Monday 30th September, 2024

Dear Members of the Rural Affairs and Islands Committee (RAI),

Re Inquiry into the implementation of the session 5 Rural Economy and Connectivity (REC) Committee's inquiry into salmon farming

I hope this correspondence finds you well.

Please find enclosed Animal Equality UK's written comments in relation to the RAI Committee's ongoing Holyrood inquiry. We hope that this will assist in your efforts to consider the extent to which the REC Committee's recommendations have been implemented since 2018.

Should you require any further information or clarification, please do not hesitate to contact me.

Yours sincerely,

Abigail Penny
Executive Director
Animal Equality

Introduction

In 2018, the Scottish Government's Rural Economy and Connectivity Committee (REC) undertook an inquiry into the salmon farming industry in Scotland. It fell short of calling for a moratorium of new salmon farms, on the condition of a series of recommendations on actions the industry ought to undertake. This submission from Animal Equality UK - for the attention of Members of the Rural Affairs and Islands (RAI) Committee conducting a follow-up 2024 inquiry - identifies key recommendations from the 2018 report and maps them against progress made over the past six years.

About the author

Animal Equality is an international animal advocacy organisation working in defence of farmed animals. Most known for our investigative exposés, public awareness campaigns, legal advocacy efforts, and corporate outreach activities, our work is frequently featured in mainstream media publications, including the BBC, The Times, the Financial Times, the Guardian, the Independent, the Herald, the Scotsman, the Press and Journal and more.

This submission has been created with expert insights provided by Mark Borthwick. Mark is an innovative aquaculture specialist and OOCDTP doctoral fellow focusing on on-farm behaviour change in salmon farming. He was formerly Head of Research at the Aquatic Life Institute, and has contributed to fish welfare legislation in a number of policy environments, including the UK All-Party Parliamentary Group for Animal Welfare, Holyrood, the Biden Administration, Global GAP, and the European Commission.

Review of recommendations and progress since 2018

> ***<u>RECOMMENDATION 2</u> The Committee strongly agrees with the view of the Environment, Climate Change and Land Reform Committee (ECCLR) Committee that if the industry is to grow, the "status quo" in terms of regulation and enforcement is not acceptable. It is of the view that urgent and meaningful action needs to be taken to address regulatory deficiencies as well as fish health and environmental issues before the industry can expand. (see paragraph 61)***

Many of the fish health and environmental advancements claimed by industry, such as closed and semi-closed systems, have been shown in other policy contexts to be ineffective.

New salmon pens, such as those proposed in Loch Long, are using semi-closed systems to improve fish health. Such benefits are guaranteed to be extremely short lived. Recirculating Aquaculture Systems (RAS), and other closed and semi-closed systems, are far from a mature science, and do not currently represent a solution to the issues presented by salmon farming. A semi-closed system in the Loch Long style, operated in Norway by Andfjord salmon, had to resume chemical treatments in 2022 after an unexpected, smaller type of lice was found to have breached containment (Jensen, 2022).

Lice are ubiquitous in ocean water, and have proven to be exceptionally able to overcome containment. Mowi's plans to place salmon in the brackish waters of Loch Etive (Outram, 2023), where the waters are fresh enough to be deleterious to lice (Guttu *et al.*, 2024), ignores both the physiological damage done to salmon by exposure to fresh water while in their oceangoing phase (Thompson *et al.*, 2023), and the fact that different lice species show different toleration to salinity. Studies of the two common Atlantic lice,

Lepeoptheirus salmonis and *Caligus elongatus*, have shown that *L salmonis* is more tolerant than *C elongatus* to low salinity (Gargan *et al.*, 2016).

There are several other case studies that show lice adapting to attempts to contain or mitigate their impact on salmon. In May 2017, an outbreak of sea lice was identified in the Magallanes region of Chile, previously thought to be too cold for Chile's local *Caligus rogercresseyi* louse (Arriagada *et al.*, 2019). Arriagada identifies that the southern cultures of *C rogercresseyi* had a low resistance to organophosphates, which were 99.9% effective in the newly infected farms, compared to the national mean of 53%, suggesting these lice were a cold-resistant wild strain, and were not brought in from other farms. A key factor here is the immunodeficiency caused by placing smolts in waters with low salinity, as proposed on the Loch Etive site (Outram, 2023). The pathogenic logic of the brackish strategy will add a beneficial selection pressure onto whatever lice survives best in this environment (Hinchliffe *et al.*, 2016).

