

Proposals for a risk-based, spatial framework for managing interaction between sea lice from marine finfish farm developments and wild Atlantic salmon in Scotland

I am writing regarding the above consultation. I have made some responses to the questions set out in the document plus some more general observations.

A general observation on the consultation is that it is presented as a relatively detailed proposal, including references to peer-reviewed scientific research which gives it a veneer of credibility but it is actually entirely lacking in any realistic detail to let concerned members of the public understand how it might work. In a sense then, it is “all talk and no trousers”.

The over-riding desire to protect wild salmon is clearly one that no-one should really argue with, but it simply isn't clear how these proposals will achieve that laudable aim and it is rather tragic that Scotland's sea trout are entirely neglected. It is also slightly bizarre that the proposals seek to reduce the risk to salmon from the known (and proven) harm caused by sea lice but then chooses not to deal with the known (and proven) harm caused to wild salmon by escapes from fish farm cages.

It isn't explained or justified how the risk posed by sea lice “escaping” from the cages and interacting with wild fish is any different from salmon escaping and interacting with wild fish. While the paper (para 2.7) acknowledges the fact that proposals may be worked up to deal with this latter threat, it is not clear how this potential harm is different. Nor is it explained how having this risk dealt with by another regulator fully achieves the streamlining of regulation discussed at para 10.4.

The Main Components of the Framework

The idea that risk to wild smolts can be described in the terms set out in para 4.1-4.5 is rather naïve and seeks to reduce a biological system and interaction to a relationship that is more applicable to something like a chemical pollutant. Out-migrating smolts and dispersing sea louse larvae are living entities and attempting to describe their behaviours and the resultant risk in the way set out in the consultation is overly simplistic.

The information provided in the sections dealing with the implementation of the new approach is also simplistic and so lacking in detail that it is difficult to comment constructively. There are some specific and substantial concerns however:

Controls over new farms

The consultation discusses the inclusion of conditions necessary to keep the number of sea lice emanating from development low enough to protect smolts but no detail is provided on such conditions.

- Is it to be a numeric limit on louse numbers on farmed fish? Will there be a requirement to treat fish that have too many lice?
- A requirement to slaughter fish where louse control is no longer effective?
- How does the need to treat – if that might be a requirement of the framework, sit with SEPA's overarching duties wrt pollution control?
- Are louse numbers and the protection of wild salmon stocks seen as more important than protection of wider biodiversity and the interests of inshore fishermen which might be damaged if treatments are applied to deal with louse infestations?
- What if a fish farmer can't treat the fish because of limits in the SEPA licence for his farm, does SEPA, waive the limits on pesticide use, or the requirements to control lice? it is important that the public are consulted on such matters and the paper has no such detail.

Existing farms

The proposals appear only to apply to new farms, and perhaps enlargements of existing farms.

- With the contribution from existing farms being considered based upon “the operation of the farms” – is this presumably previous louse count history?
- It is not clear how restrictions will be put in place to ensure that the numbers of lice emanating from these farms cannot increase significantly?
- Presumably the existing controls on biomass ensure this, or is there an intention to control numbers of fish in the farms?

- Or impose limits on the number of lice in the farm?

Sea trout

Perhaps one of the most glaring and fatal omissions from the framework is a consideration of the impacts of sea lice on sea trout. This seems to be justified on the basis that “more science is needed”. This is a bizarre cop out and probably simply untrue. The likelihood is that sea trout do not fit the framework proposed in the paper and their inclusion would be significantly more inconvenient for the sector and SEPA as a greater number of areas would be restricted regarding fish farm developments. Thus they have been excluded.

The research used in the paper to set the thresholds etc for salmon are derived from a single paper and there is similar peer-reviewed published research on sea trout. For example *Bohn, T et al: Salmon louse infestation levels on sea trout can be predicted from a hydrodynamic lice dispersal model. J. Appl Ecol Vol 59:3*. If a framework for salmon can be developed through a single data source, there is more than enough data for sea trout to be included in the framework.

The omission of sea trout is particularly grave for other reasons. The sea trout is known to be the preferred host for the “salmon louse” *L. salmonis* as described in the host preference work of Mordue (Luntz) at Aberdeen University. Sea trout are also likely to be exposed for the entire marine phase of their life cycle.

The model described in the paper is one where risk is apportioned based on the concentration of lice larvae in the waterbody and the time duration of exposure. For salmon smolts this has been defined as the passage time through the “wild salmon protection zone”. Where exposure, typically for a few days, to a “known” concentration of lice is predicted to be harmless or cause harm. The risk is then proportionate to a given concentration of louse larvae and the exposure period to that concentration.

Even if the information for sea trout were more sparse, we can conclude two things with certainty. First, sea trout are at least as vulnerable or, given that they are the preferred host of the salmon louse, more vulnerable than salmon to infection from a given concentration of louse larvae. Secondly, the exposure period for sea trout is not measured in terms of a few days but in months or years. Thus whatever “risk quotient” might be applied to salmon in a given waterbody, the situation is likely to be orders of magnitude more serious for sea trout.

To attempt to protect less vulnerable salmon but exclude more vulnerable sea trout is a perversion of a policy that is designed to protect. Even if the system proposed in the document for salmon were adapted for sea trout by using the same critical louse concentrations but considering continuous temporal exposure it would be an improvement on inaction. It would likely still be inadequate but would at least be less derisory and would offer some scant protection to sea trout, it would also be as defensible to challenge from SEPA's friends in the fish farming industry.

