An aerial photograph of a salmon farming vessel's deck. A large, dark net is spread out on the deck, containing many fish. The net is held up by ropes and orange floats. In the background, the ship's superstructure is visible, including a crane and various pipes. The ship's name 'PRINCESS' and 'Sraclia' are visible on the side. The water is dark and choppy. The overall scene is busy and industrial.

WildFish.

Scottish salmon farming

Harvesting,
sea lice and
disease

Monday 17th October 2022

Executive summary

This report explores how the Scottish salmon farm industry is exploiting the use of ‘harvesting’, both in its mandatory reporting and as a disease management technique, and how this misuse is impacting on the environment, fish welfare, and the salmon entering the food chain across the UK and beyond.

In contrast to wild Atlantic salmon, farmed salmon spend their lives in tanks and cages; first in a freshwater hatchery, then in netted cages in coastal waters. The latter stage of the salmon farming process is referred to as ‘open net’ farming due to the free flow of water through the nets. By using open nets, salmon raised in intensive farms across the west Highlands and Islands of Scotland are in constant contact with the surrounding marine environment, giving rise to a number of issues. These include exposure to diseases, harmful water conditions and parasites (including sea lice); Sea lice build up in huge numbers on these farms, spreading to, harming and, in some cases, killing wild salmon and sea trout.

The culmination of a farmed salmon’s life is its slaughter for market; known as ‘harvesting’. This report explores two issues related to the industry’s use of ‘harvesting’. One is its use by the industry to avoid the mandatory reporting of sea lice on its farm; In doing so, the true picture of infestation levels and potential risk of spread to wild salmon and trout is being obscured. This has profound repercussions for the health and survival of farmed and wild fish alike.

The second is its use of targeted prolonged harvesting of salmon suffering from disease(s).

When deployed rapidly, harvesting can prevent ongoing suffering and curb environmental impacts of disease and/or sea lice infestations. However, this report finds that the industry is inappropriately using targeted harvesting of diseased pens over a prolonged period of many months, under the guise of ‘welfare’ or ‘reducing biomass’. In one case, despite a number of diseases seriously affecting the fish, harvesting was ongoing for 5 months on Loch Duart’s Sound of Harris farm in 2021. During this time weekly mortality rates reached over 6%, contributing to the farms overall production mortality rate of 50.3%. Such harvesting is seemingly ineffective in controlling or treating diseases. It results in continued suffering and high mortality rates in the remaining fish which continue to be grown to larger sizes.

**Since March 2021,
Scottish farms
have failed to
report lice counts
by exploiting this
regulatory loophole
over 600 times.**

600

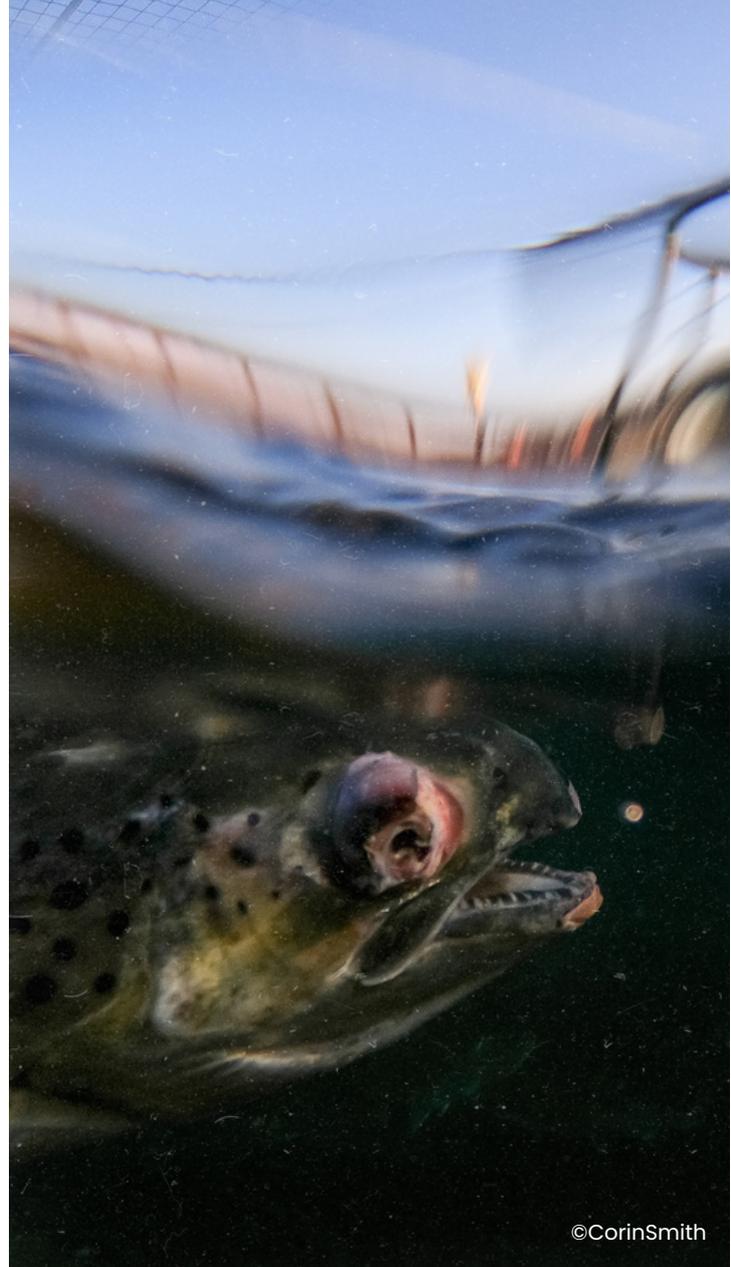
The report concludes that these dual uses of the term 'harvesting' by the industry raise some serious questions about the quality control of the intensive farming industry producing Scottish salmon. Often certified under schemes such as RSPCA Assured, GlobalGAP, Aquaculture Stewardship Council (ASC) and Soil Association, Scottish salmon is being marketed as a high welfare, healthy and appetising fish to restaurants, supermarkets, and the public. However, this report puts the spotlight on an industry that is failing to control common parasites and diseases or maintain adequate conditions for keeping fish healthy, whilst appearing to conceal the true extent of these failures.