Tasmania, situated in the South Pacific Ocean, has no wild salmon, so was thought to have no transmission vector for sea lice. However, sea lice emerged in Tasman waters in 2010 (Nowak *et al.*, 2011). *Caligus longirostris*, yet another species of louse, host-switched from endemic fish local to Australian waters, such as the sand flathead, and latched onto the farmed Atlantic salmon. Studies have shown a consistent level of ambient sea lice, floating in the water far away from salmon farms, which will be able to interfere with any new salmon farming system (Gargan *et al.*, 2016; Diggles *et al.*, 2021).

Salmon farms represent the meal of a lifetime for these lice, and any that finds itself able to adapt to survive and eat in the farm environment is hugely competitive. Perfect containment is impossible in agriculture (Helfrich and Libey, 1991), and any attempt to contain against sea lice will create new pathogenic frontiers. Industry representatives from Iceland's salmon industry have identified that the timeline for adaptation and resistance to new lice treatments is five years (Nelsen, 2019).

> ***RECOMMENDATION 9*** ***However, the Committee considers the current level of mortalities to be too high in general across the sector and it is very concerned to note the extremely high mortality rates at particular sites as highlighted in the data recently produced by the SSPO. It is of the view that no expansion should be permitted at sites which report high or significantly increased levels of mortalities, until these are addressed to the satisfaction of the appropriate regulatory bodies.***

There are two distinct phases where mortalities can occur within the production of farmed salmon: freshwater and saltwater. Over 16 million salmon died on Scottish farms last year. It is possible to estimate the number of deaths that happen in freshwater, from the Scottish Government's annual Fish Farm Production Survey 2022 (see table 19 below).

This gives the ratio of ova laid down to smolts produced in Scotland as 1:4. A small proportion of other smolts are produced elsewhere. If the same ratio applies to all smolts put to sea in Scotland, then, in 2022, 55,300,000 smolts were put to sea, so 77,420,000 ova must have been laid down two years earlier, in 2020. Therefore 22,120,000 fish must have died before the surviving smolts were put to sea, marking a 29% mortality.

Calculated in this way, the average mortality from ova being laid down until the smolts are ready to put to sea is 31%, for the five most recently reported ova year-classes (2016-2020).

If this average freshwater mortality is combined with the circa 25% average mortality rate for smolt year-classes at sea (reported in the Scottish Government's annual Fish Farm Production Surveys), then the average mortality for the whole process is around 48% across the salmon farming industry in Scotland.

Fish Farm Production Survey 2022					Therefore (if the same ratio applies to actual smolts put to sea)			
Table 19								
	Actual smolts put to sea (includes Scottish & non-Scottish smolts)			Ratio ova to smolts produced in Scotland	ova laid down was	in year-class	Therefore deaths in freshwater for each year-class	
2018	45,500,000			1.5	68,250,000	2016	22,750,000	33%
2019	53,000,000			1.4	74,200,000	2017	21,200,000	29%
2020	52,500,000			1.6	84,000,000	2018	31,500,000	38%
2021	51,100,000			1.4	71,540,000	2019	20,440,000	29%
2022	55,300,000	122%	2018-2022	1.4	77,420,000	2020	22,120,000	29%
		22% increase in number of smolts put to sea 2018-2022						31% average mortality ova laid down to smolts put to sea, for 2016-2020 year-classes

Smolts Produced and Put to Sea

Table 19: Actual and projected smolt production and smolts put to sea (millions) during 2013-2024

