



## SEPA's Analysis of the Feedback on its Consultation on the Introduction of a Regulatory Regime to Control Sea-Lice Loss from Fish Farms

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## Executive Summary

In October 2021, Ministers decided that SEPA should be responsible for regulating the loss of sea lice from marine pen fish farms so as to protect wild salmonids. The SEPA consultation was launched in December 2021 and closed on 14 March 2022. This high-level consultation was intended to allow SEPA to develop the direction of travel. We will work with stakeholders to develop the details of the new regime.

Sixty-two responses were made to SEPA's consultation from across industry, regulators, interest groups, and individuals. There were opposing responses to many of the questions reflecting the different perspectives of those engaged in discussions about aquaculture. The consultation responses have been very helpful in developing our ideas for the further development of the regime.

### Comments on Scope of framework

There was strong opposition from many finfish aquaculture sector respondents to the creation of the framework and its scientific basis whilst other interest groups were broadly supportive.

The key concerns from marine finfish farm operators were the proportionality of controls and the focus on sea lice as a cause of the decline of salmonid populations.

- **Proportionality.** Respondents from the finfish aquaculture sector considered that a risk-averse approach to regulation by SEPA would result in controls that were disproportionate to the environmental risk and that this would create an unjustifiable barrier to the sector's growth. They highlighted a lack of regulatory impact assessment that compared the benefits of environmental protection with the socio-economic costs.

SEPA regulates any activity which has the potential to have a significant impact on the water environment. It does this through The Water Environment (Controlled Activities) (Scotland) 2011 "CAR" Regulations which requires controlled activities, such as fish farming, to be authorised by SEPA and subject to conditions it considers necessary or expedient for the purposes of protecting the water environment.

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We will work with the industry and interest groups to ensure that the controls introduced are proportionate to the given risk. We will produce a further consultation before implementing the regime, which will include an assessment of the social and economic implications of the framework.

- **Focus on sea lice.** Respondents from the finfish aquaculture sector expressed concern that SEPA was developing a framework to control risks to wild salmon populations without equivalent action being taken to address other pressures on those populations.

The sea lice framework will create an additional regulatory tool for the protection of salmonid populations. Where action is needed to drive improvements to salmonid populations, we will use the appropriate regulatory tool or combination of tools to address the relevant pressures on wild salmonid populations in the river catchment concerned (e.g. barriers, diffuse pollution, habitat damage or sea lice). For example, the recent Wild Salmon Strategy committed to reviewing existing CAR licences as part of River Basin Management Plans to improve fish passage at a range of operations, including distilleries, public water supply and hydropower, with barrier removal at redundant sites and a Wild Salmon Strategy Implementation Plan will be published later this year and will identify detailed actions that need to be taken across all pressures impacting wild salmon populations.

The key concerns of interest groups covered the phasing of the framework and the exclusion of sea trout.

- **Phasing.** SEPA proposed that it should initially focus on preventing deterioration of wild salmon populations by controlling sea lice losses from new developments and by ensuring that existing fish farms which pose the greatest risk to Wild Salmon Protection Zones (WSPZ) are not increasing their sea lice contribution. Interest groups considered that action should be taken immediately to reduce sea lice losses from existing farms.

We still consider that it is necessary to phase-in the new framework. We are committed to driving reductions in lice loss from existing farms where this is

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required to improve salmonid populations. We are considering the following phasing-in of the regime.

- I. For new farm developments or expansions of existing farms, we will include permit conditions to control sea lice losses to prevent sea lice from such developments risking deterioration of wild salmon populations.
  - II. To ensure robustness of risk assessments, we will review the accuracy of methods for counting fish numbers and sea lice numbers at farms contributing sea lice to WSPZs in which sea lice concentrations are modelled as high.
  - III. To protect wild salmon populations from deteriorating, in WSPZs where sea lice concentrations are modelled as high, we will apply permit conditions to existing farms to prevent concentrations in the WSPZs from rising further.
  - IV. Collect evidence of impacts on wild salmonid populations in those WSPZs in which modelling has identified wild salmon as being at high risk.
  - V. Adjust permit conditions for existing farms to ensure sea lice losses are reduced in those circumstances where we have collected suitable evidence of impacts on wild salmonid populations.
- **Exclusion of sea trout.** The consultation proposed that the framework should only cover wild salmon and that sea trout would be brought into the framework later.

As a result of feedback from interest groups and the aquaculture sector SEPA and Marine Scotland Science agree that sea trout should be included from the beginning of the framework. We will initially focus on providing protection of sea trout in the WSPZs during the early sea phase of their lifecycle and the development of a sea trout monitoring programme that will provide information to help assess risk and further develop the regime.

### Comments on Regulatory approach

Many representatives from the finfish aquaculture sector stressed the importance of avoiding dual/conflicting regulation with respect to sea lice numbers on farmed fish. We are working with the Fish Health Inspectorate to unify our monitoring requirements and coordinate any regulatory action. The transfer of sea lice and

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nutrient assessments from local authorities into the SEPA assessment process will also streamline the regulatory process for developers.

Many interest groups emphasised the importance of developing controls over sea lice which were based upon specified limits in the licence. We agree with this approach and are developing methods of setting conditions which achieve a balance between the need for enforceable standards and the practical constraints of managing a biological agent whose abundance is affected by natural factors as well as farm management. We will be looking to operators to provide information on the variability of sea lice numbers on farmed fish and will discuss options for how permit limits are defined with all stakeholders.

We had conflicting representations over the implementation timing of the regime. We intended to introduce the framework in early 2023. Industry suggested that this was too ambitious. However, some interest groups wanted earlier implementation.

It is important to ensure the proposed framework is the right one. We expect to implement the framework during 2023 and are planning to consult on the detailed proposals for implementation in the second half of 2023.

Rather than introducing a separate regulatory framework for sea lice regulation, we will integrate it into, and at the same time take the opportunity to further evolve, our wider regulatory framework for marine finfish farms introduced in 2019. This will include expanding the pre-application risk screening process to bring together cumulative impact assessments of solid organic waste discharges, bath medicine discharges, nutrient discharges and sea lice releases. This will help operators and interest groups better understand new development proposals. Over the next few years, we will transfer regulation of marine finfish farms to the Integrated Authorisation Framework. This will allow us to also include the regulation of waste management issues within a single, integrated framework.

