Environment, Climate Change and Land Reform Committee

Environmental impacts of salmon farming

Written submission from Lochaber Fisheries Trust

Thank you for the opportunity to comment on the SAMS "*Review of the Environmental Impacts of Salmon Farming in Scotland.*" The Lochaber Fisheries Trust (LFT) is a small charity that works to conserve fish populations and freshwater habitats. We have been part of a number of research projects looking at the impact of aquaculture on wild salmonid populations and participated in initiatives to manage interactions between wild fish and aquaculture. Our remit covers the impact of aquaculture on wild salmonid populations and this forms the focus of our submission.

Overall we welcome the review and broadly agree with its findings. The sections on disease transfer and genetic introgression provide a good summary of the potential impact and current lack of data in these important areas and we have nothing further to add to the report's findings. Most of our comments concern the impact of sea lice covered in Section 2 and the concept of Adaptive Management discussed in Section 8.

The LFT is a member of Fishery Management Scotland (FMS) and we fully support the points made in their submission to the Inquiry. In particular, we would like to emphasise FMS's clarification of the mortality levels due to sea lice stated in section 2.1.1 of the report as ranging from 1-20%. The 1% and 20% figures quoted do not represent variability in the size of the effect seen, but rather a difference in the way the same data are interpreted. A 1% increase in smolt mortality would result in an approximate 20% reduction in the number of adult salmon returning to a river to spawn. Either interpretation is statistically correct, but the 20% reduction in adult spawners is more relevant as it will determine whether a salmon population reaches its Conservation Limit.

The report highlights the paucity of data relating to aquaculture impacts on wild salmonids in Scotland and contrasts this with the greater research effort undertaken in Norway and Ireland. We agree that this is a significant constraint on our understanding and management of the industry, but feel that a large body of evidence has been collected in Scotland that is consistent with the nature and scale of impacts measured in other countries. Studies carried out by Marine Scotland Science (MSS) have shown that the densities of infective lice recorded in the sea are driven by lice infections on farmed fish (Penston & Davies 2009; Harte *et al.* 2017). The lice burdens on wild sea trout on the west coast of Scotland are highest close to farms, and patterns in the level of lice on wild sea trout are correlated with farm production cycles (Middlemas *et al.* 2013; Shepherd et al. 2016). We regularly record lice burdens on wild sea trout that have been shown to cause stress and mortality in captive fish (Wells *et al.* 2006). The Norwegian government has developed a tool for assessing the impacts of aquaculture including the effect of lice burdens on wild fish (Taranger *et al*. 2015). This method predicted that of the 83 sea trout we sampled near Fort William in 2017, 72% would die as a result of their lice

burden. This is despite neighbouring salmon farms using cleaner fish, chemical and mechanical lice treatments as part of an Integrated Sea Lice Management strategy.

Lice levels on wild salmon are not monitored in Scotland and, to date, no large-scale studies on the effect of lice on the overall health of salmon or sea trout populations have been completed in this country. MSS are currently attempting to address the latter knowledge gap, but their pilot study on population-level effects has identified major logistical challenges and there is probably only one river on the west coast where such a study will be possible using wild salmon. It is unlikely we will ever manage to intercept sufficient wild salmon smolts in Scottish waters to permit a robust lice monitoring programme. Even in Norway population-level studies have only been carried out on a small number of rivers and surveillance monitoring relies on the results from wild sea trout, cages of experimental fish and modelling. The Norwegian Government has accepted that direct data will not be available in all areas or for all species and has extrapolated from what data are available to create a nationwide regulatory system. We need to decide whether conditions in Scotland are so different from those in Norway and Ireland that the infective lice pressure and sea trout lice burdens we can measure in this country would result in a different population-level effect on wild salmonids and so justify the time and resources necessary to test this on a single Scottish river. The alternative would be to accept that there is a reasonable likelihood of significant impacts in some locations in some years and move to a system of Adaptive Management.

