Enclosure 12 – Email received from Costal Communities Network.

From: info@communitiesforseas.scot <info@communitiesforseas.scot>
Sent: 19 November 2021 14:32
To: Cabinet Secretary for Rural Affairs and Islands <CabSecRAI@gov.scot>; Minister for Environment and Land Reform <MinisterELR@gov.scot>
Cc: [redacted]googlegroups.com
Subject: Thank-you from the Coastal Communities Network

Dear Ms Gougeon; Ms McAllan

Many thanks to you both, and your colleagues, for meeting with the Coastal Communities Network on Tuesday 16th November.

We greatly appreciate your time and enjoyed the opportunity to speak with you more about the interests and activities which CCN represents. We wanted to share the attached letter of thanks, to briefly summarise the main points of our discussion, and highlight the follow-up actions identified during the meeting.

I'm also attaching a (2 page) summary of global salmon farming case studies and a recent piece from CCN member [redacted] which featured in British Wildlife.

We look forward to building a positive and constructive working relationship with you both and do hope to meet again soon.

Sincerely,

[redacted]
On behalf of
The Coastal Communities Network, Scotland

www.communitiesforseas.scot | Address: 5 Rose Street, Edinburgh, EH2 2PR
Subscribe to the CCN email newsletter.

CCN has a vision for Scotland's seas to be abundant in biodiversity and resilient to future changes, providing sustainable and diverse livelihoods to those living around them, in perpetuity.

Enclosure 12.1 – Attachment

Coastal Communities Network
Scotland

Ms Mairi Gougeon, Cabinet Secretary for Rural Affairs and Islands
Ms Mairi McAllan, Minister for Environment and Land Reform

19th November 2021

Re: meeting with the Coastal Communities Network, Tuesday 16th November 2021

Dear Cabinet Secretary; Minister

Many thanks to you both, and your colleagues, for meeting with the Coastal Communities Network (CCN) on Tuesday 16th November. We greatly appreciate your time and enjoyed the opportunity to speak with you more about the interests and activities which CCN represents. We wanted to briefly summarise the main points of our discussion, and highlight the follow-up actions identified during the meeting.

Fauna & Flora International (FFI) introduced the background to CCN and FFI's current role in providing neutral facilitation, with a view to longer-term independence for CCN. This is underpinned by a central CCN Advisory Group, selected from within CCN's membership, of which representatives within Tuesday's meeting were drawn from. The full CCN Advisory Group membership is made up of:

[redacted]

[redacted] also kindly joined the meeting, as an active member of CCN.

Members of CCN spoke initially about their own local points of focus and experience – this included the positive impact upon biodiversity which communities can make in leading Marine Protected Areas; the ongoing challenges community institutions (including Community Councils, such as is the case in the Clyde) face in securing a representation within wider fora such as Regional Marine Planning Partnerships; the lack of legal enforcement of marine wildlife laws (e.g. ongoing use of Acoustic Deterrent Devices); the need for ecosystem-based assessment of salmon farm operations in Scotland; and the challenges that exist around the salmon farming industry's loss of social licence to operate.

Later in the meeting we also spoke upon the challenges that exist around Inshore Fisheries Groups and the need to ensure their governance and composition is reformed; issues around the robustness of Government-commissioned economic reports; and we referenced the Clyde (in its highly altered state) as a representative microcosm of the deficiencies within aquaculture consenting, as well as a useful example of the negative cumulative environmental impact of other industries.

We're sure you appreciate that we had a small amount of time to cover a large and complex number of issues and would very much welcome the opportunity to unpack these issues further with you both in future meetings.

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We were therefore encouraged to hear that you would both like to meet with CCN again and we'd be happy to follow this up separately, with some suggested dates for the new year. Perhaps it would be most useful for us to dedicate future meetings to specific topics? We would like to suggest either salmon farming or Highly Protected Marine Areas for the next meeting, and would be guided by your advice in terms of what would be the timeliest. We're also keen to organise site visits and boat trips for you both, perhaps after the winter months, where you can really get a sense of the coastal areas CCN represents, first-hand.

We were incredibly encouraged to hear that you believe working with communities is critical to moving beyond the ongoing crises, and we also agree that the changes we need to make now to meet these challenges ought to be fair and just. As we stated in the meeting, we are living through a critical moment in time at present and, as such, we do also need to see big actions - we therefore implore you to be bold in delivering your respective portfolios. If your actions are taken to protect the natural environment, we can assure you that you will have CCN's – and the tens of thousands of individuals it represents - full backing.

We note here a small number of follow-up actions:

- Exploring the difficulties Fairlie Coastal Trust are experiencing in accessing the Clyde Regional Marine Planning Partnership.
- Exploring the current Clyde fish farm applications.
- Organising further engagement with CCN regarding Highly Protected Marine Areas.
- CCN and [redacted] to follow-up suggestion of a meeting - in progress.
- CCN to share a brief (2 page) comparative summary of salmon farming models which operate in other countries – attached.

Since meeting with you on both on Tuesday, CCN has been invited to meet with Professor Griggs regarding the aquaculture regulatory review, something we were unable to secure beforehand. We appreciate the speed at which you were able to move this along for us, thank-you.

We look forward to building a positive and constructive working relationship with you both. Please don't hesitate to get in touch with us at any time - both directly with CCN or with the respective organisations which it represents.