### **Comments on Scientific approach**

Taking account of discussions at the Salmon Interactions Working Group of the importance of providing protection for wild salmon in migration bottlenecks such as sea lochs and sounds, Marine Scotland and SEPA worked together to define the

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WSPZs set out in the consultation. Where indicated by improved evidence about wild salmon migration routes, we will revise the zones or create new ones as appropriate. We received detailed comments on the delineation of zones as part of the consultation and will take these into account in updating the zones prior to implementation of the framework.

Marine Scotland and SEPA developed an environmental threshold which we consider would protect wild salmonids. Operators expressed scepticism in their consultation responses over how we developed the standard, fearing that it was over-precautionary. Some criticized the assumption that Norwegian sea lice science was applicable in Scotland. We consider the use of Norwegian science to be appropriate. We consider that we are proposing action based on the best available evidence internationally. As part of our adaptive approach to the development of the framework, we are reviewing the comments on the science used to define the standard. We will also use our models to explore the consequences of applying the standard using our developing screening models. This information will help inform our assessment of the socio-economic consequences of the proposed framework in early 2023.

Some interest groups suggested changes to the way the zones and standards were managed. We agree that fish passage through multiple zones should be considered as a cumulative impact. We also agree that it may be necessary to increase the period over which controls are applied. This will include commencing controls in early March because as lice levels on farms in March will influence infective-stage sea lice concentrations in WSPZs in April (when smolt runs start). We will also consider extending the control period into June, recognising that smolt runs can be delayed because of periods of dry weather.

Feedback on the development of a modelling framework focused on the challenges involved and more time may be required to develop suitable models. We will not bring the regime into force until we are satisfied that the models are fit for purpose. Our current focus is on the development of screening models where the level of precision required is low. Addressing the modelling challenges will be achieved by

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working across the modelling community in Scotland and with our Norwegian colleagues.

Feedback on monitoring focused on two areas:

- Monitoring compliance with permit conditions; and
- Monitoring to assess the effectiveness of the regime in delivering environmental protection.

We will use operator counts of fish numbers and sea lice to assess compliance against permit conditions. Many respondents stressed the importance of independent audit of these counts and the prompt publication of the figures. We agree that audit will be important, and we will work with the Fish Health Inspectorate to develop means of undertaking independent counts. We will also review whether the existing counting regime provides the level of accuracy necessary to allow us to appropriately assess the contribution of farms to infective-stage sea lice in WSPZs. We will do this for farms contributing lice to WSPZs in which modelling indicates a risk of lice concentrations approaching the environmental threshold

The development and implementation of a programme of environmental monitoring to assess the effectiveness of the regime will take several years. Marine Scotland and SEPA will aim to develop a monitoring strategy during 2022. The initial focus of the programme will be on collecting information to help improve our models.

### **Next steps**

Over the remainder of 2022, we will be organising engagement with stakeholders on particular topics (e.g. modelling). This will allow us to develop the details of the regime.

We hope to run another set of stakeholder meetings to provide an overview of progress towards the end of 2022.

In early 2023, we plan to produce a detailed consultation document which will allow stakeholders to understand the details of the regime and its implications for finfish farm businesses and other interested parties. This will include the proposed monitoring strategy. The consultation will detail a phased implementation plan. Our

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intention is to work towards the initial adoption of the controls in the second half of 2023. This will initially cover the release of lice from new and expanded farms as proposed by applications made after the implementation date.



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## 1 Purpose

This document describes SEPA's assessment of the responses received to SEPA's Consultation on Proposals for a risk-based, spatial framework for managing interaction between sea lice from marine finfish farm developments and wild Atlantic salmon in Scotland. Our responses on science questions have been developed jointly with Marine Scotland Science.

We also ran three workshops (covering monitoring, modelling and regulation) on 27 and 28 June. These explored some of our responses to the comments and suggestions made by consultees. The feedback provided at the workshops was helpful in formulating our final response.

## 2 Background

Populations of wild salmon are at critically low levels. The reasons for the decline in wild salmon populations are wide-ranging and complex. Sea lice from finfish aquaculture are identified as one of the pressures affecting wild salmon in Scotland.

In 2018, the Scottish Parliament's Environment, Climate Change and Land Reform Committee (ECCLR) and Rural Economy and Connectivity (REC) Committees each held an inquiry into Scotland's salmon farming industry. The focus of the ECCLR inquiry was to investigate the environmental impact of the salmon farming industry. The REC inquiry focused on identifying opportunities for the future development of the industry and explored the fish health and environmental issues identified in the ECCLR inquiry.

In October 2018<sup>1</sup>, the Salmon Interactions Working Group (SIWG), was set up by Scottish Ministers to make recommendations on how to minimise the impact of fish farming upon wild salmonids.

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<sup>1</sup><https://webarchive.nrscotland.gov.uk/20200114014112/https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/salmon>

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The SIWG published its report on 1 May 2020, setting out more than 40 recommendations on measures to address the interactions between the marine finfish farming and wild salmonids. Scottish Ministers published their response to SWIG on 5<sup>th</sup> October 2021.

The response identified that SEPA would become the lead body responsible for managing the risk to wild salmonids from sea lice from fish farms in Scotland. Ministers also stated their expectation that SEPA would consult on its proposals for a regulatory framework by the end of 2021.

The [SEPA consultation](#) was launched in December 2021 and closed on March 14<sup>th</sup> 2022. It described SEPA's proposals for the new, spatially based, risk assessment framework for regulating the interaction between sea lice from marine finfish farm developments and wild Atlantic salmon. The framework is designed to be applied through the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR).

The individual consultation responses are available on the [SEPA consultation hub](#).

### 3 Response and reaction to the consultation

We received 62 consultation responses. The responses came from the following groups:

Respondent Group	Number
Marine finfish farm operators/developers	9
Aquaculture supply chain	5
Trade bodies	2
Fishing/fishery interest	15
Community groups	2
Environmental non-Government organisations (NGOs)	5
Public bodies	6
Others (i.e. Individuals)	18

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The responses to the consultation were highly polarised. In general, responses from community groups, fishing/fishery interest groups, environmental NGOs and some respondents included in the 'others' group:

- Welcomed the approach to regulating the interaction between sea lice and wild salmon and supported the underlying principles.
- Told us that there is already a strong and demonstrable impact from sea lice from fish farms on wild salmonids and, consequently, the framework should go further by, for example, including sea trout and encouraging further development of semi-closed containment facilities.
- Wanted the framework to be implemented much sooner than the timescale indicated in the consultation.