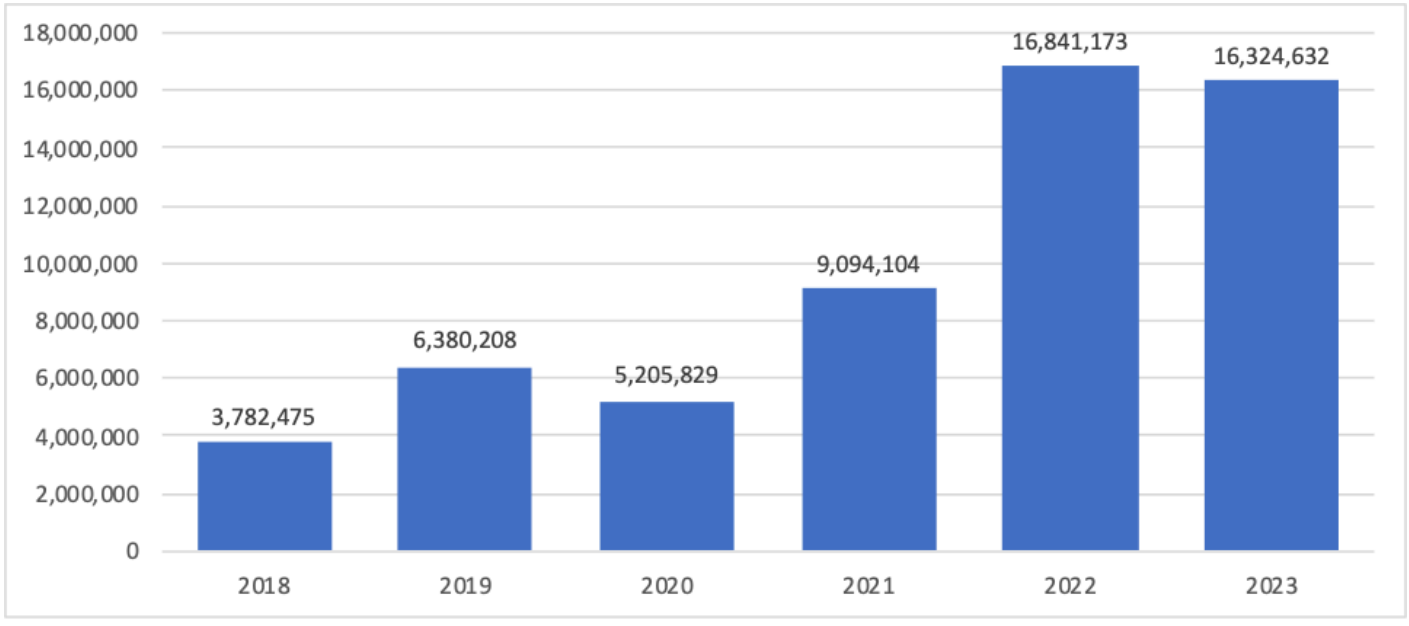
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Actual smolts put to sea	40.9	48.1	45.5	43.0	46.1	45.5	53.0	52.5	51.1	55.3		
Smolts produced	40.5	45.0	44.6	42.9	46.2	47.1	51.4	50.5	51.2	55.1		
Estimated production	28.1	39.9	43.4	36.6	39.3	46.1	38.6	52.1	55.6	54.1	47.1	56.6
Ratio of ova laid down to smolts produced	1.6	1.6	1.5	1.5	1.4	1.5	1.4	1.6	1.4	1.4		

Fish Farm Production Survey 2020 notes, under Table 19:

"The figure for the number of smolts put to sea includes smolts produced in England and smolts imported from elsewhere, whereas **smolt production data relate only to those produced in Scotland.** Smolt producers estimate putting 47.1 million smolts to sea in 2023. The ratio of ova laid down to hatch to smolts produced in 2022 was the same as the ratio in 2021."

The mortality data published by the FHI shows that the level of mortality in 2018, which the Committee considered "too high", was over four times higher by 2023. Even this data hugely underreports the number of deaths (see below).

Salmon mortalities in freshwater and seawater reported by FHI:



Source:https://www.gov.scot/publications/fish-health-inspectorate-mortality-information

(Data based on the start date of the week of the mortality event)

Salmon Scotland data reveals that, since 2018, 34 sea farms have suffered mortality of over 50% during the marine part of the production cycle. Only one of those incidents was in 2018. Eight incidents were in 2022 and ten in 2023. This is in addition to mortality in freshwater, before the fish were put to sea.

Data released this week also shows that Culnacnon suffered from 86.6% production cycle mortality, the highest ever on record. Evidently, high death rates continue to persist on Scottish salmon farms.

> ***RECOMMENDATION 11*** ***The Committee considers it to be essential that this work delivers high levels of transparency that will provide confidence to all stakeholders. It therefore recommends that the information provided in future should provide an accurate, detailed and timely reflection of mortality levels including their underlying causes across the whole sector. It should also incorporate a mechanism for reporting where early harvesting has been carried out because of a disease outbreak. (see paragraph 150)***

Incomplete mortality data continues to be a problem, for a number of reasons:

Late reporting
A significant number of mortalities aren't reported to the FHI within 30 days of them occurring. Many only come to light months or even years later, when they are discovered during routine inspections. This is problematic because the reporting of mortalities should lead to the inspections, not the other way round.