Average marine production cycle mortality rates are close to 25% and reported sea lice levels have reached more than 20 times those stipulated in the industry's own Code of Good Practice. The true picture of open net salmon farming in Scotland undermines the industry's assertion that it produces seafood 'responsibly'. [1]

All the information, on which this report is based, is in the public domain. This would suggest that regulators (including Marine Scotland and the Fish Health Inspectorate), certification bodies (including RSPCA, Aquaculture Stewardship Council (ASC), Soil Association), suppliers and supermarkets are routinely turning a blind eye to serious welfare abuses and environmental impacts.

In allowing these diseases to proliferate in farmed salmon through prolonged or delayed harvesting, salmon farming companies are risking the health of populations of wild Atlantic salmon and sea trout.

Furthermore, they are potentially sending to market fish that have been raised in pens suffering from high mortalities, disease and sea lice infestations. This is the antithesis of responsible farming.



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Introduction

The wild Atlantic salmon is one of the UK's most iconic species. Beginning its life in our rivers and streams, the Atlantic salmon then undergoes an incredible physiological transformation, enabling it to make its way out to sea and across thousands of miles of open water. The few that survive this epic journey, return to spawn in the same rivers and streams they were born in.

Far removed from this incredible migration, is the life and journey of a farmed Atlantic salmon. These selectively bred Atlantic salmon spend the first year of their lives reared in tanks in land-based freshwater hatcheries, before being transferred to netted cages in coastal waters. In these cages, hereafter referred to as 'open net salmon farms', due to the free flow of water through the nets that enclose the fish, the salmon will spend up to two years before being harvested.

Through the use of open nets, the farmed fish are in constant contact with the surrounding environment, which raises significant and unique biosecurity issues; namely exposure to disease, parasites (such as sea lice), and harmful water conditions, both for the farmed fish and surrounding wild fish and sea life populations. [2] For example, accumulation of sea lice within these farms pose welfare issues for the farmed salmon, and can also spread into the surrounding environment, increasing the risk of potentially fatal lice infestations in wild Atlantic salmon and sea trout. [3]

Moreover, enclosing the farmed fish in cylindrical shaped nets allows fish waste, chemicals, and uneaten food to freely discharge into the surrounding waters.

Diseases, including those linked to farmed salmon's direct contact with the surrounding environment, are becoming increasingly prevalent on farms.

Consequently, the mortality rates of the farmed salmon in these marine cages are unacceptably high. The most recently available data shows that 24.1% of the salmon stocked into Scottish marine farms died before harvest.[4]

On average, the number of farmed salmon that die before harvest on Scottish marine farms.

1 in 4

Mowi, the largest Atlantic salmon producer globally, reported gill infections, low oxygen, algal blooms and disease treatment losses as top mortality causes in 2021. [5] With an annual production of over 200,000 tonnes of Atlantic salmon across the industry in Scotland, equivalent to tens of millions of fish, these cumulative factors present a huge environmental, sustainability and welfare issue.

Despite this, the Scottish Government continues to support the Scottish farmed Atlantic salmon farming industry's targeted expansion, from the current production of roughly 200,000 tonnes annually, to 300-400,000 tonnes annually by 2030. In fact, often referred to as the "Blue Revolution", the Scottish Government promotes the Scottish Atlantic salmon farming industry as a sustainable and innovative livestock production model. However, as the industry expands, so too does criticism of its high environmental costs, the inherent unsustainability of its business model, and the unacceptable levels of animal suffering due to disease, parasites and poor husbandry.

The culmination of a farmed salmon's life, after up to 24 months in open-net farms in Scotland's coastal lochs, is its slaughter for market. This is referred to within the salmon farming industry as 'harvesting'. This report explores two issues related to 'harvesting'.

One is the industry's use of 'harvesting' as a reason to avoid reporting its sea lice figures (as is required by the Scottish Government), and the environmental and welfare impacts of this. The second is related to the industry's use of harvesting as a means of disease management.

When deployed rapidly, harvesting out can prevent ongoing suffering, disease spread and mortalities in farmed salmon populations, and, in the instance of parasitic sea lice, can reduce the risk of sea lice transfer to wild salmonid populations.



However, this report explores how the Scottish salmon farming industry is harvesting farmed salmon for prolonged periods from farms affected by disease(s)/parasites. As fish continue to be grown to a larger size, the environmental and welfare costs can be huge.

