Scottish Salmon Watch, 9 March 2020

SCOTTISH SALMON WATCH

WELFARE

Stop Thermolicing Farmed Salmon to Death!

- Thermolicer contravenes welfare standards says Dr. Lynne Sneddon
- Heat turned on the RSPCA & Animal Welfare Commission
- Parliamentary Questions increase scrutiny on mass mortalities & welfare abuse
- Renewed calls to ban the RSPCA Assured heated torture chamber for farmed salmon
- Advocates for Animals will be sending a letter to the Scottish Government challenging them on the lawfulness of the Thermolicer under animal welfare legislation
- Over half a million farmed fish liced to death since 2016

Campaigners are turning up the heat against the use of a thermal washing machine to clean lice-infested fish on Scotland's salmon farms. The use of the Thermolicer - which can heat fish up to 34°C - has come under fire following scientific evidence of welfare abuse published in the December 2019 issue of Veterinary & Animal Science and a recommendation of the Norwegian Food Safety Authority in August 2019 who called for a ban within two years.

Now a leading fish welfare expert - supported by Animal Concern, the Fish Welfare Initiative, PETA and Scottish Salmon Watch - has called on the Scottish Government to ban both the Thermolicer and Optilicer.

In January 2020, Dr. Lynne Sneddon of the University of Liverpool wrote to the Scottish Government, the RSPCA, the Animal Welfare Commission and Scottish Parliament's Cross-Party Group on Animal Welfare calling for a ban on the use of the Thermolicer and Optilicer on salmon farms due to the contravention of welfare standards **[1]**.

Dr. Sneddon's letter dated 7 January 2020 concluded:

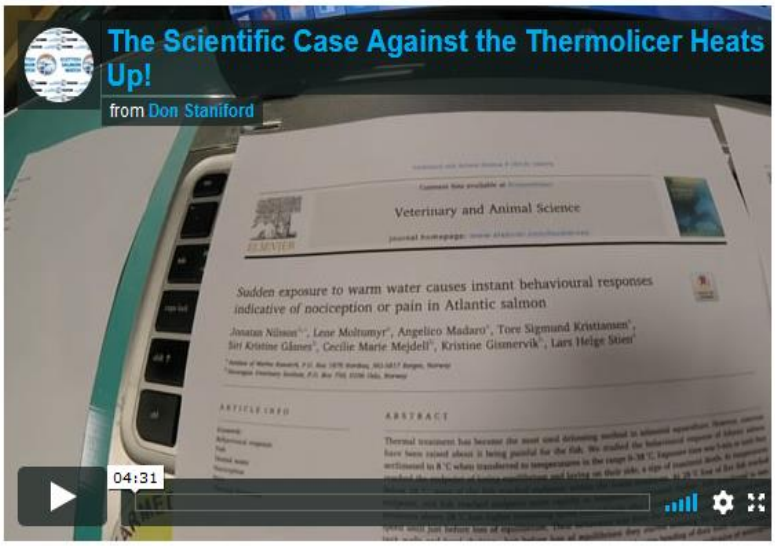
The Farm Animal Welfare Council (FAWC) stipulates in their five freedoms that farmed animals should have "Freedom from pain, injury or disease" and "Freedom from fear and distress". FAWC also state in their recent report farmed fish have "the capacity to experience pain" (FAWC 2014) and RSPCA (2018) agrees with this opinion in their report on the welfare standards of farmed Atlantic salmon stating "fish need to be protected from pain". The Thermolicer® and Optilicer® expose Atlantic salmon to painful temperatures, result in injuries and this process is likely to cause fear and distress. Further the Animal Welfare Act (2006) states clearly that harm should be prevented and welfare promoted.

Therefore, in my expert opinion and based upon scientific studies from other laboratories, both of these thermal treatment methods contravene the FAWC five freedoms, the RSPCA (2018) welfare standards for farmed Atlantic salmon and the Animal Welfare Act (2006) resulting in harm and poor welfare and should not be employed within the Atlantic salmon farming industry.

Dr. Sneddon's [follow up letter dated 29 January 2020 to the Scottish Government (who replied on 16 January 2020) included]:

> So reading between the lines in your response you are advocating the use of thermal treatment because the industry, you and EMFF have invested heavily financially and the industry is a lucrative one. In my opinion using money to justify the use of an inhumane treatment is not ethically or morally right. You do not mention any of the scientific evidence which supports my view. So can you please confirm that you and the other organisations continue to advocate this treatment despite the negative impacts upon salmon welfare? It is a yes or no question, therefore, I gratefully expect a yes or no answer.
>
> I do think it wonderful that you are reviewing the use of thermal treatments and are gathering evidence. This approach should be commended but why have you not suspended thermal treatments in the meantime until the information is gathered. I appreciate your point about the efficient removal of salmon lice but it should not be at the expense of welfare and indeed it's all very well removing the infestation but if the fish are injured suffering, pain or are dead then the treatment is not what I would consider successful.

A video interview with Dr. Lynne Sneddon is available [online here]



Read more via:
[Video Exclusive: Dr Lynne Sneddon on Welfare Abuse on Scottish Salmon Farms]
[Press Release: "Welfare Abuse on Scottish Salmon Farms - Legal Action Vs Scottish Ministers & Salmon Farming Companies"]
[Media Backgrounder: The Welfare Nightmare of Scottish Salmon]

Don Staniford, Director Scottish Salmon Watch, said:

"Scottish salmon are being Thermoliced to death with over half a million cruelly killed since 2016. The Thermolicer, Hydrolicer and Optilicer are torture chambers. We have instructed Advocates for Animals who will be writing to the Scottish Government challenging them on the lawfulness of the Thermolicer under animal welfare legislation. The weight of scientific and damning case evidence demands an immediate ban to end the welfare nightmare."

John Robins of Animal Concern said:

"When mechanical lice removers went wrong the first time it was a horrific mistake causing immense suffering and mass mortalities. When these machines were used again with the same horrific results, that was a criminal offence under the Animal Health and Welfare (Scotland) Act 2006. I helped put protection of fish into the 2006 Act but fourteen years later I have yet to see the Act used to prosecute any of the many fish farmers who routinely breach that legislation."

Dawn Carr, Director of Vegan Corporate Projects at PETA UK which supports the Thermolicer ban, said:

"Animals raised for their flesh – whether on land or in water – suffer horribly and needlessly. Severe crowding and confinement on fish farms can lead to the rapid spread of gill disease, open sores, and flesh-eating lice, which fish endure all while swimming in their own diluted waste. Fish farming is devastating to fish and the environment, and the best way for individuals to help these sensitive animals is simply to stop eating them."

Dr. Marco Cerqueira of the Fish Welfare Initiative said:

"Should we morally accept fish being placed in temperatures above those that are seriously detrimental to their well-being? Thermal delousing is emotionally stressful for fish, as panic-like states due to this painful event often occur. Like any other being, fish require thermal regulation for welfare, fitness, and survival. Therefore, the pain fish experience from being instantly submersed in heated water is harmful and goes against all notions of animal welfare. We cannot be passive with allowing such stressful procedures to occur and Fish Welfare Initiative applauds the Norwegian Food Safety Authority's decision to phase out thermal delousing over two years or until further research and improvement of its welfare impact is completed."

Bob Elliot, Director of One Kind, said:

"The Thermolicer treatment machine exposes salmon to higher water temperatures, abrasive surfaces and severe crowding. OneKind calls for a moratorium of the salmon farming industry until it has successfully addressed all the serious animal welfare challenges."

Read more in today's National newspaper:
The National: "Scottish salmon farming tools 'break animal welfare rules'"

The Welfare Case Against the Thermolicer, Hydrolicer & Optilicer

Scottish Salmon Watch has reviewed 'Case Information' and 'Mortality' data published by the Scottish Government's Fish Health Inspectorate providing damning evidence of welfare abuse.

Physical damage, thermolicer post-treatment

Thermolicer treatment started on 24th June for 4 days. Fish with bleeding gills, "collision damage" and heart damage.

Losses following Thermolicer treatment. Thought to be fish weakend by HSMI.

Mortality Event No	Reporting Business Name	Site Name	Date reported	Mortality rate recorded (%)	Explained reasons	Total mortality during event
MRT01453	Mowi Scotland Ltd	Loch Duich	04/12/2019	3.58	Malfunction with mechanical lice treatment boat resulting in treatment mortality	25966

w/b 18/11/19 25 966 (3.58%) - post treatment losses following thermolicer treatment, mortality of ~1000 - 2500 per cage. Cage 6 worst affected with mortality of 4686, due to pump failure on thermolicer during treatment.

