

RURAL ECONOMY AND CONNECTIVITY COMMITTEE

SALMON FARMING IN SCOTLAND

SUBMISSION FROM DR CAROL HAWLEY

I wish to submit my views in answer to those of your questions I feel qualified to address. I use your question numbers.

1. Do you have any general views on the current state of the farmed salmon industry in Scotland?

Yes, it is expanding at an alarming rate without due regard for the environment and **visual impacts.**

3. The farmed salmon industry is currently managing a range of fish health and environmental challenges. Do you have any views on how these might be addressed?

Open-net fish farming has been shown to cause environmental damage. A solution is to move towards closed containment systems of aquaculture. I quote from my colleague Dr A. Magnay's letter of objection to recent planning applications:

i) There is well documented blanket local destruction of seabed ecology and marine life per se, as fish waste pollution (caused by large biomass aggregations of farmed fish) causes.

a) smothering of biologically essential seabed vegetation species from light, preventing photosynthesis; b) suffocation of locally endemic species due to oxygen deprivation and reductive sulphur reactions at the seabed, due to reduced photosynthesis and increased deposition of marine-toxic ammonia products leading to death and decay.

ii) Well-documented additional contribution to local blanket destruction caused by uneaten food waste adding to the nitrogen and ammonia burden

iii) Well-documented additional burden to regional and local ecosystem caused by external aggregations of wild fish attracted by feeding and by behaviours of farmed fish:

a) Wild fish attracted to feeding aggregate in ecologically unsustainable large numbers locally, as evidenced by many studies in Atlantic and Mediterranean published studies.

b) Redistribution of wild fish stocks to congregate in biologically abnormal numbers near fish farms simply for food availability, will likely depopulate areas for which they are biologically adapted, where the balance of predator/prey/grazing/regenerating ecosystem is substantially damaged by rapidly imposed imbalances.

iv) Well-documented convergence of bird, mammal, and piscine predators both to the farmed fish, and to the congregating wild fish associated with fish farms, leading to overpredation exploitation of local fish populations.

v) Risk of local fishermen/fisheries exploiting the inevitable wild fish attraction to Fish Farms, leading to collapse of already pressured wild fish stocks.

B) Catastrophic outbreaks of marine disease caused by pooling of large numbers of fish therefore vulnerable to high prevalence of communicable disease exposure and excessively high infecting loads. The reason epidemics occur is that two criteria are met:

a) The availability of sufficient vulnerable individuals in a population (eg an unnaturally large local aggregation of a single species). b). The means of transmission of an infectious pathogen amongst the population. Physical contact, vectors such as cleaner fish, and also Aqueous media alone, are perfect culture and transmission methods.

An epidemic will be inevitable therefore, if these two criteria are met, once an infectious pathogen enters the population, unless the means of transmission can be interrupted quickly. For example, the bacterial fish pathogen *Pasteurella skyensis* was first identified following an outbreak in a Salmon Farm on Skye, and demonstrated as the cause in four outbreaks in the Scottish Isles, between 1995 & 2001. (Birkbeck T, et al, *Int J Syst Evol Microbiol.* 2002 May;52(Pt 3):699-704). Further outbreaks have occurred with distressing frequency and mortality since then. Repeated epidemics of this fish plague in fish farms across the west coast of Scotland indicate that this bacterium must now be considered endemic to the waters around the Scottish Islands, if it wasn't already.

c) Other bacteria (eg *Franciscella* species, streptococcus and many others), Marine TB, fungi, rapidly fatal and highly transmissible piscine viruses, and debilitating parasites, all have been documented at substantially and significantly increased prevalence in and around Fish Farms, and also amongst fish eg Salmon and Sea-Trout whose natural migration route passes close enough – we still don't have any meaningful basic data to predict the safe magnitudes of distances separating acceptably low risk of transmission, with confounding effects of variable migration routes, tides and currents, and local wild fish aggregations, effects of vector transmission by predators, and so forth.

