SALMON & TROUT CONSERVATION SCOTLAND'S AQUACULTURE CAMPAIGN

LOCH FYNE UPDATE

Executive summary

1. In the second year of their production cycle, the ten fish farms on Loch Fyne operated by The Scottish Salmon Company can hold a maximum of somewhere between 2½ and 3 million adult farmed fish.

2. In each of the last two production cycles, ending winter 2014 and winter 2016, average adult female sea lice numbers on the farmed fish in the Loch Fyne farms rose to well over the Code of Good Practice threshold, reaching levels which seriously threaten wild fish (salmon and sea trout) with high levels of lice infestation.

3. Inspection of the farms shows extensive use of a range of sea lice treatments which do not appear to have kept adult female sea lice numbers on the farmed fish below Code of Good Practice thresholds.

4. There are serious concerns over the two chemical treatments most widely used to treat sea lice. Recent research shows that the negative effects of the use of the in-feed treatment, emamectin benzoate (Slice), as widely used on Loch Fyne, have been underestimated and that residues of Slice, excreted by farmed fish and spread into the wider sea loch environment, have had a far greater impact on wild crustaceans than was predicted when Slice was first licenced. SEPA believes that the use of Slice must be phased out by 2018.

5. There are also serious concerns with the apparently very frequent use on Loch Fyne of the organophosphate treatment for sea lice, azamethiphos (Salmosan), with data suggesting that some Loch Fyne farms used this treatment up to 17 days a month last year. This has been reported to the Scottish Environment Protection Agency (SEPA), which is investigating the use of azamethiphos in summer/autumn 2016.

6. The most recent surveys of benthic pollution (organic pollution of the seabed under the sea farms with fish faeces and uneaten feed) show that at least two of the ten farms are considered 'unsatisfactory' by SEPA, one 'borderline'. Over the last two benthic surveys, half of the Loch Fyne farms have recorded a 'borderline' or 'unsatisfactory' benthic survey.

7. An examination of mortality suffered on the fish farms themselves shows a strong correlation between mortalities and average adult female lice numbers across Loch Fyne as published by the Scottish Salmon Producers' Organisation

(SSPO). Published data suggests that over one million farmed fish may have died in the Loch Fyne fish farms in 2016 with approximately 200,000 fish dying in October 2016 alone. Despite this, at least some of the Loch Fyne farms enjoyed certification by the RSPCA under the RSPCA Assured certification in 2016 but it is not clear if they still do.

8. Given all of the above, S&TCS believes that any expansion on Loch Fyne, including variation of licences to allow any increase in biomass at existing farms, should be ruled out.

9. Urgent consideration must also be given to the reduction in permitted biomass and/or relocation of farms from Loch Fyne, in order to protect wild salmon and sea trout, crustaceans and the wider sea loch environment.

10. A move to closed containment production of farmed salmon - maintaining a complete biological separation of farmed fish on the one hand, and wild fish and the wider sea loch environment on the other – would eliminate many of the problems and issues outlined above. There is significant research being undertaken in Norway into closed containment technology, and recent analysis by a leading European investment bank states that closed containment farming is now "*closer than ever before to being a financially viable alternative to traditional net pens*".

The impact of fish farming on wild fish

11. Fisheries scientists are clear that sea lice produced on fish-farms harm wild salmonids, both at an individual and at a population level.

12. Scientists from Norway, Scotland and Ireland have reviewed over 300 scientific publications on the damaging effects of sea lice on sea trout stocks in salmon farming areas, and examined the effect of sea lice on salmon, concluding that sea lice have a potential significant and detrimental effect on marine survival of Atlantic salmon with potentially 12-29% fewer salmon spawning in salmon farming areas.

13. They also note that reduced growth and increased mortality will reduce the benefits of marine migration for sea trout, and may also result in selection against anadromy [migration of fish between freshwater and seawater] in areas with high lice levels. Sea trout may also suffer altered genetic composition and reduced diversity, leading to the complete loss of some sea trout populations.

14. The science is giving us a very loud warning, but this is not being translated into effective control of fish-farms, which is essential to protect wild fish.

Fish farms on Loch Fyne

15. There are ten salmon farms on Loch Fyne, all run by The Scottish Salmon Company (with permitted maximum tonnage of farmed fish):

Meall Mhor	1345
Glenan Bay	1220.4
Gob a Bharra	1072
Quarry Point	1060
Tarbert South	1030
Ardcastle Bay	1372
Ardgadden	1696
Rubha Stillaig	741
Strondoir Bay	1767.4
Furnace Quarry	450

16. This totals a maximum of just under 12,000 tonnes of farmed fish across Loch Fyne. At an average second year of production weight of 4kg per fish, this suggests that a maximum of between 2.5 and 3 million adult fish can be held in Loch Fyne’s fish farms .