Section 1

Exploiting harvesting as a reporting loophole



Harvesting out and reporting lice

The Scottish salmon industry claims to operate openly and transparently. Its trade representative body, Salmon Scotland, states on its website that it “offer[s] open and transparent insight in to how [the industry] operates”.[6]

However, this report finds that, far from being transparent, the industry is using reporting loopholes to obscure the true picture of an environmentally harmful intensive livestock production model that suffers from huge numbers of parasitic sea lice. Additionally, by exploiting these reporting loopholes, the industry gives the illusion that it is in control of the complex, and often concurrent, parasites and diseases that plague the intensively farmed fish. Not only does this fail to “protect [farmed salmon] from pain, suffering, injury and disease” as per the Animal Health and Welfare (Scotland) Act 2006, but it also risks fatally infecting migrating young wild salmon and sea trout.[7] High and persistent numbers of adult sea lice in farmed salmon increase the numbers of free floating juvenile lice which, when carried away from the farms via water currents, can attach to and kill wild salmonids.[8]

Sea lice reporting requirements

Since March 2021, with the introduction of the Fish Farming Businesses (Reporting) (Scotland) Order 2020, it has been a legal requirement for every active marine open-net salmon farm to report weekly average female sea lice (AFSL).

This represents the average number of sea lice attached to each fish, and therefore the likely level of sea lice infestation, on a farm. In principle, by monitoring weekly sea lice levels, Marine Scotland (currently responsible for regulating sea lice levels) aims to ensure that satisfactory measures are in place by the Scottish aquaculture industry for the prevention, control and reduction of sea lice on farm sites.[9] Although now a legal requirement, weekly average sea lice counts continue to rely on unaudited self-reporting at a farm level. Furthermore, although not formally documented by Marine Scotland, farms are able to avoid reporting sea lice counts for a number of reasons. One of these reasons, commonly used in industry self-reporting, is “withdrawal period prior to harvest”.

Failure to count sea lice

Based on the available data, there are clear and frequent instances of the reasoning “withdrawal period prior to harvesting” for lack of supplying weekly average sea lice counts for prolonged periods of time, where the lice burden in the weeks preceding has been high. One example can be seen in the weekly lice reports for Bastaness farm, owned by Cooke Aquaculture, in 2021. Following four consecutive weeks of average lice counts above Marine Scotland’s “increased monitoring level” of 2.0 (3.44, 3.50, 4.49, 4.39), during which harvesting was already taking place, the farm then switched to reporting “No Count” for the following five consecutive weeks. The reason given for the farm not reporting sea lice levels was “withdrawal period prior to harvest”.

Given the high, and increasing, lice burden in the four weeks preceding this, it is highly likely lice numbers continued to increase on this site. The industry's own Code of Good Practice (CoGP) suggests treatment for sea lice should commence at average lice levels above 0.5 and 1.0 AFSL (depending on the time of year). Had Cooke continued to report high lice levels, it would have likely have been under pressure to treat the fish, at a financial cost. Additionally, in not reporting weekly sea lice counts during this period, the Bastaness farm was also able to evade the increased surveillance or penalisation by Marine Scotland associated with lice counts exceeding 2.0 and 6.0 as specified in the enforcement regime.[10]

The adult lice present on the farm would have contributed to the quantity of free moving juvenile lice, which emanate from the farms and can lead to fatal lice infestations in wild salmon and sea trout. Continued high lice levels would also have impacted on the welfare of the farmed salmon, prolonging the suffering associated with chronic and high sea lice burdens, and likely contributing to an increased mortality on the site.[11] Not only does this represent a severe welfare and environmental concern, but it raises questions and doubts about industry claims of "responsible" farming practices and "an example of a 'good food' in terms of its standards of production", as claimed by Salmon Scotland.[6]

Another example of a company exploiting this reporting loophole, following a period of high lice counts, is Scottish Sea Farm's South Sound farm in 2021.

In the 13 weeks following an average sea lice count of 3.22, during which time physical delicing was being performed, this site only reported a weekly average lice count on 5 occasions. Despite physical delicing (see description below) and destocking during this 13-week period, lice levels remained high at 2.47 and 2.88 in weeks 51 and 52 respectively. This is suggestive of poor treatment efficacy, and an ongoing high lice burden.

Scottish Sea Farms then switched from reporting weekly average sea lice counts, instead reporting "withdrawal period prior to harvesting" for a further 8 weeks. This example demonstrates a period of 22 weeks in which average sea lice levels were inappropriately monitored, under-reported and potentially poorly controlled. The above findings raise questions around whether the salmon being harvested during these time periods, from pens likely experiencing high counts of parasitic sea lice, would have entered the UK and/or international food chains.



Physical delicing refers to two methods of non-chemical lice treatment which aim to physically remove attached lice; both these treatments require fish to be crowded and pumped out of the cages and onto treatment boats: Thermolicers bath farmed salmon in approximately 34oC water for 30 seconds (salmon show signs of stress approx 22°C, with deaths being reported at 25 – 28oC).[12,13] Hydrolicers used pressurised jets of water to dislodge lice from the salmon. Both practices are associated with high treatment mortalities, damage to vital organs such as the gills and skin, and raise significant concerns around suffering and welfare. [14]

Case study: Scottish Sea Farms

We have also identified examples where salmon farms have logged “withdrawal period prior to harvest” in place of a weekly sea lice count for such a prolonged period within a production cycle that it makes it impossible to accurately assess lice populations. This has profound issues for both farmed and wild salmonids.

The lack of monitoring and/or reporting compromises the welfare of the farmed fish at that site, potentially allowing the uncontrolled build-up of lice within this population. Furthermore, it prevents the vital communication of lice levels between farms with a Farm Management Area (FMA) or shared water body as per the Code of Good Practice (CoGP). As such, this does not allow neighbouring farms to act appropriately and synchronously in order to “reduce and manage risks posed by infectious agents and parasites”(CoGP). Not only does this not adhere to the CoGP, and the majority of certification schemes, but it also risks higher prevalence of mobile lice within a water body, further increasing potentially fatal lice infestations in wild salmonids.[1]

Scottish Sea Farms’ Hunda farm (Orkney) gave no count for 25 weeks of the most recent single production cycle, instead stating “withdrawal period prior to harvesting”.