Sincerely,

[redacted]

On Behalf of the Coastal Communities Network

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Enclosure 12.2 – Attachment

Coastal Communities Network
Scotland

Salmon Farming Global Case Studies (brief high-level examples)

Canada - The Federal Government has set a goal that all salmon farming in British Columbia should take place in closed cages by 2025. 17 open net farms in the Broughton Archipelago will be emptied by 2023, to establish a farm-free migration corridor to reduce harm to wild salmon. Several farms in the Discovery Islands have not been stocked for the first time and sea lice numbers on wild salmon smolts have been much lower as a result https://alexandramorton.typepad.com/. Biologist Alexandra Morton's book ***Not on My Watch*** documents the science that supported this decision. https://seawestnews.com/a-new-era-for-salmon-farming-in-british-columbia/

USA - March 2018, the Governor of Washington State banned open net salmon farming, following the escape of 250,000 Atlantic salmon. https://www.npr.org/sections/thesalt/2018/03/26/597019406/after-three-decades-washington-state-bans-atlantic-salmon-farms

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Denmark - In 2020, the Environment Minister put forward two bills that put '*an end to the expansion of marine production*.' She said, '*the aquatic environment is in crisis and the sea should not be a dustbin*'. Land-based farming '*is the path we should take, instead of expanding marine farming at risk to the aquatic environment*.' https://salmonbusiness.com/the-sea-should-not-be-a-dustbin-says-danish-government-announcing-new-bills-to-move-production-to-land-based/

Norway - In January 2021, the Minister of Fisheries said, *'.....the goal of sustainable growth will be central. Then there must be solutions to the challenges of lice, escapes and high mortality. Among the instruments being considered is a new incentive scheme to lock more of the current fjord farming into closed facilities. The new scheme has not been decided yet. The ministry has started work on a facility, and hopes for a clarification before the summer.' 'We want a development that also facilitates closed facilities. Customers are increasingly demanding documentation on sustainability and the environment...' 'Canadian authorities have announced a phasing out of open salmon cages in their fjords by 2025, following persistent pressure from environmentalists and indigenous peoples in their farming regions. This is an iceberg that comes driving. Without customers, there will be little business. If you look at where the market is moving, with EU taxonomy and documentation requirements, then I think closed farming is something that will force itself out'* (i.e. is inevitable) https://e24.no/hav-og-sjoemat/i/kR8k4Q/varsler-ny-havbruksstrategi-vil-ha-mer-lukket-oppdrett-i-norge

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Sweden - in March 2017, as a result of the Weser-judgement from the EU Court and new environmental quality standards in water in Sweden, the Supreme Land and Environmental Court ruled to stop fish farming in cages in open water in three places and to reduce the amount farmed at a fourth site. The three banned farms would be closed within three years. The Court questioned

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whether uses open net cages was the best technique and whether the affected waters could break down the discharged nutrients without eutrophication. This judgement was seen as likely to bring an end to all fish farming in open cages, affecting waters not having reached Good Ecological Status. https://sverigesradio.se/artikel/6652202

Argentina - In June 2021, Argentina's southernmost province, Tierra del Fuego, approved a bill that bans salmon farming in open net pens. https://www.independent.co.uk/climate-change/news/argentina-salmon-farming-ban-environment-b1880503.html

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Australia - In September 2021, the Tasmania State Government announced that it would place an immediate 12-month halt on offshore salmon farm expansion. The state will cease granting new leased areas from January 2023. The Primary Industries Minister announced that the government would develop a new 10-year plan for the salmon industry over the next 12 months, including investigation of opportunities for land-based fish farming and farming further offshore. https://www.premier.tas.gov.au/site_resources_2015/additional_releases/10-year_plan_to_support_our_sustainable_salmon_industry This was in the aftermath of a clear loss of social licence, and the publication of the well-researched book ***Toxic***, by Booker prize winning author Richard Flanagan.

Chile – in November 2021 Chile announced that they will no longer cite salmon farms in marine protected areas – claiming they will not give any further concessions (of which there are currently many) to salmon farmers in MPAs and they will giving remaining sites a deadline to leave. www.elmostrador.cl/destacado/2021/11/17/no-mas-salmoneras-en-areas-protegidas-presentan-proyecto-que-prohibe-concesiones-en-zonas-de-conservacion/

Please note: there are no examples globally of open net salmon farms being environmentally sustainable. They dump all their pollution, pesticides, sea lice and diseases into the shared sea, on which others depend. They are also inherently cruel, routinely killing a quarter of the smolts that are put into the cages before harvest, with sea lice, diseases and chemical and physical treatments for. These reasons are why so many nations are phasing out or banning open net farms.

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The environmental impact of salmon-farming in Scotland

John Aitchison

There are growing concerns over the impact of an expanding salmon-farming industry on marine habitats and wild salmonids. Corin Smith

Aquaculture is widely seen as essential to feed the growing world human population (FAO 2020). Its output has more than doubled since 2000, producing 54% of the fish consumed in 2020. This should help overexploited fish stocks, but wild-capture landings also rose by about 20% during this time (Mowi 2020), one fifth of all fish caught now being used for aquaculture feed. Although 70% of their feed is plant-based (Mowi 2020), Scottish farmed salmon consume 460,000 tonnes (t) of fish annually, the same amount as the UK's human population (Feedback 2019). Salmon feed includes fish oil from 'reduction fisheries' (harvesting for the production of fishmeal/oil rather than for direct human consumption) of Peruvian Anchoveta *Engraulis ringens*, and Atlantic Greater Sand Eels *Hyperoplus lanceolatus* and Caplin *Mallotus villosus*. Algal Omega-3 oils can replace fish oil, but uptake by salmon-farmers has been limited so far, perhaps because their customers may view this diet as less natural.