According to data provided by FHI, since 2018 there have been 343 mortality events that were not reported to the FHI within 30 days.

FHI mortality reporting threshold limits
Under a voluntary reporting agreement between the sector and FHI, farms need only to report weekly mortality figures when they exceed set threshold limits.

Table of mortality reporting thresholds, seawater farms:

Site Ave. Weight (g)	Max. weekly mortality (%)	Max. 5-week rolling mortality (%)
Under 750	1.5	6
750+	1.0	4

Source: https://thecodeofgoodpractice.co.uk/documents/chapter-4-seawater-lochs.pdf

Table of mortality reporting thresholds, freshwater lochs:

- Egg to 1st feed – 10 weeks – 6% weekly
- 1st feed to 5g – 10 weeks – 3% weekly
- 5g to smolting – 20 weeks – 1.5% weekly

Source: https://thecodeofgoodpractice.co.uk/documents/chapter-3-freshwater-lochs.pdf

Six week grace period

The same voluntary agreement also states that farms are not required to report any fish deaths at all during the first six weeks after stocking a marine site. In an email, FHI representatives wrote:

> *"Mortality figures are not required to be reported until 6 weeks after original stocking of the site. Higher mortalities at this time are often associated with handling at transport when smolts have first went [sic] to sea."*

Given the FHI reporting thresholds and six week grace period, up to half the deaths in marine farms could be going entirely unreported. This is apparent when comparing SEPA's mortality figures (published without the FHI's reporting thresholds on Scotland's Aquaculture website, but only giving the weight of mortalities) with FHI's figures, which report the weight and the number of dead fish. SEPA's figures for the weight of dead fish are usually much higher than FHI's.

Culls

Where fish are culled on a farm, those figures are not included within the FHI published mortality data. For example, the first image below shows the mortality spreadsheet for a freshwater farm with an 80% mortality rate after a problem with air in the water lines. A later inspection report shows that the remainder of the stock were euthanised.

Site Name	SiteNo	Case No	Date reported	Water Type	Start Date	End Date	Size of fish	Average weight of affected population	Species	Yearclass	Weekly or 5 weekly?	Mortality rate recorded(%)
Couldoran Incubation Unit	FS1051		19/12/2022	FW	05/12/2022	11/12/2022	Eggs to 1st feed	0.2g	SAL	Q3	Weekly	80.00

Gas issue recorded on the site (w/b 5/12/2022) water demand to the hatchery tanks coupled with a suspected fracture in the site pipe resulted in vortex supersaturating air into the water lines. This was vented through the system into the comp hatches resulting in loss of 1159752 (80.01%), and the remainder of 289861 (19.99%) were euthanized. Additional drum filter has been installed on the influent water to ensure degassing prior to entering the comp hatches.

> ***<u>RECOMMENDATION 19</u> The Committee welcomes the recent voluntary commencement of sea lice data provision by the SSPO on an individual farm basis. However, it agrees with the ECCLR Committee's position that the provision of sea lice data should in future be mandatory for all salmon farms in Scotland. (see paragraph 213)***

Since 2021 the number of breaches of the Code of Good Practice (CoGP) lice count guidelines has decreased but the number of no counts has increased to one in five in 2023.

	2021	2022	2023
Above CoGP guidelines	**23.2%**	**17.6%**	**16.4%**
Above 0.5 in Feb-Jun	10.0%	9.8%	8.6%
Above 1 rest of year	13.2%	7.8%	7.8%
Below Threshold	**60.8%**	**65.0%**	**65.3%**
Count is blank	**16.0%**	**17.4%**	**18.3%**

	2021	2022	2023
Above CoGP guidelines	**1390**	**1294**	**1153**
Above 0.5 in Feb-Jun	600	721	605
Above 1 rest of year	790	573	548
Below Threshold	**3639**	**4785**	**4587**
Count is blank	**956**	**1278**	**1287**
Grand Total	**5985**	**7357**	**7027**

Source: https://scottishepa.maps.arcgis.com/apps/webappviewer/index.html?id=2218824350e5470e8026076d4138da58

It should also be noted that, while sea lice reporting is now mandatory, there are many reasons accepted by the Government for non-reporting; importantly, these result in no-counts. While lice data includes salmon and trout, the Government supplied data does not record the species at the farm.