This translated into no weekly lice counts being given for almost the entire final six months of this farm’s 18-month marine production cycle. Considering that this farm is licenced to produce a maximum of 1679.7 tonnes of Atlantic salmon per production cycle, equivalent to approximately 250,000 harvest size fish, even a low lice burden on this site during this time has the potential to significantly increase lice loads within the water body.

During the last 27 weeks of production cycle, the farm reported only one weekly lice count, an average of 1.43 lice per fish.[1, 15] At the time of this report’s publication, the Scottish Environment Protection Agency (SEPA) Fish Farm Monthly biomass and Treatment Reports detailing chemical lice treatments for the final third of this farm’s production cycle were not available.

Scottish Sea Farms failed to report weekly sea lice numbers for 1/3 of the production cycle on its Hunda farm.

1/3

However, for the same timespan during the previous year the site had used the in-feed lice treatment Slice (2mg/kg Emamectin Benzoate) on two occasions.[16] This, in combination with the single reported lice count of 1.43, above the CoGP advisory threshold for treatment, suggests that lice levels were likely to have been high during the period of non-reporting.

As can be seen in Table 1 (see next page), this is not an isolated case for the Norwegian-owned company, which has repeatedly used the mitigation “withdrawal period prior to harvesting” to justify not reporting weekly lice counts for prolonged periods. At the company’s Westerbister farm (Orkney), which reported the death of 58,577 fish (11.35%) due mainly to gill disease over a four-week period in 2021, average lice counts were not reported for 14 weeks prior to the site being followed.[17, 18]

A similar pattern was evident at its Lippie Geo farm (Shetland), on-growing a population of fish suffering from viral and gill issues, for which Scottish Sea Farms did not report average sea lice counts citing “withdrawal period prior to harvesting” for 13 weeks. At its Vidlin North farm (Shetland), which had suffered from gill issues and high lice burdens above Marine Scotland’s average sea lice per fish threshold of 2.0, “withdrawal period prior to harvesting” had been reported for 10 weeks of the production cycle.

A common theme in these cases is the presence of one or more underlying conditions or diseases leading to increased mortality (Table 1).

Most often this is complex gill disease (CGD), caused by unfavourable or harmful environmental conditions, pathogens (viral, parasitic and bacterial infections) and/or inadequate farm management.[19]

With the prevalence of concurrent disease, in which a population is highly likely to be immunocompromised, failing to count and report lice levels represents a significant welfare issue for farmed salmon, which may be exposed to high lice burdens for long periods of time without appropriate treatment or intervention. Furthermore, it has the capacity to increase the load of mobile lice in a water body or FMA, risking the health and welfare of wild salmonids and that of other farmed Atlantic salmon within the dispersion zone.

This represents irresponsible fish health management, with a disregard for monitoring and upholding fish welfare and reducing the risk of lice spread to wild salmonids.



Table 1.

Disease conditions on Scottish Sea Farm sites reporting "withdrawal period prior to harvest" for 6 weeks or more in 2021-2022, as reported to the Fish Health Inspectorate.

Farm name	No. of weeks with no lice count ("Withdrawal period prior to harvesting out")	Condition(s) reported to Fish Health Inspectorate	Causative agent(s) reported to Fish Health Inspectorate
Wyre	9	Viral	Cardiomyopathy syndrome
Westerbister	14	Gill health	Complex gill disease
Vidlin North	10	Gill health, parasitic	Complex gill disease, Lice
Toynes	7	Gill health, parasitic	Complex gill disease, Lice
Teisti Geo	8	Gill health, viral	Complex gill disease, Cardiomyopathy syndrome
Dury Voe	6	-	-
South Sand	9	Gill health, parasitic	Complex gill disease, Lice
Sian Bay	7	Gill health, viral	Complex gill disease, Cardiomyopathy syndrome
Shuna	6	-	-
Lober Rock	9	-	-
Lippie Geo	13	Gill health, viral	Complex gill disease, Cardiomyopathy syndrome
Hunda	25	Gill health	Complex gill disease

Farm name	No. of weeks with no lice count (“Withdrawal period prior to harvesting out”)	Condition(s) reported to Fish Health Inspectorate	Causative agent(s) reported to Fish Health Inspectorate
Holms Geo	8	Gill health, viral	Complex gill disease, Cardiomyopathy syndrome
Fishnish A	9	Gill health	Cardiomyopathy syndrome
Dunstaffnage	10	-	-
Bring Head	8	Gill health	Complex gill disease
Bloody Bay	6	Gill health	Complex gill disease

The average weekly lice count is a tool to monitor and uphold the health and welfare of farmed salmon. Following the Scottish Parliament’s Inquiry into salmon farming in 2018, the Scottish Government decided to make SEPA responsible for managing interactions (notably sea lice) between salmon farms and wild Atlantic salmon and sea trout. SEPA’s new sea lice regime (which has no timeline for dealing with the impact of existing farms) is scheduled to become operational in the second half of 2023. By failing to record and report sea lice counts (a health and welfare parameter), using ‘harvesting’ to justify this action, the Scottish salmon farming industry is failing to protect the health and survival of both these populations. Without a true commitment to accurate and reliable sea lice counting by the Scottish salmon farming industry, it is (and it will continue to be) difficult for regulatory bodies to determine the true extent of lice burdens on farms.