Post Hydrolicer treatment, fish with compromised health did not survive the treatment well - mechanical damage

Mortalities post Thermolicer treatment, Thermolicer treatment losses

Pen 1 and 2 affected post Thermolicer treatment the rest of the site was not treated

Losses from sea lice treatment with thermolicer, no suspected underlying condition

Thermolicer treatment on one cage. Decided not to treat other cages with thermolicer.

Thermolicer treatment carried out on 15/07/2019 thought to have exacerbated mortality.

Fish have complex gill disease incuding gill bleeding, with associated mild anaemia. Recent thermolicer treatment - fish with poor gills/anaemia did not survive treatment.

. Treated two cages last week using optilicer, but mortality levels increased due to physical damage so decided not to use optilicer on further cages.

w/b 28/1/19 through to 3/3/19 - 52,634 physical damage following treatment with optilicer (see mortality event sheet for weekly details)

Currently treating on site with a thermolicer. Treatment abandoned today as fish were not taking to it very well. (Hot weather) Fish in the pen that had been treated looked very lethargic, the fish were visible a brighter shade of blue (probably due to the stress of crowd, water temperature). The weather was very hot on the day of inspection which probably contributed to the abandoning of the treatment.

During visual inspection of pens some fish were observed with physical damage to heads and tails. Site staff noted that this is localised to the larger fish which are more susceptible to damage when going through the optilicer.

The case evidence includes over 50 cases involving over 343,000 dead farmed salmon where mechanical treatments such as the Thermolicer, Hydrolicer and Optilicer were cited between 2017 and 2019 - including:

Mortality Event No	Reporting Business Name	Site Name	Date reported	Mortality rate recorded (%)	Explained reasons	Total mortality during event
MRT00529	The Scottish Salmon Company	Druimyeon Bay	23/11/2017	8.69	post treatment hydrolicer losses, handling, CMS.	45089
MRT01453	Mowi Scotland Ltd	Loch Duich	04/12/2019	3.58	Malfunction with mechanical lice treatment boat resulting in treatment mortality	25966
MRT00514	The Scottish Salmon Company	Druimyeon Bay	13/11/2017	4.44	post treatment hydrolicer losses.	25607
MRT01244	Mowi Scotland Ltd	Shuna SW (Rubh'an Trilleachain)	20/09/2019	4.07	Suspect recent environmental gill insult involving gill bleeding. Mortalities with recent hydrolicer treatment, with fish with poor gills not surviving treatment	22136
MRT01148	Grieg Seafood Shetland Ltd	West of Burwick	05/08/2019	3.63	Post treatment (optilicer)	16500
MRT01151	Grieg Seafood Shetland Ltd	West of Burwick	05/08/2019	3.46	Post treatment (optilicer)	14529
MRT01282	Mowi Scotland Ltd	Shuna SW (Rubh'an Trilleachain)	03/10/2019	3.08	Suspect recent environmental gill insult involving gill bleeding. Mortalities with recent hydrolicer treatment, with fish with poor gills not surviving treatment	13920
MRT01447	Mowi Scotland Ltd	Ardintoul	04/12/2019	1.83	Compromised gill health, anaemia due to gill bleeding + piscirickettsia infection. Fish also treated with mechanical lice system.	12858
MRT01451	Mowi Scotland Ltd	Ardintoul	04/12/2019	1.49	Compromised gill health, anaemia due to gill bleeding + piscirickettsia infection. Fish also treated with mechanical lice system.	10252
MRT01240	Mowi Scotland Ltd	North Shore	20/09/2019	1.09	Fish have complex gill disease incuding gill bleeding, with associated mild anaemia. Recent thermolicer treatment - fish with poor gills/anaemia did not survive treatment.	9933
MRT01320	Mowi Scotland Ltd	Shuna SW (Rubh'an Trilleachain)	10/10/2019	3.25	Complex gill disease + hydrolicer treatments	9557
MRT01452	Mowi Scotland Ltd	Loch Alsh (Sron)	04/12/2019	1.11	Compromised gill health + mechanical lice treatment	9306
MRT01149	Grieg Seafood Shetland Ltd	West of Burwick	05/08/2019	2.06	Post treatment (optilicer)	9025
MRT00850	Scottish Sea Farms Ltd	Lismore North	18/10/2018	4.27	Complex gill issues and sea lice treatment (physical treatment)	8585
MRT01358	Mowi Scotland Ltd	Ardintoul	25/10/2019	1.02	Complex gill disease with significant gill bleeding and resultant anaemia + thermolicer treatment losses	7,601
MRT00751	The Scottish Salmon Company	Vacasay	05/09/2018	2.56	Post treatment losses (hydrolicer)	7516
MRT01150	Grieg Seafood Shetland Ltd	West of Burwick	05/08/2019	1.74	Post treatment (optilicer)	7468
MRT01171	The Scottish Salmon Company	Portree Outer	19/08/2019	1.20	Post treatment (mechanical)	6686
MRT01318	Mowi Scotland Ltd	Poll na Gille	10/10/2019	1.10	Complex gill disease + hydrolicer treatments	6079
MRT01375	The Scottish Salmon Company	Druimyeon Bay	01/11/2019	1.04	Post treatment (Thermolicer) and challenged gills	5586
MRT01153	Grieg Seafood Shetland Ltd	West of Burwick	05/08/2019	1.7	Post treatment (thermolicer)	5584
MRT01345	Cooke Aquaculture Scotland Ltd	Flaeshins	15/10/2019	1.06	Post treatment mortality (Thermolicer)	5414
MRT01236	Mowi Scotland Ltd	Cairidh	20/09/2019	4.03	Anaemia due to bleeding from gills. Losses were exacerbated by thermal sea lice treatment in week 36.	5398
MRT01212	The Scottish Salmon Company	Maragay Mor	08/09/2019	1.36	Mechanical lice treatment, low level PD myopathy	5117
MRT01152	Grieg Seafood Shetland Ltd	West of Burwick	05/08/2019	1.26	Post treatment (optilicer)	5112
MRT01211	The Scottish Salmon Company	Maaey	08/09/2019	1.32	Mechanical lice treatment, low level PD myopathy	4858
MRT01217	Mowi Scotland Ltd	Cairidh	13/09/2019	3.36	Anaemia due to bleeding from gills. Attempted thermal sea lice treatment and losses exacerbated.	4654
MRT00584	Scottish Sea Farms Ltd	South Sound	29/01/2018	2.19	Physical damage, thermolicer post-treatment	4253
MRT00513	The Scottish Salmon Company	Strome	13/11/2017	1.83	post treatment hydrolicer losses.	3546
MRT01276	Mowi Scotland Ltd	Port na Cro	03/10/2019	1.23	Suspect recent environmental gill insult involving gill bleeding. Mortalities (fish with poor gills) with recent hydrolicer treatment	3184
MRT00402	The Scottish Salmon Company	North Uiskevagh	10/10/2017	1.64	Severe gill health issues, losses post hydrolicer treatment	2,721
MRT00492	The Scottish Salmon Company	Loch Odhairn/Gravir	06/11/2017	1.45	post treatment hydrolicer losses.	2652
MRT01216	Mowi Scotland Ltd	Sconser Quarry	13/09/2019	1.42	Losses incurred following thermal sealice treatment	2147

'Case Information' published by the Scottish Government's Fish Health Inspectorate - included:

Mowi - Ardintoul (17 October 2019):