Most responses from marine finfish farm operators/developers, trade bodies, aquaculture supply chain companies as well as some other respondents in the "others" group:

- Questioned the justification for the framework, requesting its implementation be put on hold until further scientific evidence is produced demonstrating there is an impact on wild salmonids from sea lice in Scotland.
- Told us that focusing on regulating sea lice was not proportionate when other pressures on wild salmonid populations were not being adequately addressed.

However, there were also common themes expressed across the spectrum of respondents.

Not all responses followed the format of consultation questions and so direct and numerical comparison between responses was not always possible or useful. Instead, we used a qualitative approach to our analyses, collating responses into recurring themes. The descriptors (e.g. a few, some, many, most) used when describing the recurring themes reflect the number of responses that mentioned, commented, discussed, or answered a direct question from the consultation hub,

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relating to that theme. [Appendix 1](#) shows a table that correlates the descriptors and the corresponding number of responses.

## 4 Justification for the Proposed Framework

Many responses challenged the justification for action on sea lice from marine finfish farms. Most of these came from marine finfish farm operators and developers; aquaculture supply chain; and trade associations. These respondents argued that:

- There is insufficient scientific evidence that sea lice from marine finfish farms are having a significant impact on wild salmon populations in Scotland.
- There is a contradiction between the objectives of the proposed framework and those set through the River Basin Management Plans and their related datasets.

However, many other responses, primarily from fishing and fishery interest groups, community groups and environmental NGOs, told us that:

There is substantial evidence of harm being caused to wild salmonids from sea lice from finfish farming and that this was recognised in the report from the Salmon Interactions Working Group.

The ambition of the proposed framework is disappointing and should include immediate action to reduce sea lice releases from existing finfish farms.

These themes and comments are examined below.

### 4.1 Challenge to Underpinning Science

In general, those marine finfish farm operators and developers; aquaculture supply chain; and trade bodies who responded believed there is insufficient scientific evidence of sea lice from finfish farms having a significant impact on wild salmonids in Scotland to warrant the introduction of the proposed regulatory framework:

*“...do not believe that there is any sound scientific evidence behind this proposal which appears to be based on pure conjecture. It seems irresponsible for another level of restrictions and regulations which appear to be based on unfounded claims to be created”.*

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*“...there is no evidence within the consultation that the potential for increased sea lice infestation pressure from fish farming poses a significant risk to the conservation status of the Scottish salmon population.”*

*“We believe there are significant fundamental issues with the underpinning principles of the framework. We do not believe it is based on the most up to date science (including evidence of an impact on wild fish populations) ...”*

However, there was a recognition from a few in the sector that regulation of marine finfish farms should encompass sea lice, but they thought that the proposed approach went beyond the evidence and would be overly precautionary.

*“For the avoidance of doubt, we support the principle of an evidence-based approach to the regulation of fish farming, including sea lice. However, we also feel strongly that it is important for SEPA to avoid employing a prescriptive approach that goes beyond the evidence available and take an unjustifiable, ultra-precautionary stance at the expense of the industry’s ability to operate within conservation thresholds and to grow sustainably in the right locations.”*

## **4.2 Challenge to the regulatory basis**

A few of the responses identified what they saw as contradiction between the objectives of the proposed framework and Scotland’s third River Basin Management Plans.

*“In considering the base requirements of the Water Framework Directive (WFD), the proposal does not provide any evidence which disproves the high and good ecological status of the waters in which marine fish farms operate established through the River Basin Management Plan (RBMP). Rather, in the false assertion made in the proposal document that sea lice from fish farms pose a demonstrated substantial and significant risk to wild salmon, there is a direct contradiction with the criteria, guidance, and requirements of the WFD being made.”*

*“Noting that WFD states that coastal waters, where all marine fish farms are located, do not have a biological element (value) which includes fish fauna in its determination of ecological status. Placing that aspect of validity aside, in Annex V*

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*of the WFD when determining ecological status, the terminology ‘values show low levels of distortion resulting from human activity but deviate only slightly from those normally associated with the surface water body type under undisturbed conditions is used to determine Good ecological status.’*

*“Further, contradiction in the intent and objectives for regulation of the water environment is demonstrated in the December 2021 SEPA publication of The RBMP for Scotland 2021 –2027 and its related datasets. These documents and web-based datasets confirmed the high and good ecological status of most of the West coast marine farm locations and therefore the majority of the waterbody areas covered in this proposal. The related datasets identify the minor role aquaculture has in delivering improvements to waterbodies to meet good status, said improvements being associated with the freshwater environment only.”*

### **4.3 Support of the development of the framework**

Many responses from fishing/fishery interest groups, community groups, environmental NGOs and others expressed overall, but qualified, support for the proposed framework. Some of the responses considered that the framework does not go far enough, specifically referencing paragraph 2.5 of the consultation. This stated that the *“proposed framework will deliver on the Scottish Government’s response, published in October 2021, to the Salmon Interactions Working Group’s recommendations on licensing and enforcement with respect to sea lice”*. These responses assert that the proposed framework does not appropriately respond to the SIWG recommendations:

*“We welcome the underlying principle of managing the overall number of infective-stage sea lice in the marine environment at a level below which sea lice would be expected to result in significant impacts on wild salmon. We strongly believe that this principle is the correct approach to managing interactions related to sea lice, but we highlight a number of concerns below in relation to the scope and detail of the proposed framework...”*

### **4.4 Challenge to SEPA’s Ambition and Lice Burden from Existing Farms**

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There were many responses from fishing and fishery interest groups; community groups; environmental NGOs; and those in the “other” category, that expressed concern that the threshold would only apply to new fish farms and expansions to existing fish farms rather than urgently addressing the impact of sea lice concentrations in the environment from existing farms:

*“The assumption implicit in sections 5.4, 6.1 and 6.2 that current lice levels from existing farms are not damaging wild fish is concerning. We do not believe that this is necessarily the case and feel that conditions should be constructed to keep lice below the exposure threshold to protect wild salmonids. This threshold should be based on the potential impacts, as detailed within scientific literature, rather than an arbitrary background level based on current conditions. If the intent of the framework is to protect the wild salmonid populations from impacts arising from sea lice then it is important that all infective sea lice are considered, from both new and existing farms.”*

*“The consultation document states that more information is needed on whether the densities of infective-stage lice resulting from existing farms are posing a hazard to wild fish populations. This is contradictory to the argument that we can use the 0.7 sea-lice days threshold to protect wild fish”*