Sea lice and on-farm biomass on farmed fish in Loch Fyne 2015-2016

17. Analysis of the control of sea-lice on Scottish fish-farms is severely hampered by the lack of farm-specific sea lice data. Only aggregated sea lice data is published for 30 regions, some three months in arrears.

18. Contrast the Scottish position with the depth of data available about Norwegian farms, where real time data concerning the different life stages of, and treatments for sea lice on the farmed fish is publically available online. See https://www.barentswatch.no/en/fishhealth/. Also see below for example page.

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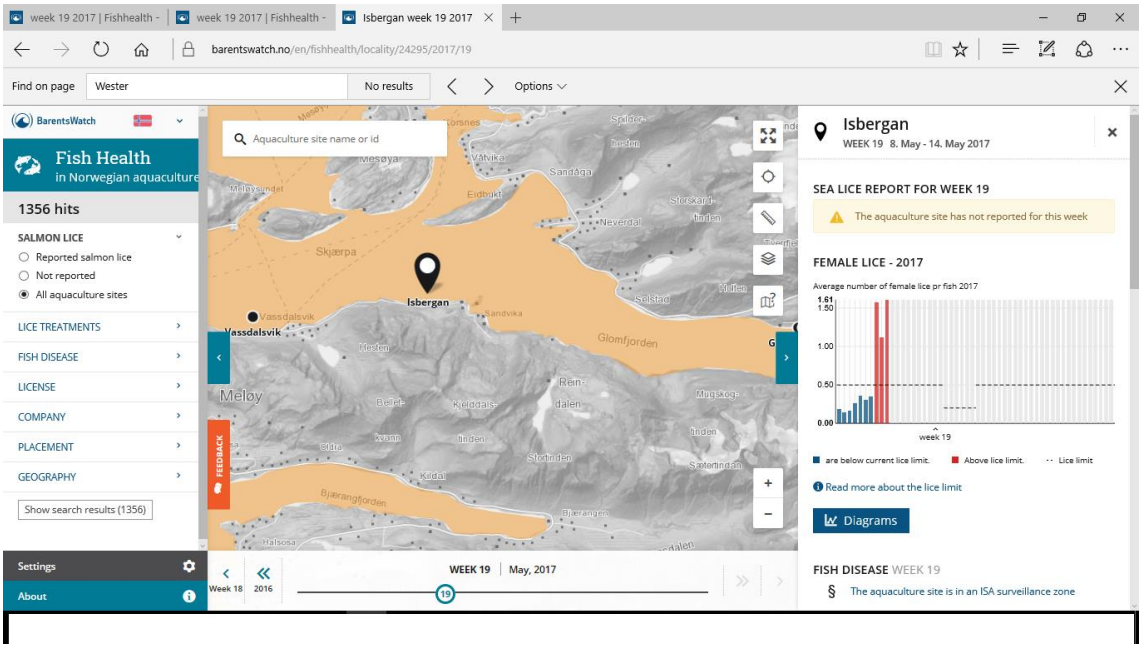
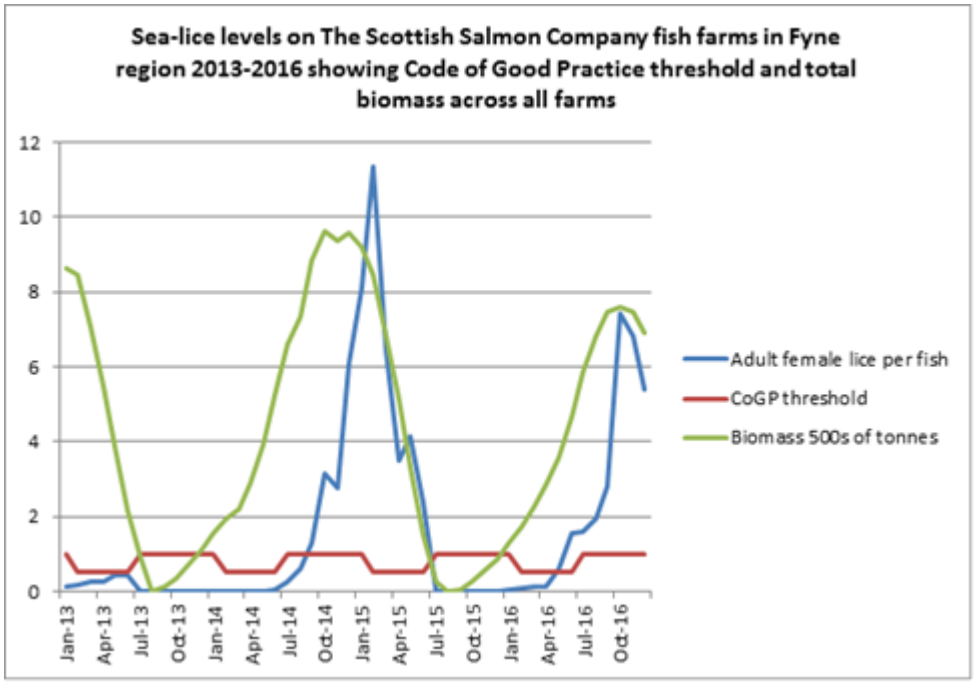


19. Nevertheless, S&TCS is constantly analysing data published in Scotland by the Fish Health Inspectorate, SEPA, the SSPO and others.