5. Evidence of recent increased/atypical mortalities?	Y
If yes, facility nos/no mortality per facility/no stock per facility/reason:	
SAL: Mortality starting to increase across the site 28/29 September between 0-500 per pen over two days. 30/9/19 5,600 morts pen 1, 1,700 morts each in pen 3, 5, 7. 1/10/19 1,750 pen 7, 1,500 morts pen 9, 1,850 morts pen 10, 2,500 morts pen 11, 2,250morts pen 12. 2/10/19 2,125 morts pen 2, 2,825 morts pen 4, 1,065 morts pen 6, 3,500 pen 8, 3,150 morts pen 12. 3/10/19 2,100 morts pen 9. 3/10/19 and following days morts sharply drop off to mid-low hundreds or double digit figures. Occasional higher numbers : 9/10/19 pen2 900 morts, 11/10/19 1,250 morts pen 3, 12/10/19 1,400 morts pen 6, 13/10/19 1,610 morts pen 7, 1,090 morts pen 10. But overall decreased to low hundreds (occasional mid hundred) and double digits per pen per day. Over the last month (9/9-13/10) most mortalities attributed to anaemia (48,879 morts) and peroxide treatment (10,700 morts total from pen 1,3,5 and 7 only). 10/10/2019 5,220 morts attributed to thermolicer treatments. This is due to gill issues and the fish being slightly too small. Normally considerable lower post treatment morts.	
6. Any other peaks in mortality during period checked?	Y
If yes, detail:	SAL: On input slight increase in pen 6 and pen 10 due to fungus. Some mortality attributed to seal predation. Seal targeting very small fish in specific pens repeatedly (pen 10). Persistently increasing morts from seal predation 1,365 morts in June 2019. July 2019 3,221 morts due to concussions due to increased Caligus burdens. Slice treatment administered. August 2019 6,380 morts attributed to Salmosan treatment, 2,185 morts attributed to thermolicer. Total morts for September 29,065 attributed to anaemia, two peroxide treatments, thermolicer and decomposed.
7. Have increased (unexplained) mortalities been reported to vet or FHI?	Y

Scottish Sea Farms - Kishorn B (North) (10 September 2019):

Visit conducted following reported mort events; wk24 - 1.14% CGI; wk32 - 2.5% CGI, wk33 4.12% CMS and post treatment, Thermolicer.

Fish observed in cage with white heads.

Additional comments:		
F1 -red head lice damage	F3 white head, lice damage.	Fish 4 : Head damage -red head- lice.

Grieg Seafood - West of Burwick (5 August 2019):

. Treated two cages last week using optilicer, but mortality levels increased due to physical damage so decided not to use optilicer on further cages.

w/b 28/1/19 through to 3/3/19 - 52,634 physical damage following treatment with optilicer (see mortality event sheet for weekly details)

Case No: 2019-0380 Site No: FS0937 Date of visit: 05/08/2019

Start date:	End date: (if applicable)	Size of fish:	Average weight of affected population:	Species:	If explained, select reason(s):	Total mortality during event (if available):
28/01/19	03/02/2019	≥750g	2.9Kg	SAL	Post treatment (optilicer)	16,500
04/02/19	10/02/2019	≥750g	2.9Kg	SAL	Post treatment (optilicer)	9,025
11/02/19	17/02/2019	≥750g	3Kg	SAL	Post treatment (optilicer)	7,468
18/02/19	24/02/2019	≥750g	3Kg	SAL	Post treatment (optilicer)	14,529
25/02/19	03/03/2019	≥750g	3Kg	SAL	Post treatment (optilicer)	5,112
06/05/19	12/05/2019	≥750g	3.8Kg	SAL	Post treatment (thermolicer)	5,584

Grieg Seafood - North Papa (28 March 2019):

Optilicer brought in first week of February and first week of March to reduce sea lice numbers across site.

Approximately 10 moribund fish observed across site with signs of physical damage (attributed to a recent optilicer treatment).

w/b 18/03/19 (1,031, 0.61%), w/b 11/03/19 (801, 0.48%), w/b 04/03/19 (1,437, 0.85%), w/b 25/02/19 (965, 0.57%), w/b 18/02/19 (697, 0.41%) - attributed to optilicer treatment.

Fish 1 Bilateral Exophthalmia

Grieg Seafood - Gob na Hoe (Loch Dunvegan) (28 March 2019):

Optilicer used in week 10 , pen 2 and 3 had increased mortality post treatment. High mortality was observed in pen 4 which has had ongoing gill issues. Mortality numbers went over the reporting threshold post treatment, this mortality event was not reported at the time, and was picked up during the inspection.

During visual inspection of pens some fish were observed with physical damage to heads and tails. Site staff noted that this is localised to the larger fish which are more susceptible to damage when going through the optilicer. It was also noted that that the optilicer treatments were very effective at clearing the fish of lice.

Severe lesions observed on gills in pen 4.

Case No: 2019-0138 Site No: FS1175 Date of visit: 28/03/2019

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):
04/03/19	10/03/2019	±750g	4.3kilos	SAL	18 SO's	Weekly	1.39	Explained	Complex gill issues, Treatment

Total mortality during event (if available):	Additional information (e.g. action taken by company):	Action taken by FHI (include case no where applicable):
3216	Post treatment mortality after treating for gills. Mortality stopped week after treatment	Mortality fell bellow the threshold the following week. No further action required.

The Scottish Salmon Company - Vacasay (Loch Roag) (5 September 2018):

Accompanied APHA staff on visit to site following report of potential welfare issues by member of the public. Hydrolicer has been used on site in May (strategic treatment), June, July (when numbers rose significantly), twice in August (weeks 32 and 35).
Inspected a number of cages on the site. Worst affected cage appeared to have ~100 fish with observable lice damage (white heads and a few with more significant damage). Numbers with lice damage were lower in other cages. Hydrolicer treatment being conducted on cage 5. Observed fish exiting the hydrolicer over dewaterer and no fish seen with observable lice damage.

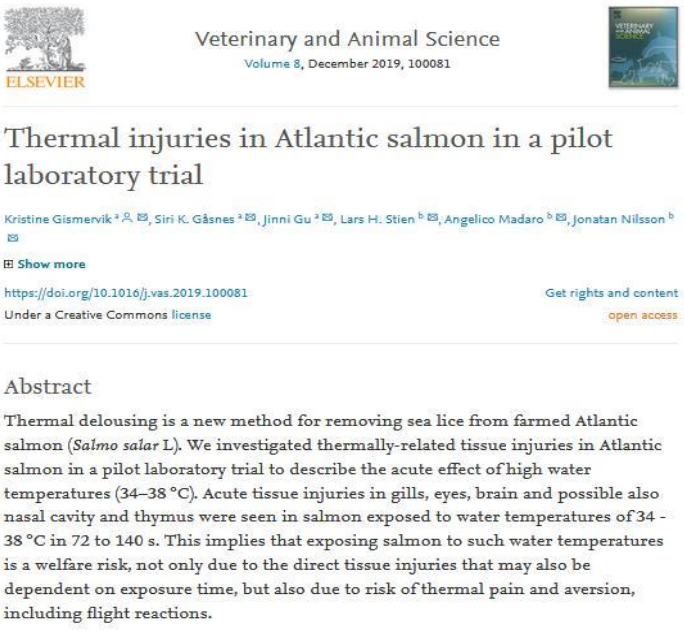
5. Evidence of recent increased/atypical mortalities? Y
If yes, facility nos/no mortality per facility/no stock per facility/reason:
wk 35 - Treatments with hydrolicer across site. Cage 4 - 1,469 (5.13%), Cage 6 - 1,264 (4.27%), cage 10 - 1,036 (3.56%)

Lice Load	Estimate numbers	high	high	high	high	high

Read more case evidence via:
"[The Welfare Case Against the Thermolicer, Hydrolicer & Optilicer: Evidence Sourced from the Scottish Government's Fish Health Inspectorate (2016-2019)]"

Scientific Support for a Ban:

Dr Sneddon's call to ban the Thermolicer and Optilicer follows new scientific evidence including two papers [published in the December 2019 issue of Veterinary and Animal Science](#) **[2]**.



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Veterinary and Animal Science
Volume 8, December 2019, 100076

Sudden exposure to warm water causes instant behavioural responses indicative of nociception or pain in Atlantic salmon

Jonatan Nilsson [a], Lene Moltumyr [a], Angelico Madaro [a], Tore Sigmund Kristiansen [a], Siri Kristine Gåsnes [b], Cecilie Marie Mejdell [b], Kristine Gismervik [b], Lars Helge Stien [a]

Abstract

Thermal treatment has become the most used delousing method in salmonid aquaculture. However, concerns have been raised about it being painful for the fish. We studied the behavioural response of Atlantic salmon acclimated to 8°C when transferred to temperatures in the range 0–38°C. Exposure time was 5 min or until they reached the endpoint of losing equilibrium and laying on their side, a sign of imminent death. At temperatures below 28°C, none of the fish reached endpoint within the 5-min maximum. At 28°C four of five fish reached endpoint, and fish reached endpoint more rapidly as temperature increased further. Fish transferred to temperatures above 28°C had higher swimming speed immediately after transfer and maintained a high swimming speed until just before loss of equilibrium. Their behaviour was from the start characterised by collisions into tank walls and head shaking. Just before loss of equilibrium they started breaking the surface of the water, swimming in a circle pattern and in some instances displayed a side-wise bending of their body. In other words, salmon transferred to temperatures above 28°C showed instant behavioural responses indicative of nociception or pain.