*“... but particularly emphasise that conditions should be not only to prevent sea lice from significantly increasing, rather the conditions should be constructed with the purpose of keeping sea lice below the exposure threshold, in order to protect wild salmonids. That must also take account of existing farms, not just new farms.”*

*“Section 5.4, 6.1 and 6.2 appear to assume that the current lice load (however defined) from existing farms will not damage wild fish and states that the focus of the framework is “to protect wild salmon populations against harmful increases in infective-stage sea lice concentrations”. We do not agree that conditions should be drafted to prevent sea lice from significantly increasing – rather the conditions should be constructed with the purpose of keeping sea lice below the exposure threshold, in order to protect wild salmonids.”*

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## 4.5 SEPA response

### 4.5.1 Challenge to Underpinning Science

Following recommendations by the Scottish Parliament and in their response to the SIWG report, Scottish Ministers, have determined that there is a risk that fish farms impact populations of wild salmon and sea trout on the West coast of Scotland, that there is evidence of population impacts in similar salmon producing nations and that a new regulatory framework for managing the interaction between sea lice from finfish farms and wild salmonids should be introduced.

Progress of such a framework is a Scottish Government Bute House Agreement and Programme for Government commitment. We do not therefore propose to revisit the discussions on the scientific basis of the decision to introduce a regulatory control regime. We are committed to engaging in the regulatory review process led by Scottish Government, which includes which include work by the Scottish Science Advisory Council to consider the use and communication of science in the consenting process.

### 4.5.2 Challenge to the regulatory basis

A few industry responses stated that it should not be necessary to regulate sea lice on marine finfish farms as the rivers on the West Coast were described as predominantly at good or high status in Scotland's River Basin Management Plan. It is correct that SEPA will not take action to deliver improvements in those situations where river water bodies are at high or good status. SEPA will, however, take action to prevent deterioration in the status of these water bodies.

The majority (53 %) of those river water bodies where the status of fish populations has been surveyed and assessed are in less than good status. The average across the Argyll and West Highland regions is 54%. For example, all river water bodies whose fish populations have been surveyed in the Loch Fyne catchment had fish populations at less than good status.

Along the East Coast of Scotland, local pressures potentially affecting fish populations include diffuse pollution and habitat damage with abstractions and barriers also contributing. Along the West Coast, potential local pressures include habitat damage, abstraction, barriers to fish migration and sea lice from finfish farms.

Where we do not have fish survey data for a river water body, its classification for fish defaults to high status. We intend to progressively increase the number of water bodies whose fish populations have been surveyed and assessed across Scotland.



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### 4.5.3 Challenge to SEPAs Ambition and Lice Burden from Existing Farms

We agree that lice burdens from existing farms could put at risk or impact wild salmonid populations, and we are committed to take action where that is the case. In order to understand the potential risk of existing farms, we need a clearer understanding of the potential associated impact of established farms within the WSPZ.

As our understanding of lice distribution improves, we will be able to identify whether the observed impacts upon native fish populations within individual catchments are the result of sea lice losses from existing farms. See section on the phasing of the new regime (section 6).

## 5 Proportionality of the proposed regime

One of the key concerns expressed by marine finfish farm operators, developers, aquaculture supply chain, trade bodies and other respondents was that the regime would not be proportionate to the scale of risk. This was linked to specific scientific questions but also to SEPA's perceived risk-averse approach: that is SEPA was prepared to impose high costs upon the industry in situations where the environmental risk was low. These concerns about proportionality focussed on three areas outlined in further detail below:

- Controls over new or expanded sites would unnecessarily constrain the development of the industry.
- Proposals disregard other pressures upon salmonid populations that could be more serious.
- Absence of a Business Regulatory Impact Assessment (BRIA).

### 5.1 Controls would unnecessarily constrain the development of the industry.

Most representations from the marine finfish farm operators and developers expressed concerns that the proposals would create controls that would be disproportionate to the environmental risks and would therefore constrain, unnecessarily, development or even create a moratorium.

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*“From the outset... wish to state that we do not support the proposed framework and that we have significant concerns with the underpinning principles on which it is based... We do not believe there is sufficient scientific evidence to support a claim that salmon farming is having a significant impact on wild salmon populations in Scotland, nor to quantify any impact. It is our view that sea lice may represent just one of a wide range of pressures on wild salmon, and that any risk assessment framework must consider the full range of pressures (locally and nationally, as relevant).”*

*“We firmly believe that the implementation of the proposed framework will lead to a moratorium on future development of the industry”.*

## **5.2 Proposals disregard other identified pressures upon salmonid populations that could be more serious.**

Many representations from marine finfish farm operators and developers, trade bodies, aquaculture supply chain, and one other respondent stated in their responses that the framework does not properly account for other pressures on wild Atlantic salmon populations in Scotland:

*“The Scottish Government has identified twelve high-level pressures affecting wild salmon populations. These include ‘fish health’, one component of which is sea lice (noting that sea lice are not a high-level pressure in their own right).”*

*“The adoption of a ‘no increased risk’ or ‘no impact’ approach is inconsistent and disproportionate with the actions taken or proposed to manage other pressures, and with the approach taken to deliver environmental protection under all SEPAs (Scottish Environment Protection Agency) regulatory remits. Such an adoption being proposed because of reduced smolt numbers migrating into the marine environment due to a failure to address, combined with a willingness to accept, hazards posed by identified freshwater pressures. It is not acceptable to impose restrictions on the development and operations of one sector to compensate for the adverse impacts of others.”*

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*“We are of the very strong opinion that the targeting of a single component of one higher level pressure (sea lice) is not only disproportionate, but will not markedly change wild salmon population dynamics as a standalone measure”*

*When taking a proportionate approach to wild salmon conservation, it is neither appropriate nor acceptable to consider the risk posed by one pressure in isolation –this is what is being proposed by SEPA. Their proposed process does not balance the risk that may be posed by a farm development, with other pressures that may be far more significant on wild salmon populations, both locally and nationally.”*

### **5.3 Absence of a Business Regulatory Impact Assessment (BRIA)**

Linked to concerns about proportionality was the expectation from some respondents that a BRIA should have been carried out to support the consultation.

