

**Environment, Climate Change and Land Reform Committee****Environmental impacts of salmon farming****Written submission from Spirit of Christianity and Knowledge (SOCK)****SUMMARY**

As an initial comment, I consider it is unreasonable for the public only to be given some two weeks to provide written responses to a 196-page report only published on 25 January 2018. I am also deeply concerned that circulation of this report has not been more widely advertised. This simply does not fit with the important democratic principle of “public participation”. The issue in question – the environmental impacts of salmon farming in Scotland – is of such national importance that proper engagement with the public must take place, and I call on the Scottish Parliament to ensure that a fair and appropriate process is adopted for this wider inquiry.

I consider it extraordinary that the Scottish Government could even consider proposing an increase in salmon farming from the present level of 165,000 tonnes to some 300,000 tonnes in 12 years’ time. Whilst the Scottish Association for Marine Science (SAMS) report acknowledges some of the detrimental effects of the industry, it omits critical facts and data which have been collated via the various research groups and individuals who have studied the impacts over the years. The report highlights some fundamental gaps in research on these impacts created by the present volume of farmed salmon in Scotland – but the gaps must be addressed as a priority (for example the impacts of sea lice on wild salmon stocks in Scotland, and the impacts of escapees in Scotland).

The salmon farming practices referred to in the report highlight frightening levels of chemical use and collateral, benthic pollution, and reveal the acute unsustainability of the present industry. A tragedy is just how very different the physiology and living conditions of a farmed salmon are to its wild counterpart and the natural conditions a wild Atlantic salmon requires. The current trajectory of salmon farming is one that is, I believe, destined to lead to an ecological catastrophe.

It is therefore essential that this forthcoming inquiry addresses the environmental impacts of salmon farming with proper independence before any conclusions and policy decisions are made – in particular in relation to the enormous proposed increase in farmed salmon production. It is unfortunate that the SAMS report is predicated on this colossal proposed increase in salmon farming by 2030. Instead of considering how to ‘mitigate’ this increase, the proper starting point for this entire inquiry would be identify what needs to be done to reduce the environmental impacts of the industry in its present form.

Comments on some of the key issues within of the SAMS report are set out below.

**SEA LICE**

Sea lice did not cause a problem until the introduction of salmon farms on the West Coast. The public have been appealing to the Scottish Government for site specific

sea lice data for years which would be of help in determining where sea lice are most prolific. The SAMS report implies that the data will be available. Yet this information which salmon farmers have in hand has continued to be withheld on grounds of 'commercial confidentiality'. Release of this data is an essential starting point for this inquiry into environmental impacts.

Management agreements were first mooted by the Scottish Government in 2001 under the Tri-Partite Working Group proposing that all the farms should be fallowed in a designated ISA area to help break the lice and disease cycle in a natural way, and thereby minimising chemical usage. Unfortunately, these areas were not recognised by some salmon farmers who chose to opt out or re-design the farming areas to suit – sometimes containing only two farms out of many. But we are no further ahead than we were in 2001 in resolving this key issue.

Adult female sea lice are counted on salmon farms. There is a **voluntary** code of good practice set up by the salmon farming industry which stated that 0.5 and 1.0 lice per fish can trigger treatments. Areas are counted, averaged and divided into regions by the farmers. This code was constantly disregarded and official reports from the industry show farm regional lice counts can average up to 10 lice per fish. The salmon farms with sea lice counts consistently above the industry's own recommended threshold were "named and shamed". But the result was that the code of good practice threshold was then lifted to a new regional average of 3 lice per fish in 2016.

To put this into context: a salmon farm with 100,000 salmon in cages where, say, there are only 3 female sea lice per salmon and which each produce one string averaging 153 eggs each, would equate to 45,900,000 larvae being washed into the surrounding waters. Sea lice have many strings and a short repeating breeding cycle suggesting significantly greater larvae production. Sea lochs now contain many salmon farms each increasing the natural sea lice base load, and these lice emanate from the farms into the surrounding waters searching for hosts to feed on.

As few as 10 sea lice can kill a young salmonid smolt.

Peer reviewed science in 2013 was published by the Scottish Government in - S. J. Middlemas et al 'Relationship between sea lice levels on sea trout and fish farm activity in Western Scotland' - from data collected by West Coast fishery trusts. The study revealed that sea lice infestations impact wild sea trout at a "critical level" within a **31km** radius of a salmon farm.

## **CHEMICALS**

There is no knowledge of the long-term effects from chemicals used by the salmon farming industry other than we know that their environmental footprint increases and accumulates with time.

Data from SEPA has indicated for many years that the sea lice were becoming immune to the 'cocktail' of chemicals. The bath treatments no longer being effective, the farmers then turned to Emamectin benzoate (SLICE) which is an in-feed treatment. However, SLICE has now become vastly ineffective through immunity

build up, as a result it is being used more frequently and is consequently more damaging for the environment.