20. Analysis of aggregated sea lice data from the Loch Fyne region, as published by the SSPO, as against monthly biomass figures for each of the Loch Fyne farms, as published by the SEPA, shows that sea lice levels on the Loch Fyne farms were, on average, way above industry Code of Good Practice thresholds in both of the last two production cycles, with adult female sea lice numbers peaking towards the end of production cycles, at the worst possible time of year for wild salmon and sea trout smolts:



Fish Health Inspectorate (FHI) inspections 2015 to 2016

21. Information relating to the inspection and operational activities of Marine Scotland's FHI is published on a regular basis at http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/CaseInformation.

22. A number of Loch Fyne farms have been inspected in 2015 and 2016 by FHI.

23. Inspection of the farms by the FHI shows considerable use of a range of anti-sea lice treatments during the peaks of sea lice numbers on farms which do not appear to have kept adult female sea lice numbers on the farmed fish below Code of Good Practice thresholds.

24. Furnace Quarry was inspected on 11th October 2016. Inspectors recorded a Salmosan treatment on 1st October 2016 and peroxide treatments throughout Loch Fyne with "*lice levels coming down below 50% of untreated total, however resettlement is quick*". A number of lice damaged fish were reported in the cages with lice load being above the suggested criteria for treatment, Inspectors also recorded that "*in addition to most sites in the area (whole loch) is treating with peroxide, however treatment has been difficult because of gill issues"(*sic*).* At the time there were 100,000 fish on site of 2.9kg average weight with mortalities in the previous four weeks reported between 15 and 8.5% per cage. Tests also confirmed the presence of AGD. There was evidence of lesions suggestive of post-treatment effects and of chronic pancreas disease (PD). Tests also were positive for salmon gill poxvirus.

25. Ardgadden was inspected on 11th October 2016. A number of lice damaged fish were reported within the cages with lice load above suggested criteria for treatment. Similarly as with all other TSSC sites in Loch Fyne, the site was treated with peroxide, but inspectors noted that treatment "*has been difficult because of gill issues*". At the time there were 322,000 fish of average weight

2.2kg on site with mortality ranging between 6.24% to 31.6% per cage over the previous four weeks, averaging 20.07% across the entire farm.

26. Glenan Bay was inspected on 12th October 2016 with the inspectors recording that wild caught mixed species of wrasse were being used as cleaner fish, the wild fish being from Mull, and the farmed, ballan wrasse from Otterferry. The site reported that wild caught wrasse were more effective at lice control than farmed wrasse. The farm reported severe and active AGD with evidence of PD and recorded that the lice load was above the suggested criteria for treatment and, as with all other TSSC sites on Loch Fyne, the fish were being treated with peroxide which was proving difficult because of gill issues. At the time there were 240,000 salmon of average weight 1.3kg on site together with 16,000 mixed species of wrasse. Recent mortalities averaged 12.24% over the previous four weeks. The lice load was recorded at about five adult females per fish.

27. Gob a Bharra was inspected on 15th June 2016 by the Fish Health Inspectorate. The inspection report confirmed sea lice treatments since November 2015 with Slice on numerous occasions, Salmosan and Alphamax. Lice numbers were recorded as having exceeded the CoGP recommended criteria for treatment over the last month to the inspection date. There were no cleaner fish on site. Two to three gravid female lice were observed on fish sampled for the Veterinary Medicines Directorate. At the time there were 355,593 fish on site of roughly 1.7kg each.

28. Inspections in 2015 show more detail of the difficulties being experienced with sea lice on the Loch Fyne farms.

29. Meall Mhor was inspected on 28th January 2015. The reports recorded that lice numbers increased in November 2014 and there had been treatments with Alphamax, Salmosan, Slice and Salmosan again in January 2015. On 11th March 2015 lice levels were recorded at 10 per fish of all stages and above the suggested criteria for treatment in the CoGP for adult female lice. At the time there were 123,500 fish on site of average weight 4.9kg. The FHI conducted an enhanced sea lice inspection.

30. Ardcastle Bay was inspected on 29th January 2015. The inspection recorded the use of Slice and Salmosan in the previous two months to control sea lice which had peaked at a level of 9.57 adult female gravids per fish. Treatments were noted to "*have seen an overall reduction of greater than 50% of all stages, but not brought numbers below suggested criteria for treatment*". At the time there were 307,260 fish on site of average weight 3.9kg.

