375
Machrihanish Hanger	FS1306	~300g	Water quality	1016
Mid Taing	FS0167	4Kg	Algal bloom, Treatment	1.88%
Kenmore Loch Torridon	FS0050	1.2Kg	AGD, Complex gill issues, Treatment	40%
Nevis B	FS0616	~1Kg	Treatment	6732
Clachbreac	FS0892	42.4g	Fungus	16027
Clachbreac	FS0892	46.5g	Fungus	8704

Read more via:
Data on Mortalities & Diseases at Scottish Salmon Farms
Scottish Salmon's Mort Mountain Leaps Over 10 Million - FOI reveals 2.3 million dead salmon at Marine Harvest farms in 2017
Hard Evidence: Dossier of Data on Lice, Diseases & Mortalities at Scottish Salmon Farms

Data disclosed by the Scottish Government via FOI in June 2018 reveals that over 100,000 farmed salmon died in 14 incidents between August 2017 and January 2018 due to lethal Thermolicer and Hydrolicer treatments. Since 2016, over 230,000 fish have died on Scottish salmon farms following the use of 'mechanical treatments' intended to kill sea lice and treat Amoebic Gill Disease.

Read more via: Press Release: "Ban Water Torture on Scottish Salmon Farms"

Nearly 100,000 farmed salmon were 'Thermoliced' to death by Marine Harvest during 2016:

Environmental news 06.11.16 29

Revealed: how Scottish fish farm cooked thousands of salmon alive

EXCLUSIVE
BY ROB EDWARDS

ONE of the world's largest fish farming companies has accidentally killed more than 175,000 of its caged salmon in Scotland while trying to treat them for lice and disease, according to internal Government memos.

Blunders by Norwegian multinational Marine Harvest have cost millions of pounds and led to more than 600 tonnes of salmon having to be incinerated. The losses have contributed to a 16 per cent drop in the company's Scottish salmon production.

Campaigners have accused Marine Harvest of treating salmon cruelly, and warn that lice and diseases are "choking the Scottish salmon farming industry to death".

The worst incident took place in July and August on a salmon farm in Loch Gresbornish on the Isle of Skye. Some 95,400 fish were killed by a new device called a thermolicer, which is designed to rid salmon of the sea lice that plague them.

But the way it does this – by suddenly immersing fish in water much warmer than they are used to – can also kill the fish themselves. What happened on Skye was explained in a memo on September 12 from government officials to Rural Economy Minister Fergus Ewing.

The "sudden temperature change" caused by the thermolicer killed 95 per cent of the lice but also caused "significant mortalities" among the salmon, it said. Officials estimated that the losses cost Marine Harvest more than £2.7 million.

"This report highlights the ongoing difficulties and costs faced by industry with regards to sea-lice management," concluded the memo, which was released under Freedom of Information law.

Another 26,000 salmon were killed at Loch Greshornish fish farm by other attempts to rid them of sea lice using chemicals. There are concerns that lice are becoming increasingly resistant to chemical treatment.

In a second memo to Ewing on September 26, officials revealed more inadvertent deaths, this time at a Marine Harvest fish farm in Soay Sound off the Isle of Harris. Earlier that month 60,000 salmon had been killed by hydrogen peroxide used to treat them for amoebic gill disease.

In the last few months, Marine Harvest fish farms in the Hebrides and Wester Ross have suffered a series of outbreaks of gill disease. Hundreds of thousands of dead fish have reportedly been transported to Wigan, near Manchester, to be incinerated.

According to the company's latest quarterly report to investors, its production of salmon in Scotland has dropped by 16 per cent since last year. Costs increased due to "incident-based mortality" that was "mainly related to gill disease and sea-lice treatment losses," the report said.

On October 28, the fish farming industry launched a plan to double its business from £1.8 billion this year to £3.6bn by 2030. The plan was backed by Ewing, who promised to set up an "industry leadership group".

But the ambition has been derided by anti-fish farm campaigners. "With lice infestation and gill diseases already plaguing salmon farming, this is sheer lunacy," said Don Staniford, director of the Global Alliance Against Industrial Aquaculture.

It was Staniford who obtained the Government memos revealing the accidental deaths. "That Marine Harvest is desperate enough to resort to a decidedly dodgy thermolicer shows how deep-rooted the industry's disease problems are," he said.

The animal welfare group Compassion in World Farming, described the thermolicer as "a very brutal form of treatment which clearly causes distress and suffering to the fish". It currently opposes its commercial use.

"Killing fish by overheating, whether accidental or not, is simply inhumane," said the group's chief executive, Philip Lymbery.

The Green MSP Mark Ruskell has lodged a parliamentary question asking for a list of fish farming incidents over the last two years.

Marine Harvest pointed out that the salmon killed in the "unfortunate" thermolicer incident had been weakened by gill disease. "We regret any loss of fish and are always mindful of the welfare of the fish and aim to continuously improve our methods to address changing environmental circumstances," said the company's manager Steve Bracken.

"We have also faced challenges with amoebic gill disease, which is increasing in this part of the world as a result of climate change."

According to the Scottish Salmon Producers' Organisation, "unexpected incidents" can happen with new treatment technology.

"Any growth will be achieved responsibly and sustainably," said chief executive Scott Landsburgh.

The Scottish Government welcomes new ways of dealing with sea lice that avoided the use of medicines.

"Industry is undertaking research with a number of partners to improve the effectiveness of those innovative treatments and enhance their reliability so that they do not cause accidental killing of fish," said a spokesperson.

Lice infestation and gill deseases are plaguing salmon fish farms owned by companies like Norway's Marine Harvest which has operations all over the Western Isles

Photograph: PA/ David Cheskin

Read more via:
['Thermolicer' Back-Fires Killing 95,400 Farmed Salmon](#)
[Fish farm firm kills 175,000 salmon by accident](#)
[Oops: fish farm firm kills 175,000 of its salmon by accident](#)
[Thousands of fish poached alive in lice treatment bungle](#)

A Thermolicer treatment caused the deaths of 5,794 salmon at Grieg Seafood Shetland's North Havra site in November 2016:

THE PRESS AND JOURNAL
Tuesday, January 17, 2017

Thermal treatment for lice blamed for salmon deaths

Fish farming: New 'Thermolicer' method under spotlight as 6,000 fish die

BY KEITH FINDLAY

Innovative technology used to combat the scourge of sea lice on Scottish salmon farms has been blamed for the deaths of nearly 6,000 fish at a site in Shetland.

The salmon at North Havra, operated by Norwegian-owned Grieg Seafood Shetland (GSS), were given the Thermolicer hot water treatment.

But instead of just eradicating any sea lice, the process killed 5,794 fish and led to Grieg launching an investigation into the "unexpected mortality".

"We had some unexpected mortality during the procedure"

According to salmon farming arch-critic Don Staniford, the Thermolicer system – developed in Norway – is behind tens of thousands of deaths on fish farms around Scotland.

"The Thermolicer sucks and kills," Mr Staniford said yesterday, adding: "This is the second known lethal incident in Scotland after only six months of operation, with other mass mortalities reported in Norway."

GSS managing director Grant Cumming said: "Grieg Seafood Shetland is using many alternative methods of treating lice.

"We use these new and alternative treatments as part of our integrated pest management strategy in order to reduce the reliance on traditional medicines.

"This is important to minimise our impact on the environment and to maximise the working life of the medicines by guarding against resistance, while at the same time ensuring our salmon have a good quality of life free from sea lice infection.

"The salmon at North Havra were treated using a Thermolicer hot water treatment. Unfortunately we had some unexpected mortality during the procedure."

Mr Cumming added: "We have investigated the reasons behind the event and have altered our procedures to minimise the risk of it reoccurring."

The Thermolicer works by gently crowding and pumping fish through the machine, where they are exposed to an elevated temperature of a maximum of 34C for 25 to 30 seconds.

Because sea lice have a low tolerance to temperature change, the warmer water kills them.

Responding to national media reports of thousands of fish being "poached alive" at one of its Scottish fish farms last year, industry giant Marine Harvest said the stories were a "gross exaggeration and completely misleading".

It added: "The Thermolicer has been rigorously tested over a nine-year period and is recommended by the Norwegian Veterinary Institute. The machine has safely treated hundreds of thousands of tonnes of salmon in Norway and Scotland.

"It is extremely regrettable we lost fish at Gresbornish which we believe was the result of treating fish that had been weakened from other treatments, particularly for amoebic gill disease, in the preceding two months.

"The Gresbornish experience has understandably raised much internal and external discussion. In particular, it highlights the fine line in judgment required on how and when we treat our fish stocks. We aim to prevent this happening again by raising awareness with staff and increased training."