Virtually all the Atlantic Salmon *Salmo salar* eaten in Britain is farmed. Scotland has 226 active farms around the west coast, Hebrides and Northern Isles. The largest holds about a million fish. Around half of Scottish salmon is exported, predominantly to the EU, Far East and North America. Six multinational companies (none of which is UK-owned) control 99% of production (Marine Scotland Science 2019), and around 2,000 people work directly on the farms, mostly in rural areas, where year-round jobs are welcome.

Marketing material often mentions Scotland's 'pristine waters', but many farms are situated relatively close to one another, discharging all their pollution, waste nutrients and parasites through net cages into the sea. Increasingly, people are questioning whether the cumulative impacts of these large industrial farms meet 'the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development 1987). Marine Scotland's officials shy away from this widely accepted definition of sustainability. Aquaculture companies and Scottish government ministers say that farmed salmon have a relatively low carbon footprint, but this advantage is squandered when fish are airfreighted abroad or die prematurely. Whether the farming of salmon will help to alleviate the global climate and biodiversity emergencies or will make these problems worse depends on how the farming is done.

This article provides a summary of current knowledge of the remarkably wide-ranging environmental impacts of salmon-farming in Scotland, and asks what hope there is for a more sustainable future.

The industry

In just half a century since its beginnings in the 1970s, salmon-farming in Scotland has expanded to sell more than 200,000t of fish per year. Concerns about the impacts from pollution, eutrophication and parasitic sea lice have increased as the industry has transformed from just a few pens to large-scale industrial farms. There is strong political support for doubling its value by 2030, but the Scottish Government has not assessed whether Scotland's coastal environment can assimilate twice as much pollution, sea lice or escaped farmed salmon – and doubling the value would probably mean doubling these impacts. The industry claims that it is strictly regulated, but there are numerous examples of special treatment. In 2018, for example, a Scottish parliamentary inquiry recommended 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', yet little has changed since then. Meanwhile, 33,000t of new fish-farm biomass have been consented, with another 18,221t likely to be permitted soon.

Scotland's planning framework instructs local authorities to favour fish farms. The Scottish Government's aquaculture 'working arrangement' prohibits local planners from questioning statutory advice or asking for cumulative-impact assessments, giving them little scope for action unless other regulators object, and these regulators are also inhibited: 2014 legislation obliges the Scottish Environment Protection Agency (SEPA) to contribute to achieving sustainable economic growth. The Scottish Regulators' Code binds SEPA and NatureScot to 'be enablers and carry out their activities in a way that helps businesses and regulated bodies to comply and also grow sustainably', and the farms' landlord, Crown Estates Scotland, has also had the promoting of economic growth added to its role. Even NewDEPOMOD, a computer model that SEPA uses to predict the environmental impact of fish-farm pollution, was developed 'to support industry expansion'.

The environmental non-compliance rate for fish farms is the highest of any industry regulated by SEPA. Companies monitor their own impacts on the seabed, analysing faunal diversity and sediment oxygen levels in grab samples taken every two years. SEPA audits these and occasionally checks sites. It now requires a few more samples to be collected, but so far only around new farms. If seabed standards are unsatisfactory for several years, SEPA may force farms to reduce their fish biomass, but self-submitted monitoring data are inadmissible in court and prosecutions for environmental breaches are vanishingly rare. Commercially caught crustacean species are never monitored, even though salmon farms discharge all their pesticides into waters used by fishermen.

Farmed fish

A few companies farm their own native strains (genetic variants) of salmon, but almost 90% of ova are 'derived from foreign sources' (Marine Scotland Science 2019), bred for faster growth, which 'may push the boundaries for how fast fish can grow, and cause production-related disorders relating to physical deformities and cataracts' (Mowi 2020). The young fish are vaccinated against some diseases and transferred to freshwater cages, or are grown on in recirculated aquaculture-system (RAS) facilities on land. Formalin, used to treat fungal disease, is discharged into watercourses and lochs.

Smolts (juvenile salmon) are transferred to sea cages when they weigh 100–150g (a total of 53 million fish reached this stage in 2019: Marine Scotland Science 2019), and then individuals are gradually removed to ensure that farm-biomass caps, set by SEPA to limit organic pollution, are not exceeded. The remaining fish are slaughtered after 20 months. Stocking is coordinated between clusters of farms in Farm Management Areas, with the cages left empty for at least 42 days between production

cycles to limit parasites and disease. Nevertheless, the mortality rate in Scotland's salmon farms remains stubbornly high. A total of 26% of the smolts put into sea cages in 2017 died before harvest (Marine Scotland Science 2019). Mowi (2020) reported that treatments for sea lice and disease were the most common non-infectious causes of death in its farms, globally, in 2020. Some companies now aim to put older, heavier smolts to sea for less time, hoping that this will reduce mortality, but these larger fish may host more sea lice (see below).