In an attempt to overcome the damaging lice problem, salmon farmers resorted to building a 'hydrolicer'. This is a boat which has warm water containers on board with a hydrogen peroxide solution (bleach). The farmed salmon are sucked up a funnel into the tanks of alien warm water to be doused with the hydrogen peroxide in an attempt to combat the sea lice. The hydrogen peroxide is also used to try and rid the farmed salmon of Amoebic Gill Disease (AGD) which is a disease of the gills that can leave the salmon gasping for oxygen as they die. As one can imagine, the hydrolicer is a stressful event for the salmon and may help to explain the vast increase of mortalities. No mortality data is available from SEPA after 2012 due to industry lobbying on the grounds of commercial confidentiality. A 2018 newspaper headline confirmed 177,000 salmon were hauled from Loch Erisort but being a fraction of the millions of diseased salmon disposed of by the industry in a single year. Indeed, an FOI disclosure revealed that Marine Harvest alone had mortalities of some 2.3 million salmon in 2017.

Hydrogen peroxide is the latest hope for salmon farmers struggling to control sea lice infestation, but it does not kill all the lice outright. Sea lice are merely stunned for a short period of time before many revive. These sea lice will find new hosts either in the cages or in the form of wild fish, thus increasing the base load.

SLICE works by preventing the sea lice from casting their shells. The residues from this chemical find their way into the water column and are deposited on the sea bed. Shellfish such as prawns and lobsters have been reported showing signs of shell deformity.

SEPA data produced headlines which read: " 45 lochs polluted by fish farm pesticides".

The shellfish (lobsters, scallops, crabs, mussels, prawns) market is a large industry on the West Coast with many families dependent on this for their livelihood. Shellfish are currently not tested by the Food Standard Agency for salmon farm chemicals. The current level of chemical usage is environmentally unacceptable, and any expansion of the industry with its additional chemical load cannot be accommodated.

## **WRASSE**

Wrasse can help to reduce the sea lice in the farmed fish to a small extent. The main fish used is the ballan wrasse and fishermen up and down the coast have been paid handsomely to catch these fish, but their numbers are diminishing and so other wrasse are increasingly being caught and used by the industry. Introducing wrasse into cages is a risk. There are the unknown dangers of introducing new parasites and diseases, as well as the waste and considerable welfare issues relating to wrasse.

It is not easy to rear these fish commercially as they are very shy, delicate and reliant on water temperature. It is difficult to achieve the correct sizing – too big and they can eat the salmon's eyes, and too small and they cower in corners to escape

from the salmon. The cheaper and easier option is for the farmers to take the wrasse from the wild.

Marine Scotland's reply to my request for information was that there was no quota on wrasse and they did not know what effect there would be on the wider environment with the depletion of these fish. Wrasse is a 'cleaner' fish and therefore very important to sea loch eco-systems.

## **PREDATORS**

The SAMS report implies that farms can be moved away from seals. However, the reason we have seals in the sea lochs is because the salmon farms have come into the area. In the old days, the seals were out to sea and only came ashore to pup, but now seals move inshore to the farms. One can site a farm away from a seal colony as the report suggests but of course the seals can swim.

## **FEED**

Feed for industrial aquaculture demands and has always been a major environmental concern. What is alarming in this section of the SAMS report is that due to the requirements of the increasing aquaculture industry, the industry is feeding salmon on unnatural substances. The natural food for farmed salmon is in short supply as it is being hoovered up increasingly to feed the expanding industry. It is very difficult due to industrial confidentiality to determine absolutely what these fish are fed on.

The suggestion in the SAMS report of using GM crops (while acknowledging the European reluctance to allow GM products in diets) is terrifying. However, I understand that in Inverness that there is an on-going experiment regarding GM feed for farmed salmon. The report offers cultivated micro-organisms but states they would be "more costly and needing more development."

Addressing the environmental regulation of the salmon farming industry is one that requires wise governance and a long-term, sustainable perspective of what is best for Scotland. I find it unacceptable that the SAMS report could even suggest the inclusion of GM feed for farmed salmon. Again, how far things have strayed from the life and habitats of the wild Atlantic salmon. It is important to think back to the 1970's prior to salmon farms, when the West Coast was alive with wild salmon. As one bag netter said to me: "There were so many salmon we did not know what to do with them". Now the netting stations are all closed, the jobs have gone and we are forbidden to sell even one wild salmon as they are so scarce.

What next? Hoovering up industrial quantities of krill to feed caged salmon? What will be the outcome for species such as penguins and whales dependent on these krill?

Where and how do SAMS propose to replace the sand eels, sprat, anchovies, capelin, herring, mackerel, blue whiting, zooplankton used in farm feed? If you take feed away from other species to feed farm fish then you adversely affect the survivability of other marine life. We need to look at the sustainability of our planet

and harvest what our environment can safely offer. We must ensure a vibrant healthy breeding stock is allowed to continue.

We can use the word sustainable but as it means “*Able to be continued*” and “*Not making excessive use of natural resource*”, I do not think it is an appropriate adjective to describe the salmon farming industry.