SOMETHING FISHY: Reports of salmon being 'poached alive' are a 'gross exaggeration' say Marine Harvest

Read more via:
[Thermal treatment for lice blamed for salmon deaths](#)
[Treatment leads to morts in Shetland](#)

Mortality events reported by the Scottish Salmon Company in 2017 include eight cases involving 90,000 dead salmon due to using a Hydrolicer:

Site Name	Start date:	End date:	Mortality rate recorded(%):	If explained, select reason(s):	Total mortality during event	Additional information (e.g. action taken):
Druimyeon Bay	13/11/2017	19/11/2017	8.69	post treatment hydrolicer losses, handling, CMS.	45089	further hydroliser treatment planned, fish on functional feed, harvesting.
Druimyeon Bay	06/11/2017	12/11/2017	4.44	post treatment hydrolicer losses.	25607	further hydroliser treatment planned, fish on functional feed.
Sgian Dubh	11/12/2017	17/12/2017	1.16	Treatment	8737	2 x hydrolicer treatments have resulted in scale loss. Vet attending on 22/12/17.
Sgeir Dughall	05/06/2017	11/06/2017	1.21	Treatment	3864	Hydroliser post-treatment losses,
Sgeir Dughall	19/06/2017	25/06/2017	1.15	Treatment	3229	Hydroliser post-treatment losses
North Uiskevagh	02/10/2017	08/10/2017	1.64	Severe gill health issues, losses post hydrolicer treatment	2,721	Harvesting
Kenmore Loch Torridon	31/07/2017	04/08/2017	1.75	Treatment	1556	Hydrolicer treatment. Harvesting and general handling may have exacerbated mortalities. No action taken, site due to be harvested out by end of August 2017.
Inch Kenneth	25/12/2017	31/12/2017	1.75	Treatment	1,204	Treatment with hydrolicer

Mortality events reported by Scottish Sea Farms in 2017 include six cases involving over 25,000 dead salmon due to using a Thermolicer:

Site Name	Start date:	End date:	Mortality rate recorded (%):	If explained, select reason(s):	Total mortality during event	Additional information (e.g. action taken):
Nevis C (Ardintigh)	26/06/2017	10/07/2017	1.82	Treatment	5924	Losses arising during sealice treatment using Thermolicer. No underlying condition suspected.
Nevis B	22/05/2017	28/05/2017	1.81	Treatment	5345	Losses from sea lice treatment with thermolicer, no suspected underlying condition
Nevis A	20/02/2017	26/02/2017	1.58	Treatment	4129	Losses following Thermolicer treatment. Thought to be fish weakend by HSMI.
Nevis B	03/07/2017	17/03/2017	1.45	Treatment	3876	Losses arising during sealice treatment using Thermolicer. No underlying condition suspected.
South Sound	01/05/2017	07/05/2017	1.06	Treatment	3460	No action taken. Mortality due to treatment with thermolicer. Mortalities reduced significantly the following week
Nevis B	10/07/2017	17/03/2017	1.23	Treatment	3256	Residual diver clearance of pens related to aboveThermolicer treatment on wk27

Mortality events reported by Marine Harvest in 2017 include three cases involving over 20,000 dead salmon due to using a Thermolicer:

Site Name	Start date	End date	Size of fish	Average weight of affected population	Mortality rate recorded (%)	If explained, select reason(s)	If unexplained, select observations:	Total mortality during event (if applicable)	Additional information (e.g. action taken)
Creag an T'Sagairt (Loch Hourn)	19/06/2017	25/06/2017	≥750g	2.75Kg	1.09	Treatment		9331	Thermolicer

Cairidh	05/01/2017	12/01/2017	≥750g	~3kg	1.3	Treatment		8561	Pen 1 and 2 affected post Thermolicer treatment the rest of the site was not treated
Caolas A Deas	21/08/2017	27/08/2017	≥750g	~4.5Kg	1.89	PGD, Treatment		4663	Thermolicer treatment on one cage. Decided not to treat other cages with thermolicer.

A Parliamentary Question from Donald Cameron MSP also provided the following information:

SCOTTISH PARLIAMENT

WRITTEN ANSWER

15 May 2017

Index Heading: Economy

Donald Cameron (Highlands and Islands) (Scottish Conservative and Unionist Party): To ask the Scottish Government what information it has on how many mortalities of salmon there have been due to the use of mechanical lice treatments on salmon farms in each year since 2007.

S5W-08947

Fergus Ewing:

Information regarding fish farm mortality is collected as part of fish health inspections conducted by Marine Scotland's fish health inspectorate. Case information is published here: http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/CaseInformation

In 2014 the Ministerial Group for Sustainable Aquaculture Farmed Fish Health and Welfare Working Group recommended that mortality over certain thresholds be reported to Marine Scotland's fish health inspectorate. Mortality thresholds were incorporated into the voluntary Code of Good Practice for Scottish Finfish Aquaculture in 2015. The following information provides details of fish mortalities which were reported to the fish health inspectorate and included mechanical lice treatment as one of the reasons for mortality.

Year	Total Mortality
2015	0
2016	115,950
2017	18,995

SCOTTISH GOVERNMENT

'Mortality Event Reports' reported between August 2017 and January 2018 included 95,751 deaths in 8 separate incidents due to the Thermolicer and/or Hydrolicer:

45,089 - Scottish Salmon Company: Druimyeon Bay (Sound of Gigha), 13 November 2017
25,607 - Scottish Salmon Company: Druimyeon Bay (Sound of Gigha), 6 November 2017
8,737 - Scottish Salmon Company Sgian Dubh (Loch Striven), 11 December 2017
4,663 - Marine Harvest: Caolas A Deas (Loch Shell), 21 August 2017
4,253 - Scottish Sea Farms: South Sound (Mangaster Voe), 1 January 2018
3,546 - Scottish Salmon Company: Strome (Loch Carron), 30 October 2017
2,652 - Scottish Salmon Company: Gravir (Loch Odhairn), 30 October 2017
1,204 - Scottish Salmon Company: Inch Kenneth (Loch na Keal), 25 December 2017

Another six 'Mortality Event Reports' provided no data on the number of dead fish but at least one incident was reported as "over 1% mortality". The 'Mortality Event Report' (1 January 2018) for The Scottish Salmon Company's salmon farm at Strome in Loch Carron stated that

the estimated number of fish lost was "not disclosed" with the: "Company unwilling to disclose the % of the mortality or the number of fish involved. Only the figure is over 1%. Discussions ongoing to get actual figures" (further mortality reports followed on 8 January and 15 January 2018).

According to the Scotland's Aquaculture database, 20,440 kg - that's 20.4 tonnes - of mortalities came from The Scottish Salmon Company's salmon farm at Strome in January 2018. If the average weight of the farmed salmon was 1 kg then there would be over 20,000 morts (even if the average weight of the farmed salmon was 4 kg then there would be over 5,000 morts).

Another mortality incident where no figure is provided started on 7 August 2017 at Marine Harvest's salmon farm at Tabhaigh in Loch Erisort (further mortality reports followed on 14 August and 21 August 2017). According to the Scotland's Aquaculture database, 265,069 kg - that's 265 tonnes - of mortalities came from Marine Harvest's salmon farm at Tabhaigh in Loch Erisort in August 2017 (that could be over 250,000 and most likely over 50,000 morts).

In 2016, Compassion In World Farming called for a ban on Thermolicers following a mass mortality of 95,000 farmed salmon at Marine Harvest's salmon farm in Loch Greshornish. Earlier this year, Norwegian veterinarian Dr. Kristin Ottesen warned against the use of the Thermolicer due to the risk of head injury including "large bleeding around the brain" and "stress-induced damage".

A study published in a Norwegian veterinary journal in May concluded that “the present use and technical solutions for thermal de-lousing are inadequate and likely to cause pain and serious lesions in treated fish”. An English summary of the scientific paper included:

"High mortality and serious lesions associated with thermal sea-lice treatments are of concern in the aquaculture industry. Lesions most commonly observed include gill haemorrhage, scale and skin loss, haemorrhage and vacuolation of thymic tissue, degeneration of nasal epithelium and brain haemorrhage. It is demonstrated beyond doubt that fish can feel pain and that the temperatures used during thermal de-lousing (28-34℃) are most likely painful to the fish. This pain will also initiate panic reactions where fish are likely to inflict serious self-damage."

A Scottish Parliament briefing published in February 2018 included:

OTHER METHODS OF CONTROL

Mechanical methods are also used to control lice [12] .

- A thermolicer works by pumping salmon through lukewarm water. Lice have a low tolerance for sudden changes in temperature
- A hydrolicer washes lice off the salmon
- A fish wash or skamik system uses brushes and water spray to remove lice.

However, as Marine Harvest (2017, p22) note "...new methods generate new challenges, as we experienced at our Greshornish site in Scotland. At Greshornish, we lost 115 283 fish during our first full-scale thermolicer treatment because we lacked experience and failed to fully anticipate the consequences of treating fish compromised by amoebic gill disease with water of up to 34ºC."

In May 2018, Scottish Salmon Watch wrote to the Scottish Ministers raising welfare concerns surrounding the operation of the Thermolicer. The letter cited Compassion In World Farming's written submission to the Rural Economy & Connectivity Committee's ongoing salmon farming inquiry:

> Use of Thermolicers has raised great concern. There are many reports, from both Scotland and Norway, of high levels of fish mortality following Thermolicer treatments. For example, according to Freedom of Information requests, 95,400 fish died over two weeks ending 08/08/16 following Thermolicer treatment at a farm in Loch Greshornish (Isle of Skye)[ii]. In Norway, this treatment has likewise caused major fish mortalities[iii, iv]. Despite these incidents, Thermolicer treatments have not been subjected to a full welfare assessment. The process is highly stressful for the salmon and involves crowding, removal from water, and exposure to much warmer water (up to 34 °C which is not in the salmon's natural range) for 30 seconds which is most likely painful to the fish. Salmon do not experience sudden temperature changes like this in the wild and it is physically challenging – if not life-threatening. During this treatment, salmon also suffer injuries such as gill haemorrhage, degeneration of nasal epithelium, vacuolation of thymic tissue, skin, fin and scale damage, brain haemorrhage, lack of oxygen due to crowding and reduced oxygen content of warmer water. Build-up of ammonia can also be an issue. There are also questions over its effectiveness. This is demonstrated by a Norwegian study which found many of the farms using the Thermolicer were back to pre-treatment levels of lice just 3 weeks later[v].