d) Documented examples of dispersing an infected population (ie releasing or dumping the infected fish) simply multiplies the volume of contamination by all primary and secondary pathogen(s), allowing spread to other ecological niches and other pockets of prevalence.

e) "Lack of scientific evidence of calculable transmission and vector risks" is **not to be portrayed as "evidence of lack of risk"**. IN all field of biology, without

exception, contagion occurs by physical transmission, by fluid dispersal, by residual environmental contamination, and by vector dissemination. Parasite and predator vectors are universal in nature. Fish Farms are supreme examples of uncontrolled contagion by all routes above.

f) Salmon in Fish Farms have been documented to host infections which cross all fish species and can be harboured in many other non-fish marine and non-marine mammalian species. It is almost inconceivable that marine outbreaks can be realistically contained to isolated Farm locations and can be cleared from the environment in a financially viable time-frame. The problems of containing Foot-and-Mouth disease on land are trivial exercises compared with the problems containing epidemics in the aqueous dispersal medium of the coastal environment.

h) studies of potentially beneficial cleaner fish for salmonids, such as wrasse and lumpfish, have shown endemicity of *Pasteurella skyensis* and other salmonid pathogens amongst those cleaner fish used in aquaculture.

g) Viral haemolytic disease affecting salmonids has already been documented as being capable of pandemicity from fish farms. European international outbreaks spreading into and affecting UK and Scottish stocks are well-described. There is absolutely no reason to think that Fish Farms in Scottish Waters are somehow immune from causing pandemic spread from Scottish Waters, with all the future legal and litigation ramifications to be borne by the taxpayer.

C. Antibiotic Resistance associated with Fish Farming. Demonstrates recklessness by using antibiotics to prop up a non-viable financial investment in an unsustainable biological farming model; and a potentially catastrophic (to humans) farming model.

i) We have over 2 decades of published and reproducible evidences demonstrating presence of antibiotic residues, AND increasing prevalence of antibiotic-resistant disease-causing pathogens, in the waste from fish farms, irrespective of the “water refresh” environment (marine tidal, estuarine, river flow, or pond).

ii) It is irrefutably true that different bacterial species carried by different species can exchange and acquire antibiotic resistances from already resistant bacteria (eg survivors of antibiotic therapy), and can therefore “learn” resistance from survivors without themselves being exposed to antibiotics.

iii) Antibiotic therapy kills bacteria indiscriminately, beneficial bacteria and pathogens alike, and inevitably generates resistant bacteria amongst survivors of therapy. It is impossible to kill all pathogenic bacterial cells with antibiotic treatment: some will always survive, with highly probable resistance to the antibiotic. Lessons from aquarium fish farming has demonstrated that frequent antibiotic therapy ALWAYS generates resistance, usually demonstrable after only a single treatment in a pool or tank, and that transmission of resistant bacteria between fish - and from fish to human - is considerably easier in water than on land.

iv) Outbreaks of multiply-antibiotic-resistant Paratyphoid infection in humans have been traced back to aquarium hobby fish farms in Indonesia (Emergence and evolution of multiply antibiotic-resistant Salmonella enterica serovar Paratyphi B D-tartrate-utilizing strains containing SG11. Djordjevic SP, Cain AK, Evershed NJ, et al. Antimicrob Agents Chemother. 2009 Jun;53(6):2319-26. doi: 10.1128/AAC.01532-08.) Most importantly, this example has implications across the entire marine world, because it demonstrates a novel method of extremely serious resistances entering the human microbiome.

v) All of these observations, from food fish farming especially, but from all fish farming in principle, are of crucial importance, environmentally highly significant findings, and **should be sufficient alone to cause a halt on development of ANY new fish farms.**

5. Do you have any views on whether the regulatory regime which applies to the farmed salmon industry is sufficiently robust?