Download PDF online here

Read more via: New Veterinary Science Papers Turn Up Heat on the Thermolicer

In October 2019, Scottish Salmon Watch published shocking video footage of welfare abuse by a Thermolicer at Mowi's salmon farm in Loch Leven.

Read more via:
The Herald: "Scottish Government is urged to ban ‘painful’ salmon delicing tech"
Video Nasty: Thermolicer - the Heated Torture Chamber for Scottish Salmon

Parliamentary Scrutiny of Fish Welfare:

Last week (3 March 2020), Mark Ruskell MSP filed two Parliamentary Questions:

Question S5W-27712: Mark Ruskell, Mid Scotland and Fife, Scottish Green Party, Date Lodged: 03/03/2020
To ask the Scottish Government what its position is on the use of thermolicers on salmon farms and, in light of recent scientific evidence, including from the Director of Bioveterinary Science at the University of Liverpool, which suggests that welfare problems can arise from their operation, whether it will consider banning these devices.

Current Status: Expected Answer date 17/03/2020

Question S5W-27713: Mark Ruskell, Mid Scotland and Fife, Scottish Green Party, Date Lodged: 03/03/2020
To ask the Scottish Government what information it has regarding how many (a) farmed salmon and (b) cleaner fish have been killed because of the use of (i) thermolicers, (ii) optilicers and (iii) hydrolicers in each year since 2016.

Current Status: Expected Answer date 17/03/2020

In September 2018, Mark Ruskell MSP filed a Parliamentary Motion on the Welfare of Farmed Salmon following shocking video footage captured by Corin Smith of welfare abuse at a salmon farm operated by The Scottish Salmon Company in Loch Roag.

The Scottish Parliament
Pàrlamaid na h-Alba

Motion S5M-13963: Mark Ruskell, Mid Scotland and Fife, Scottish Green Party, Date Lodged: 18/09/2018 R
Welfare of Farmed Salmon
That the Parliament accepts that fish are sentient individuals with the capacity to suffer; understands that keepers of animals are obliged under the Animal Health and Welfare (Scotland) Act 2006 to prevent them suffering unnecessarily; is aware of photographic and video evidence published by *The Ferret* showing, it believes, farmed salmon at a site in Loch Roag on the Isle of Lewis, suffering from heavy sea lice infestations as well as fin and tail damage; considers that these fish will have suffered in these circumstances; notes the animal welfare concerns described in the recent OneKind report, *Fish Welfare on Scotland's Salmon Farms*; believes that the operator of the company has stated that animal welfare challenges are "industry-wide"; understands that the industry aims effectively to double production to between 350,000 and 400,000 tonnes per annum, which is estimated to be over 75 million individual fish, by 2030, and calls on the Scottish Government to support a moratorium on such expansion until the industry can guarantee that farmed salmon have a good life that is worth living.

Supported by: John Finnie, Alex Rowley, Patrick Harvie, Alison Johnstone, Ross Greer, Mark McDonald

The Scottish Government admitted in a Parliamentary Reply in November 2016 that "no safety and welfare review of the use of the Thermolicer has been carried out":

Question S5W-04592: Mark Ruskell, Mid Scotland and Fife, Scottish Green Party, Date Lodged: 09/11/2016
To ask the Scottish Government whether it has conducted a safety and welfare review of use of the Thermolicer device in salmon farms.

Answered by Fergus Ewing (17/11/2016):

No safety and welfare review of the use of the Thermolicer has been carried out by Scottish Government. The aquaculture industry is responsible for overseeing the use of treatments for disease and/ or parasites. The health and welfare of the fish on site are primarily the responsibility of the operator of the fish farm.

Current Status: Answered by Fergus Ewing on 17/11/2016

Question S5W-04593: Mark Ruskell, Mid Scotland and Fife, Scottish Green Party, Date Lodged: 09/11/2016
To ask the Scottish Government whether the Thermolicer is licensed for use in Scotland and, if not, what information it has regarding whether Marine Harvest had a Home Office licence to carry out experiments using the device.

Answered by Fergus Ewing (17/11/2016):

The Thermolicer is a commercially available treatment system for sea lice control. The use of the Thermolicer is not part of an experiment and as such does not require a Home Office Licence for operation.

Current Status: Answered by Fergus Ewing on 17/11/2016

In September 2019, the Scottish Government set up a new body to protect animals (including farmed fish) called the Animal Welfare Commission chaired by Professor Cathy Dwyer. In February 2020, twelve members of the Animal Welfare Commission were appointed including Libby Anderson of One Kind and Mike Flynn of the SSPCA (an organisation chaired by the head veterinarian of Scottish Sea Farms).

Photographic Evidence:

In August 2018, the Scottish Government published gruesome photographs of diseased salmon following a Freedom of Information request from Scottish Salmon Watch.

Scottish Government
Riaghaltas na h-Alba
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PUBLICATION - FOI/EIR RELEASE

Photographs of farmed salmon following 2016 mechanical treatment: EIR release

Published: **6 Aug 2018**
Directorate: Marine Scotland Directorate
Part of: Marine and fisheries, Public sector

Information request and response under the Environmental Information (Scotland) Regulations 2004.

FOI reference: FOI/18/01782, FOI/18/01869
Date received: 28 June and 9 July 2018
Date responded: 2 August 2018

The photographs (published online via Dropbox) included:

F2 Haemorrhaging

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


F2
Pen 10


F3

Read more via:
[Hard Evidence: Photos of Diseased & Deformed Scottish Salmon (August 2018)]
[Photo Dossier of Diseased, Deformed & Abused Scottish Salmon]
[Scottish Government rejects industry pleas on sick salmon photos]
[EXPOSED: Photo Disclosures Opens Floodgates to More Diseased & Deformed Scottish Salmon]
[Meet Pop-Eye the Scottish Salmon - Tortured by an Optilicer!]
[Hard Evidence: Photos of Diseased & Deformed Scottish Salmon (June 2018)]

RSPCA Approved Torture:

The majority (ca. 70%) of Scottish salmon farming production is certified as 'welfare friendly' via RSPCA Assured which shockingly approve the use of the Thermolicer and other mechanical treatments. The Scottish Salmon Producers Organisation claims on their web-site:

What is it?

A thermolicer is a mechanical removal treatment used to treat **sea lice** on farmed salmon.

Why is it used?

Sea lice are naturally occurring ectoparasites that can cause harm to farmed salmon, mechanical treatments are part of an array of management methods used to treat sea lice on farms.

How does it work?

Mode of action: The treatment method uses water at 30-34^{O}C, the sea lice have a low tolerance for changes in temperature causing removal of the lice. The salmon get passed through the processing loop in 25-30 seconds before being returned to their pens.

Is it safe for the fish?

Staff trained in fish welfare are always present during a treatment to ensure fish welfare is maintained throughout the process. A treatment will be stopped immediately should any concerns over fish health and welfare arise.

All members subscribe to the **code of good practice**, this details fish health and welfare standards that all farmers commit to upholding. In addition to the code farmers can volunteer to subscribe to the **RSPCA Assured accreditation scheme**. To receive this accreditation farmers must operate to the RSPCA welfare standards for Atlantic Salmon.

The Sunday Times [reported last month (2 February 2020)]:

Sun 2 Feb

THE SUNDAY TIMES | NEWS | SCOTTISH NEWS

Scientist hits out at RSPCA for backing salmon farms

The RSPCA said its food-assurance scheme existed "only to bring about welfare improvements for farm animals" and confirmed that all certified salmon farms had been assessed in the past 12 months.

On the issue of heat treatments to kill lice, a spokeswoman said: "It's not an easy issue to address, but in the absence currently of a concrete solution to eradicate lice, RSPCA Assured salmon farms can use mechanical lice-removal methods as long as the process is carried out responsibly and the welfare of the fish is a priority at all times."

The RSPCA's ['Welfare Standards for Farmed Atlantic Salmon'] (February 2018) include:

Sea lice

The problems involved with availability of effective treatments for sea lice infestations are recognised. The welfare and environmental impact of treatments must be given full consideration. The RSPCA will monitor the situation, and review new technology and research as it develops.