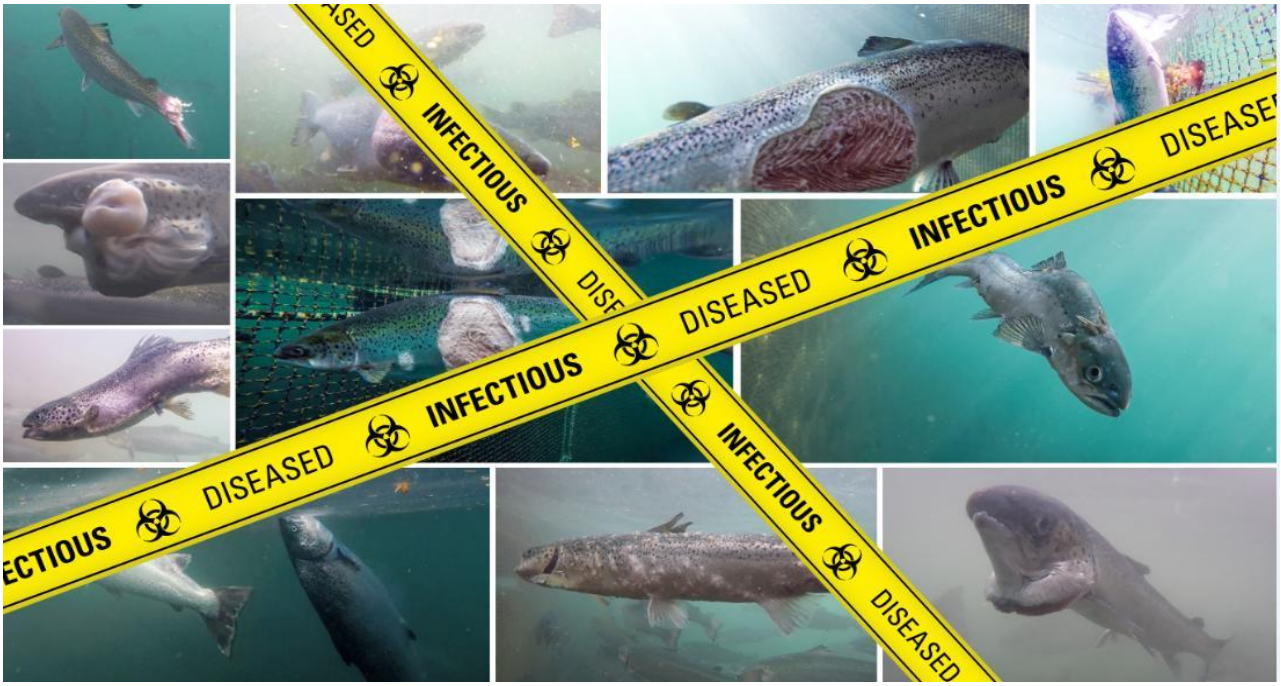
Read more via Press Release: "Ban Water Torture on Scottish Salmon Farms"

Note that the increase in mortalities cannot be explained simply as a function of an increase in salmon farming production - in fact the ratio of mortalities to salmon farming production is now the worst ever:

Year	Production (t)	Mortalities (t)	P/M	Ratio M:P
2002	144,589	4,578	31.58344255	1:32
2003	169,736	6,537	25.96542757	1:26
2004	158,099	6,907	22.88967714	1:23
2005	129,588	5,100	25.40941176	1:25
2006	131,847	8,183	16.112306	1:16
2007	129,930	11,495	11.30317529	1:11
2008	128,606	9,088	14.15118838	1:14
2009	144,247	8,064	17.88777282	1:18
2010	154,164	7,713	19.98755348	1:20
2011	158,018	9,475	16.67736148	1:17
2012	162,223	13,234	12.25804745	1:12
2013	163,234	10,424	15.65943975	1:16
2014	179,022	16,245	11.02012927	1:11
2015	171,722	18,373	9.346432265	1:9
2016	162,817	22,232	7.323542641	1:7
2017	177,202	25,435	6.966856694	1:7

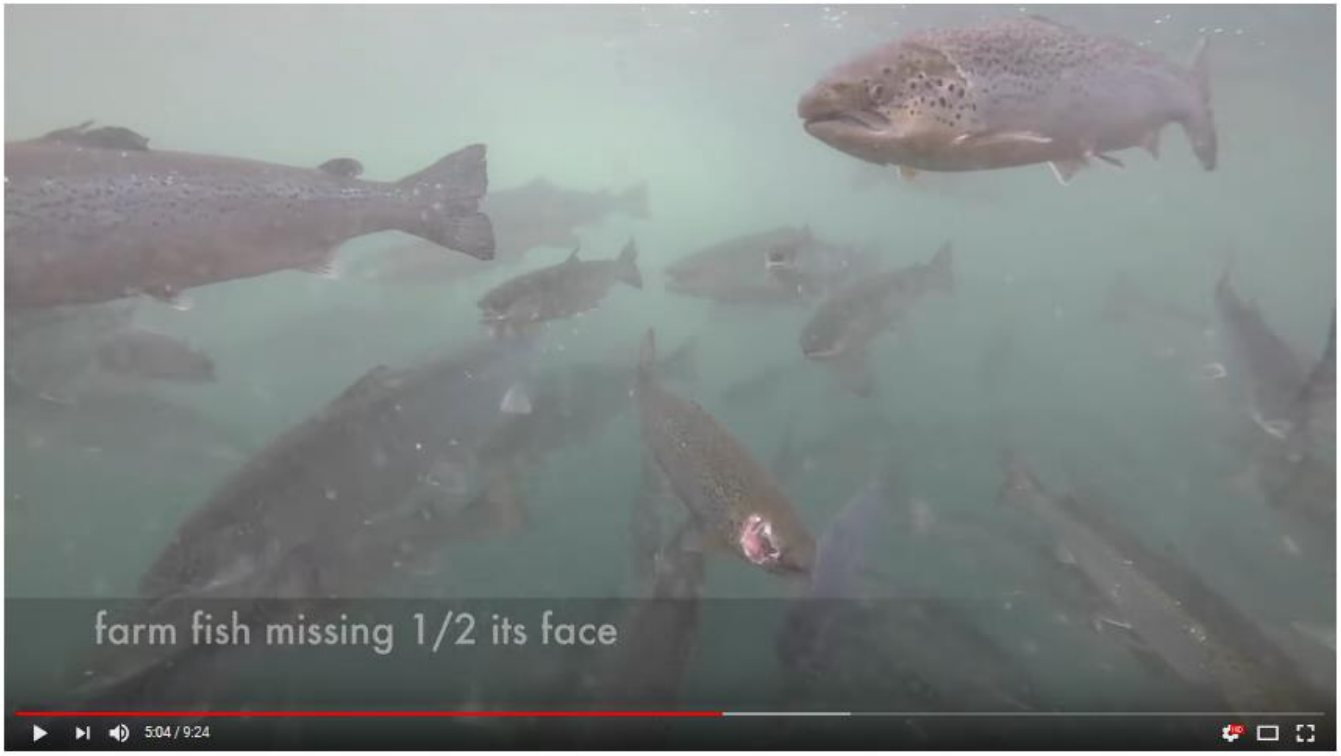
Video Evidence from Canada

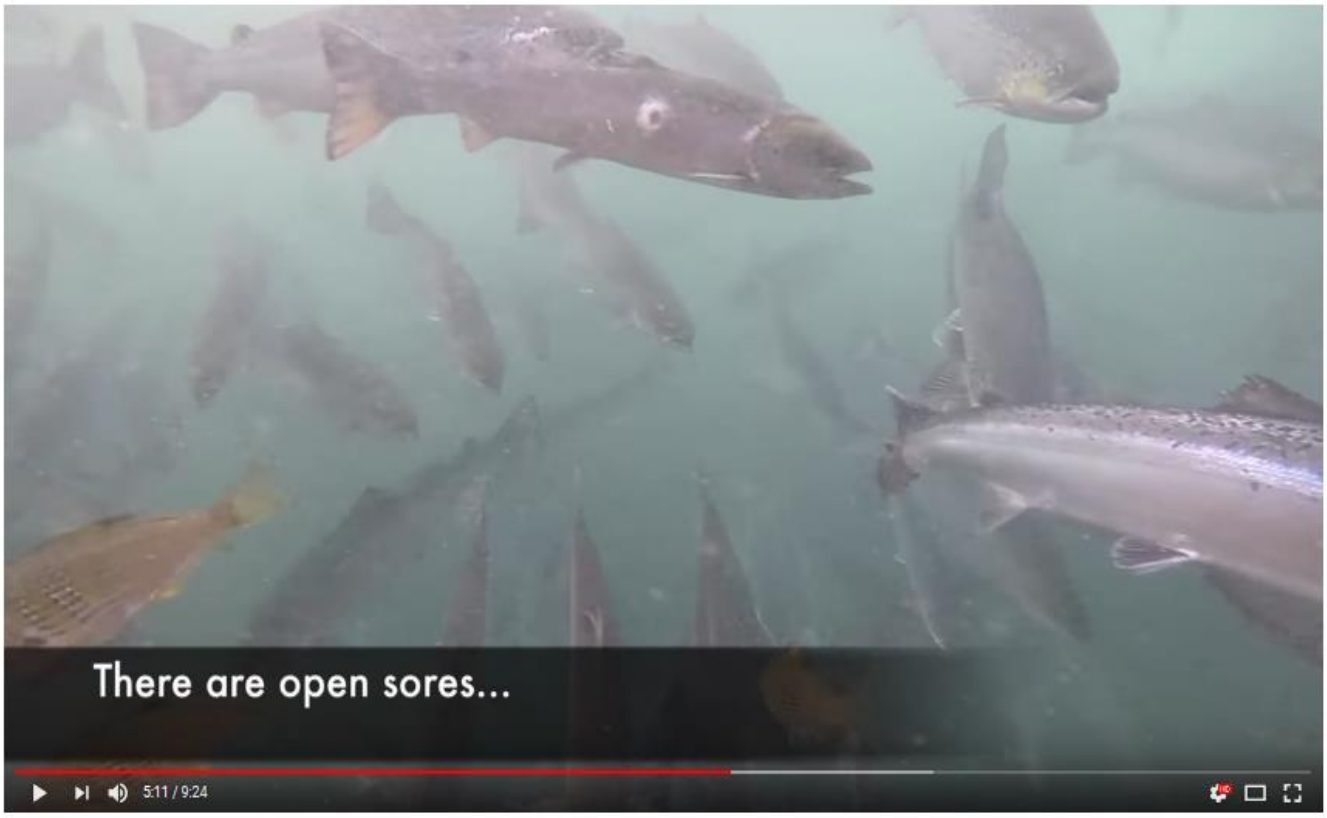
When award-winning biologist Alexandra Morton went fishing with her Go Pro inside a salmon farm in Canada in 2016, the video footage and photos she captured on camera was both shocking and thought-provoking.