Yes. The ECCLRC report documented evidence that the regulatory regime as applied to the farmed salmon industry is far from robust. The Scottish Environmental Protection Agency (SEPA) have provided evidence that suggests that of the seabed surveys they carried out on 224 fish farms, one third (76 farms) showed unacceptable impacts (letter from SEPA CEO to Graeme Dey, 28th March 2018). SEPA are not applying the Precautionary Principle when assessing suitability of fish farms in sensitive locations.

Scottish Natural Heritage is responsible for ensuring that priority marine features (PMFs) are safeguarded, but their own planning guidance does not permit them to object to planning applications for fish farms unless the NATIONAL population of those PMFs is at risk. They do not submit a formal objection if there are negative impacts in a region or locality. This is surely not correct. If this attitude is taken to a string of fish farms along a coastline then, when taken individually, each will have regional or local impacts which will be deemed acceptable, but the cumulative impact and overall view is not taken. These cumulative impacts may add up to be of national importance for the species in question.

This attitude is evidenced by the recent approval of two fish farms on the East Coast of Trotternish, Isle of Skye. The planning department claim that because SNH and SEPA did not make a formal objection then these farms can go ahead even though they are in a cSAC for Harbour Porpoise and the seabed survey revealed rare priority marine features such as Northern Sea Fan and Fireworks Anemone, which is deemed globally important on SNH's own website.

Another example is the recent approval of a new fish farm off the Isle of Mull. This is in a Marine Protected Area, MPA. If a polluting open-net fish farm can be sited here what is the point of MPA designation?

This has to change, or so called protected or priority species will be destroyed or severely impacted in many locations which will ultimately cause serious negative impact on the national population.

Similarly, for the above Trotternish planning applications, the fish farms are within a Special Landscape Area adjacent to a National Scenic Area (although the SLA is easily as attractive as the NSA). Despite this, the visual impact although described in the Landscape and Visual Impact Assessment report as: Large and Major effect on Scenic quality, Up to Large and Major effect on seascape condition, Up to Large and Major effect on seascape value, Up to Medium and Major effect on tranquillity. Large and up to Substantial effect on scenic quality, Large and up to Substantial effect on landscape condition, Large and up to Substantial effect on landscape value. Despite all this, these two fish farms were approved by Highland Council.

The Highland Coastal Development Strategy (HCDS) (2010) provides evidence of the value and importance of the coastal landscape and how it should be protected. The report identifies the coastline of Skye as one of Scotland's greatest natural assets, see below. The area of these developments is also a designated Special Landscape Area. So surely that should be good enough reason to refuse planning permission for two commercial fish farms in this sensitive location. Quotes are directly from the HCDS report:

“5.9.1 The landscape resource of the Highland coast, particularly the west coast which includes Skye and the Small Isles, is one of Scotland's greatest natural assets. Landscape forms the core of the area's appeal to visitors in an increasingly competitive global tourism market and is integral to Highland culture and identity. .” **“5.9.2 Most of the Highland west coast is designated either as National Scenic Area or Area of Great Landscape Value (regionally important). ... It is a resource which is not just significant at a national level. The interest from abroad shows that it is significant at a European level as well.”**

And yet, the planning committee decided to site the fish farms here anyway.

The Trotternish, Skye fish farm applications do not comply with the Highland Development Plan policies 28, 49, 50, 57, 58 and 61 as detailed below. However, all of these were dismissed by the Planning Officer who claimed that the developments were acceptable within these policies. **There is clear subjectivity here which needs to be tightened up.**

In conclusion

The system for approving applications for new fish farms needs to be scrutinised and tightened up to remove subjectivity. Planning officers require training on the Precautionary Principle and how to measure developments against the Highland Development plan to ensure it is consistently applied. SNH must be allowed to object to new applications where they threaten PMFs at a regional level, and not only when the development will threaten them at the national level. It is difficult to argue that a fish farm will have significant negative impacts at a national level, and because of

this so many fish farms are being sited in sensitive areas because a SNH, a statutory consultee cannot object.

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