Read more via:
[Sunday Times: "RSPCA paid over £500,000 to back Scottish salmon industry"]
[Open letter to the RSPCA calls for an end to the certification of Scottish salmon]
[Sunday Times: "Scientist hits out at RSPCA for backing Scottish salmon farms"]
[RSPCA defends involvement in Scottish salmon farming]

Thermal treatment for lice blamed for salmon deaths

Scottish Government is urged to ban 'painful' salmon delicing tech

Treatment leads to morts in Shetland

Thousands of fish poached alive in lice treatment bungle that could hit Christmas salmon prices

Authorities mull over ban on thermal delousing

Sudden exposure to warm water causes instant behavioural responses indicative of nociception or pain in Atlantic salmon

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

Campaign group to file legal challenge against Scottish salmon farms' use of Thermolicer

Scientist hits out at RSPCA for backing Scottish salmon farms

Thermal injuries in Atlantic salmon in a pilot laboratory trial

Vet warns of head injury risk to fish during delousing

Study questions fish welfare in thermal delousing

Calls to ban salmon farms' lice treatment

Industry arch critic claims new machine 'sucks and kills' salmon

Norwegian Support for a Ban on the Thermolicer:

In August 2019, the Norwegian Food Safety Authority (Mattilsynet) recommended a ban on the Thermolicer within two years "unless new knowledge proves that it can be used in a well-justified manner in terms of fish welfare".

Mattilsynet

Statens tilsyn for planter, fisk, dyr og næringsmidler

Termisk avlusing: Fiskevelferd, forskning og avklaring fra Mattilsynet

Publisert 20.08.2019 Sist endret 15.10.2019 Skriv ut

Nyere undersøkelser viser at oppdrettslaks har klar smerteatferd når de er i vann som er fra og med 28 °C. Resultatene indikerer at det ikke er fiskevelferdsmessig forsvarlig å avluse med varmtvann fra og med 28 °C.

Mattilsynet mener derfor at metoden med bruk av vann fra og med 28 °C må fases ut i løpet av to år, dersom ikke ny kunnskap dokumenterer at den kan brukes på en velferdsmessig forsvarlig måte.

Resultatene fra undersøkelsene Havforskningsinstituttet og Veterinærinstituttet utførte for Mattilsynet, er publisert.

Publiseringen innebærer ingen endring i Mattilsynets avklaringer, oppfølging eller forventninger til aktørene

Bakgrunn for undersøkelse

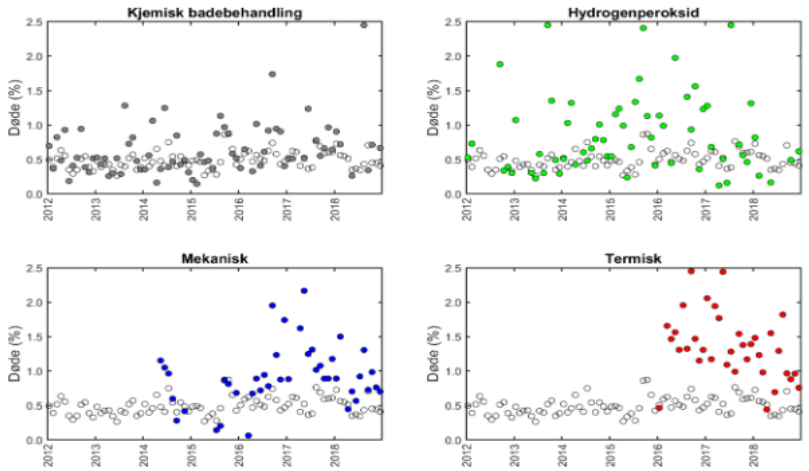
Fakta termisk avlusing

Varmtvannsbehandling eller termisk avlusing er en metode for å fjerne lakselus fra oppdrettslaks.

Metoden går ut på at oppdrettsfisken overføres til et vannbad på vanligvis mellom 28 og 34 °C i ca. 30 sekunder.

Det oppvarmede vannet dreper lakselus og den faller av fisken.

Mekanisk og termisk behandling inneholder i prinsippet mange av de samme risikofaktorene (trenging, transport gjennom rør, osv), men mekanisk avlusing har minst en ekstra mekanisk risikofaktor (f.eks spyling), mens termisk avlusing har en ekstra termisk risikofaktor. Den jevnt over høyere dødeligheten observert for termisk behandling kontra mekanisk (Figur 1) tyder derfor på at varmtvannet i seg selv medfører en risiko.



Figur 1: *Sammenligning av dødelighet per måneder for lokaliteter som ikke har rapportert en avlusingsoperasjon (åpne sirkler) vs. dødelighet for lokaliteter som har rapportert (fargede sirkler). A) kjemisk badebehandling, B) avlusing med hydrogenperoksid, C) mekanisk avlusing, d) termisk avlusing. Analysen er gjennomført basert på produksjonsområde 6-12. Produksjonsområder 2-5 er utelatt fordi disse er sterkt dominert av termisk avlusing.*

Salmon Business reported (22 August 2019):

Authorities mull over ban on thermal delousing

News by **editorial staff** - 22 August 2019

Most-used non-chemical method to remove lice may be phased out.

The Norwegian Food Safety Authority has warned this week that it may be phasing out thermal delousing over two years, the Norwegian Animal Protection Alliance wrote in a press release.

"This is too passive. It is high time that the suffering of the fish is taken seriously," said Animal Protection Alliance zoologist Susanna Lybæk.

Thermal delousing is a method that uses hot water to remove lice from fish in Norwegian fish farming. The use of thermal treatment has increased greatly in recent years and has become the most widely used drug-free lice treatment in Norwegian fish farming.

Several experts on fish health and welfare have questioned in recent years whether the method violates the Animal Welfare Act.

This week, the Norwegian Food Safety Authority has warned that thermal delousing may be prohibited, unless "new knowledge proves that it can be used in a well-mannered manner". The phase-out period is set at two years. Zoologist and scientific advisor in the Animal Protection Alliance, Susanna Lybæk, thinks this is the right time.

A study conducted by the Norwegian Veterinary Institute and the Institute of Marine Research on behalf of the Norwegian Food Safety Authority confirms that the method is painful for the salmon. Desalination with hot water above 28 degrees gives clear pain behaviour in the form of the fish swimming in panic into the vessel wall, shaking their heads and splashing on the surface.

The recommended treatment temperature is 28-34 degrees, which causes pain and panic in the salmon. The Fish Health Report 2018 reveals that some use temperatures up to 36.1 degrees. This points out the Food Safety Authority is in violation of the Animal Welfare Act.

Susanna Lybæk. PHOTO: Ihne Pedersen

"We are pleased that the Food Safety Authority is clear that one must not exceed the maximum temperature of 34 degrees," she said.

"In addition, doubts have been raised as to whether the water in the treatment chamber actually maintains the desired temperature when quickly treating a large number of fish. Questions are being asked as to whether the temperature can be a degree higher or lower than one thinks," the press release wrote.

"Here, the researchers have uncovered two major challenges for the salmon. Not only is the most common non-drug method painful, but the system in place to safeguard against it has grossly failed. This is suffering put into the system," said Lybæk.

In January 2018, [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".

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"

Scottish Salmon Watch Called for a Ban Back in 2018:

In July 2018, Scottish Salmon Watch called for a ban on the Thermolicer:

Scottish Salmon Watch, 10 July 2018

Ban Water Torture on Scottish Salmon Farms
- Over 100,000 farmed fish Thermoliced & Hydroliced to death since August 2017

SCOTTISH SALMON WATCH WELFARE

Campaigners are calling for a ban on 'torture chambers' used on salmon farms to kill parasites and treat for diseases. Data disclosed by the Scottish Government via Freedom of Information (FOI) reveals that over 100,000 farmed salmon died in 14 incidents between August 2017 and January 2018 due to lethal Thermolicer and Hydrolicer treatments **[1]**. 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 **[2]**.

'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).

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 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].

In October 2019, Scottish Salmon Watch wrote again to Scottish Ministers:

SCOTTISH SALMON WATCH WELFARE

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

9 October 2019

Dear Scottish Ministers,

Ban the Thermolicer & Hydrolicer for breaching the Animal Health & Welfare (Scotland) Act 2006

Please ban the Thermolicer & Hydrolicer for breaching the Animal Health & Welfare (Scotland) Act 2006. Scottish Salmon Watch believes that salmon farms across Scotland are breaching Section 19 ("Unnecessary Suffering"); Section 21 ("Cruel Operations") and Section 24 ("Ensuring Welfare of Animals"). Video footage published today shows how Scotland's iconic Atlantic salmon - *Salmo salar* in Latin meaning 'the Leaper' - is being systematically abused via the use of mechanical treatments.