'Hard Evidence' was viewed over 1 million times on Facebook and prompted significant media coverage including CTV News, APTN News and CBC News.

Filming in 2017 exposed further shocking video evidence. A video shot with a Go Pro camera by Hereditary Chief George Quocksister - "A Look Inside Salmon Farms" - published by Alexandra Morton and Sea Shepherd Society in August 2017 included:


farm fish missing 1/2 its face
5:04 / 9:24


There are open sores...
5:11 / 9:24


What disease does this fish have and...
5:18 / 9:24


What is causing this?
6:34 / 9:24


So many unhealthy fish in the Clio Channel farms.
7:04 / 9:24

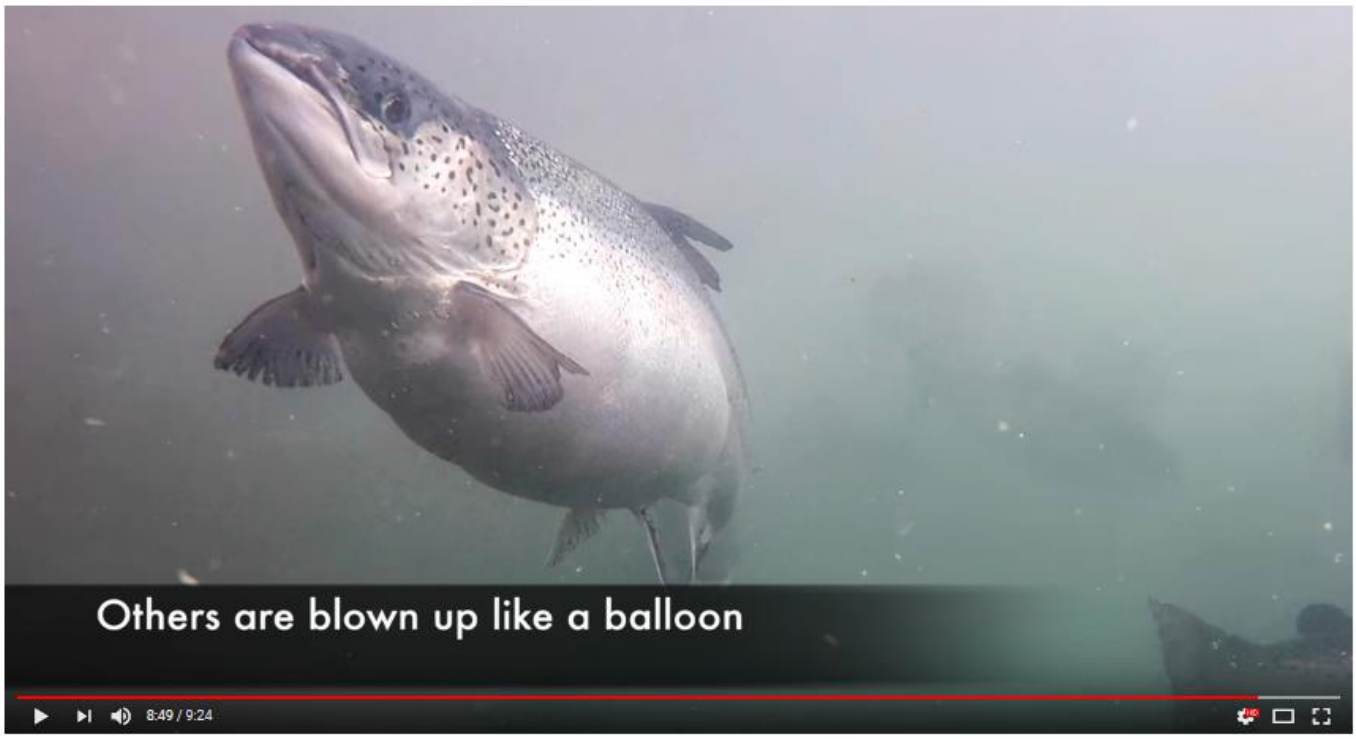

7:36 / 9:24


Why are the gills on these emaciated fish so swollen?
7:42 / 9:24


Why are the gills on these emaciated fish so swollen?
7:47 / 9:24


What disease is this?
7:57 / 9:24


And then there are the tumours...
8:06 / 9:24



Watch video reports via:
Hard Evidence: What happens when Alexandra Morton gets 10 minutes on a salmon farm with a GoPro and a pole? (Twyla Roscovich, August 2016)
Operation Virus Hunter: A Look Inside Salmon Farms (Sea Shepherd, August 2017)

Read more via:
Hard Evidence - The Welfare Nightmare of Scottish Salmon Farming

The damning video evidence from Canada begs the question: are the welfare conditions any better, the same or even worse in Scotland?

Certainly, we know from photos obtained by Scottish Salmon Watch from the Scottish Government in June 2018 via FOI that salmon farms contain disease-ridden fish with some of the same welfare problems as visible in Canada:

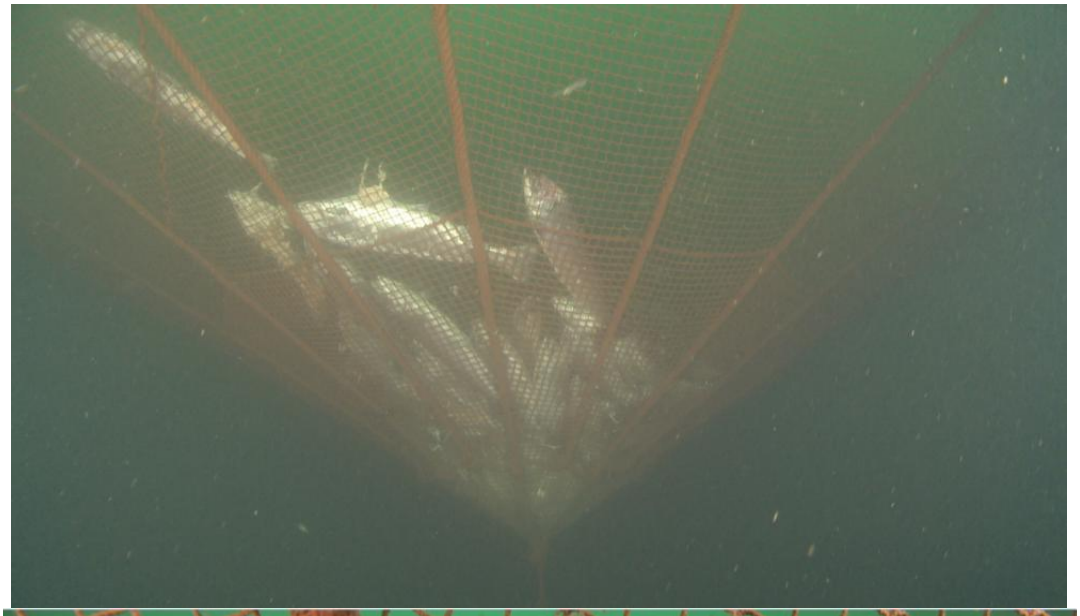
2016-0449-photos.pdf

Fish in cage 16

Read more via:
EXPOSED: Gruesome Photos of Deformed & Diseased Scottish Salmon
Hard Evidence - Photos of Diseased & Deformed Scottish Salmon

Scottish Salmon Watch has also filed a further FOI with the Scottish Government for more photos.

And we know from existing video footage (shot by diver David Ainsley) under a Scottish salmon farm that something is seriously rotten in the state of Scotland.



Watch via "Dead salmon at the bottom of a cage in a salmon farm"

Scientific Evidence for Fish Feeling Pain

Suffice to say that there is a growing body of scientific evidence detailing pain in fish.

Read more via:
It's Official: Fish Feel Pain: The verdict is in. But will our oceanic friends ever get the same legal protections as land animals?
What a Fish Knows: The Inner Lives of Our Underwater Cousins
Do fish feel pain and why does it matter?
Cognitive evidence of fish sentience
Why human pain can't tell us whether fish feel pain
Fish brains and behaviour indicate capacity for feeling pain
Fish sentience and the precautionary principle
Science Shows Fish Feel Pain, So Let's Get Over It and Do Something to Help These Sentient Beings
Fish Intelligence, Sentience and Ethics
Fish Are Sentient and Emotional Beings and Clearly Feel Pain
Do Fish Feel Pain?

In the photos disclosed by the Scottish Government in June 2018 the farmed salmon clearly look in pain.

In assessing the scientific case against the use of the Thermolicer, [Compassion In World Farming stated in 2016]:

COMPASSION in world farming

Factory farming | Farm animals | Take action | Donate

Our mission is to end factory farming

Philip Lymbery, Compassion CEO

ABOUT PHILIP | BOOKS | BLOG | GUEST ARTICLES | SPEAKING DATES

PHILIP LYMBERY › BLOG › 2016 › 11 › SCOTTISH INTENSIVE SALMON FARMING PLUMBS NEW DEPTHS

SCOTTISH INTENSIVE SALMON FARMING PLUMBS NEW DEPTHS

Fish farm

Reports that Scottish salmon farms have killed tens of thousands of fish accidentally by overheating them have sent shockwaves through an industry already under fire for shooting seals.

Seals are all too often shot as part of 'predator control' around intensive fish farms that are effectively factory farms in the sea.

Now nearly a hundred thousand salmon are reported to have been killed after the use of a new device, the 'thermolicer'. The device was used in the latest desperate bid to rid intensively farmed fish from lice, a parasite infestation which is inevitable when so many fish are crammed in a confined space.

Welcome

"Compassion in World Farming campaigns to end factory farming. My book, Farmageddon, explodes the myths behind our broken food system and sets out an alternative vision that will benefit animals, people and the countryside."