Scottish SEPA 2024 data also shows that three sites - Outer Bay (Loch Droighniche), Sian Bay, and Turness - have only provided one single lice count between them so far in 2024.

The FHI replied to an email querying the lack of reporting for Outer Bay:

> *"Sites holding broodstock are not exempt from the requirements of The Fish Farming Businesses (Reporting) (Scotland) Order 2020 (legislation.gov.uk). The legislation requires sea lice data to be reported or in the event that no count is undertaken, a reason for no count should be reported. The site in question has complied with the requirement of the legislation".*
>
> ***RECOMMENDATION 45 The Committee shares the view of the ECCLR Committee that the siting of farms in the vicinity of known migratory routes for wild salmon must be avoided. (see paragraph 384)***

The 2018 inquiry reports that "The Committee understands that there is at present only limited empirical scientific evidence to suggest that wild salmon are infected by sea lice as they pass salmon farms." We

would question the factual basis of this, since the connection between salmon farms and the desertification of wild salmon is well established in the literature.

Scholars suggest that, based on the reproductive patterns of the sea louse, open-net farms will be producing billions of sea lice larvae, which are flushed out to sea on the tide (Costello, 2009). Many studies have linked the presence of salmon farms with sea lice incidence in wild salmon (Carr and Whoriskey, 2004; Penston *et al.*, 2004). In an attempt to understand the concurrence of salmon farm development and wild salmonid depletion, Krkošek found that lice infection pressure for salmon passing along a migration corridor with a salmon farm in was 73 times greater than ambient levels (Krkošek, Lewis and Volpe, 2005; Krkošek *et al.*, 2007) Even a few sea lice can be fatal to juvenile salmon, who usually hatch upstream long after the hen salmon has departed. From their smoltification until they return to the river to spawn, salmon are solitary, meaning the chances of them meeting another adult salmon while juvenile are slim, happening only by accident of chance while they are oceangoing. However, since open net farms are placed in tidal estuaries suitable for salmon, this provides a close contact between juvenile salmon undergoing a normal migration, and a critical mass of adult salmon.

> ***RECOMMENDATION 46*** ***The Committee is of the view that a similar precautionary approach must be taken in Scotland to assist in mitigating any potential impact of sea lice infestation on wild salmon. It therefore recommends that there should be an immediate and proactive shift towards siting new farms in more suitable areas away from migratory routes and that this should be highlighted in the strategic guidance on the siting of salmon farms. (see paragraph 386)***

Despite the 2018 report recommending that no new salmon farms are placed in salmon migration routes, this has continued to happen. On 29th August 2023, Argyll and Bute voted to approve a new salmon farm incorporating twelve 120m cages in North Kilbrannan. The Kilbrannan Sound is on the migration route for salmon up into many waters in Argyll and Bute, which are salmon migration paths. A local resident, representing Cour Ltd., asked the council to consider the precautionary principle, as recommended by the 2018 report, but the council, who have complete arbitration when it comes to approving new sites, and have no obligation to read or consider the 2018 report, unanimously voted to approve the new farm (Argyll and Bute Council, 2023).

The Scottish Government's annual statistics report a continued downward trend of wild salmon populations. Catch of wild salmon for 2023 was 32,477. This is a decrease of 24% year-on-year, 77% of the previous five-year average, and the lowest catch ever recorded (Scottish Government, 2024b).

> ***RECOMMENDATION 56*** ***The Committee endorses the ECCLR Committee's recommendation for urgent research on the subject and the consideration of ways to incentivise the industry to explore further use of the technology. However, it is aware that RAS is not the only closed containment option and would encourage wider research on alternative technologies.***

Much progress has been made regarding containment salmon production systems, such as Recirculating Aquaculture Systems (RAS), but little has been done to mitigate their environmental risks. RAS farms enjoy grandfathered exclusions from environmental protection legislation (such as Nitrate Vulnerable

Zones, as defined in Directive 91/676/CEE [1]). Experts calculate that RAS facilities, such as the facility due to be constructed in Cleethorpes, Lincolnshire, will be producing 17,000 times the permitted pollution from a terrestrial farm, and any lapse in filtration will be devastating for the surrounding environment (Borthwick, 2024).The salmon farming industry technical handbook states that:

> *"[In order to prevent mass mortality] the system needs to be in excess of 99.99% reliable, of the order required of the chemical process or nuclear industries." (Stead and Laird, 2002)*

Despite this, in a 2023 meta-study of 239 studies on nitrogen filters, it was discovered that none operate with 99.99% efficacy. A wide range of operating results were reported, with the highest being 98%, but the interquartile range being 44-70% (Suriasni *et al.*, 2023). The voluntary salmon mortality data published by the FHI shows many examples of filters failing, and fish dying, and this is from the freshwater stage of the salmon life-cycle, where the environmental needs are much less complicated (Scottish Government, 2024a).