*“We note also that a Business Regulatory Impact Assessment in this consultation document, the purpose of which is to ensure that social and economic impacts of any new regulatory regime have been carefully considered, has not been included and this as discussed earlier has great potential to interfere with the business arrangements of particularly smaller operators with whom ... and ... have close working partnerships, both downstream and up”.*

*“We question “SEPA’s ability to assess the proportionality of the proposed system until a BRIA is completed. We now face the prospect of significant further investment of public resources into the development of this system, without any clear understanding of how the framework will affect businesses and Scotland’s rural communities that rely so heavily on fish farming SEPA have intimated that a BRIA will form part of a subsequent, final consultation on the proposed framework. It is difficult to see how, at that stage, a published BRIA will be anything more than a “box ticking exercise” and that by that stage the framework will be a “done deal”.*

They go on to set out the extent of the contribution that the industry makes to the Scottish economy and the associated benefits enjoyed by local communities because of salmon farming.

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*“On average every active farm in Scotland (and thus every new farm) provides local jobs for 8 people in farming roles and a further direct 5 support staff within the relevant farming business (e.g., health, environment, management etc.). The farm will support local facilities, shops, schools, road infrastructure, businesses and housing in some of the most sparsely populated areas of Scotland. On average, each farm will provide over £3m to the Scottish economy in direct, indirect and induced impacts.”*

One marine finfish farm operators/developer expressed the challenge that:

*“The framework proposed by SEPA in the consultation does not reference the social or economic benefits of fish farming. The risk assessment approach that is set out does not account for salmon farming being a key provider of employment (particularly in remote rural communities), capital investment, tax revenue or the provision of food with health benefits at affordable price points, for example The framework appears to fail to properly and fully apply the legislative requirements imposed on SEPA by The Regulatory Reform (Scotland) Act and the Water Environment (Controlled Activities) (Scotland) Regulations 2011”*

## **5.4 SEPA response**

### **5.4.1 Proposed framework will unnecessarily constrain the development of the industry.**

We agree with industry representatives that we do not want to introduce a regime that is overly precautionary relative to the environmental risk.

It is our intention to create a fair regime that ensures that our decision-making is transparent, reasonable and protects the environment and other users of the water environment, whilst supporting social and economic development. These are the underpinning principles of CAR.

Under our proposals, development will not be constrained unless the proposal would increase lice levels above environmental thresholds. Where this would be the case, we will support applicants to work with other farms in the area to reduce their sea lice levels and so enable the development to proceed; or support applicants to innovate to reduce the sea lice that their development would produce, for example, by using semi-contained systems of farming.

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**5.4.2 Proposed framework disregards other identified pressures upon salmonid populations that could be more serious.**

SEPA is responsible for controlling some of the pressures affecting salmonid populations, all of which require prior authorisation:

- Point source pollution (introduced 1974);
- Diffuse sources of pollution (2006);
- Abstractions (2006);
- Impoundments (2006);
- Modification of the morphology of rivers and lochs (2006); and
- Freshwater invasive species (2006).

The proposed introduction of controls over sea lice from marine finfish farms adds another tool to SEPA's regulatory capability to protect salmonid populations.

We intend to follow the same approach to regulating sea lice from finfish farms as we do for the other pressures that we regulate.

We aim to prevent deterioration in status by ensuring that new activities do not cause environmental standards to be exceeded. The critical requirement here is to set the environmental standard at an appropriate level that provides protection but is not overly-precautionary.

We aim to deliver improvements in the status of salmonid populations by using the most effective combination of actions. This means understanding which pressures are the most important in individual catchments and then taking action. We will only require action at existing farms where we consider that they are a key pressure upon fish populations within individual catchments. The key pressures will vary between catchments.

**5.4.3 Absence of a Business Regulatory Impact Assessment (BRIA)**

We note the request to provide a BRIA to allow stakeholders to understand the consequences (both positive and negative of the proposals). BRIA are typically undertaken by Government associated with the creation of new regulatory instruments. We agree, however, that it is important for stakeholders to understand the consequences of the proposed regime.

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Over the implementation period, we will develop the detailed proposals for the implementation of the regime in discussion with stakeholders. This will allow us to understand the consequences of the proposals as we develop them and use this understanding to inform the choices and decisions we make. We plan to provide an assessment of the consequences of the framework as part of a final consultation before its introduction.

## 6 Timing of implementation

The consultation proposed that we would bring the regime into effect in April 2023. There were many responses that raised concerns about this timetable from a range of stakeholders including marine finfish aquaculture operators/developers, fishing/fisheries interest groups, environmental NGOs, community groups and others. However, many of the stakeholder responses that discussed the timing of the framework's implementation as a concern did so for conflicting reasons.

The responses can largely be categorised into two contradictory sections:

- framework being implemented too quickly; and
- framework not being implemented quickly enough.

Responses falling into these categories are detailed below.

### 6.1 Framework being implemented too quickly

Some respondents stated that they considered that the April 2023 implementation timing was overly optimistic. In particular, they emphasised the challenges involved in developing the science required to underpin the standards, modelling and monitoring tools. Furthermore, concerns were raised about SEPA's ability and track record to deliver within timescales. All responses that highlighted these concerns came from marine finfish aquaculture operators/developers, aquaculture supply chain or trade bodies. The following response from an aquaculture operator summarises this position.

*“The scale of what SEPA is proposing in terms of this proposed new regulation should not be underestimated. Accordingly, there is no confidence that SEPA has the competence to regulate in this area nor the ability to deliver the*

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*implementation of such a framework within the stated period. On the basis of previous performance levels, it is likely that this will lead to a prolonged period of regulatory delays that would lead to business uncertainty and delayed investment decisions ultimately impacting on sustainable growth.”*

## **6.2 Framework not being implemented quickly enough**

There were also many responses that expressed concerns about how the impacts on wild salmon would be managed until the regime came into effect and were looking for quicker implementation of the framework. All these responses came from stakeholders within fishing/fishery interest groups, community groups, environmental NGOs and others. This response from a community group stakeholder summarises the position.

*“It is deeply worrying that SEPA intends not to implement these proposals for another year. We urge SEPA to develop and deliver the new framework more quickly.”*

## **6.3 SEPA Response**

We are aiming to bring the regime into effect as soon as is practicable. However, it is important we get it right and, if necessary, we will take the additional time we need. Once in place, we will continue to develop the framework to ensure it reflects the latest scientific understanding and feedback and remains proportionate to the environmental risk.

We consider that it is necessary to phase-in the new framework. We intend to start with controls over new farms and progressively move towards driving reductions in lice loss from existing farms where this is required to improve salmonid populations. We are considering the following phasing-in of the regime.