Philip Lymbery

Information from the Scottish Government, received following **a Freedom of Information request** by the Global Alliance Against Industrial Aquaculture (GAAIA), reveals that 95,000 fish died on a single Scottish fish farm following the use of a thermolicer.

The thermolicer procedure involves crowding the fish used to the cold coastal waters of Scotland, pumping them into heated water and then dumping them back into their seawater cages. Salmon would never normally experience such sudden temperature changes. Little wonder that so many seem to have died as a result.

Killing fish by overheating, whether accidental or not, is simply inhumane.

The use of rough handling and heat treatment to tackle problems of sea lice is unacceptable on welfare grounds.

Here's Compassion in World Farming's scientific assessment of the Thermolicer prepared by Phil Brooke (Scientific Manager - research and education):

Thermolicer:

Scientific Assessment by Compassion in World Farming (6 November 2016)

The Thermolicer appears to be a brutal treatment which has not been subjected to a full and proper welfare assessment. It involves a series of steps which are inherently stressful and will cause poor welfare to the fish.

1. The salmon are crowded in a net
2. They are pumped in water through a tube into a boat with the Thermolicer on board
3. They are taken out of water – the dewaterer is a metal grid which lets the water through. They bounce along a metal grid into the treatment water
4. They then pass into seawater heated to 30-34 degrees centigrade. Salmon would never normally experience sudden temperature changes like this
5. Finally, they are pumped back into their seawater cage

Improved design and management could reduce this stress but cannot be expected to eliminate it.

Background information

We have seen one report from the Norwegian Veterinary Institute ("Thermal de-licing of salmonid fish - documentation of fish welfare and effect") which documented statistically significant increases in:

- snout injury following treatment. It is suggested that this should be caused by the effects of crowding the fish before pumping onto the Thermolicer vessel
- fin damage
- scale damage following treatment on one of the sites
- cataracts on one site 3 weeks after treatment

In January 2018, a [Norwegian veterinarian also warned]:

Vet warns of head injury risk to fish during delousing

Fish vet Kristin Ottesen warned that whatever mechanical delousing method is used, it kills some fish. Photo: Linn Therese Skår Hosteland.

A fish vet has highlighted major head injuries she has seen to fish treated with warm water delousing machinery.

By Linn Therese Skår Hosteland

Kristin Ottesen, of Norwegian firm HaVet, addressed lice treatment with warm water and the Thermolicer or Optilicer, during the Fisheries and Aquaculture Industry Research Fund (FHF) conference "Prevention and Control of Lice" in Trondheim.

"No matter what non-drug method you use for delousing, it kills. Same if it's Skamik, FLS, Thermolicer and Optilice. Both the method and the logistics," Ottesen began.

She noted that temperatures of 30-34 degrees that are lukewarm for humans can be searing for farmed salmon.

'Hear the fish panic'

"But we do not know. When you stand with these machines you can still hear that something happens. One can hear that the fish panic. So the thoughts around this are not from out of the blue," she said.

She says they often see apparently healthy fish that just die after treatment, without finding the fish.

"But is it [the fish] fine? Are we looking for the right things when we look at the fish afterwards?" she asked, adding that surviving fish are not necessarily OK.

"Especially 12 to 24 hours after treatment. You will begin to see 'spare tyres' around the eyes and fluid collections in the palate after warm water treatment. This seeps in gradually. Fish farmers often say they see unconscious and lethargic fish."

Bleeding around the brain

Ottesen said that after opening such fish, she saw large bleeding around the brain and the palate of some of the fish.

"Classically, we are coming to a farm that says they have had some mortality, but are satisfied."

What farmers classify as satisfactory mortality, she adds, ranges from maybe 0.2% to 3%.

"A few weeks later we come to the same farm and see that the fish are falling and there are some sick fish. They look wrong, the eyes of the fish look strange."

Also, on fish that look fine two weeks after treatment, she finds major bleeding in the head region.

Stress-induced damage

"The fish health service has tried to document the trends in this, and the analysis companies they work with conclude that there have been major acute injuries in the head region, which can't be explained by anything other than the lice treatment.

"I see a lot of stress-induced damage to the fish after these treatments in addition to handling. I think we should think about how to build these machines. Is warm water treatment safe? It's something we must ask ourselves."

She says that as a fish health worker she has also fought a hard battle to know what the farmers treat the fish in, besides that it is hot water.

Read in full via "Vet warns of head injury risk to fish during delousing"

The Fish Site reported in May 2018 via 'Study questions fish welfare in thermal delousing':

Immersing farmed salmon in warmed water as a means of removing sea lice presents serious fish health and welfare issues according to a new study.

The authors of the study, which was led by researchers at Pharmaq Analytiq, suggested that "a better regulatory framework for mechanical treatment of fish in general" is needed and "the present use and technical solutions for thermal de-lousing are inadequate and likely to cause pain and serious lesions in treated fish."

Mechanical treatments that use warm water to remove lice, such as Thermolicers, have been widely adopted by the salmon farming industry – in particularly in Norway and Scotland – and have been shown to remove over 95 percent of the parasites. They have been increasingly popular at a time when a number of therapeutants against sea lice are losing their efficacy, or their use is being limited by regulations.

Cooke Aquaculture has recently acquired a Thermolicer for its operations on the east coast of Canada

However, as the researchers note, high mortality and serious lesions associated with thermal sea lice treatments are of concern in the aquaculture industry. Lesions most commonly observed include gill haemorrhage, scale and skin loss, haemorrhage and vacuolation of thymic tissue, degeneration of nasal epithelium and brain haemorrhage.

The new paper – which was published in the *Norsk veterinærtidsskrift* journal – does, the authors argue, demonstrate "beyond doubt that fish can feel pain and that the temperatures used during thermal de-lousing (28-34 °C) are most likely painful to the fish. This pain will also initiate panic reactions where fish are likely to inflict serious self-damage."

Here's the English summary of the paper referred to above:

ENGLISH SUMMARY

High mortality and serious lesions associated with thermal sea-lice treatments are of concern in the aquaculture industry. Lesions most commonly observed include gill haemorrhage, scale and skin loss, haemorrhage and vacuolation of thymic tissue, degeneration of nasal epithelium and brain haemorrhage. It is demonstrated beyond doubt that fish can feel pain

and that the temperatures used during thermal de-lousing (28-34 °C) are most likely painful to the fish. This pain will also initiate panic reactions where fish are likely to inflict serious self-damage.

The present documentation of thermal sea-lice treatment on welfare is in the opinion of the authors based on a weak scientific basis and not calibrated for the use in field situations. Furthermore, a better regulatory framework for mechanical treatment of fish in general is called upon. It is concluded that the present use and technical solutions for thermal de-lousing are inadequate and likely to cause pain and serious lesions in treated fish.

For further information please contact the authors of the paper:

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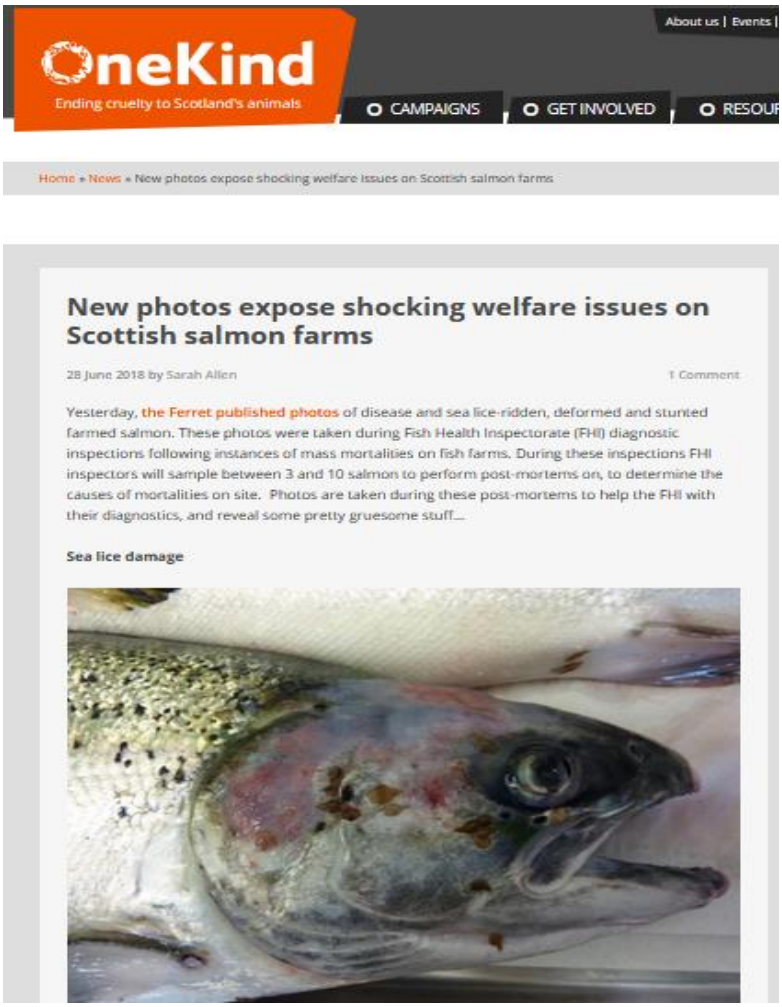
Public Interest

There is a clear public interest in bringing a welfare abuse case against salmon farming companies.

OneKind [reported in a blog](#) in June 2018:



Sea lice feed on the scales, flesh and tissue of fish. The photos show the extent of the damage they can cause, for example at **Ardintoul** one fish was described as having skin loss on the head following high lice burdens. At the farm **Raineach**, all four fish sampled were described as having "severe lice damage to their heads".

Damage from strong tidal currents

Many salmon farms in Scotland encounter problems with storms or strong tidal currents. These can harm salmon as they can result in fish being pushed against the side of the cages. This can create physical damage to salmon, as shown at the site **Ardmaddy**, where inspectors described seeing fish with "rubbed sides, which is thought to be caused by the strong tidal currents".