Pollution of the marine environment

Netted cages are the cheapest way to farm salmon, providing free disposal of pollution and pesticides. When other industries discharge effluent to sea, SEPA allows a 100m radius 'mixing zone' around each outfall pipe, within which pollution standards may be exceeded. For fish farms, however, SEPA adds a 100m margin around each cage, then merges the total area into a large ellipse. Thus, while an effluent pipe's mixing zone measures 31,415m², a ten-cage 2,500t fish farm can pollute an area almost five times as large, equivalent to 21 football pitches. SEPA confirms that fish-farming now contributes more pollution to Scotland's seas than any other industry. Its organic particulate waste alone (mostly fish faeces) is currently equivalent to the sewage from about 2.5m people (SAMS Research Services Ltd 2018).

Within these mixing zones SEPA permits particulate waste to smother benthic life, so long as at least 1,000 individual polychaete worms of two species survive to aerate each square metre of sediment. Elsewhere, the ecological quality of the seabed should not fall below the EU Water Framework Directive's (WFD) 'good' status. SEPA bases each farm's biomass limit on NewDEPOMOD modelling, which predicts how currents will distribute the impact of particulate pollution on the seabed. Crucially, though, SEPA no longer sets upper biomass limits for fish farms, so that in principle these can repeatedly expand the area that they pollute by adding more, larger cages, until the WFD's maximum allowance of 15% of a waterbody is degraded below 'good' status.

Fish farms use significant quantities of pesticides to treat sea lice, this being the only industry permitted to dump all the pesticides that it uses into the sea. SEPA licenses five fish-farm pesticides, including an organophosphate and two synthetic pyrethroids. It sets Environmental Quality Standards (EQS) to limit their impacts and caps the quantities discharged – except for hydrogen peroxide, 5.2 million litres of which were used in 2018. Research shows that all these chemicals are deadly to crustaceans, particularly their planktonic larvae. The argument for discharging them in crab, lobster and prawn fishing grounds is that dilution will ensure that any harm is short-lived. The in-feed pesticide emamectin benzoate, however, persists for more than four years on the seabed. A 2017 government-funded study (Wilding *et al.* 2017) in Shetland found that use of emamectin benzoate correlated with >50% average declines in crustacean abundance and diversity outside the areas that fish farms were allowed to pollute. Despite this, SEPA dropped a proposed ban, allowing farms with pre-existing licences to carry on using emamectin as before. Fewer than 20 new farms have had their emamectin use limited by a lower interim environmental standard. Scottish ministers will have the final say on whether and when to apply any lower limit to the others.

The body that conducted the Shetland research (SARF) has since been shut down.

High stocking densities and selective breeding for faster growth can lead to poor health in farmed fish. Mortality rates remain high, this due primarily to parasites and disease, and the interventions used to treat them. Corin Smith

As farms expel all their waste into the sea, those situated in sheltered sea lochs can create high concentrations of pollutants in the surrounding water and on the seabed. Corin Smith

Currently, the industry is lobbying to use neonicotinoids, claiming that their acute toxicity is unimportant because they can be filtered from the water after treatment onboard specialised ships. What happens if the filtration process fails has not been disclosed.

Dissolved nutrients from fish farms sometimes contribute to harmful algal blooms (HABs) which can starve fish of oxygen. Nutrients can also promote the growth of marine bacteria (Navarro *et al.* 2008). Organisms in some blooms can produce toxins and damage the gills of fish. Although Scotland's farmed salmon excrete around 14,500t of dissolved nitrogen per year, the 2018 parliamentary inquiry was told that all HABs are triggered offshore. This cannot be true of the 2019 bloom that killed thousands of farmed fish in upper Loch Fyne, which is far from the open sea. SEPA's hydrodynamic modelling reveals that water flushes slowly in some coastal areas, for instance around the Isle of Skye, where hydrozoan jellyfish helped to kill 670,000 farmed salmon belonging to Grieg Seafood in 2020. The company is now quitting operations in Scotland. The link between eutrophication and hydrozoa has not been fully explored. SEPA monitors HABs by remotely sensing chlorophyll-a, as a measure of the quantity of algae, but it does not yet sample blooms. Bacterial and jellyfish blooms do not contain chlorophyll. HABs will be exacerbated by rising sea temperatures and threaten the future of open-net fish-farming.

Wild salmon

Wild Atlantic Salmon populations are in crisis, Fisheries Management Scotland (FMS) reporting the lowest rod-catch on record in 2018. In 2014, IUCN reassessed their status as Vulnerable, given a 27% population decline within the span of three generations (to the mid-2000s). The fastest declines have been in Scotland (ICES 2019). In 2018, ICES estimated the Scottish adult salmon population as 546,472 (NASCO 2020), of which around 10% breed in the 'aquaculture zone'. Degraded river habitats, impassable weirs, changes at sea and climate change are all having an impact (Marine Scotland 2019), but it is unsurprising that parasitic sea lice have also become a serious problem in the aquaculture zone, where farmed salmon outnumber wild fish by more than a thousand times.

The Scottish Government discourages fish-farm development on the north and east coasts, 'as a precautionary measure to safeguard migratory fish species' (Developmental Department Scottish Executive 2007), obliquely acknowledging that farming does pose a risk to wild salmon in the west. This was expressly recognised by the industry and its regulators in 2020 (Salmon Interactions Working Group 2020), and by the 2018 parliamentary inquiry (Rural Economy and Connectivity Commit-

Populations of wild Atlantic Salmon are in a perilous state, with fish farms suggested to be one of the primary drivers of decline. Fergus Gill

Fish farms support high densities of sea lice, which cause huge economic loss and can have severe negative impacts on wild salmonid populations. Eva Thorstad

tee 2018), but so far only one farm has been closed to help wild fish.