- I. Include permit conditions to control sea lice losses for new farm developments or expansions of existing farms to prevent sea lice from such developments risking deterioration of wild salmon populations.
- II. Review of an accuracy of fish numbers and sea lice counting regime at existing farms identified as contributing to infective-stage sea lice in WSPZs in which sea lice concentrations are high. The intention is to ensure that we have

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data at sufficient level of accuracy to allow us to quantify the contributions to sea lice concentrations in WSPZs from existing farms.

- III. To protect against deterioration, impose permit conditions on existing farms contributing to sea lice levels in WSPZs in which sea lice concentrations are high and, hence, the risk to wild salmon is greatest.
- IV. Collect evidence of impacts on wild salmonid populations in those WSPZs in which modelling has identified wild salmon as being at high risk.
- V. Adjust permit conditions for existing farms to ensure sea lice losses are reduced in those circumstances where we have collected suitable evidence of impacts on wild salmonid populations.

Scottish Ministers proposed that an inclusive implementation group should be created to oversee the development of the regime. We will use the Fish Farm Advisory Group for this purpose. The work of this group will be complemented by a range of other engagement processes, including meetings and formal consultation processes. We will undertake reviews of progress informed by the views of the Advisory Group.

We will issue a more detailed consultation in early 2023 which will present the proposed implementation timetable. Our intention is to work towards the initial adoption of the controls in the second half of 2023. This will initially cover the release of lice from new and expanded farms as proposed by applications made after the implementation date.

## 7 Protection of Sea trout

The proposed framework did not define protection zones for sea trout because, although understanding of the interaction between sea trout and sea lice is improving, more science is required to provide sufficient knowledge to enable the creation of a practical, effective, and risk-based regulatory framework for sea trout that would properly account for the physiological and behavioural differences from Atlantic salmon. As a result, the consultation stated that sea lice interactions with sea trout will continue to be a consideration in local planning decisions.



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There were many responses to this part of the consultation, representative of stakeholders from marine finfish aquaculture operators/developers, aquaculture supply chain, trade bodies as well as community groups, individuals (others), public bodies and fishing/fishery interest groups.

The main concerns raised were of two types.

1. Protection of sea trout
2. Concerns about regulatory efficiency and the double regulation of sea-lice impacts.

## 7.1 Sea trout

Many respondents from fishing/fishery interest groups, community groups and others expressed their disappointment over the exclusion of sea trout from the framework:

*“We are therefore particularly disappointed to see that the protection of sea trout is not being taken forward alongside that of Atlantic salmon. We do not consider that this is in line with the SIWG recommendations, or the Scottish Government response. We do not agree that the transitional arrangements for sea trout should rely on the status quo as currently undertaken by local authorities.”*

*“As the Chair to the SIWG stated in the very first words of his Foreword to the SIWG Report in 2020, “populations of wild salmon and sea trout are at critically low levels”... Further the SIWG Report noted that “at an early meeting the SIWG acknowledged the potential hazard that farmed salmonid aquaculture presents to wild salmonids (Atlantic salmon and sea trout) and agreed to examine measures to minimise the potential risk”... Therefore, SEPA’s proposals represent a complete failure to deal with the damage caused by fish farming to sea trout populations that occur all year round, and therefore to respond properly to SIWG.”*

## 7.2 Regulatory efficiency

Responses from Marine Finfish Farm Operators/Developers and trade bodies focused on the creation of a more complicated regulatory landscape with two regulators covering the environment risks posed by sea lice from marine finfish farms.

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Some feared that the proposed framework would result in a duplication of monitoring requirements and double regulation of the finfish farming sector, as there would be requirements under CAR as well as the existing requirements currently undertaken by local authorities.

*“With the proposed introduction of a risk framework for salmon, and the likelihood that Local Authorities will have no option but to continue its requirement for EMPs to cover sea trout, finfish farmers face the prospect of “double regulation”. This is in direct conflict with the principles of Better Regulation, as required by the Scottish Regulators’ Strategic Code of Practice”.*

*Currently, Local Authorities require applicants to develop an EMP to support the management of interactions between farm raised salmon and wild salmonids (including both salmon and sea trout). With the proposed introduction of a risk framework for Atlantic salmon, it is likely that Local Authorities will require to continue its requirement for EMPs to cover sea trout with the consequence that fish farmers face the prospect of “double regulation”. This is in direct conflict with the principles of better regulation, and the requirements of The Scottish Regulators’ Strategic Code of Practice.”*

### **7.3 SEPA response**

We agree that it would be desirable if the regime protected sea trout as well as salmon populations. We also note the concerns about the potential dual regulatory burden posed by the protection of sea trout by local authorities and salmon by SEPA.

It had been our intention to work to include sea trout within the protection of the regime as our understanding of the potential complications posed by implementing it to sea trout improved. However, the balance of consultation responses has led to us reconsider our approach.

We accept that splitting the regulation of sea lice between SEPA and local authorities is not desirable. Within an adaptive approach to regulation, the protection zones will provide a level of protection for sea trout, which would be at least as effective as the current system of environmental management plans (EMPs) required

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as a condition of planning permission. Therefore, requiring local authorities to consider sea trout where a protection zone exists appears unnecessary

Over the period during which we are developing the new regime we will work with Marine Scotland Science, local authorities, operators and other interested parties to assess how we can incorporate sea trout into the regime thereby progressively improving the protection of sea trout. This will involve the following considerations

- How to incorporate sea trout into the monitoring programme.
- Whether we have evidence to change the definition of the sensitive period during which protection of WSPZs applies.
- Whether we have evidence to change the definition of the protection zones.

Because we intend to include sea trout in our considerations, we intend to change the name of WSPZs to wild salmonid protection zones.

We will initially focus on the protection of the early sea phase of the sea trout lifecycle following the sea trout smolt runs and the development of a sea trout monitoring programme that will provide information to further develop the regime.

## 8 Development of sea-lice controls under CAR

There were some comments and questions about how the regulatory responsibility will be transferred between local authorities and SEPA. Some fishing/fishery interest groups focused on, what they considered to be, the limited effectiveness of EMPs in protecting salmonids. Most comments on this area were in favour of moving away from EMPs and into CAR as soon as possible.