In November 2019, Scottish Salmon Watch wrote again to Scottish Ministers:

SCOTTISH SALMON WATCH WELFARE

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

13 November 2019

Dear Scottish Ministers,

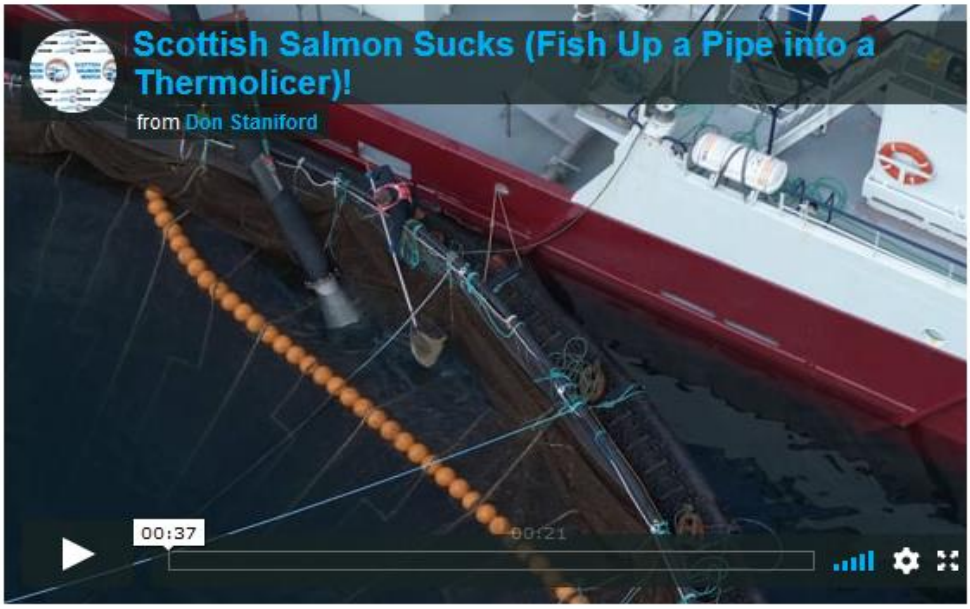
New Scientific Papers Detailing Welfare Abuse by the Thermolicer

Further to Scottish Salmon Watch's call to Scottish Ministers to ban the Thermolicer (our letter dated 9 October 2019 is re-enclosed below for easy reference), please take the time to read two new scientific papers reporting welfare abuse adding to the weight of scientific and veterinary evidence against the Thermolicer. Please re-consider your position of allowing such a torture chamber to continue to operate in Scottish waters and immediately ban the Thermolicer which Scottish Salmon Watch argues is in breach of the Animal Health & Welfare (Scotland) Act 2006.

Scottish Salmon Watch have now instructed Advocates for Animals who will be writing to the Scottish Government challenging them on the lawfulness of the Thermolicer under animal welfare legislation.

Read more via:
Sunday Times: "Scientist hits out at RSPCA for backing Scottish salmon farms"
New Veterinary Science Papers Turn Up Heat on the Thermolicer
The Herald: "Scottish Government is urged to ban 'painful' salmon delicing tech"
Video Nasty: Thermolicer - the Heated Torture Chamber for Scottish Salmon
Welfare Abuse at Scottish Salmon Farms - Why No Legal Enforcement Or Prosecutions?
Authorities mull over ban on thermal delousing
"Campaign group to file legal challenge against Scottish salmon farms' use of Thermolicer"
Daily Mail: "Calls to ban salmon farms' lice treatment"
Ban Water Torture on Scottish Salmon Farms - over 100,000 farmed fish Thermoliced & Hydroliced to death since August 2017
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
Study questions fish welfare in thermal delousing
Vet warns of head injury risk to fish during delousing

Thermal treatment for lice blamed for salmon deaths - new 'Thermolicer' method under spotlight as 6,000 fish die
Thousands of fish poached alive in lice treatment bungle that could hit Christmas salmon prices
Thousands of salmon are poached alive when a lice treatment process went horribly wrong in a mistake that could see prices soar ahead of Christmas
Fish farm firm kills 175000 salmon by accident
Revealed: how Scottish fish farm cooked thousands of salmon alive
'Thermolicer' Back-Fires Killing 95,400 Farmed Salmon - £2.7 million up in flames for Marine Harvest on Isle of Skye



Contact:

Don Staniford: 07771 541826 (salmonfarmingkills@gmail.com)

Notes to Editors:

[1] In January 2020, Dr Lynne Sneddon of the University of Liverpool wrote to the Scottish Government, the RSPCA, the Animal Welfare Commission and Scottish Parliament's Cross-Party Group on Animal Welfare:

Dr Lynne U. Sneddon

Director of Bioveterinary Science

University of Liverpool,
Institute of Integrative Biology,
BioScience Building,
Liverpool
L69 7ZB

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E lsneddon@liverpool.ac.uk

www.liv.ac.uk

7th January 2020

For the attention of:
Animal Welfare Commission
Scottish Government: Animal Health and Welfare
RSPCA Assured Science Group/Technical Advisory Group
Cross-Party Group on Animal Welfare

Opinion on the use of thermal treatments to delouse Atlantic Salmon, *Salmo salar*

To whom it may concern,

Please note the following is my personal expert opinion and does not reflect the opinion or views of my employer.

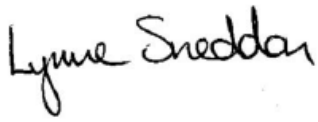
Atlantic salmon farming has increased over recent years and due to the high stocking density of sea-caged adults there is a high prevalence of disease including infestation by salmon lice, *Lepeophtheirus salmonis* (Overton et al. 2019). These lice can cause large sores and make the fish more vulnerable to secondary infections and thus seriously reduce health and welfare. Treatment has previously employed chemotherapeutants (e.g. hydrogen peroxide) to kill salmon lice but since 2015 there has been an increase in the use of mechanical (physical) and thermal (heat) methods (Overton et al. 2019). The Thermolicer® and Optilicer® treats salmon by exposing them to high temperatures which kills the lice (temperatures above 30°C and typically 34°C and above; Overton et al. 2019; Gismervik et al. 2019; Nilsson et al. 2019). These temperatures sit outside the natural temperature range Atlantic salmon inhabit or can tolerate. Elliot and Hurley (1997) determined the lower and upper temperature limits for growth of Atlantic salmon as 6.0°C and 22.5°C, with 15.9°C as the optimum temperature for growth. Salmon shows signs of stress at approximately 22°C and that the upper lethal limits were between 25° and 28°C (Anttila et al., 2014; Elliott & Elliott, 2010; Garside 1973). Further, I was the first to show that fish have nociceptors, nerve endings that respond to painful stimuli (Sneddon 2002), and demonstrated that a closely related salmonid species, the rainbow trout, *Oncorhynchus mykiss*, possessed nociceptors that responded to temperatures that would give rise to pain in humans (Sneddon 2003; Sneddon et al. 2003). These nociceptors are strikingly similar to those found in mammals including humans (Sneddon 2018; 2019) and those on the skin and cornea of the eye are excited by temperatures from 29°C and above (Ashley et al. 2006; 2007). Therefore the Thermolicer® and Optilicer® exposes Atlantic salmon to painful temperatures. Behavioural studies have demonstrated that Atlantic salmon exposed to temperatures above 28°C perform abnormal behaviours and lose equilibrium (the ability to maintain an upright position) which is a precursor to mortality (Gismervik et al. 2019; Nilsson et al. 2019). Tissue injuries in gills, eyes, brain, nasal cavity and thymus were recorded in Atlantic salmon exposed to water temperatures of 34 - 38 °C (Gismervik et al. 2019). Therefore, the high temperature treatment exposes Atlantic salmon to painful temperatures resulting in altered behaviour and damage which could lead to mortality. Indeed there are cases where the use of the Thermolicer resulted in the mortality of 96,000 salmon (Holen et al. 2019) and these heat methods result in greater mortality rates than other treatments (Overton et al. 2019).

The Farm Animal Welfare Council (FAWC) stipulates in their five freedoms that farmed animals should have "Freedom from pain, injury or disease" and "Freedom from fear and distress". FAWC also state in their recent report farmed fish have "the capacity to experience pain" (FAWC 2014) and RSPCA (2018) agrees with this opinion in their report on the welfare standards of farmed Atlantic salmon stating "fish need to be protected from pain". The Thermolicer® and Optilicer® expose Atlantic salmon to painful temperatures, result in injuries and this process is likely to cause fear and distress. Further the Animal Welfare Act (2006) states clearly that harm should be prevented and welfare promoted.