As can be seen in the cases above, this almost certainly represents an under-reporting of lice infestations on Scottish salmon farms; indeed the actual numbers of parasitic sea lice building up and emanating from these farms will surely be far higher than is currently reported. “No count” most certainly does not mean no lice. Additionally, the examples above raise questions about how responsible the farming practices, used by the Scottish salmon industry to produce salmon that is sold to the hospitality sector and served to the public, truly are.

Section 2

Harvesting on farms suffering with disease



Disease (mis)management

Fundamental to sustainability is fish health, welfare, and survival. Not only does high disease prevalence and mortality rates pose a welfare issue, but they also increase the carbon footprint and environmental impact of a production system. In the most recent full marine production cycle for which survival can be fully calculated, the mortality rate from smolt input to harvest was 24.1%.^[3] This equated to approximately 11 million fish prematurely dying before harvest over a period of approximately 18-24 months.

Disease is one of the leading causes of high mortality rates reported in Scottish farmed salmon. In cases of severe disease outbreaks, such as gill disorders and viral diseases, more than 50% of the fish on a site can be lost in one week.^[18] Within this context, in the later stages of production, when fish are larger, the industry will often opt to harvest diseased fish over treating them, by selectively targeting and harvesting fish within farms or specific cages most affected by disease(s) or condition(s).^[21]

When deployed rapidly, harvesting out can prevent ongoing suffering, disease spread and mortalities in farmed salmon populations, and, in the instance of parasitic sea lice, can reduce the risk of sea lice transfer to wild salmonid populations (for instance, in Norway, farms which breach sea lice, disease or mortality thresholds are subject to an immediate cull/harvest).^[22]

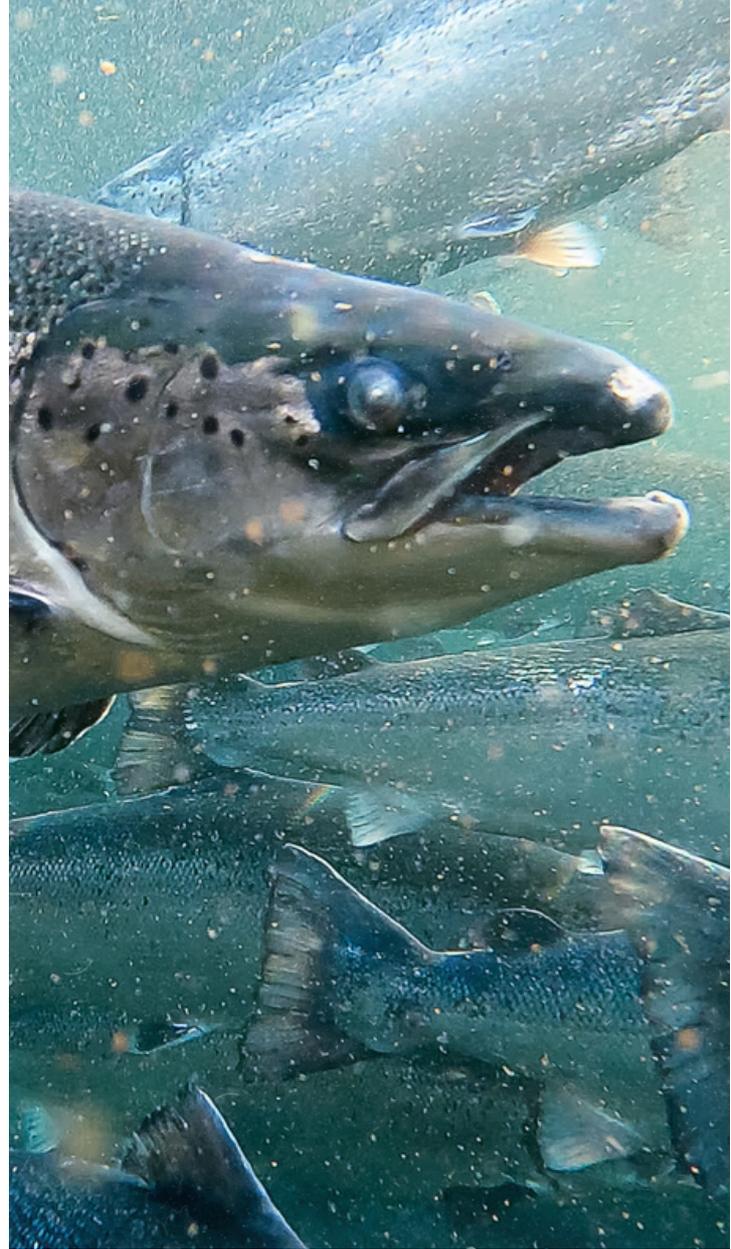
However, this report finds numerous examples of salmon being harvested out from diseased farms over a prolonged period of time, raising questions about the welfare of the fish, the subsequent environmental impact of diseased fish on the surrounding wild fish populations, and the motivation behind the decision-making process.

Across the Scottish salmon farming industry, conditions affecting gill health are becoming increasingly prevalent, and represent a significant proportion of fish mortalities. Vital for breathing, gills are also integral to many other critical processes for fish, including regulations of blood salts and pH, excretion of nitrogenous waste, and hormone production. By the very nature of the constant contact between the gills and the marine environment needed to achieve these processes, salmon gills are vulnerable to environmental assault, from pathogens, toxins and harmful organisms such as jellyfish and plankton blooms.^[19]

Losing nearly 25% of fish before harvest is particularly concerning when we consider the Scottish salmon farming industry's reliance on wild caught fish, such as herring, anchovies and mackerel, in salmon feed. Given that 90% of the wild caught fish used to produce the fish meal and fish oil used in salmon feed could be consumed directly by humans, this represents the loss of thousands of tonnes of wild caught, food-grade fish from the food chain, and ultimately tens of millions of fish from our oceans. At a time where our wild-caught fisheries are pushed to the brink, this is unacceptable.^[20]

When this vital organ becomes damaged it severely compromises a fish's ability to exchange gas and perform vital bodily functions, resulting in poor growth rates, increased susceptibility to infections and increased mortality. Despite the welfare implications associated with diseased or compromised gills, this report finds examples of companies continuing to grow compromised salmon for months to avoid having to harvest smaller size fish and the financial implications that come with this.