*“The framework should reflect this by focussing on avoiding harmful overall concentrations of infective-stage sea lice in the environment which may arise from both existing and new/expanding farms. To allow appropriate regulation of 6.2 (b), and in line with the SIWG recommendations for a regulatory system which is “robust, transparent, enforceable and enforced” (as accepted by the Scottish Government), it is crucial that both farmed fish numbers and on-farm sea lice levels are published in real time.”*

*“Where farms have the oversight of the local authority via the implementation of environmental management plans (EMPs), these have limited real time potential*

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*and are not consistent across areas. Further, the local authorities do not have the expertise or the capacity to fully enforce these conditions. Indeed, it is widely recognised that planning is a poor tool for the management of dynamic interactions. We would therefore suggest that the use of conditions within the CAR licence would be a more suitable tool for the creation of a fit for purpose, enforceable and dynamic system for the management of sea lice.”*

*“EMPs should not have a role in the new regulatory framework. Specific conditions in the CAR licence should be used to create a fit-for-purpose, enforceable system for management of sea lice”*

Others looked for EMPs to be transferred to CAR regulation in a way that did not impose additional burdens upon operators.

*“Prior to implementation, if this occurs, a clear process needs to be defined that, where necessary, allows existing fish farms with agreed Environmental Management Plans to migrate these EMPs from Planning Permission to CAR licence without additional regulatory burden on operators.”*

*“The transfer of an existing EMP from Planning Authority to SEPA could be straightforward which would have minimal impact either positive or negative on the business. If, however, the sea lice risk framework is applied in such a way as to mandate for the rigid application of sea lice thresholds on our sites during the April / May period then there may be serious implications for the business.”*

## **8.1 SEPA response**

SEPA regulates by setting conditions within authorisations. The conditions that we set must deliver the following principles.

- Protect the environment
- Transparent, so that operators and stakeholders can understand them.
- Enforceable, so that SEPA can detect when conditions are not complied with and take action.
- Proportionate to the environmental risk that the permit condition is intended to control.

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- Achievable by the operator (i.e. operator can take reasonable measures to deliver the permit conditions).
- Flexibility to allow operators to choose the most appropriate approach to meet their environmental obligations.

We have considered three types of permit conditions to protect wild salmonids.

- Numeric Standard – defines number or load of sea-lice that must not exceed defined numeric limit
- Process Control – defines technology, working practices or procedures which will control the loss of sea-lice (e.g. closed containment)
- Environmental condition – sets an environmental standard/condition which must not be exceeded (e.g. no impact on wild fish)

Our conclusion is that numeric standards would make the most appropriate permit conditions. This key concerns with this approach are the:

- dependence upon operator monitoring and reporting and, therefore, the need for effective auditing; and
- ability to define the compliance statistics for a numeric standard in a way that delivers the appropriate level of environmental protection; and is practical for the operator to meet.

We have started to develop potential options for permit conditions such as a rolling average number of lice per fish or sea lice load from the farm. We will be looking for operators to provide raw sea lice counts units from a range of farms to allow us to explore options with all stakeholders.

## 9 Definition of Wild Salmon Protection Zones.

SEPA's consultation hub asked about the suitability of the WSPZs identified within the framework. The WSPZs are narrow or constrained areas of the sea (e.g. sea lochs, sounds or river mouths) that wild salmon post-smolts pass through as they migrate away from the coast to the open sea. The proposed WSPZs have been identified using advice from fisheries managers and Marine Scotland, and delineated for each graded salmon river under the Conservation of Salmon (Scotland) Regulations 2016 and for rivers designated as Special Areas of Conservation or Sites of Special Scientific Interest for the conservation of Atlantic salmon or freshwater pearl mussels. Most of the responses, both emailed and submitted

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through SEPA's consultation hub, referred to the WSPZs proposed in the consultation. The responses can be categorised into two areas:

Additional zones;  
the 5 Km radius.

Each of these response categories is detailed below.

### 9.1 Additional Zones to be considered

There were many consultation responses from fishing/fishery interest groups, environmental NGOs, community groups, and others that provided information on potential additions to the WSPZs identified in the proposed framework. There were also different reasons given for the proposed additional protection zones, including areas that have historically held salmon populations but no longer do.

*"We recognise that the classification of river mouths, sea lochs and sounds as wild salmon protection zones is a useful starting place, but many of our members are concerned about gaps in the current proposals. We have already highlighted areas such as the Summer Isles, West Sutherland and the Inner Hebrides where further attention would be warranted, and as our understanding of smolt migration pathways improves, it is likely that some additional areas may require inclusion into the framework."*

Other representations mentioned the addition of the Summer Isles, West Sutherland and Inner Hebrides.

*"Salmon smolts migrate northwards through the Minch and certainly all those coastal area from Skye northwards should be considered salmon protection zones. There seem to be major river systems such as the rivers Kirkaig, Inver and Laxford which don't seem to have protection zone status and that need to be corrected. There are smaller systems in between such as the Duart that also have salmon which are not currently covered and they need to be."*

A few respondents noted that the proposed framework designates protection zones based on rivers that are designated as SAC or SSSIs for Atlantic salmon or

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freshwater pearl mussels (excluding those where the mussels are known not to be dependent on salmon).

*“SLRT feels that any river with a FWPM population, a critically endangered species, should be included in a protection zone, regardless of the type of salmonid species present. We would also argue that any river where FWPM are reliant on sea trout as their host species instead of salmon would be at potentially greater risk from the presence of aquaculture because of the overlap in coastal habitat use between sea trout and salmon farms as outlined previously.”*

## 9.2 Five kilometre radius around salmon rivers entering the sea

Some salmon rivers enter the sea on open coastlines rather than into constrained sea lochs or sounds. Smolts emigrating from these rivers will initially be concentrated in a relatively small sea area leading away from the river mouth. For these salmon rivers, we proposed that the area contained within a 5 km radius of the river mouth be identified as a WSPZ.

There were a few representations on this part of the proposed framework. Some respondents told us that the use of a 5 km radius was arbitrary whilst others believed that a 5 km radius was too small.

*“The rationale behind the selection of 5km buffer zones around watercourses is particularly questionable. We would request that SEPA provide more information on the complete process of zone selection and delineation in order to allay any concerns in this regard... The river mouth 5km buffer in particular seems entirely arbitrary.”*

*“Some of the constrained waterbodies that SEPA has designated as separate wild salmon protection zones are extremely small, resulting in less protection for smolts than if an area of 5km radius had been drawn from the river mouths... There are several examples in the Hebrides, for instance the River Hinnisdal on Skye (upper green dot in Figure 1), where the shortest swim to ‘open sea’ is only 1270m.”*

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*“Water movements can disperse sea lice copepodids more than 30km from the farms where they originate. Observations at sea and hydrodynamic modelling confirm that tidal, temperature and salinity features in the sea can concentrate copepodids from multiple farms at high densities, far from their source. The proposed wild salmon protection zones should be reviewed in the light of hydrodynamic modelling of virtual lice particles, to predict where the lice will accumulate.”*

### 9.3 SEPA Response

We are grateful for the information we have received on the definition of protection zones. We will review the definition of the WSPZs, together with Marine Scotland Science, over the next year and will add to, and modify, zones as appropriate.