31. Quarry Point was inspected on 14th April 2015. The inspection recorded that lice levels were averaging 20 per fish of all stages with 1 to 4 adult female lice per fish. A peroxide treatment on 5th March had brought numbers down from 49.65 lice per fish of all stages to 8.64 lice per fish of all stages. At the time there were 130,907 fish of average 5.5kg on site and an escape was reported to Marine Scotland on 2nd November 2014. This was later confirmed as an escape of 2090 farmed salmon[1].

32. Tarbert South was inspected on 14th April 2015. Lice levels were recorded at 6.1 lice per fish with 0.6 adult female lice per fish. Fish had been moved onto

[1] http://aquaculture.scotland.gov.uk/data/fish_escapes_record.aspx?escape_id=2000412

the site from Ardgadden as Ardgadden was going to exceed its permitted biomass. At the time there were 53,346 fish on site of mean weight 4.7kg.

33. On 16th April 2015, Rubha Stillaig was inspected. The inspection report records that the fish had been treated with Alphamax in November 2014, Slice in January 2015, Salmosan in January 2015 and Hydrogen peroxide in March 2015. Mortalities had reached 9,000 and 7,000 in cages 1 and 2 due to gill issues. There was an average of 9.2 lice of all stages with 1.2 adult female lice per fish recorded. At the time there were 29,972 fish on site of average 4.66kg.

34. On 15th April 2015, Strondoir Bay was inspected with the inspection recording that the site had been treated with Alphamax in November, Slice in December and Salmosan in January, which achieved only a 40 to 50% clearance. Hydrogen peroxide treatment on 13th March had achieved a 90% clearance, but lice levels of all stages were currently at 9.58 with adult females at 3.2 lice per fish. Total mortalities for the production cycle were recorded at 25,692, which is "*considered low*". At the time there were 229,598 fish on site of average weight 4.9kg.

35. On 15th April 2015 Ardgadden was inspected. The inspection recorded Salmosan treatment in October and November 2014 and Alphamax in November 2014, Slice in December 2014, Salmosan in January and February 2015 and peroxide treatment in March. During the cycle there had been 39,937 mortalities amounting to 5.67%. At the time there had been 276,298 fish on site of an average weight of 4.7kg.

In-feed treatments for sea lice with emamectin benzoate, the impact on wild crustaceans and phasing out Slice

36. Recent research shows that the negative effects of the use of the in-feed treatment Slice (as widely used on Loch Fyne) have been underestimated.

37. A 2016 Scottish Association for Marine Science (SAMS) report[2] has raised serious concerns that residues of Slice, excreted by farmed fish and spread into the wider sea loch environment, have had a far greater impact on wild crustaceans than was predicted when Slice was first licenced. The SAMS authors concluded that:

    "the evidence indicates a wide scale cumulative impact and incomplete recovery between successive emamectin benzoate treatments….."

    "the ecosystem consequences of the observed reduction in crustacea are not known, but crustacea include important fishery species such as crabs and lobsters…"

    "the evidence suggests that benthic crustacean may not be adequately protected by the current regulation of EMB use in Scottish salmon farms".

    "our results indicate that, even allowing for regional differences in the physical properties of the receiving environment, the use of EMB is associated with substantial, wide scale reductions in both the richness and abundance of non-target crustacea. Given the findings in this report we believe there is an urgent requirement to… consider the likely ecosystem consequences of large scale reductions in crustacean richness and abundance at the scale of sea lochs".

38. In February 2016, SEPA's high level Agency Management Team (AMT) was asked to approve appropriate regulatory action to effect a managed phase out of the use and discharge of Slice on Scotland's fish farms, reducing use immediately and setting *"a date for the complete suspension of the relevant CAR licence conditions to prevent use of Slice at all fish farms in Scotland (at present we recommend a target of 2 years to achieve this phase-out, (in any event it should not exceed 3 years)".*[3]

39. Subsequently, the SAMS report was subject to peer review commissioned by SARF, as the review states *"to provide a wider context to the PAMP 2 (2016) Report (see below) and to address some of the concerns and recommendations from SARF Directors*" which led to the key conclusion that "*all those reviewers who commented on technical, statistical, benthic and inferential matters seemed therefore to regard this investigation as one whose nature and conclusions are insufficiently well founded to demonstrate cause, pathway or appropriately measured effect, one that is therefore unsuitable for direct use in evidence based regulation, but as one that is indicative of an issue that deserves more rigorous investigation*".

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[2] Wilding TA and Black KD (2015) "A statistical analysis of sea-lice medicine use and benthic monitoring at Scottish marine salmon farms (2002 to 2014)" in SARF098 "Towards Understanding of the Environmental Impact of a Sea Lice Medicine – the PAMP suite".