Therefore, in my expert opinion and based upon scientific studies from other laboratories, both of these thermal treatment methods contravene the FAWC five freedoms, the RSPCA (2018) welfare standards for farmed Atlantic salmon and the Animal Welfare Act (2006) resulting in harm and poor welfare and should not be employed within the Atlantic salmon farming industry.

I would be very grateful if you could please consider my opinion within your respective organisations.

Yours faithfully,



Lynne U. Sneddon (Dr)

Download Dr Sneddon's letter dated 7 January 2020 online here

UNIVERSITY OF LIVERPOOL

Dr Lynne U. Sneddon

Director of Bioveterinary Science

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Institute of Integrative Biology,
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29th January 2020

For the attention of:
Animal Welfare Commission
Scottish Government: Animal Health and Welfare
RSPCA Assured Science Group/Technical Advisory Group
Cross-Party Group on Animal Welfare

Your reference: 202000011487

Opinion on the use of thermal treatments to delouse Atlantic Salmon, *Salmo salar*

Dear Mr Burns,

Please note the following is my personal expert opinion and does not reflect the opinion or views of my employer.

Thank you for your letter dated 16th January 2020 stating your stance in regard to my letter providing an opinion based upon published scientific evidence that the use of thermal treatments in salmon is inhumane and should not be used. I appreciate your time and kindness in responding.

As a world leading authority in the field of fish welfare being invited to give plenary and keynotes across the globe I am well aware of the problems of salmon lice and the economic impact and benefits of salmon farming in rural areas. You also state the obvious employment opportunities and the efficiency of farmed salmon production. Further you mention that the industry has spent a vast amount of money along with the Scottish Government and EMFF on treatment strategies including thermal methods. You state thermal treatment is very efficient but fail to mention other treatments that are efficient that do not employ heat to delouse the salmon causing pain, tissue damage and high mortality.

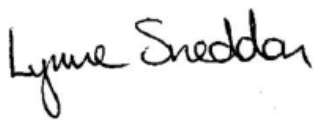
So reading between the lines in your response you are advocating the use of thermal treatment because the industry, you and EMFF have invested heavily financially and the industry is a lucrative one. In my opinion using money to justify the use of an inhumane treatment is not ethically or morally right. You do not mention any of the scientific evidence which supports my view. So can you please confirm that you and the other organisations continue to advocate this treatment despite the negative impacts upon salmon welfare? It is a yes or no question, therefore, I gratefully expect a yes or no answer.

I do think it wonderful that you are reviewing the use of thermal treatments and are gathering evidence. This approach should be commended but why have you not suspended thermal treatments in the meantime until the information is gathered. I appreciate your point about the efficient removal of salmon lice but it should not be at the expense of welfare and indeed it's all very well removing the infestation but if the fish are injured suffering, pain or are dead then the treatment is not what I would consider successful.

I have no doubt that you, your organisations and the industry wish to safeguard the health and welfare of these animals but given there are alternative treatments and given the fact thermal treatments negatively affect the welfare of salmon in my opinion the use of Thermolicer and Optilicer does cause unnecessary suffering so contravenes the Animal Health and Welfare Act 2006. Using financial reasons to justify this unnecessary suffering is ethically and morally questionable in my opinion.

I would be very grateful if you could please consider my opinion and questions within your respective organisations.

Yours sincerely,



Lynne U. Sneddon (Dr)

Download Dr Sneddon's letter dated 29 January 2020 online here

[2] 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:

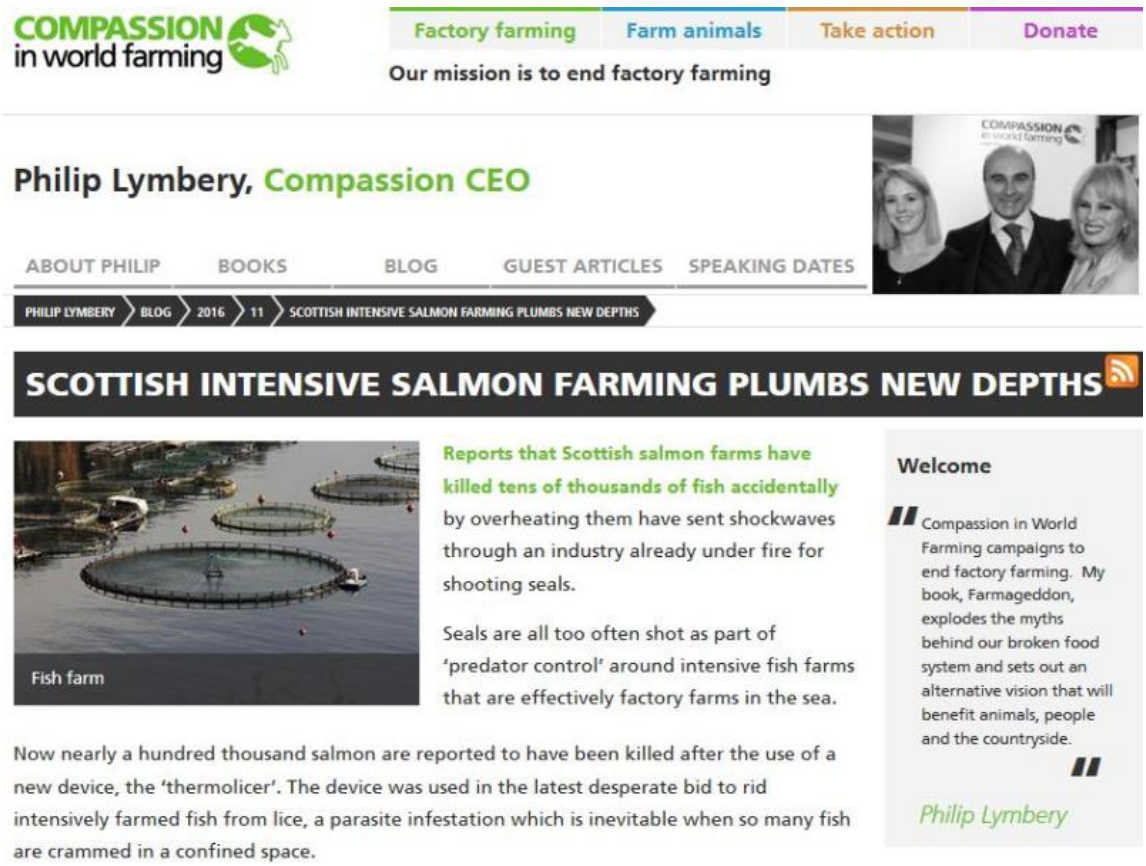
ENGLISH SUMMARY

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.

In November 2016, [Compassion in World Farming called for a ban on the Thermolicer] following mass mortalities at Mowi's salmon farm in Loch Greshornish.



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.

Moreover:

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

[3] Information supplied by the Scottish Government on 18 June 2018: FoI-18-01466 - Mortality Event Reports - June 2018

Download the covering letter from the Scottish Government dated 18 June 2018 online here

'Mortality Event Reports' included 95,751 deaths in 8 separate incidents due to the Thermolicer and/or Hydrolicer:

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

Mortality Event Report

Mortality Event ID	MRT00529
Site Name:	Druimyeon Bay
Site No:	FS0336
Start date of mortality:	13/11/2017
Period of mortality:	Weekly
Percentage mortality:	8.69
Explained/unexplained:	Explained
Reason (if explained):	post treatment hydrolicer losses, handling, CMS.
Business Name:	The Scottish Salmon Company
Business Number:	FB0169
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	2.8kg
Age:	2016 S0
Estimated number of fish lost:	45089
Additional information:	further hydroliser treatment planned, fish on functional feed, harvesting.
MS action:	Site inspection planned for wk 48.