## **ESCAPES**

This is an on-going problem and it is serious for the wild Atlantic salmon is the ‘king’ of fish. It starts its journey in its natural river and swims through the wide Atlantic Ocean for food before returning back to its same river of origin to breed. Stop and think just how fantastic its anadromous life cycle is. Are we content to put this extraordinary fish at risk with escapees from salmon farms? Farmed fish which escape from cages pose the major risk of interbreeding with wild salmon, and in turn producing a genetically poorer fish. This cross breed will be weaker and unlikely to be able to swim to the likes of Greenland and return, leaping the wonderful waterfalls reaching the upper parts of Scotland’s rivers ready to spawn. Are we to gradually to watch the ‘king of fish’ resort to a flabby, enfeebled cross-breed that is only fit to swim round in circles?

To the best of my knowledge, no case has been taken by the Scottish Government or its agencies in relation to salmon farm escapees over the last 20 years, despite overwhelming evidence of massive escapes from individual known farms. Marine Scotland data shows that in the last 5 years a staggering excess of ½ million escapees have been reported which was a considerably higher number than the previous 5 years.

## **BENTHIC POLLUTION**

This is another unseen threat:- Reports from divers reveal that there are piles of muck below salmon farms, with some piles as high as 14 feet. This is no doubt the case as a result of farms sitting on the same site for years. Research is on-going into algae blooms and whatever way you look at it, the water quality must be impaired. The SAMS report states: “Aggravated footprints only exceed 4% of total seabed in a few lochs and voes” (my emphasis).

Many of these farms are crammed close into the coast to take advantage of calmer waters, but with poor flushing capacity they require to move sites. The loch area they take up is constricted to what they find convenient. That same area is used for lobster creels, prawns, scallops, mussel farming, recreation and sport and has in the past been the intimate environment for the once abundant but now almost extinct sea trout. The location of these farms places them directly in the way of the migratory routes of vulnerable out-going smolts and returning adult salmon. The king of the fish is now greeted with salmon farm disease, sea lice and pollution in their once pristine sea lochs.

Journalist Charles Clover wrote citing the report by Marine Ecologist, Malcolm MacGarvin that: “This year salmon farms will produce 7,500 tons of nitrogen, equivalent to the annual sewerage of 3.2 million people, and 1,240 tons of

phosphorus, comparable to sewage produced from 9.4 million people. The ecological result is effectively greater than the sewage produced by Scotland's 5.1 million humans".

## SCOTTISH GOVERNMENT PLANNING REGULATIONS

The Scottish Government is introducing Marine Protected Areas (MPA), which are to protect areas of seas, oceans, estuaries and lochs. MPAs restrict human activity for a conservation purpose typically to **protect** natural or cultural resources.

It would therefore be appropriate to remove salmon farms from MPAs as a priority.

The numbers of salmon and sea trout on the West Coast have fallen dramatically since the introduction of the salmon farms. The Scottish Government would appear to acknowledge this in their current National Marine Plan (paragraph 7.18) which states:

***“Wild salmon and migratory fish:** The farming of salmon carries a risk of impacting on wild salmonids. There is an ongoing programme of research to establish the effects of interactions with wild salmonids, primarily because of the potential impact of sea lice, but also because the potential for impact of escaped farmed fish on the genetic stock of wild salmonids is, as yet, not fully understood. Introduction of disease to wild populations is also a risk. There is a continuing presumption against further marine fish farm developments on the north and east coasts to help safeguard migratory fish species.”*

## CONCLUSION

An inquiry into the environmental impacts of salmon farming in Scotland is sorely needed. But it must be independent and maintain a scientific rigour. If the inquiry is, as I fear, premised to sanction a doubling in farmed salmon production, then I call on Scottish Ministers to re-frame the purpose of this exercise.

The SAMS report would benefit from a clear identification of the gaps in scientific research relating to these environmental impacts in Scotland. Why is it, for example, that the Government has not yet commissioned a study into the impacts of sea lice on wild salmon populations? Why is there no proper transparency on sea lice numbers and levels of escaped salmon?

It would seem that overseas aquaculture regulations are of a standard that foreign companies find it easier to establish their operations in Scotland. But why is regulation here not more stringent? Why are steps not being taken by the Scottish Government to protect our ever so precious natural capital? Once-pristine lochs are now host to a range of ecological issues including destruction of the benthic layer, incidents of chemicals present in the water, and the unnatural changes to crustaceans and other marine life.

A final element which this Inquiry must address and which the SAMS report omits is the import of salmon eggs from abroad to Scotland. Indeed, FOI data reveals that some 90% of farmed salmon in Scotland originate from eggs imported from out with

Scotland. In 2005 the percentage level of imported eggs was 13%. We are now, therefore, at a stage where the majority of farmed salmon in Scotland would appear to be non-native.

At this crossroads of a forthcoming inquiry, the Scottish Government needs to take stock of how far adrift Scotland currently is from managing salmon sustainably. As a country we urgently need to retreat from the current level of salmon farming and invest for the long term in restoring our wild salmon fisheries and the multiple benefits this would bring to the economy and the environment.

**Jenny Scobie**