[3] SEPA (2016) Recommendations to SEPA AMT from Andrew J Rosie, Head of Operations: North, Chair ASMG, Douglas Sinclair, Lead Aquaculture Specialist and Calum MacDonald, Executive Director, (Operations Portfolio) 12th February 2016

40. SARF's director body, listed below, is dominated by bodies supportive of aquaculture, including the Crown Estate (which leases the seabed to fish farms), the Sea Fish Industry, Association of Scottish Shellfish Growers, Marine Scotland, Highlands and Islands Enterprise and the Scottish Salmon Producers' Organisation.

Azamethiphos use on Loch Fyne in 2016

41. Azamethiphos is an organophosphate pesticide, which works by interfering with the transmission of nerve impulses. It is used in fish farming (as Salmosan) to control external parasites, particularly sea lice.

42. After use, azamethiphos remains dissolved until it is broken down into non-toxic derivatives, for which a decay half-life of 8.9 days has been determined[4]. This means azamethiphos remains active for some time after treatments have finished on fish farms and treated water has been released into the wider sea loch.

43. The effect of repeat organophosphate doses on non-target organisms, such as wild crustaceans, with insufficient recovery time between doses, is to progressively depress acetylcholinesterase enzyme activity, leading ultimately to mortality.

44. Azamethiphos was used very extensively indeed on the Loch Fyne fish farms in 2016.

45. The table below shows the reported[5] use of azamethiphos on Loch Fyne farms as against the 24hr limits contained in the CAR licences which are designed to protect against the effect of repeat exposure, without sufficient recovery, to organophosphates. The right hand column shows the minimum number of days the farm must have been treating with azamethiphos to stay within its CAR licence:

Date	Loch Fyne farm	Reported use of azamethiphos (g)	CAR 24hr limit for azamethiphos (g)	Implied days of use (to remain within CAR licence)
Nov-16	Strondoir Bay	800	310.4	3
Oct-16	Ardgadden	2000	238.7	9
Sep-16	Ardgadden	2000	238.7	9
	Glenan Bay	1680	196.3	9
	Gob a Bharra	2000	223.04	9
	Meall Mhor	3600	342.6	11
	Quarry Point	2250	1069	3
	Rubha Stillaig	2660	702.8	4
	Strondoir Bay	3000	310.4	10
	Tarbert South	700	785.4	1
Aug-16	Ardcastle	4850	295.4	17

[4] https://www.sepa.org.uk/media/113498/fish-farm-manual-annex-g.pdf
[5] Scotland's Aquaculture database at http://aquaculture.scotland.gov.uk/

	Ardgadden	2000	238.7	9
	Furnace Quarry	1680	147.7	12
	Glenan Bay	1960	196.3	10
	Gob a Bharra	2000	223.04	9
	Meall Mhor	1800	342.6	6
	Quarry Point	4770	1069	5
	Rubha Stillaig	1400	702.8	2
	Strondoir Bay	4000	310.4	13
	Tarbert South	1960	785.4	3
Jul-16	Ardgadden	2000	238.7	9
	Glenan Bay	1260	196.3	7
	Gob a Bharra	2000	223.04	9
	Meall Mhor	1800	342.6	6
	Rubha Stillaig	1400	702.8	2
	Tarbert South	1960	785.4	3
Jun-16	None reported			
May-16	Glenan Bay	1960	196.3	10
	Gob a Bharra	2200	223.4	10
	Meall Mhor	1680	342.6	5
	Rubha Stillaig	1400	702.8	2
	Tarbert South	840	785.4	2

46. The number of days per month each farm must have treated using azamethiphos to stay within each farm's respective CAR licence ranges from 2 days to 17 days.

47. The data suggest that many Loch Fyne farms treated 9 or more times a month through the summer and autumn of 2016.

48. Total use of azamethiphos on Loch Fyne by The Scottish Salmon Company between May and November 2016 was 66 kilogrammes.

49. Assuming there was no breach of CAR licence conditions by any farm, and given the half-life of azamethiphos, the number of days of bath treatment with azamethiphos on the Loch Fyne farms that is implied across the ten farms represents an almost continuous exposure of the wider loch and its wildlife, including highly sensitive wild crustaceans, to significant environmentally significant concentrations of azamethiphos in the summer and autumn of 2016.

50. This has been reported to SEPA, which has responded that:

"*we would agree that the number of days treatment per month which has been reported at some sites, warrants further investigation….In the first instance we will focus our investigation on those sites in your Loch Fyne table which have reported 10 or more azamethiphos uses in a single month. It may take some time to collect the necessary level of detail from the operators, but I will provide you with an update on our findings when they become available".*

51. Given the status of Upper Loch Fyne and Loch Goil as a Marine Protected Area (MPA), as SNH describe it, "*designated to protect an assembly of seabed habitats, these long narrow sea lochs are home to the spectacular fireworks anemone, brightly coloured flame shells and the ocean quahog - one of the longest lived animals on the planet*[6]", this level of use of an organophosphate should also be of serious concern to SNH.