Interbreeding between farmed and wild fish poses an additional threat. As pollution can accumulate in sheltered sea lochs, some companies have developed very large farms in exposed locations in order to disperse their waste. Fish-farm licences supposedly require these farms to be equipped to withstand a once-in-50-years storm. In recent years, however, there have been four major escapes of fish from Mowi's exposed farms during storms. In August 2020, 48,834 fish escaped from its Carradale farm, and 3,000 of these are estimated to have entered 17 different rivers, as far away as Cumbria (Fisheries Management Scotland 2021). A Mowi-funded genetic study will investigate whether they breed. The Norwegian authorities say that genetic introgression (the result of interbreeding and backcrossing) is the most pressing threat to wild Norwegian salmon, along with sea lice (Forseth *et al.* 2017). A 2013 Scottish Government-funded study found farmed-fish genes in 25.1% of wild west-coast salmon, 'significantly higher than that seen for the east coast "wild" baseline' (Coulson 2013). It is likely that climate change and the associated increase in frequency of severe storms will increase the risk of escapes in future.

Sea lice

The salmon louse or sea louse *Lepeophtheirus salmonis* is a parasitic copepod that feeds on salmonid fish. Planktonic larvae can be carried more than 30km by currents, before infesting new hosts. Cumulatively, farms can release billions of larvae, even if louse numbers on farmed fish are kept to the industry's voluntary Code of Good Practice target levels, according to Marine Scotland. Fish-farmers have for long denied that this causes significant harm, but recent research findings from Scotland, Ireland and Norway contradict this view. A 2018 Norwegian analysis (Thorstad & Finstad 2018) states: 'scientific studies indicate that salmon farming increases the abundance of salmon lice in the marine habitat and that salmon lice in the most intensively farmed areas have negatively impacted wild Atlantic Salmon and Sea Trout populations', while in 2021 NatureScot confirmed that 'there is now significant scientific evidence to conclude that population-level impacts are possible'. According to experts advising the Norwegian government, at larval (copepodid) densities of 2 lice/m² of sea surface, salmon held in sentinel cages in order to test infestation rates at sea each acquired around one sea louse per day (Sandvik *et al.* 2020). Modelling suggests that higher louse densities occur in some Scottish waterbodies: when sea-louse densities rise, infestation happens more quickly.

A burden of 2–4 sea lice can kill 20% of 20g salmon smolts, with 100% killed by >6 lice. When 30% of the smallest smolts have >2 lice each, deaths will have a high 'population regulating effect' on wild salmon (Taranger *et al.* 2015). Louse burdens on migrating salmon smolts are hard to sample because the fish leave the coast, but levels of infestation can be estimated by counting lice on Sea Trout *Salmo trutta*, the marine phase of Brown Trout. Irish, Norwegian and Scottish studies have found elevated numbers of lice on Sea Trout relative to naturally occurring levels within 30km of the nearest farms. In Loch Fyne and the Firth of Clyde, 'at some sites, in some years, a significant proportion… carry sea lice burdens that have been demonstrated to cause mortality' (Argyll District Salmon Fishery Board letter to Argyll and Bute Council 2021, unpublished). The industry's Code of Good Practice farm-louse levels there were exceeded 71 times between January 2018 and June 2020 (*ibid*).

In Norway, louse infestation is several orders of magnitude higher in farm-intensive areas compared with farm-free areas (Taranger *et al.* 2015). Norway is estimated to have lost 10% of its wild salmon population each year from 2010 to 2014 owing to sea lice (Norwegian Scientific Advisory Committee for Atlantic Salmon 2017). The louse-infestation-associated reduction in numbers of salmon returning to Irish rivers can be as high as 46%, with a mean of 33%, in the period immediately after the biomass of fish in nearby farms reaches its peak (Shephard & Gargan 2020). Over seven production cycles in Loch Shieldaig, Marine Scotland Science (2014) consistently found sea-louse levels sufficient to kill a high proportion of Sea Trout during the second year of salmon production at the closest farm (Figure 1).

Images of louse-ridden farmed fish are undermining the industry's claims to have high welfare standards. These infestations result from its use of open nets. Tarpaulin skirts can exclude some lice, and one Scottish farm is trialling 'snorkel' cages (with net 'ceilings' to prevent the fish from spending much time in surface waters, where lice are concentrated), but the standard treatments are pesticides, cleaner fish (see below) and the practice of pumping the salmon rapidly through 'physical treatment' devices, which warm them or pummel them with freshwater. All have serious welfare concerns and cost tens of millions of pounds per year in treatments and dead salmon (Overton *et al.* 2018). So far, louse prevention has not extended to using closed-containment methods in Scotland, which would prevent the parasites from entering and leaving the cages. These sorts of farms would also capture particulate waste, which can be used as fertiliser or to produce biogas, although they would still discharge substantial amounts of dissolved nutrients. Closed-containment farms at sea and closed systems on land are being developed in many other countries.

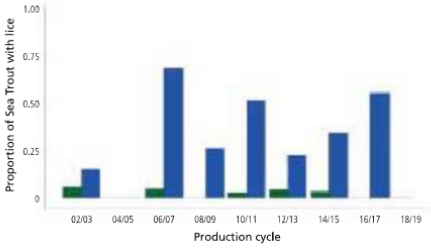
Regulatory protection of wild salmonids

Even a small additional mortality due to sea lice can push the salmon populations of some rivers towards extinction. Norway uses coupled hydrodynamic and biological modelling to forecast sea-louse infestation and to regulate farm production to protect wild fish. Scotland has no such system, instead relying on local planning authorities to do this, despite their having no specialised knowledge and no means to enforce changes in fish-farm management. Planning permission is granted in perpetuity, and mistakes therefore have long-term consequences.