Damage from handling

Handling can cause damage to fish as it can result in the loss of scales, and the development of lesions. At the fish farm **Scotasay**, salmon were seen with lesions which were attributed "to handling during a recent freshwater treatment".

Salmon with severe eye damage, or no eyes

On inspection of the farm **Leinish**, inspectors removed four fish for diagnostic sampling, all of which were described as being lethargic. Two of the salmon were found to have cataracts- **a common problem** with farmed salmon. Even more shocking was that inspectors also found a salmon with no eyes.

Anorexic salmon

Many reports by the FHI note seeing "anorexic fish", in poor body condition. Such fish were seen at the site **Maol Ban**. These fish were also described as "poor doing fish", which are also referred to by previous research unsympathetically as "**loser fish**". These are fish that have poor body quality and are less active.

Salmon with spinal deformities

Spinal deformities are common in farmed salmon and are thought to be caused by multiple things such as genetics, parasites, pollution and injury during husbandry. At the farm Vuiabeag, one of the salmon removed for sampling is described as having scoliosis, which would have hindered their swimming ability.

Salmon with deformed hearts

Research has previously shown that farmed salmon have deformed heart shapes, meaning the heart is not as effective as doing its "job". Some of the photos support this research, for example at Port na Cro, one of the sampled fish was described as having a "slightly deformed heart".

Diseased salmon

As well as the obvious physical damage shown in the photos, FHI inspectors found that fish were suffering from a number of disease, including amoebic gill disease, salmon gill poxvirus and cardiomyopathy syndrome. Bacterial infections were also documented. At the farm Scotasay, one fish was described as having "an open skin wound" which was "further compromised by a mixed bacterial infection".

Let's not forget that salmon feel pain. Scientific evidence for this can be seen in their neural biology and their behaviour. Whilst these photos are not representative of all salmon within the farming industry in Scotland, they show that farming can cause severe harm to farmed salmon. The individuals in these photos would have suffered, and this is unacceptable. Fish can no longer be the forgotten animal, it is time for the salmon farming industry to seriously improve welfare standards on Scottish salmon farms.

PETA reported in July 2018:

ANIMALS ARE NOT OURS

to eat, wear, experiment on, use for entertainment, or abuse in any other way.

Home Features Videos Action Blog Issues Living Shop Investigations Media Center A

All Opinion Rescued Adoptable

GRAPHIC: More Proof That Fish Are Suffering in Food Industry (Photos)

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The Photos

More than 300 photos were taken throughout the last four years, spanning 30 different investigations conducted by the Scottish government's Fish Health Inspectorate. Although government officials tried to prevent the photos from being made public, they were forced to release them under the nation's freedom of information law. The images published last week by *The Ferret* are unsettling:

The Ferret
@FerretScot

Pictures taken since 2015 by fish health inspectors investigating mass deaths at salmon farms reveal diseases, bloody lesions, eye damage, deformed organs, plagues of flesh-eating sea lice and much else.theferret.scot/pictures-disea…

12:06 PM - Jun 27, 2018

Horror photos of farmed salmon spark legal threat

The diseases, damage and infestations suffered by hundreds of thousands of caged salmon in Scotland have been exposed by theferret.scot

50 80 people are talking about this

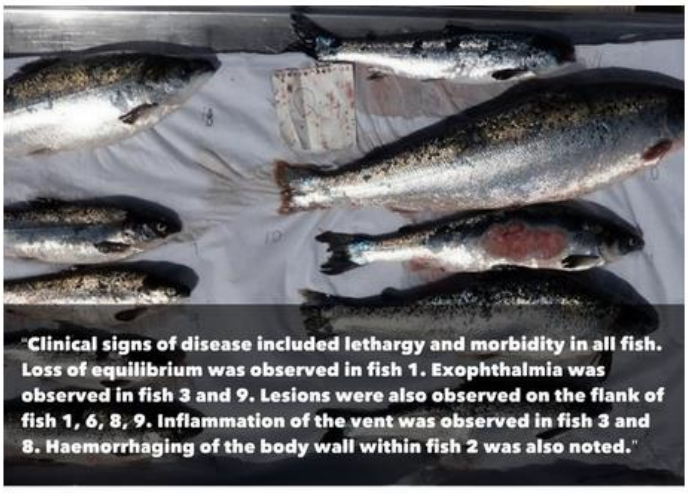
The salmon inspected during the investigations were farmed, meaning that they were raised to be killed and eaten. According to *The Ferret*, the majority of the farms in question are operated by Marine Harvest, which supplies one-fifth of the salmon consumed worldwide. Salmon from the company's farm in Loch Linnhe suffered from bacterial kidney disease:

The Ferret @FerretScot · 27 Jun
Replying to @FerretScot
In this example, the physical damage to the #Salmon was attributed to a lice treatment. More > theferret.scot/pictures-disea… pic.twitter.com/9p6vE60RfJ

The Ferret
@FerretScot

Here's an extract from another inspection into a #fishfarm at Loch Linne. More > theferret.scot/pictures-disea… pic.twitter.com/nNGrO30nvH

12:17 PM - Jun 27, 2018



Fish Farm: Gorsten, Loch Linnhe

Company: Marine Harvest
Problems: Bacterial kidney disease
Fish heath inspection: 10 fish sampled on 14 May 2016
Case number: 2016-0187

The Ferret

1 See The Ferret's other Tweets

And salmon on another Marine Harvest–operated farm were found to have sustained injuries apparently caused by a lice treatment:

The Ferret @FerretScot · 27 Jun

Replying to @FerretScot

Here's an example from Harris > theferret.scot/pictures-disea... pic.twitter.com/I2U6slHWaY

The Ferret
@FerretScot

In this example, the physical damage to the #Salmon was attributed to a lice treatment. More > theferret.scot/pictures-disea… pic.twitter.com/9p6vE60RfJ

12:15 PM - Jun 27, 2018

That's right—lice. Flesh-eating sea lice, to be exact. The salmon below—also from a farm operated by Marine Harvest—suffered from a severe case of lice damage to his or her head:

> **The Ferret** @FerretScot · 27 Jun
> Pictures taken since 2015 by fish health inspectors investigating mass deaths at salmon farms reveal diseases, bloody lesions, eye damage, deformed organs, plagues of flesh-eating sea lice and much else.theferret.scot/pictures-disea…
>
> **The Ferret**
> @FerretScot
>
> Here's an example from Harris > theferret.scot/pictures-disea…
> pic.twitter.com/I2U6sIHWaY
> 12:13 PM - Jun 27, 2018
>
> 

Salmon and other fish are smart and most certainly feel pain. Scientists who study pain are in agreement that fish's pain-response systems are basically identical to those of mammals and birds. Imagine the agony that these hundreds of thousands of salmon must have endured.

PETA's co-founder and president Tweeted to her 15,000 followers:

The Ferret reported in June 2018:

> The Scottish animal welfare charity, OneKind, described the photos as a "grim catalogue of horrors". It was more evidence that suffering and disease had become "endemic" on salmon farms, said director Harry Huyton.
>
> "Whoever is responsible for allowing these poor fish to suffer in this way should be held accountable, and relevant animal welfare legislation should be applied just as it would be for any other farmed animal," he told The Ferret.
>
> "We're calling for an urgent and comprehensive review of welfare on fish farms, and in the meantime the Scottish Government's ambition to grow the industry must be put on hold."

> Dr Krzysztof Wojtas, head of fish policy at Compassion in World Farming, urged salmon farmers to take animal welfare more seriously. "The high level of disease and mortalities we see in the salmon farming sector make it clear that this industry is operating beyond its limits, with very little respect for animal welfare," he said,
>
> "Salmon are kept in very high densities where sea lice can thrive and cause major welfare problems. They are subject to painful, stressful treatments to rid them of these lice, and high fish death rates become an accepted result."
>
> John Robins from Animal Concern called on the Scottish Government to control the fish farming industry instead of promoting it. "Filthy floating factory fish farms cause terrible suffering to the salmon imprisoned in them and they expose wild salmon and sea trout to a huge risk from numerous diseases and parasites," he said.

In Canada, CBC News [reported](#) in August 2017:

MENU cbcnews

British Columbia

New video appears to show disfigured, unhealthy farmed salmon

'I'll tell you, I don't sleep right at times, because I keep seeing [it] in my sleep, right?'

Rafferty Baker - CBC News

August 27, 2017

"I'm not a scientist, right, but you can obviously tell they have a disease," said Quocksister. "It's beyond horrible."

The footage has been edited into a video and posted online by independent biologist and marine activist Alexandra Morton.

An image of a deformed farmed salmon was broadcast via "W5 investigates the battle over farmed Atlantic salmon on the B.C. coast" on CTV News in October 2017:

Activists and First Nations in B.C. say farmed Atlantic salmon are spreading viruses, lice and disease to native Pacific salmon (W5).

Conflict of Interest at the SSPCA & RSPCA:

Finally, it is regrettable that the SSPCA (a reporting agency with respect to animal welfare) has a considerable conflict of interest with their recently appointed Chairperson employed as Head of Veterinary Services at Scottish Sea Farms (one of the salmon farming companies listed in this complaint and the company involved in the exposé by BBC's The One Show in December 2017 featuring 'The Dead Salmon Run').

Moreover, the RSPCA also have a clear financial and conflict of interest via the certification of over 70% of Scottish salmon farming production via RSPCA Assured including all of the production of Marine Harvest (named in this complaint) and various sites operated by the Scottish Salmon Company, Scottish Sea Farms, Grieg Seafood and Loch Duart (sadly the RSPCA has refused to name which salmon farms are certified via RSPCA Assured).

Marine Harvest, The Scottish Salmon Company, Scottish Sea Farms, Cooke Aquaculture, Loch Duart and Grieg Seafood are all represented on the RSPCA's Salmon Standards Technical Advisory Group - with former Marine Harvest employee Ian Michie in charge of the RSPCA's assessment of salmon farms.