> *"Large quantities of water that has not been properly filtered and has hosted a high concentration of farmed fish with protein feed, can release into to [sic] the environment a significant amount of nitrates and pollute the groundwater." (Giammarino and Quatto, 2015)*

> ***§45. "It is clear that significant increases in sustainable aquaculture production will be required, both at a domestic and global level, in order to deliver improved population health and food security in future." Source: Sainsbury's Supermarkets Ltd***

Atlantic salmon are carnivorous animals; to suggest that there will be food security improvements while feeding fish to farmed fish is unrealistic.

The National Food Strategy identifies that, if we want to continue to eat animal meat into the future, we need to drastically reduce the amount of animal products we consume (Dimbleby, 2021, p. 109). Farmed salmon are fed feed consisting of soy, poultry meal, and caught fish (Borthwick, 2020), with estimates suggesting that trillions of caught fish are fed to farmed salmon every year (Borthwick, 2021). The UN suggests that 19% of all caught fish are processed into fish feed for aquaculture (UNFAO, 2024, p. 69). Salmon farming is not sustainable aquaculture, it is a major contributor to overfishing, and the salmon farming industry is a primary contributor to the "full exploitation" of 58% of global waters (Dimbleby, 2021, p. 134).

The feed conversion of giving fish feed to salmon is reductive, meaning that fewer calories and much more environmental pollution are produced by food which is almost entirely palatable by humans.

> ***§90 It was suggested in both written and oral evidence that there was potential for the Scottish brand to suffer damage because of the environmental and health issues facing the industry.***

In April 2024 DEFRA revised the Protected Geographical Identification of 'Scottish Farmed Salmon' to, simply, 'Scottish Salmon'. This makes it increasingly difficult for consumers, both domestically and abroad, to distinguish the production method of the fish flesh they are buying. This move seriously risks misleading

consumers. As identified in the 2018 report - “Increasing and persistent controversy around fish health, environmental degradation and doubts about the quality of farmed salmon means that brand Scotland itself is at risk with far-reaching implications for other producers of food labelled “Scottish" (Rural Economy and Connectivity Committee, 2018).

> ***§141. The Committee was also aware of some negative media coverage around such issues in the lead up to and during its inquiry. This coverage often included a suggestion that the level and nature of mortalities in salmon farms was being covered up by producers.***

The salmon farming industry is highly consolidated, and has an unprecedented amount of lateral movement to control data flow out of the farm. As these farms are secure and remote, farms can control the flow of images out of them.

But when drones are flown over the sites, a very different story becomes clear. Some sites have lice infestations so bad that the lesions on the fish can be seen from the air (McVeigh, 2023). Animal Equality’s use of drone footage has identified several significant lapses in standards and practice (*Fish Expert Reacts to Investigative Footage From Scottish Fish Farm* [Youtube Video], 2023). Animal Equality UK’s exposés have revealed Scottish salmon suffocating to death on multiple farms, having their gills cut while conscious, being thrown and kicked by workers, and suffering from painful wounds and deformities. See more here: https://animalequality.org.uk/news/

And, as you will be aware, just last week the BBC reported that “tonnes” of moribund salmon were removed from Dunstaffnage farm just hours before Members of the Rural Affairs and Island Committee visited for a fact-finding tour (Keane, 2024).

Light is the best disinfectant, and data ought to be compulsorily, and non-voluntarily shared. This should be held to a rigorous standard. The voluntary data published by the aquaculture industry is so poorly formatted it is almost impossible to use. Mortality data provided by the FHI fails to include deaths of animals during transport, those culled, and so-called ‘cleanerfish’. There are also substantial reporting thresholds in place, thus masking the real scale of the issue. Adequate monitoring and inspections should be mandated, enforced, and sufficiently resourced so they can become a vehicle for continuous improvement. Reporting should be rigorous enough to be meaningful to the public. For an industry with an increasingly precarious social license to operate, we should be fostering a data-rich environment with the potential for genuine improvement.