Adaptive Management has been suggested as a means to overcome the difficulties of licensing and regulating an industry where the environmental impacts are uncertain and difficult to predict. We see great promise in the development of such methods, but also potential difficulties. Adaptive Management is only appropriate if the potential effects can be effectively monitored and there is a well-resourced regulatory system to enforce management action when required. This does appear to be the case for benthic impacts where there are well established methods for measuring effects and SEPA have demonstrated a willingness to order reductions in biomass where farms have failed to meet the standards. However, the extension of Adaptive Management to sea lice impacts on wild salmonids is likely to be more challenging.

We have many years' experience of attempting to measure directly lice levels on wild salmonids and it will not be possible in all areas. It is unlikely that sufficiently large numbers of salmon (as opposed to sea trout) smolts could ever been sampled. More resources would be helpful, but the same problems have been encountered in Norway, where monitoring budgets are much higher. We are about to begin discussions with the aquaculture industry, MSS, the Crown Estate and other wild fish interests with the aim of developing an agreed method for monitoring lice levels on wild fish and linking it to farm management. If this is to provide any basis for effective Adaptive Management, then indirect and less than robust evidence of impacts on wild salmonid populations will need to be accepted by the industry and regulators as triggers for management action on the farms. It is not clear if such an agreement can be reached and we have further concerns about the capacity of Planning Authorities to provide ongoing participation in management agreements

and their willingness to take strong enforcement action such as biomass reductions or farm closures.

Unless or until closed containment is adopted, Adaptive Management of the impact of farm-derived lice on wild salmonids probably presents the best means of regulating this interaction. Taking a strictly precautionary approach and permitting farms only if the industry can demonstrate the absence of significant impacts would obstruct an economically vital industry in the Highlands and would be disproportionate except where a Natura site may be affected. Likewise, the current system that puts the onus on the wild fish sector to categorically prove a significant negative impact is also unacceptable given the near impossibility of reaching this evidence bar. Adaptive Management represents a pragmatic middle ground and a potential way forward if it can be correctly implemented. However, the two examples of Adaptive management of wild fish impacts through Environmental Management Plans (EMPs) that I am currently aware of in Scotland have so far failed to deliver this promise due to poorly-designed monitoring programmes, ill-defined trigger thresholds and management actions and a failure to enforce agreements on the part of the Planning Authority. Confidence in the ability of Adaptive Management and EMPs to address lice impacts on wild fish will quickly dissipate if these issues are not quickly resolved.

Most of the main environmental impacts of aquaculture were covered by the report, but we agree with the Lochaber DSFB that disruption to the imprinting mechanism of outmigrating wild smolts and impacts on freshwater loch habitats through open-cage smolt rearing also need to be considered. The lack of published studies in these areas is probably due to the great difficulty involved in conducting such research. The magnitude of these impacts could, however, be significant and should not be ignored.

The report stresses the importance of ecosystem-level effects and suggests salmonids are of interest mainly because of public concern linked to recreational fisheries. We would suggest that the value of salmon and sea trout goes beyond that of a single species. Freshwater habitats in northern Scotland were colonised relatively recently following the last ice age. As a results salmon and trout are two of only a limited number of species are present compared to similar habitats further south and play a pivotal role in these ecosystems. Adult salmon and sea trout represent a significant transfer of nutrients to our rivers and lochs from richer marine environments through the eggs they deposit and the high mortality of fish following spawning. Juvenile salmon and trout are usually the most numerous fish present in Highland rivers and are an important predator of invertebrates and prey species for otter and piscivorous birds. They are also essential for the critically endangered freshwater pearl mussel to complete its life cycle. Severe declines or local extinction of salmon and sea trout would have ecosystem-wide effects in addition to the socio-economic and cultural loss of their fisheries.

Finally, we would suggest more consideration needs to be given to the potential effect that climate change could have on the environmental impacts of aquaculture. We have seen new diseases emerge and proliferate on farms in recent years and

warmer sea temperatures are likely to have played a part in this. Lice control on farms also appears to be more challenging in warmer years and the ability of wild fish to tolerate lice burdens is reduced at higher sea temperatures and salinities. Climate change predictions are imprecise at a local level, but more consideration should be given to the effect that likely climate change scenarios would have on the report's conclusions to ensure that Committee's recommendations remain relevant in future years.

References

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