52. The conservation objectives and aim of the MPA are "*to recover the flame shell bed and to conserve the protected features of the Upper Loch Fyne and Goil MPA*". Protected features include burrowed mud; flame shell beds; horse mussel beds; ocean quahog aggregations; sublittoral mud and specific mixed sediment communities – many of which contain species that will be sensitive to organophosphates.

[6] http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/mpas/mpa-lfg/

Surveys of pollution and damage to the seabed under Loch Fyne fish farms

53. All fish farms must carry out a benthic survey every production cycle under the conditions of their CAR licences granted by SEPA. As SEPA states in its Fish Farm Manual the purpose of this monitoring is "to assess the 'health' of the benthos surrounding proposed and existing fish farms… to examine this risk to the local environment"[7].

54. These surveys are largely required to ensure there is sufficient pollution-tolerant fauna on the sea bed under and immediately adjacent to fish farms to 'turn over' and degrade the organic wastes (uneaten fish food and fish faeces) produced by the hundreds of thousands of farmed fish above.

55. SEPA will categorise all surveys into 'satisfactory'. 'borderline' or 'unsatisfactory' depending on the level of pollution and damage to the sea bed under any fish farm. SEPA states that a "borderline" classification is "indicate(s) that a site is close to having an unsustainable impact on the environment"

56. An "unsatisfactory" classification is "an indication that the emissions arising from the site in question are of a scale that is beyond the assimilative capacity of the local environment. This classification may relate to impacts on benthic fauna or sediment chemistry, unacceptable infeed medicine residues concentrations, or a combination of these parameters"[8].

57. On Loch Fyne, the last two surveys at each farms are shown below:

Site Name	Survey Date	SEPA Classification
Glenan Bay	28-Oct-14	Borderline
Glenan Bay	13-Dec-12	Not Accepted
Meall Mhor	03-Dec-14	Satisfactory
Meall Mhor	12-Dec-12	Satisfactory
Quarry Point	24-Nov-16	Unsatisfactory
Quarry Point	20-Nov-14	Borderline
Ardcastle	21-Jan-15	Satisfactory
Ardcastle	28-Nov-12	Satisfactory
Furnace	21-Nov-14	Unsatisfactory
Furnace	27-Nov-12	Satisfactory
Gob a Bharra	29-Nov-16	Satisfactory
Gob a Bharra	29-Oct-14	Unsatisfactory
Ardgaddan	22-Feb-15	Satisfactory
Ardgaddan	21-Nov-12	Satisfactory
Tarbert South	30-Oct-14	Satisfactory
Tarbert South	09-Jan-13	Satisfactory
Rubha Stillaig	04-Dec-14	Satisfactory

[7] https://www.sepa.org.uk/media/114761/ffm_anx_f.pdf
[8] https://www.sepa.org.uk/media/114940/fish-farm-manual-attachment-15.pdf

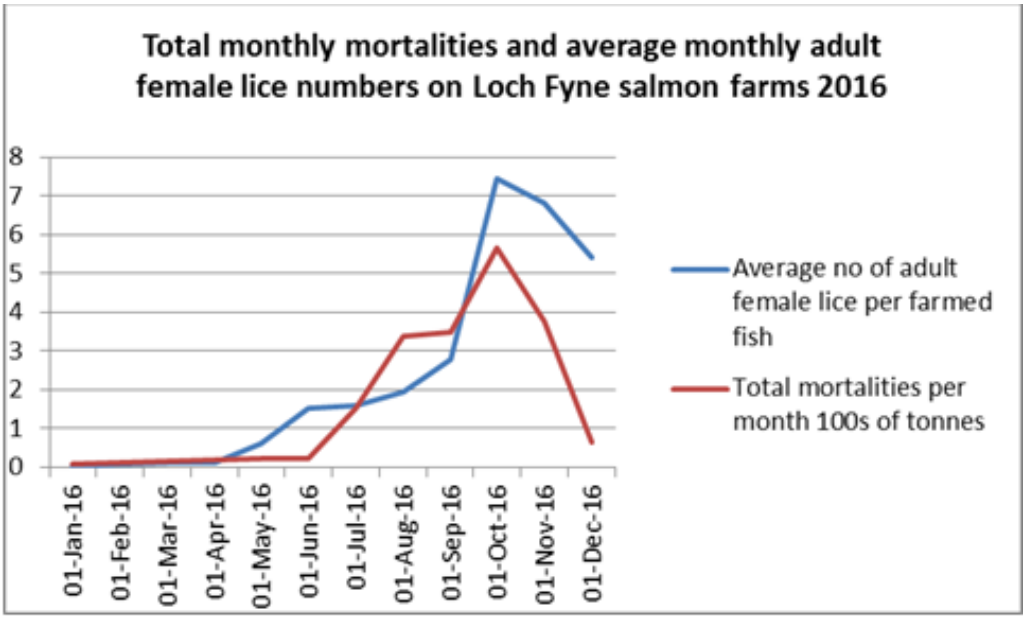
Rubha Stillaig	20-Mar-13	Unsatisfactory
Strondoir Bay	24-Feb-15	Satisfactory
Strondoir Bay	22-Nov-12	Satisfactory