Mortality Event Report

Mortality Event ID	MRT00514
Site Name:	Druimyeon Bay
Site No:	FS0336
Start date of mortality:	06/11/2017
Period of mortality:	Weekly
Percentage mortality:	4.44
Explained/unexplained:	Explained
Reason (if explained):	post treatment hydrolicer losses.
Business Name:	The Scottish Salmon Company
Business Number:	FB0169
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	2.5 kg
Age:	2016 S0
Estimated number of fish lost:	25607
Additional information:	further hydroliser treatment planned, fish on functional feed.
MS action:	Site inspection delayed until wk 48. figures updated 23/11/17

Mortality Event Report

Mortality Event ID	MRT00550
Site Name:	Sgian Dubh
Site No:	FS1281
Start date of mortality:	11/12/2017
Period of mortality:	Weekly
Percentage mortality:	1.16
Explained/unexplained:	Explained
Reason (if explained):	Treatment
Business Name:	The Scottish Salmon Company
Business Number:	FB0169
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	2.1kg
Age:	2017 S1
Estimated number of fish lost:	8737
Additional information:	2 x hydrolicer treatments have resulted in scale loss. Vet attending on 22/12/17.
MS action:	FHI to monitor situation going forward.

Mortality Event Report

Mortality Event ID	MRT00501
Site Name:	Caolas A Deas
Site No:	FS1291
Start date of mortality:	21/08/2017
Period of mortality:	Weekly
Percentage mortality:	1.89
Explained/unexplained:	Explained
Reason (if explained):	PGD, Treatment
Business Name:	Marine Harvest (Scotland) Ltd
Business Number:	FB0119
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	~4.5Kg
Age:	2016 Q3
Estimated number of fish lost:	4663
Additional information:	Thermolicer treatment on one cage. Decided not to treat other cages with thermolicer.
MS action:	FHI not informed at time. Site inspected 7/11/17.

Mortality Event Report

Mortality Event ID	MRT00584
Site Name:	South Sound
Site No:	FS0183
Start date of mortality:	01/01/2018
Period of mortality:	Weekly
Percentage mortality:	2.19
Explained/unexplained:	Explained
Reason (if explained):	Physical damage, thermolicer post-treatment
Business Name:	Scottish Sea Farms Ltd
Business Number:	FB0125
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	4.8kg
Age:	2016 S0
Estimated number of fish lost:	4253
Additional information:	Storm at site, fish showed damage from rubbing against net. Company biologist attended site, mortalities dropped below 1% following week.
MS action:	FHI to monitor

Mortality Event Report

Mortality Event ID	MRT00513
Site Name:	Strome
Site No:	FS0570
Start date of mortality:	30/10/2017
Period of mortality:	Weekly
Percentage mortality:	1.83
Explained/unexplained:	Explained
Reason (if explained):	post treatment hydrolicer losses.
Business Name:	The Scottish Salmon Company
Business Number:	FB0169
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	3.2kg
Age:	2016 S0
Estimated number of fish lost:	3546
Additional information:	Further treatment with salmosan planned
MS action:	Site due to fallow early 2018. FHI to monitor situation going forward with view to visiting when inspector in area

Mortality Event Report

Mortality Event ID	MRT00492
Site Name:	Loch Odhairn/Gravir
Site No:	FS0242
Start date of mortality:	30/10/2017
Period of mortality:	Weekly
Percentage mortality:	1.45
Explained/unexplained:	Explained
Reason (if explained):	post treatment hydrolicer losses.
Business Name:	The Scottish Salmon Company
Business Number:	FB0169
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	2kg
Age:	2016 S0s
Estimated number of fish lost:	2652
Additional information:	mortalty event considered to be the result of treatment and numbers should reduce next week
MS action:	FHI monitoring. Site inspected 16/8/17 and diag samples taken

Mortality Event Report

Mortality Event ID	MRT00574	
Site Name:	Inch Kenneth	
Site No:	FS0593	
Start date of mortality:		25/12/2017
Period of mortality:	Weekly	
Percentage mortality:	1.75	
Explained/unexplained:	Explained	
Reason (if explained):	Treatment	
Business Name:	The Scottish Salmon Company	
Business Number:	FB0169	
Species:	SAL	
Water Type:	S	
Weight (site average):	≥750g	
Weight (affected population average):	3.8Kg	
Age:	2016 S0	
Estimated number of fish lost;		1204
Additional information:	Treatment with hydrolicer	
MS action:	No further action	

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":

Mortality Event Report

Mortality Event ID	MRT00577
Site Name:	Strome
Site No:	FS0570
Start date of mortality:	01/01/2018
Period of mortality:	Weekly
Percentage mortality:	1.92
Explained/unexplained:	Explained
Reason (if explained):	Post hydrolicer treatment
Business Name:	The Scottish Salmon Company
Business Number:	FB0169
Species:	SAl
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	
Age:	2016 S0
Estimated number of fish lost:	not disclosed
Additional information:	Company unwilling to disclose the % of the mortality or the number of fish involved. Only that the figure is over 1%.
MS action:	Discussions ongoing to get actual figures. % figure collected during visit to office; 26/3/18

Mortality Event Report

Mortality Event ID	MRT00599
Site Name:	Strome
Site No:	FS0570
Start date of mortality:	08/01/2018
Period of mortality:	Weekly
Percentage mortality:	1.5
Explained/unexplained:	Explained
Reason (if explained):	Post hydrolicer treatment
Business Name:	The Scottish Salmon Company
Business Number:	FB0169
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	3.5kg
Age:	2016 S0
Estimated number of fish lost:	not disclosed
Additional information:	% figures now below the reporting threshold.
MS action:	% figure collected during visit to office; 26/3/18

Mortality Event Report

Mortality Event ID	MRT00582
Site Name:	Strome
Site No:	FS0570
Start date of mortality:	15/01/2018
Period of mortality:	Weekly
Percentage mortality:	1.63
Explained/unexplained:	Explained
Reason (if explained):	Post hydrolicer treatment
Business Name:	The Scottish Salmon Company
Business Number:	FB0169
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	3.5kg
Age:	2016 S0
Estimated number of fish lost:	not disclosed
Additional information:	>1% - numbers expected to drop to below reporting threshold
MS action:	% figure collected during visit to office; 26/3/18

Note that the Scotland's Aquaculture database reports that 20,440 kg - 20.4 tonnes - of mortalities came from The Scottish Salmon Company's salmon farm at Strome in January 2018.

Mortality Event Report

Mortality Event ID	MRT00465
Site Name:	Tabhaigh
Site No:	FS1297
Start date of mortality:	07/08/2017
Period of mortality:	Weekly
Percentage mortality:	3.7
Explained/unexplained:	Explained
Reason (if explained):	H2O2 and thermolicer treatment
Business Name:	Marine Harvest (Scotland) Ltd
Business Number:	FB0119
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	4.3kg
Age:	2016 Q3 & Q4
Estimated number of fish lost:	
Additional information:	Vet visited.
MS action:	Sister site visited wk 42 - morts now dropped. Wk 41 - 0.05%.

Mortality Event Report

Mortality Event ID	MRT00466
Site Name:	Tabhaigh
Site No:	FS1297
Start date of mortality:	14/08/2017
Period of mortality:	Weekly
Percentage mortality:	6.57
Explained/unexplained:	Explained
Reason (if explained):	H2O2 and thermolicer treatment
Business Name:	Marine Harvest (Scotland) Ltd
Business Number:	FB0119
Species:	SAL
Water Type:	S
Weight (site average):	≥750g
Weight (affected population average):	4.3kg
Age:	2016 Q3 & Q4
Estimated number of fish lost:	
Additional information:	Vet visited.
MS action:	Sister site visited wk 42 - morts now dropped. Wk 41 - 0.05%.

Mortality Event Report

Mortality Event ID	MRT00467	
Site Name:	Tabhaigh	
Site No:	FS1297	
Start date of mortality:		21/08/2017
Period of mortality:	Weekly	
Percentage mortality:	2.54	
Explained/unexplained:	Explained	
Reason (if explained):	H2O2 and thermolicer treatment	
Business Name:	Marine Harvest (Scotland) Ltd	
Business Number:	FB0119	
Species:	SAL	
Water Type:	S	
Weight (site average):	≥750g	
Weight (affected population average):	4.3kg	
Age:	2016 Q3 & Q4	
Estimated number of fish lost:		
Additional information:	Vet visited.	
MS action:	Sister site visited wk 42 - morts now dropped. Wk 41 - 0.05%.	

Note that 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.

[4]

Scottish Parliamentary question and answer in May 2017:

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 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.

Online via: "[Scottish Salmon's Mort Mountain Leaps Over 10 Million - FOI reveals 2.3 million dead salmon at Marine Harvest farms in 2017]".

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 Gresbornish 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" and "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".

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."

"We had some unexpected mortality during the procedure"

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" and "Treatment leads to morts in Shetland"