A report published last year by Salmon & Trout Conservation Scotland included:

> Neither Freedom Food Limited nor the RSPCA publishes a list of salmon farms in Scotland certified by RSPCA Assured and there are few published metrics that enable an assessment of whether the RSPCA Assured scheme has improved overall husbandry on Scottish fish farms.
>
> The percentage of the Scottish salmon farming industry that is said to be certified by the RSPCA Assured scheme has dropped from 78% in 2012 to 67% in 2015. Data suggests that between 2015 and 2016 a total of 41,130 tonnes of farmed salmon died on Scottish fish farms generally as a result of one or more of fish diseases, infestation with parasites, damage caused by handling, crowding of fish, treatment losses and predation. As 67% of the salmon farming industry is RSPCA Assured, pro rata, this mortality would equate to roughly 27 million fish having died on RSPCA Assured farms between 2015 and 2016. The percentage by weight of mortality as against total production of the Scottish salmon farming industry by weight between 2013 and 2016 has almost doubled from under 7% to almost 14%.

Moreover:

3.8 It is claimed by RSPCA Assured that "*unlike other labelling schemes, we are completely independent from the food and farming industries*"[7].

3.9 However, in respect of farmed salmon, members of the RSPCA Salmon (Freshwater) Standards Technical Advisory Group (FW) and RSPCA Salmon (Seawater) Standards Technical Advisory Group (SW), which are both heavily involved in setting the welfare standards applied by RSPCA Assured, are dominated by the salmon farming industry and associated companies, with at least 20 of 24 members of that Group from the industry[8]:

John Avizienius (RSPCA farmed salmon specialist) FW and SW
Alasdair MacDonald (The Scottish Salmon Company) FW
Andy Young (Cooke Aquaculture) FW and SW
Chris Findlay (Fish Vet Group) FW and SW
Dave Danson (Landcatch) FW
David Cockerill (Marine Harvest) SW
David Roadknight (Lochduart) FW
George Whyte (Kintail Hatchery) FW
Gilpin Bradley (Wester Ross Salmon) FW and SW
Grant Cumming (Hjaltland Seafarms Ltd) SW
Hugh Murray (Migdale Smolt Ltd) FW
Hugh Richards (Wester Ross Salmon) FW and SW
Ian Armstrong (Partners in Welfare) FW and SW
John Barrington (Scottish Sea Farms) FW and SW
John Richmond (Marine Harvest Scotland) FW
Jon Walden (Hjaltland Seafarms Ltd) FW
Kim Thomas (The Scottish Salmon Company) FW and SW
Michelle Johnson (Cooke Aquaculture) FW and SW

Nick Joy (Lochduart) FW and SW
Paul Armstrong-Wilson (Solway Transport) FW
Paul Irving (Meridian Salmon) FW
Rob Murray (Howietoun) FW
A technical/field operations representative of Freedom Food Ltd FW and SW
A representative of RSPCA field staff (Farm Livestock Officers) FW and SW

RSPCA Assured charges for certification

4.1 In the year to December 2015, Freedom Food Limited made £2.4m, with assurance scheme licence fees and assessments amounting to £2.0 million. Freedom Food Limited's annual report states that 233 million fish benefitted from the scheme in 2015, as against 283 million in 2014[9]. Its expenditure in 2015 was also given as £2.4 million.

4.2 67% of Scottish farmed salmon are said to be covered by the RSPCA Assured scheme[10]. In 2012, a higher figure of 78% of Scottish salmon was claimed to be farmed to the RSPCA's higher welfare standards[11].

4.3 It is also important to note that all certified fish farms are charged to be RSPCA Assured. Freedom Food Limited charges a £119 for new membership of the RSPCA Assured scheme, a £486 annual fee per fish farm site and a charge of 0.875p per kg of the value of product sold (gutted weight).

4.4 Based upon annual Scottish salmon production figures given in the Scottish Fish Farm Production Survey 2015[12] of 171,722 tonnes in 2015, from 250 seawater sites, these charges imply a total charge levied upon Scottish salmon farming of between £800,000 and £900,000 per year.

With Scottish salmon farming production predicted to double or treble by 2030 to anywhere between 300,000 and 400,000 tonnes then the RSPCA's income from the certification of salmon farms could be well over £2 million.

Conclusion - A Clear Cut Case of Cruel Operations & Unnecessary Suffering

Scottish Salmon Watch strongly believes there is a clear-cut case of systematic breaches of the Animal Health and Welfare (Scotland) Act 2006 to Unnecessary Suffering (Section 19) and Cruel Operations (Section 21) and Ensuring Welfare of Animals (Section 24); namely:

Prevention of harm

19 Unnecessary suffering

(1) A person commits an offence if—

(a) the person causes a protected animal unnecessary suffering by an act, and

(b) the person knew, or ought reasonably to have known, that the act would have caused the suffering or be likely to do so.

(2) A person who is responsible for an animal commits an offence if—

(a) the person causes the animal unnecessary suffering by an act or omission, and

(b) the person knew, or ought reasonably to have known, that the act or omission would have caused the suffering or be likely to do so.

(3) A person ("person A") who is responsible for an animal commits an offence if—

(a) another person causes the animal unnecessary suffering by an act or omission, and

(b) person A—

(i) permits that to happen, or

(ii) fails to take such steps (whether by way of supervising the other person or otherwise) as are reasonable in the circumstances to prevent that happening.

(4) The considerations to which regard is to be had in determining, for the purposes of subsections (1) to (3), whether suffering is unnecessary include—

(a) whether the suffering could reasonably have been avoided or reduced,

(b) whether the conduct concerned was in compliance with any relevant enactment or any relevant provisions of a licence or code of practice issued under an enactment,

(c) whether the conduct concerned was for a legitimate purpose, for example—

(i) the purpose of benefiting the animal, or

(ii) the purpose of protecting a person, property or another animal,

(d) whether the suffering was proportionate to the purpose of the conduct concerned,

(e) whether the conduct concerned was in the circumstances that of a reasonably competent and humane person.

21 Cruel operations

(1) A person commits an offence if the person performs an operation on a protected animal without due care and humanity.

(2) A person ("person A") who is responsible for an animal commits an offence if—

(a) another person performs an operation on the animal without due care and humanity, and

(b) person A—

(i) permits that to happen, or

(ii) fails to take such steps (whether by way of supervising the other person or otherwise) as are reasonable in the circumstances to prevent that happening.

Promotion of welfare

24 Ensuring welfare of animals

(1) A person commits an offence if the person does not take such steps as are reasonable in the circumstances to ensure that the needs of an animal for which the person is responsible are met to the extent required by good practice.

(2) The circumstances to which, for the purposes of subsection (1), regard is to be had include—

(a) any lawful purpose for which the animal is kept,

(b) any lawful activity undertaken in relation to the animal.

(3) For the purposes of subsection (1), an animal's needs include—

(a) its need for a suitable environment,

(b) its need for a suitable diet,

(c) its need to be able to exhibit normal behaviour patterns,

(d) any need it has to be housed with, or apart from, other animals,

(e) its need to be protected from suffering, injury and disease.

Scottish Salmon Watch asks that the welfare abuses of Scottish salmon farms operated by Marine Harvest, the Scottish Salmon Company, Scottish Sea Farms, Grieg Seafood, Cooke Aquaculture and Loch Duart are investigated further with a view to a prosecution via the Procurator Fiscal.

The Fisheries Health Inspectorate 'Case Information' dates back to 2013 and is now available for the first quarter of 2018. This is a useful resource along with documents accessed via FOI.

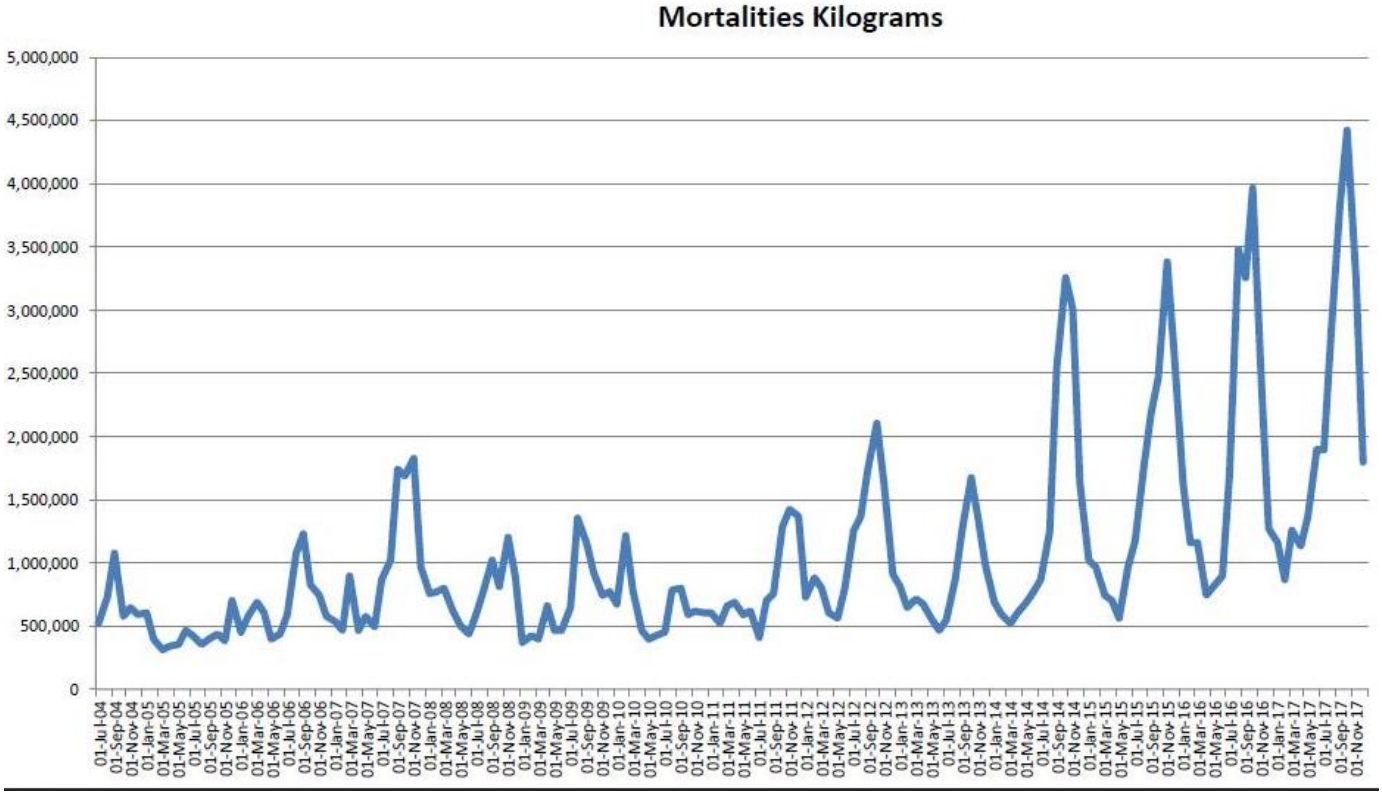
However, Scottish Salmon Watch firmly believes that the damning photographic evidence published by The Ferret in June 2018 and case information via Fisheries Health Inspectorate reports are merely the tip of an iceberg. Enhanced inspections and an increased number of inspections at salmon farms towards the end of their harvest cycle would surely uncover further damning evidence of welfare abuse.