Atlantic Salmon and Sea Trout are Scottish Government Priority Marine Features (PMFs), which should protect their national population, but local authorities do not assess whether the cumulative impact of lice from multiple fish farms threatens these wild fish, because fish-farm proposals are considered one at a time. This ignores the impact of lice from existing farms, run by other companies. The local authorities' statutory consultees regarding wild fish are Marine Scotland, the District Salmon Fishery Boards and NatureScot (particularly when Special Areas of Conservation (SACs) for salmon or Freshwater Pearl Mussels *Margaritifera margaritifera* are involved). Marine Scotland's non-committal advice may be a consequence of its dual role as regulator and the Scottish Government's champion for fish-farming. The Fishery Boards, in contrast, are robust in objecting to many developments, but their advice is mostly ignored by local authorities.

Marine Scotland maintains that Scotland's salmon population is largely protected because most smolts come from north- and east-coast rivers, where there are no farms. This downplays the losses from genetically distinct populations in rivers in the aquaculture zone. In March 2021, Marine Scotland

Figure 1. The proportion of trout sampled in the lower Shieldaig exhibiting louse burdens above the threshold level with regard to fish-farm production cycle. Green bars are those in the first year of production, and blue are in the second year. From Marine Scotland Science (2014)



Science accepted that 'the body of scientific information indicates that there is a risk that sea lice from aquaculture facilities negatively affect populations of salmon and sea trout on the west coast of Scotland', but Marine Scotland Science is still reluctant to ascribe impacts to individual farms. Its recent advice on one development was that it 'has the potential to increase the risks to wild salmonids. This is not to say that it will be a risk' (Marine Scotland letter to Argyll and Bute council 2020, unpublished).

When a Scottish Government-funded study on sea-lice risk (Rivers and Fisheries Trusts of Scotland 2013) found that 57% of salmon farms were in the most important areas for wild Atlantic Salmon and Sea Trout, Marine Scotland instructed local authorities to ignore the results. The 2018 Scottish parliamentary inquiry recommended that salmon farms should be sited away from wild salmon migration routes and breeding rivers. Three years on, a Scottish Government working group has yet to report on a new planning framework. It suits the companies and politicians for salmon production to double in this piecemeal way, without assessing its overall impact.

A few breeding rivers for salmon have greater protection as SACs. For these, local authorities must be sure beyond reasonable doubt that fish farms will not compromise wild salmon but, even then, cumulative impacts are largely ignored. Smolts from the Endrick Water SAC must pass through the Greater Clyde, which already has 16 salmon farms, holding 25,500t of fish. Six more farms are proposed. Initially, NatureScot advised the local authorities that they should assess the cumulative risk of lice from multiple farms, but retracted this advice within days, saying instead that each new farm could be considered separately. When there is uncertainty about risk to any SAC the precautionary principle should apply, but Argyll and Bute Council's planners have commented that 'it would not be appropriate to routinely refuse applications on a precautionary basis simply because definitive information was not available' (letter to Friends of the Sound of Jura, unpublished). The council has never turned down a fish-farm proposal to protect wild fish, despite multiple objections from FMS and others.

Impacts on other marine life

SEPA accepts that waste from multiple farms may accumulate outside their mixing zones, possibly impacting maerl, seagrass *Zostera*, Northern Sea Fan *Swiftia pallida* and other PMFs. Risks to PMFs should be flagged by NatureScot, resulting in proposed new farm biomass being refused or reduced if necessary. This sometimes happens, but NatureScot's map of PMFs is incomplete, omitting data from fish-farm surveys for instance. Community groups are working with NatureScot to fill some of the gaps.

SEPA does not regulate for seabed recovery, which can take many years. The 2020 Scottish Marine Assessment (www.marine.gov.scot/sma) details severe PMF losses over the previous decade, including a 35% decline in the beautiful *Serpula vermicularis* (polychaete worm) reefs in Loch Creran, Argyll, despite its designation as a Marine Protected Area (MPA). Pollution from the loch's fish farms is not mentioned as a possible contributory factor. New farms close to PMFs are still being proposed, for example in the Wester Ross and Small Isles MPAs.

The problem of sea-louse infestation has generated a new and currently unregulated fishery for 'cleaner-fish' such as Ballan Wrasse *Labrus bergylta*. FLPA/Alamy Stock Photo

Prior to a ban in 2020, fish farms could shoot seals in order to prevent damage to nets and fish. Ben Queenborough/Alamy Stock Photo

Another more recent impact comes from the wild harvesting of 'cleaner fish'. In 2019, 660,000 Lumpsuckers *Cyclopterus lumpus* and 59,000 wrasse were bred to pick lice from salmon (Marine Scotland Science 2019), but many more wild wrasse are still caught for this purpose. These cleaner fish can carry diseases, so hundreds of thousands are slaughtered each year, along with the salmon. No other type of farming sacrifices other species to deal with a problem of its own making.

Seals, which bite holes in nets, harming fish and causing escapes, were previously shot under licence, but this was recently banned to prevent the US Marine Mammal Protection Act from blocking Scottish salmon exports to the USA. Some companies are installing seal-proof nets at their farms, but members of the Scottish Salmon Producers Organisation (SSPO) are also demanding compensation from the Scottish Government.