For example, in 2021 Bakkafrost (formerly The Scottish Salmon Company) delayed the harvesting of fish at its Eport outer site by eight weeks, despite the fact that the population at this site had tested positive for amoebic gill disease (AGD). This condition is triggered by the parasite *Neoparamoeba perurans*, causing inflammation and thickening of gill tissue, thus reducing a fish's ability to breathe. Fish at this site were also experiencing high burdens of the sea lice *Lepeophtheirus salmonis* and *Caligus* sp. Following two consecutive weeks of weekly mortality rates >1% a site representative told the Fish Health Inspectorate that the site would be fallowed by the end of September. [18] In reality, harvesting at the site only began at the end of September, with the site not being recorded as fallow until eight weeks later – during which time the salmon would have presumably grown from the 3.9kg size recorded in the FHI report, to closer to the industry's average harvest size of 5.5kg.[4] Demonstrating how the misreporting and misuse of harvesting converge within this 8-week production cycle extension, the site also failed to report weekly sea lice counts for 6 of these weeks, instead citing "withdrawal period prior to harvest". In the two weeks that average weekly sea lice numbers were reported, they were well above the CoGP advisory threshold for treatment, and the Marine Scotland level for increased surveillance (3.48 and 3.39 av. AFSL).



Through misuse of the mitigation "withdrawal period prior to harvest", Bakkafrost was able to avoid reporting what were highly likely to be high lice counts, and therefore the financial implications that come with treatment, during the 8-week extension period in which this site was meant, according to its statement to the FHI, to be fallow. Extending the production time, in combination with failing to count and report sea lice where a comorbidity is present in a population, in this case AGD, poses a significant welfare issue. Furthermore, it increases the load of motile sea lice within a waterbody, increasing the risk to both wild salmonids and neighbouring farmed Atlantic salmon.

Case study: Loch Duart

Often the preferred supplier to acclaimed members of the hospitality sector due to its high profile and claims of provenance, Loch Duart is often named on menus. This reputation has led to Loch Duart salmon being served at globally recognised, high-profile events including the United Nations Climate Change Conference (COP26) in 2021 and Wimbledon 2022, as well as public endorsements from well-known chefs.

Clashnessie Bay

The company's website states: "Fish welfare is at the heart of everything we do... we aim to rear the best quality salmon with the lowest possible impact on the environment." Despite these claims, and its inclusion on "sustainable" menus, this report finds that publicly available self-reported industry data provides evidence of Loch Duart slowly harvesting out salmon on sites suffering from some of the highest mortality rates and average lice counts across the Scottish industry in 2021.

One of these farms, Clashnessie Bay, was one of the worst performing salmon farms with respect to sea lice in 2021. From the onset of the legal requirement to report weekly lice count in week 13 of 2021, to the site being empty (fallow) in week 41, this farm did not achieve any weekly lice levels below the CoGP advisory threshold.

Average sea lice counts on the farm peaked at 10.47 lice per fish, 10 times the industry CoGP level, and far exceeding the Scottish Government's enforcement trigger level of 6.0. As a result, Loch Duart's Clashnessie Bay was the only salmon farm in Scotland to be served with an Enforcement notice by Marine Scotland for failure to control sea lice levels, receiving two notices, one in June 2021 and one in September 2021. During this period the farm reported weekly mortality rates of up to 12.02%, due to diseases present on the farm. In one month alone, almost one third of the fish on the farm died.^[23] Despite the significant welfare issues associated with high lice burdens and Pancreas Disease, alongside the risk to wild salmonids with the former, Loch Duart did not harvest this site in a rapid manner. Instead, the company began harvesting salmon in week 17, and continued until week 41. This represents a 5-month period, during which disease and lice ridden fish remained on the Loch Duart farm, as they were slowly harvested – at the expense of high mortality rates, fish welfare and risk to wild salmonids.

Sound of Harris and COP26

This was not an isolated event for Loch Duart, nor was it the worst example of chronically diseased fish being harvested over a prolonged period. In July 2021 Loch Duart began reporting high weekly mortality rates at its Sound of Harris site. Average weekly mortality was above the Fish Health Inspectorate reporting threshold for 18 out of the following 21 weeks, until the site was fallowed.

Weekly mortality rates at this site ranged between 1.12% and 6.36%, accounting for over 18,000 fish per week in some cases. A Fish Health Inspectorate investigation, carried out in week 40, concluded that fish on this site tested positive for the gill pathogens *Neoparamoeba perurans*, *Paranucleospora theridion* and salmon gill poxvirus, as well as the bacteria *Vibrio sp.*. Lethargic fish were observed in all pens, indicative of a site-wide issue. Of the fish collected for post-mortem exam, internal adhesions were noted in all fish, with abnormal changes noted in the liver, kidney and/or spleen noted in some.

Despite these findings and a known history of gill disease (amoebic gill disease) in this population, Loch Duart continued to slowly harvest from this site over a period of 22 weeks. This inaction would have contributed to the site reporting a total marine production mortality rate of 50.3%, more than double the industry average.[24] The surviving 49.7% of salmon were harvested over a period of 5 months.