58. As can be seen, the most recent surveys show Glenan Bay is ‘borderline’ and Quarry Point and Furnace are ‘unsatisfactory’
.
59. Over the last two surveys half of the Loch Fyne farms have recorded a borderline or unsatisfactory benthic survey.

Mortalities suffered at Loch Fyne farms

60. Data on monthly level of mortalities of farmed fish submitted to SEPA by The Scottish Salmon Company suggests that sea lice on the Loch Fyne farms were not only a problem for wild fish.

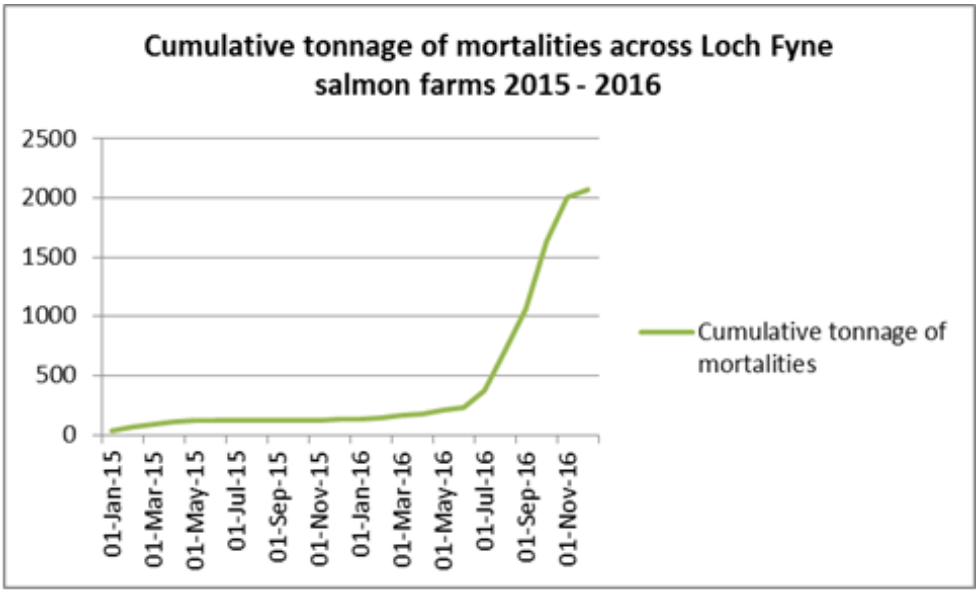
61. The data on mortalities of farmed fish experienced across the ten Fyne farms shows a strong correlation between on-farm sea lice numbers and mortalities being experienced in the farms.



62. Over the ten farms in Loch Fyne, SEPA data shows that the cumulative tonnage of mortalities - the weight of dead fish that have been removed from the cages during the month, not including fish that have been harvested as production[9] - reached 2,068 tonnes in the production cycle to December 2016.

63. For comparison, this figure is greater than the permitted biomass of any of the ten farms on Loch Fyne and is roughly twice the permitted biomass of the Tarbert South farm, Gob a Bharra or Quarry Point farms.

[9] http://aquaculture.scotland.gov.uk/glossary/glossary.aspx



64. While it is difficult to estimate how many fish this equates to, if an assumption is made that the average weight across all Loch Fyne farms in October 2016 was about 3kg[10]that would suggest that approximately 200,000 farmed fish died in Loch Fyne fish farms in October 2016 alone.

65. Over the full two year production cycle, it is likely that mortalities on Loch Fyne exceeded one million farmed fish.

66. Despite this level of mortalities, and the issues with high sea lice infestation and benthic pollution highlighted above, in autumn 2016, The Scottish Salmon Company had been supplying Co-Op supermarkets with salmon from Loch Fyne farms, with the packaging from Co-Op products from Gob a Bharra and Quarry Point both carrying the RSPCA Assured logo.

67. It is believed that at least Strondoir Bay, Meall Mhor, Tarbert South, Rhuba Stillaig and Glenan Bay[11], all of which once held or applied for Freedom Food certification, also held RSPCA Assured status.

68. It is not clear which Loch Fyne salmon farms remain RSPCA Assured if any, but neither the RSPCA, nor Freedom Foods Limited publishes a list of RSPCA Assured fish farms.