Fish farms also use acoustic deterrent devices (ADDs) to scare seals away, but ADDs disturb cetaceans, which is illegal in Scotland. For years, Marine Scotland has turned a blind eye, even after 2017, when Scottish Natural Heritage (now NatureScot) pointed out that all fish-farm ADDs were likely to be disturbing cetaceans. European Protected Species licences would allow this if there was no viable alternative, but fish farms using tougher nets operate successfully without ADDs in Scotland and elsewhere. The SSPO is pinning its hopes on new acoustic startle devices, said to avoid problems of seal habituation without disturbing cetaceans, but laboratory trials show that Bottlenose Dolphins *Tursiops truncatus* are also startled. A petition to ban ADDs on fish farms has gathered more than 31,000 signatures, and in March 2021 the industry announced that it had turned them off, one day before Marine Scotland reported to the Scottish Parliament on their use. In another apparent example of the special treatment reserved for fish-farming, the UK's Marine Noise Register includes ADDs but excludes those on fish farms.

Several NGOs certify fish farms, claiming that this encourages good practice, while helping supermarkets and others to advertise 'responsibly produced' salmon, but these labels should be treated with caution. The RSPCA Assured welfare standards still permit seal-shooting in some circumstances, thermolicers (a form of physical treatment for sea lice) and the killing of all cleaner fish (RSPCA 2021). WWF helped to set up the Aquaculture Stewardship Council, which also allows thermolicers, cleaner-fish slaughter and pesticide discharges (ASC 2017), while the Soil Association organic certification allows these, too, including some pesticide use (twice a year, but not organophosphates) (Soil Association 2021).

Alternative futures

Salmon-farmers have made some progress towards sustainability, but some companies still argue for less strict regulations on pollution and the use of pesticides, and all their farms use open nets. The assessments commissioned and quoted by the Scottish Government's previous Cabinet Secretary for Rural Economy, Fergus Ewing, count only the economic benefits of fish-farming (including pesticide sales of £16.5m in 2016), while the cumulative impacts and cost to other jobs have never been assessed. In Norway, the cumulative risk of sea lice to wild salmon is central to fish-farm regulation, but the Scottish Government has repeatedly delayed giving better guidance to local authorities. Expanding salmon-farming without assessing its collateral damage does not help people in coastal communities, whose jobs will go if the industry implodes. These jobs are valuable, but more responsible methods could support just as many. Elsewhere, billions are being invested

in farming salmon in tanks on land, while rising licence costs in Norway are making open-net farming at sea more expensive than land-based farming (EUMOFA 2020). In Scotland, the same companies and their political allies do not want their costs to rise.

In time our warming seas could make Scottish salmon-farming unviable, but the industry needs to change direction before it reaches that point. It needs better regulation, by regulators who do not have to facilitate growth. Reforming Crown Estates seabed leases could encourage more responsible fish-farming, as has happened in Norway, where discounts favour less damaging methods. If Scotland becomes independent, it will need its key assets – including the sea – to be in good shape. Government and industry must strive for genuine sustainability if there is to be any future for aquaculture, for healthy marine wildlife communities, including wild salmonids, and for Scottish coastal communities, too.

As consumers, if we want a particular outcome and enough of us choose to spend accordingly, we can make this future more likely. On this basis, I gave up eating farmed salmon some time ago.

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John Aitchison is a wildlife filmmaker and chair of the charity Friends of the Sound of Jura (www.friendsofthesoundofjura.org.uk), a member of the Coastal Communities Network, Scotland (www.communitiesforseas.scot). He lives on the west coast of Scotland.

Enclosure 13 – Scottish Government emails.

From: [redacted]gov.scot>
Sent: 14 January 2022 14:34
To: [redacted]gov.scot>; [redacted]
[redacted]gov.scot>; [redacted]gov.scot>;
[redacted]gov.scot>; [redacted]gov.scot>;
[redacted]gov.scot>; [redacted]gov.scot>;
[redacted]gov.scot>; [redacted]gov.scot>;
[redacted]gov.scot>; [redacted]gov.scot>;
[redacted]gov.scot>; [redacted]gov.scot>;
[redacted]gov.scot>; [redacted]gov.scot>;
[redacted]gov.scot>
Subject: Aquacen

Hi all,

Just to provide some follow up info to what I said at the meeting with regards to Aquacen. You can see in the Products Catalog (cenavisa.com) that there are a number of products that appear under the Aquacen name. None of these have a Market Authorisation (MA) in the UK but can be prescribed under cascade. Which is how the Formaldehyde is being used, which is the product most of you will be familiar with under the Aquacen name. This is acceptable use under the cascade as there is no product with MA available in the UK with the same active ingredient. Going forward I am not sure how that is liable to change with view to us no longer being part of the EU.

However, they do need a special import certificate from VMD to be able to import and use these products. And if there is a products that has a MA in the UK such as Aquatet (Oxytetracycline) then that should be preferentially used. VMD grant the special import certificated on a case by case basis.

[redacted]

Thanks,

[redacted]
Marine Scotland - Science

Scottish Government | Marine Laboratory | 375 Victoria Road| Aberdeen | AB11 9DB

Tel: [redacted]
S/B: [redacted]
Mobile: [redacted]
e: [redacted]gov.scot
w: https://www.gov.scot/marine-and-fisheries

Enclosure 14 – Scottish Government emails.