Salmon from Loch Duart is often served and sold in high-end restaurants and specialist fishmongers. Loch Duart farmed salmon was also served at United Nations Climate Change Conference (COP26) in Glasgow between the 31st of October to the 12th of November 2021. As can be seen in Appendix A (p22), Loch Duart's Sound of Harris farm was the only active Loch Duart site to have fish close to the average market size of 5.5kg around this time. Furthermore, based on the publicly available data, it was the only farm to be reporting harvesting around the time of the COP26 event, which served fresh Loch Duart salmon fillets on its "sustainable" menu. [25]

The Sound of Harris reported its highest weekly average sea lice value for 26 weeks (3.04) during the COP26 event; in response to this, the farm reported to Marine Scotland that it would harvest out the "pen of concern", indicating that Loch Duart was harvesting high lice burden farmed salmon during the COP26 event.

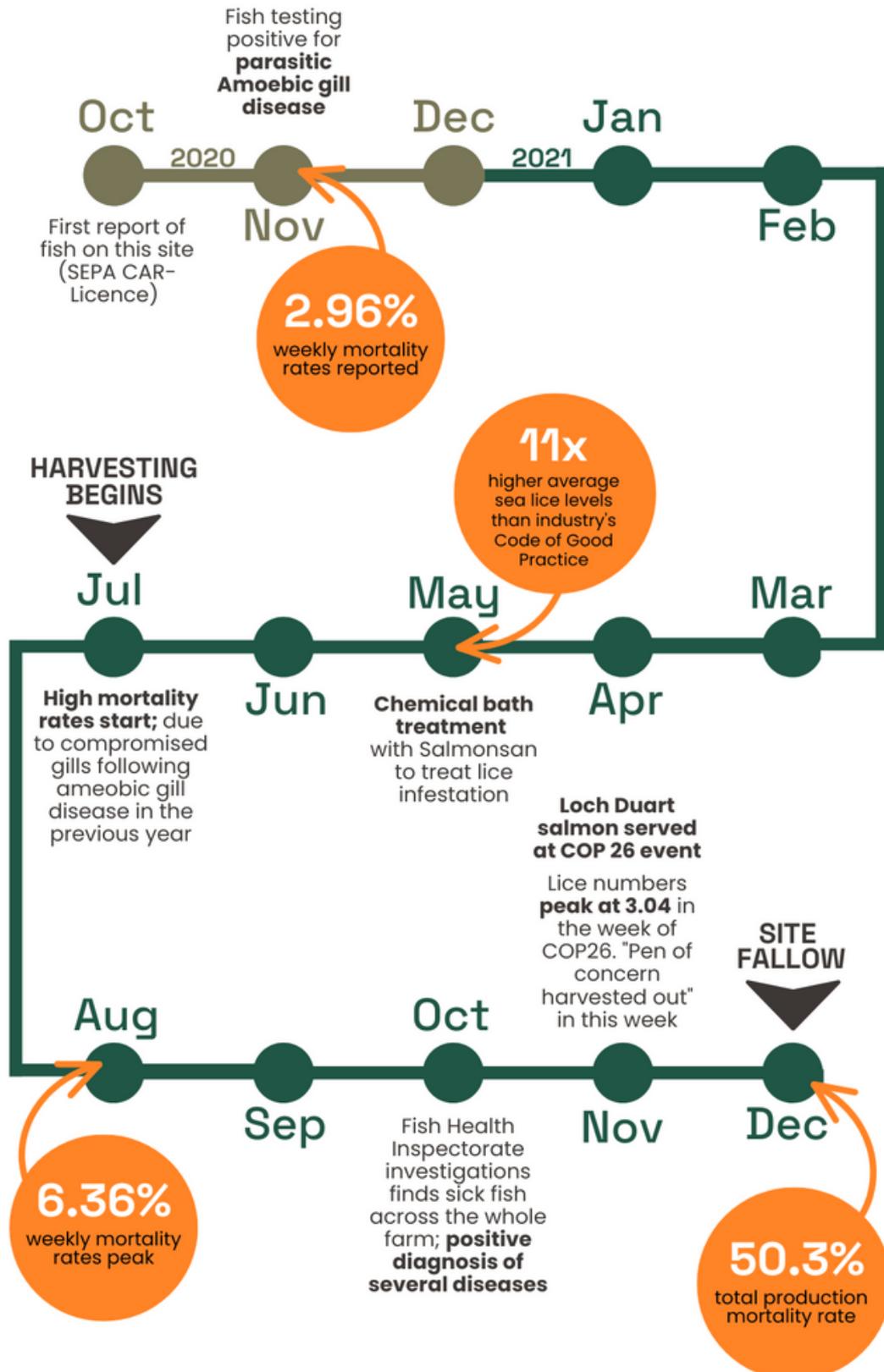
Loch Duart's response in the face of severe morbidity and mortality at its sites, harvesting from a severely compromised population over a prolonged period, is some distance from the image of a "high-welfare producer chosen to be served at the event.[25]

This report has exposed and detailed multiple examples, from across the Scottish salmon farming industry, of diseased fish and/or fish from pens where disease was rife being harvested over periods of months, allowing disease to spread and mortality rates to increase. When deployed rapidly, harvesting out can prevent ongoing suffering, disease spread and mortalities in farmed salmon populations, and, in the instance of parasitic sea lice, can reduce the risk of sea lice transfer to wild salmonid populations. Opting for a slow harvest, as opposed to a rapid cull, prolongs livestock suffering and increases the environmental impact of open net salmon farming.