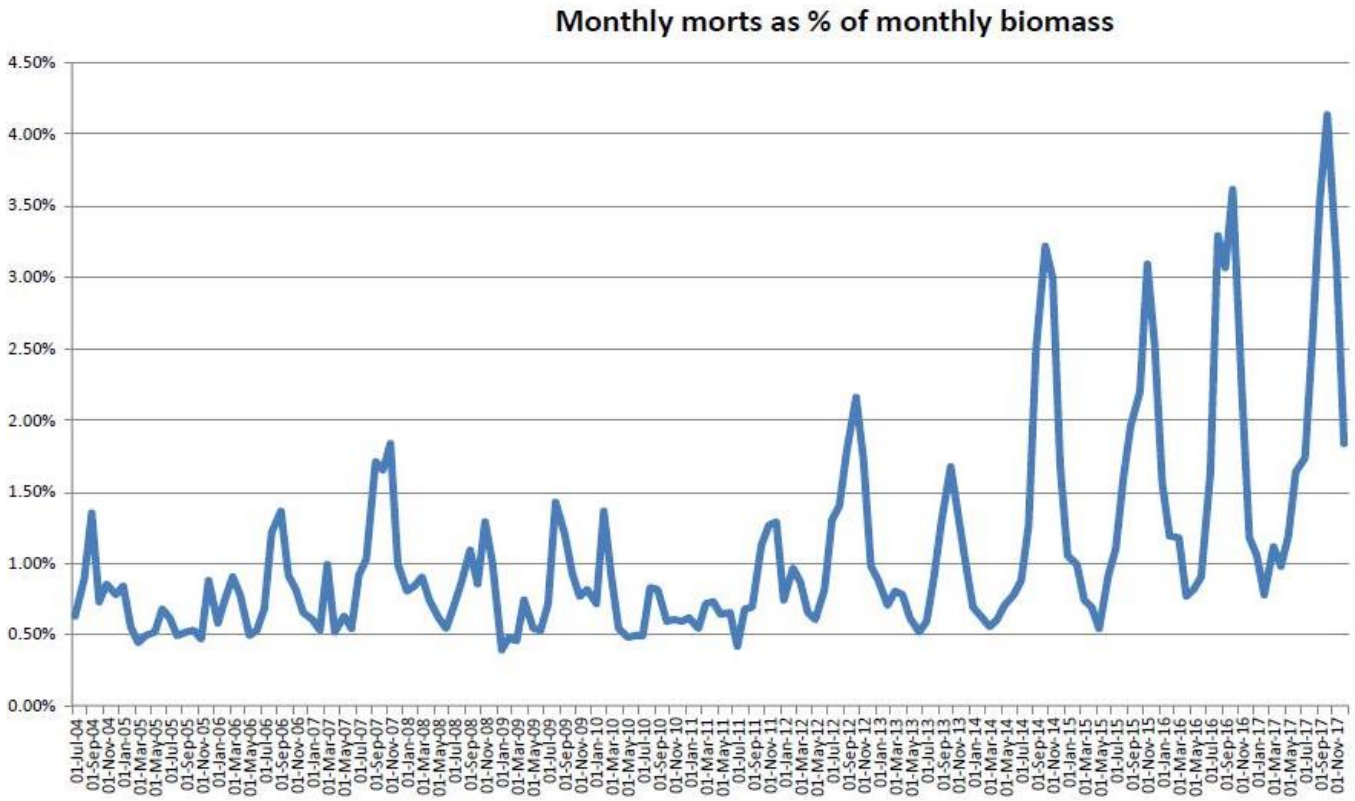
With mass mortalities, infectious disease and welfare problems expected to peak in late Summer and early Autumn, Scottish Salmon Watch recommends that Police Scotland and APHA conduct targeted inspections at salmon farms reaching maximum biomass and in the last few months of their harvest cycle.

For example, of the 20 worst salmon farm sites for mortalities (by weight and month) between 2002 and 2017 17 occurred in September, October, November and December:

1	Year	Mortalities (Kg)	Submitted By	Site Name	Local Authority
2	01-Dec-15	640812	Grieg Seafood Shetland Ltd	Cole Deep	Shetland Islands
3	01-Feb-10	564900	Rysa Farm Salmon	Pegal Bay	Orkney Islands
4	01-Oct-17	527936	Cooke Aquaculture Scotland	Stead of Aithness	Shetland Islands
5	01-Oct-13	494652.3731	Marine Harvest (Scotland) Ltd	Portnalong	Highland
6	01-Nov-17	487622	The Scottish Salmon Company Ltd	Druimyeon Bay	Argyll and Bute
7	01-Apr-02	423165	Scottish Sea Farms Ltd	Sand Sound, Bixter	Shetland Islands
8	01-Nov-17	422946	Cooke Aquaculture Scotland	Stead of Aithness	Shetland Islands
9	01-Oct-16	396461	The Scottish Salmon Company Ltd	Trilleachan Mor	Eilean Siar
10	01-Oct-14	392856.0973	Marine Harvest (Scotland) Ltd	Greshornish	Highland
11	01-Oct-14	361742.2665	Marine Harvest (Scotland) Ltd	Marulaig Bay	Eilean Siar
12	01-Oct-12	340000	Hjaltland Seafarms Ltd	Setterness South	Shetland Islands
13	01-Nov-14	330998.5855	Marine Harvest (Scotland) Ltd	Eilean Raineach	Eilean Siar
14	01-Aug-02	326520	Lewis Salmon Ltd	Arbhair	Eilean Siar
15	01-Sep-17	319615	The Scottish Salmon Company Ltd	Tuath (Rubha na Gall)	Argyll and Bute
16	01-Aug-08	317940	Scottish Sea Farms Ltd	Fiunary	Highland
17	01-Nov-14	294281.1441	Marine Harvest (Scotland) Ltd	Greshornish	Highland
18	01-Oct-11	291056	The Scottish Salmon Company Ltd	St Molios	North Ayrshire
19	01-Sep-16	289180.2091	Marine Harvest (Scotland) Ltd	Soay Sound	Eilean Siar
20	01-Nov-14	285003.843	Marine Harvest (Scotland) Ltd	Scotasay	Eilean Siar
21	01-Oct-16	283830.0231	Marine Harvest (Scotland) Ltd	Noster	Eilean Siar

Notice the spikes in mortalities in late Summer and Autumn:





Please note that on 1 September 2018, new biomass data for the second quarter of 2018 (April to June) goes online via Scotland's Aquaculture web-site. Police Scotland and APHA could use this data to work out which salmon farms in Scotland are reaching maximum biomass and nearing the end of their production cycle (which is now an average of 16 months compared to an average of 20 months a decade ago) when welfare problems are at their worst.

For further background on the welfare nightmare that is Scottish salmon farming please read:

Hard Evidence - The Welfare Nightmare of Scottish Salmon Farming
Campaign group to file legal challenge against Scottish salmon farms' use of Thermolicer
Daily Mail: "Calls to ban salmon farms' lice treatment"
Press Release: "Ban Water Torture on Scottish Salmon Farms"
EXPOSED: Gruesome Photos of Deformed & Diseased Scottish Salmon
Hard Evidence - Photos of Diseased & Deformed Scottish Salmon
Horror photos of farmed salmon spark legal threat
GRAPHIC: More Proof That Fish Are Suffering in Food Industry (Photos)
New photos expose shocking welfare issues on Scottish salmon farms
Letter to Scottish Ministers re. Welfare Abuses at Scottish Salmon Farms
Deaths, Deformities & Welfare Abuse at Scottish Salmon Farms - Breach of the Animal Health & Welfare (Scotland) Act?
EXPOSED: Early Harvesting at Scottish Salmon Farms Due to Disease & Mortalities
Hard Evidence: Fast-Tracking Disease-Ridden Scottish Salmon
Letter to the Cross-Party Group on Animal Welfare: Thermoliced to Death
Hard Evidence: Dossier of Data on Lice, Diseases & Mortalities at Scottish Salmon Farms

The Herald: "Video: Disease concern as Scots salmon farmers' produce "stomach-churning" record levels of fish deaths"
Scottish Salmon's Mort Mountain Leaps Over 10 Million - FOI reveals 2.3 million dead salmon at Marine Harvest farms in 2017

If you require further information please do not hesitate to contact me.

Yours sincerely,

Don Staniford

Director of Scottish Salmon Watch

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