From: [redacted]gov.scot>
Sent: 08 March 2022 10:24
To: [redacted]gov.scot>
Cc: [redacted]gov.scot>
Subject: Mortality issue at Torhouse Mill

Hi [redacted]

[redacted]and myself visited Torhouse Mill last week. During the remote inspection we picked up an unreported mortality from July 2021; 20% loss for site due to White Spot and water temp of 29oc. Aerators were used and formalin to reduce the white spot.

The [redacted]told us [redacted]had spoken to you about it at the time and I was wondering if you can recall the conversation.

Thanks

[redacted]
Marine Scotland - Science

Scottish Government | Marine Laboratory | 375 Victoria Road| Aberdeen | AB11 9DB

Tel: [redacted]
S/B: [redacted]
Mob: [redacted]

e: [redacted]gov.scot
w: https://www.gov.scot/marine-and-fisheries/

Enclosure 15 – Email to Scottish Government.

From: [redacted]btinternet.com>
Sent: 16 May 2022 07:50
To: First Minister <firstminister@gov.scot>
Subject: Scottish Intensive Fish Farming

AO [redacted]

Hi Nicola

[redacted]

[redacted] next to the beautiful loch. One morning there was a disgusting smell and the loch was a cloudy colour. The odor lingered for a few days and I watched as families stood on the edge of the loch but did not venture in to paddle as the water looked disgusting. This was due to the effluent from the fish farm 20 miles away building up at the head of the loch.

Since my return from that trip I have been reading about the pollution generated by intensive fish farming in our lochs. The slurry from so many fish, the dioxins used in the fish food sourced from the Baltic sea. The gallons of formaldehyde sprayed into our lochs to reduce fish lice. The use of antibiotics and layres of dead fish sinking to the base of the cages. Not to mention the heavy metals and damage to the natural fish population. This is all quite alarming and I am not even interested in fishing.

I used to enjoy what I thought was fresh natural Scottish salmon, but no more. I would not touch it.

I appreciate that there are a large number of Scottish jobs and income which rely on intensive fish farming. Maybe now is the time to clean up our act while we still have a positive reputation in the world market. I think this is an opportunity to lead the way as Scotland does in so many other areas. We may not be in the cut price high volume farmed salmon market but rather move to the sustainable, enviromentally responsible end of the price range.

I can foresee that if the industry does not change they will ultimatly destroy their own reputation, market and damage our tourist industry. This cannot be in Scotlands best long-term interests.

I am not seeking a reply as I realise how busy you and your team must be. It was just to express my concern on the matter.

[redacted]

Sent from my [redacted] - Powered by [redacted]

Enclosure 15.1 – Attachment.

DIRECTORATE FOR MARINE SCOTLAND
DMARINE : Aquaculture and Recreational Fisheries
[redacted]

Our Reference: 202200300380
1 June 2022

Dear [redacted]

Thank you for your letter of 16 May to Nicola Sturgeon MSP, First Minister of Scotland, highlighting your concerns about the environmental impact of fish farms. I have been asked to respond.

We support the sustainable development of aquaculture which, as you note, is a significant employer and economic contributor, especially in many of our most remote and fragile rural communities. However, we are clear that growth of the aquaculture industry must be sustainable and this includes the need to consider the natural marine environment and to have high regard for the health and welfare of farmed fish. In Scotland, fish farming is overseen by a number of regulators, including Marine Scotland, the Scottish Environmental Protection Agency (SEPA), and local authorities.

All fish farms in Scotland have to meet strict environmental standards, set out within licence, and these are regulated by SEPA with the aim of ensuring that the environmental impacts from the industry are assessed and managed safely. SEPA continues to implement its finfish regulatory framework, which ensures development is in the right place, and with sufficient environmental assessments. The framework uses enhanced modelling techniques and as well as the regular monitoring of impacts and compliance.

Scottish fish farms are regularly inspected by Marine Scotland fish health inspectors. They will report any significant case of poor welfare to the veterinarians in the Animal and Plant Health Agency (APHA), who are responsible for overseeing the requirements of the Animal Health and Welfare (Scotland) Act 2006. Through various work-streams, we are committed to working collaboratively with a range of key stakeholders on improving fish health and related welfare including the use of medicines and other treatments for treating sea lice.

Food Standards Scotland works closely with the Scottish Government, Local Authorities, and UK authorities to ensure that feed produced, distributed and sold is safe and meets legislative requirements. The aim of legislation is to ensure that feed is put into circulation only if it is sound, genuine and does not represent any danger to human health, animal health or the environment. Legislation prohibits the dilution of contaminated feed materials and it includes maximum limits for heavy metal presence such as arsenic, lead, mercury and cadmium as well as for arsenic, dioxin, aflatoxin, certain pesticides, and botanical impurities.

We are committed to going beyond the status quo and have recently undertaken an independent review of aquaculture regulation. We are clear that the sector must aim

to minimise its environmental impact to ensure a sustainable future and maintain the right balance across our economic, environmental and social responsibilities.

We appreciate the time you took to write to us with your concerns. While I hope that we have demonstrated that fin-fish aquaculture is a highly regulated sector with environmental controls in place, we always encourage members of the public to contact Scottish Environment Protection Agency (SEPA) where they are concerned about possible environmental pollution so it can have investigated and, where appropriate, take action.

Yours sincerely

[redacted]

DMARINE : [redacted]

St Andrew's House, Regent Road, Edinburgh EH1 3DG
www.gov.scot