Over 50% of fish died on Loch Duart's Sound of Harris Farm between Oct 20 - Dec 21.

50%

Loch Duart Sound of Harris production timeline



Conclusion

This report has explored how the Scottish salmon industry is exploiting the use of ‘harvesting’, both in its mandatory reporting of sea lice and as a disease management tool. This not only obscures the industry’s true welfare and environmental impacts, but also raises questions about the reality of how this industry produces salmon that is sold on the UK market and beyond.

The average weekly lice count is a tool to monitor and uphold the health and welfare of farmed salmon and to evaluate the risk of lice spread to wild Atlantic salmon and sea trout. As a consequence of the extensive exploitation of ‘withdrawal period prior to harvest’ as a reason for not reporting a weekly lice count, Atlantic salmon grown in Scottish open-net salmon farms are suffering. The true extent of sea lice not being accurately captured by the Scottish Government’s mandatory reporting regime. Having this mitigation as an option to avoid reporting sea lice levels demonstrates a disregard for the impact on already severely declining populations of Atlantic salmon and sea trout, risking increased exposure to potentially fatal sea lice infestations. It also masks the true lice levels within the Scottish salmon farming industry, highlighting the opaque nature of the industry.

When deployed rapidly, targeted harvesting of diseased salmon can prevent ongoing suffering and curb environmental impacts of disease and/or sea lice infestations.

However, this report has exposed and detailed multiple examples, from across the Scottish salmon farming industry, of diseased fish and/or fish from pens where disease was rife being harvested over periods of months. In doing so, diseases are allowed to spread, further increasing mortality rates. Opting for a slow harvest, as opposed to a rapid cull, prolongs livestock suffering and increases the environmental impact of open net salmon farming.

Often certified under schemes such as RSPCA Assured, GlobalGAP, Aquaculture Stewardship Council and Soil Association, Scottish salmon is being marketed as a high welfare, healthy and appetising fish to restaurants, supermarkets, and the public. However, this report puts the spotlight on an industry that is failing to control common diseases and sea lice parasites, needed to maintain adequate conditions for keeping fish healthy, as well as failing to report the true extent of these issues.

Coupled with an average marine production mortality of 24.1% and reported sea lice levels more than 20 times that stipulated in the industry’s own Code of Good Practice (CoGP), the true picture of open net salmon farming in Scotland undermines the industry’s purported responsible farming practices and assertion that it produces seafood of the highest quality.²⁶ This raises questions as to the quality control of the industry producing Scottish salmon; furthermore, in allowing these diseases to proliferate in farmed salmon through delayed harvesting, the industry is risking the health and population stability of wild Atlantic salmon and sea trout.

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Appendix A

At the time of UN Climate Change Conference 2021 (COP26)					
SEPA Farm name ¹	Farm status ¹	Reported average size of fish	Harvesting status of farm ^{1,4}	Stocking date ¹	Comments
Torr Mor	Inactive				
Holmar	Inactive				
South Ford East (Loch Carnan)	Recently stocked	<750g ¹	No reports of harvesting	September 2021	706g average fish weight in FHI April 2022 report ²
Torgawn	Recently stocked	<2.5kg ¹	No reports of harvesting	October 2021	3kg average fish weight in FHI April 2022 report ³
Loch na Thuill	Inactive				
Sound Of Harris	Active	4.6kg ¹	Actively harvesting	March 2020	Harvesting first reported in July 2021, continuing until fallow in December 2021 ⁴ . Farm reported to SEPA "one pen of concern [high sea lice] to be harvest out" during the week of the COP26 event, due to a high average weekly sea lice count (3.04) ¹
Droighniche	Inactive				
Drumbeg	Inactive				
Oldany (Clashnessie)	Inactive		Harvest completed by week commencing 4th October 2021		May have been used for producing the smoked salmon served at COP26 conference in Glasgow 2021.
Nedd	Inactive				
South Ford East (Gashernish East)	Inactive				
Sandavaig	Inactive				
Duartmore North	Inactive				
Inner Loch Carnan	Inactive				
Badcall Site 10	Active	2.8kg ⁴	No reports of harvesting	June 2021	

Badcall Site 11	Inactive				
Badcall Site 12	Inactive				
Badcall site 9	Inactive				
Eilean Ard (Laxford Site 3)	Inactive				
Eilean Ard (Laxford Site 2)	Recently stocked	<1kg ⁴	No reports of harvesting	September 2021	
Fanagmore Bay (Laxford Site 4)	Inactive				
Foindle East (Lanxford site 1)	Inactive				
Calbha Site 5 (Calbha Beag)	Active	2kg ⁴	No reports of harvesting		
Calbha Site 6 (East Rubh a Mhucard)	Inactive				
Calbha Site 8 (south Bay)	Inactive				
Calbha Site 7 (North Calba Bay)	Inactive				
Caolas Loch Portain	Active	<2.5kg [*]	No reports of harvesting	March 2021	No reporting to Marine Scotland (weekly average sea lice) or FHI (mortality) under this name
Ferramus (Lochmaddy)	Recently stocked	800g ¹	No reports of harvesting	October 2021	
Reintraid (Loch A Chairn Bhain)	Active	<2.5kg ³	No reports of harvesting	March 2021	3kg average fish weight in FHI April 2022 report ³
Duartmore South	Inactive				
Geisgeil	Inactive				
Loch Fad, Bute	Inactive				

Loch Duart references

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* No reporting to Marine Scotland (weekly average sea lice) or FHI (mortality rates >1.0%) under this name; likely to have received same smolt class as Reintraid given same dates of smolt transfer (March 2021).