69. The Co-Op website continues to state that "*all of our 'Irresistible' fresh salmon and smoked salmon is certified against RSPCA Welfare Standards*"[12].

[10] Note that the average weight of fish in Furnace Quarry in the autumn 2016, per the FHI inspection, was 2.9kg.
[11] Per email from Gregory Brabon, Freedom Food 27th June 2012
[12] http://www.co-operativefood.co.uk/globalassets/assets/projects/2017/food-matters/animal-welfare-2016.pdf

Applications in 2017 to SEPA to expand Loch Fyne farms

70. Despite the many problems on Loch Fyne, in 2017, The Scottish Salmon Company has made applications for variations of authorisation at Tarbert South, Ardcastle and Ardgadden fish farms CAR/L/1010476, CAR/L/1010775, CAR/L/1010817 to allow them increase the biomass of farmed fish allowed at those farms even further.[13]

71. These applications would allow the following increases:

	Existing max biomass	Proposed biomass	% increase
Tarbert South	1030	1568	52
Ardgadden	1696	2381	40
Ardcastle	1372	1752	28

72. S&TCS has objected, given the available evidence above, and has argued strongly that SEPA should not grant these applications and has asked SEPA to consider revising downward the current permitted biomass across Loch Fyne as a whole, in accordance with its wider duties and, specifically, its duty and power to review, per Regulation 21 of the Controlled Activities Regulations[14].

[13] https://www.sepa.org.uk/regulations/consultations/advertised-applications-under-car/
[14] Formal letter of objection to SEPA, 24th March 2017

Conclusions

73. In the second year of production, the ten fish farms on Loch Fyne operated by The Scottish Salmon Company can hold a maximum of somewhere between 2½ and 3 million fish. This represents a huge population of potential host fish for sea lice, way in excess of any background natural host population of wild salmon and sea trout.

74. Data published by the SSPO and SEPA suggests that average adult female sea lice numbers on the farmed fish in the Loch Fyne farms rise to well over the Code of Good Practice threshold during the second year of production, reaching levels which seriously threaten wild fish (salmon and sea trout) with high levels of lice infestation.

75. Inspection of the farms by the FHI shows considerable use of a range of sea lice treatments leading up to and during the last two peaks of sea lice numbers on the farms, but these treatments do not appear to have kept adult female sea lice numbers on the farmed fish below Code of Good Practice thresholds.

76. Recent research shows that the negative effects of the use of the in-feed treatment Slice (as widely used on Loch Fyne) have been underestimated and that residues of Slice, excreted by farmed fish and spread into the wider sea loch environment, have had a far greater impact on wild crustaceans than was predicted when Slice was first licenced.

77. There are also serious concerns with the use of the organophosphate treatment for sea lice, azamethiphos, on Loch Fyne. This has been reported to SEPA. SEPA is investigating the use of azamethiphos in summer/autumn 2016 across Loch Fyne.

78. The most recent published surveys of benthic pollution (pollution of the seabed under the sea farms) show that at least two of the ten farms are considered ‘unsatisfactory’ by SEPA, one ‘borderline’, and over the last two benthic surveys, half of the Loch Fyne farms have recorded a ‘borderline’ or ‘unsatisfactory’ benthic survey.

79. An examination of mortality suffered on the fish farms themselves shows a strong correlation between mortalities and average adult female lice numbers across Loch Fyne as published by the SSPO.

80. An estimate of the cumulative tonnage of mortalities across Loch Fyne in the last production cycle suggests that over one million farmed fish may have died in the Loch Fyne fish farms with approximately 200,000 fish dying in October 2016 alone, but despite this level of mortalities and the issues with high sea lice infestation, at least some of the Loch Fyne farms enjoyed certification by the RSPCA under the RSPCA Assured certification.

81. SEPA should not grant any applications for expansion of farms or increases in permitted biomass on Loch Fyne and should consider revising downward the current permitted biomass across Loch Fyne as a whole, in accordance with its wider duties. Urgent consideration must also be given to the reduction in permitted biomass and/or relocation of farms from Loch Fyne, in order to protect wild salmon and sea trout, crustaceans and the wider sea loch environment.

82. A move to closed containment production of farmed salmon - maintaining a complete biological separation of farmed fish on the one hand, and wild fish and the wider sea loch environment on the other – would eliminate many of the problems and issues outlined above. There is significant research being undertaken in Norway into closed containment technology, and recent analysis by a leading European investment bank states that closed containment farming is now "*closer than ever before to being a financially viable alternative to traditional net pens*"[15].

[15] DNB Markets analysis, as reported in Undercurrent News (2017) Land-based salmon farming: the numbers now make sense, 29th March 2017 https://www.undercurrentnews.com/2017/03/29/land-based-salmon-farming-the-numbers-now-make-sense/