The final twist of the knife for the sea trout population is provided in para 9.3 where it is suggested that sea trout can “*re-enter freshwater to rid themselves of sea lice infestations*”. The paper quoted, while discussing this behavioural adaptation which may allow sea trout to “survive”, also discusses the “costs” to the fish in doing so, in terms of compromised biological fitness and growth opportunities. Essentially, the welfare of these fish may be compromised and their fecundity reduced. Setting out early return to freshwater in the consultation as almost an excuse for inaction on this species is particularly telling and insulting. SEPA should not forget the sea trout are afforded the same status as a priority marine feature as salmon.

The map describing “Salmon Protection Zones” appears almost like an illustration of a “genocide” for migratory salmonids to the North of Caithness, alternatively, a cultural apartheid for the communities for whom the sea trout fishery provides recreation and tourist income.

- Is this simply about sea trout or is it because the migratory fisheries on the West coast and in the western isles are feudally “owned” by often rich landowners whereas the migratory fisheries in the Northern Isles belong to no one?
- Is SEPA perhaps simply scared of the risk of prosecution by a fishery owner on the mainland for harm to their interests whereas no such risk may be apparent in the Northern Isles?

In a similar vein,

- Was this new policy subject to an Islands Community Assessment under the Islands (Scotland) Act 2018, have the communities of Orkney and Shetland been directly consulted on SEPA's plans to desert their wild sea trout stocks?

This seems particularly relevant given the rampant and apparently unrestrained expansion of salmon farming in the Isles seen in the last year or two under SEPA's new rules for the industry.

Proposed sea lice exposure threshold

The concept of relating exposure time to mortality is well known in terms of ecotoxicology but the appropriateness in the context of smolt mortality induced by sea louse infestation is less clear for a whole host of reasons. It is also slightly bizarre (and probably questionable in terms of scientific appropriateness) to try to describe the interaction between two mobile species as if they were inert particles.

Smolt passage time.

The swimming speeds and passage times for smolts of different sizes are discussed in the paper. It discusses "average progression speeds". The distribution of swimming speeds of fish that were used to derive this average is not provided but if the range of swimming speeds were approaching a normal distribution then it is likely that around 50% of the smolt population may have longer passage times through the salmon protection area, presumably with implications for the survival of this slower swimming cohort. This seems recklessly inappropriate.

It also seems dubious to consider the distance and swimming duration from natal river to open sea in terms of straight-line distance. While many smolts may swim directly from river to open sea, it is likely that a proportion may not and may dawdle. The approach with respect to the mean swimming speed and the straight-line assessment of distance is not appropriate. It would be more appropriate to consider the swimming speed that encompasses the majority of smolts – the 95th percentile perhaps, and use this swimming speed to maximise protection rather than condemning a substantial minority of smolts to a potentially lethal dose of sea lice before they have left inshore waters.

Modelling

Little detail is provided of the modelling techniques that SEPA will use in implementing the system, there is a discussion of the areal concentration of lice to a depth of 2m but little justification for this choice of depth or of the parameters used in the model. The detail provided refers to a paper by *Murray, A and Moriarty M in Ecological Modelling vol 443*. This research is however just that, theoretical research using a simplistic model to look a theoretical risk and connection between lice from farms infecting wild salmonids. Such an approach is entirely inappropriate to be used in a regulatory context or to inform regulatory decisions, to set conditions relating to lice etc. SEPA would be in deep trouble if it tried to use such a simplistic approach in regulation, but who knows, perhaps something better in anticipated.

SEPA is clear on the validation and calibration required for models used in regulation and the work that SEPA undertook in this connection, for example in relation to DEPOMOD. These details are provided on the SEPA website.

- What validation has been undertaken of the modelling of louse dispersion that will be used by SEPA in screening likely risk, and what will be required of applicants in terms of the "3D" louse distribution modelling for applications and the validation and calibration of those models ?
- How is the modelling driven?
- Does the modelling approach account for worst case scenarios (which will occur regularly) where louse larvae may be driven by wind into locations which smolts may use for migration?

For example, it might be assumed that out-migrating smolts in West coast sea lochs will generally follow the northern shore of the sea loch to the open sea. In such circumstances, southerly or south-westerly winds will tend to push planktonic louse larvae onto the North shore of the loch with significant implications for the concentration of lice found there and therefore the survival of smolts.

- How does the SEPA modelling or applicant modelling account for this inevitable wind driven effect?
- Are modelled louse concentrations simply evenly distributed across the area of the waterbody to a depth of 2m, or concentrated by currents, or by wind, or by wind and currents?
- What wind or current regime would be used, averages for April and May?
- Are diurnal vertical migrations of lice accounted for which may reduce the impact of wind at certain times of day but increase its effects at others?

Conclusion

The proposals lack detail but appear to offer little realistic protection to salmon, other than in a few limited geographical areas for a very limited period of time.

No protection is offered to sea trout, erroneously justified because “more science is needed” whereas the reason is more likely to be because including sea trout would be significantly more inconvenient to the fish farmer industry.

It is clear that science to support the protection of sea trout does exist and even if it were true that it was absent, applying a similar framework of protection as proposed but adapted to sea trout would not fully protect sea trout but at least would not condemn the species to extinction.

Available science would demonstrate that sea trout are more vulnerable than salmon (due to sea louse host preference and exposure time) and the decisions to exclude them from protection is unfathomable.

Like any response to any public body consultation, I don't anticipate my contribution making an iota of a difference but at least it might expose the sham that the current proposals are.

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