> ***§155 It is suggested in the evidence received by the Committee that the principal contributor to the increase in farmed fish mortality is that of complex gill disease.***

Gill health is, indeed, complex and multifactorial (Boerlage *et al.*, 2020). In the voluntary mortality data to EOY 2023, 414 (8.5%) reported cases mention anaerobic gill disease (AGD), and 2302 (47%) mention “gills”, which is a combination of gill damage (e.g. through jellyfish), gill pox, and nebulous terms like ‘gill damage’ and ‘general poor gill health’ (Scottish Government, 2024a). It is worth noting that, even though half of all reported mass mortality events mention gill health, gills are comorbid with other factors. Fish in general poor health can be wiped out through an emerging gill disease that might have not affected them if they were in fettle. A good analogy is with respiratory health in humans. Older people, and the clinically

vulnerable, are much more likely to be killed by respiratory viral infections like influenza and coronaviruses, because they are in general poor health. Gill health diseases are not a problem that will go away, but rather, the inevitable conclusion of aggregate poor health in the intensive system. We have not seen any proposal from the salmon industry which proposes a viable solution to the multifactorial bacterial, viral, water quality, and genetic factors which contribute to gill disease.

Moving the salmon into higher-control management regimes, such as RAS, vastly increases the risk of catastrophic human failure when it comes to water quality.

Biofilters, which contain nitrifying bacteria which dissolve nitrogenous waste products, are susceptible to failure caused by biotic disruption of the bacterial culture, or saturation if overloaded with more nitrogen than expected (Nędzarek *et al.*, 2022). The nitrification rate of the bacterial culture varies depending on their transmission and reception of chemical signal molecules. If the bacteria fail to detect a quorum of neighbours, they do not form an effective polymer matrix, and their ability to filter nitrogen is greatly diminished. Maintaining the health of the bacterial culture is a complicated process which is a challenge for producers to reliably manipulate (Williams and Cámara, 2009; Ruiz *et al.*, 2020). In the voluntary salmon mortality data, there are several examples which illustrate the challenges of maintaining the perfect conditions in this high-control environment. In a Dawnfresh site in 2019, a “disc filter got blocked”, but the alarm system had not been set, resulting in the death of 23,347 salmon. Inevitable mechanical failures can compound with human error to become a catastrophic event. Fungus, bacteria, and viruses, are all in a perpetual dance with the salmon, vying for advantage. In August last year, Applecross hatchery experienced a “malfunction with a chiller unit which led to improper function of the units [sic] biofilters”. This led to a fungus build-up on site, which caused the deaths of 213,823 salmon. Applecross has a persistent fungus problem, and appears unable to clear the fungus culture out of their complex system of pumps and filters. They reported seven mass mortality events due to fungus in the past two years.

To highlight the complexities of analysing the industry data, these incidents are reported as ‘fungus outbreak’, ‘water quality issue’, and ‘furunculosis’. The pathology of furunculosis includes pus and inflammation in, and fusing of, the gill lamellae. A certain analysis could categorise these incidents, also, as gill disease. If this dataset was properly managed, this kind of higher-level analysis would be possible for industry to undertake to improve standards, practice, and outcomes.

We would recommend that we properly resource SEPA and the APHA to send qualified officials to salmon farms on a routine basis, in order to encourage a culture of feedback, learning, and change. An FOI request in 2020 revealed that only 35 salmon farm visits had ever been conducted by the APHA (The Animal Law Foundation, 2022, p. 338). Close monitoring, high standards, and reliable enforcement, are required to both improve fish health, and regain public confidence in the industry.

Conclusion

The 2018 report fell short of calling for a moratorium on new salmon farms on the condition that progress was made by industry in a wide range of areas. Animal Equality has been following advancements in salmon farming during this period, and we do not believe that meaningful progress has been made in terms of the environmental risks, or animal health, of the processes involved in salmon farming. Most of the advancements proposed, such as RAS and brackish salmon rearing, have been shown by both international experience, and the pathogenic logic of factory farming, not to be successful.

It is clear that the precautionary principle called for in 2018 has failed to be applied by key stakeholders, including local councils that are ultimately responsible for granting planning permission to new farms. At this time, in order to prevent catastrophic environmental impacts and animal health disasters which damage Scotland's reputation both at home and abroad, we would recommend the introduction of a salmon farming moratorium until these serious and pervasive challenges have been adequately addressed.

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