We will also ensure an on-going and open process to review protection zones, ensuring their continued development as our understanding improves. We have provided an appendix at the end of this document ([Link to appendix 2 here](#)) listing additional zones for consideration and removal, as submitted by the consultation respondents.

There were some respondents that stated that the framework’s protection zones should also include rivers that previously held salmon. Such areas do not fall under the scope of the framework at this stage as the goal of the framework is to deliver protection in areas that are being used by wild salmon post smolts. However, the identification of WSPZs in respect of these rivers will be considered as part of future action plans to restore salmon populations in the rivers concerned.

We proposed WSPZs for all but three Special Areas of Conservation (SAC) designated for the protection of freshwater pearl mussels. There is currently no evidence of Atlantic salmon acting as a host for freshwater pearl mussels in the three SACs.

Resident brown trout are likely to be a host for pearl mussels in each of these SACs. However, all also include stretches of river below impassable falls in which sea trout may act as a host.



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We will consider the identification of suitable protection zones for the three SACs as we develop a framework for the protection of sea trout.

With respect to the delineation of WSPZs around salmon rivers entering the sea on open coastlines, we recognise that the use of a 5 km radius is to some extent arbitrary.

We proposed a 5 km radius taking account of:

The approximate distance an average sized salmon post smolt could cover in around 12 hours swimming at 1 body length per second.

- The estimated median dispersal distance of sea lice from a fish farm<sup>2</sup>.

As part of the proposed adaptive approach, our intention is to revise the delineation of zones around river mouths as information on salmon migration routes becomes available from tracking studies. Until such information becomes available, we think that 5 km radius zones will afford a suitable amount of protection.

## 10 Definition of the sea lice exposure threshold

In the consultation, we proposed an exposure threshold of 0.7 infective-stage sea lice-days per m<sup>2</sup> integrated over the upper two metres of the sea.

The proposed threshold is derived from scientific studies in Norway in which sea lice numbers found on salmon post-smolts held in sentinel cages were compared with the corresponding modelled environmental concentrations of infective-stage sea lice.

Most consultees' comments regarding the sea lice exposure threshold were centred on the following topics:

- appropriateness of the proposed threshold;
- period of the year in which the proposed threshold would apply; and

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<sup>2</sup> Salama, N. K. G., Murray, A. G. & Rabe, B. (2016), Simulated environmental transport distances of *Lepeophtheirus salmonis* in Loch Linnhe, Scotland, for informing area management structures. *Journal of Fish Diseases* 39, 419 - 428

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- potential exposure and transit times through protection zones.

## 10.1 Appropriateness of the proposed threshold

### 10.1.1 Level of protection

Some respondents from fishing/fishery interest, environmental NGOs and others told us that they supported the use of the proposed threshold in the framework.

*“We feel that SEPA have captured the relevant scientific information but ongoing monitoring and assessment to ensure that these thresholds continue to be protective throughout and outwith the proposed wild salmon protection zones will be necessary.”*

*“SEPA’s risk assessment system must be precautionary, in the face of the known risk that sea lice can harm wild salmon and sea trout. SEPA is right to base its approach on the Norwegian approach, and to use the 0.7 copepodid.day/m<sup>2</sup> threshold, rather than setting its own.”*

However, a few consultees representing fishing/fishery interests argued that the proposed threshold was insufficient to guarantee no increase in lice-induced mortality of wild salmon and, hence, would not meet a NASCO objective.

*“...what is being proposed will not ensure that those objectives [NASCO objective of 100 % of farms to have effective sea lice management such that there is no increase in sea lice loads or lice-induced mortality of wild salmonids attributable to the farms] are met.”*

Some marine finfish farm operators/developer consultees told us that the proposed threshold would be overly precautionary.

*“The current threshold of 0.7 simulated lice per m<sup>2</sup> has been defined as an infection pressure of 1 lice/fish, gained over a three-week period. This has been defined as a “low” infestation pressure and is lower than the Low Limit threshold in the Norwegian TLF. Additionally scientific experimentation has outlined that lice concentrations less than 2 lice/fish have been associated with no mortality, with infection pressures of 0.08 lice/g-1 /fish associated with impaired swimming ability and 0.04 lice/g-1 /fish eliciting a stress response. If a mean smolt size of 30g is*

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*assumed, this equates to an infestation pressure of 2.4 lice/fish for impaired swimming and 1.2 lice/fish for a laboratory observed stress response. The 0.7 lice/m<sup>2</sup> /year threshold is therefore considered excessively conservative and not supported by physiological studies into smolt response to lice attachment. SSC request that an uplifted threshold supported by modelling and physiological studies in a Scottish context is agreed with industry.”*

*“The salmon farming sector believe the introduction of the framework, as proposed, will result in a de facto moratorium on farm development on the west coast of Scotland and Western Isles.”*

A few also questioned the justification for the proposed threshold, given that a higher threshold of two infective-stage sea lice-days per m<sup>2</sup> had been discussed during the early development of the framework.

*“Initial consultation and engagement activity with the industry on the early development of this proposal promoted a sea lice threshold of 2 lice-days/m<sup>2</sup>. No justification is provided for moving from a sea lice threshold of 2 to 0.7 lice-days/m<sup>2</sup>?”*

### **10.1.2 Use of Norwegian research**

Many consultees representing marine finfish farm operators/developers and trade bodies questioned the applicability of the proposed threshold value in Scottish conditions, given potentially significant differences between the environmental conditions in the original Norwegian study area and those in Scotland.

*“The validity of transferring a modelled threshold number to a different model system is highly questionable. There are no data supporting such a threshold value currently available from Scotland.”*

*“This threshold will only hold as reliable in Scotland if the exact same model architecture is used and if we make the very significant assumption that the principles that apply for Norwegian fjordic systems also apply for Scotland. It is noteworthy that all work relating to this threshold was undertaken in Hardangerfjord, a fjordic system renowned for containing the highest density of salmon and trout farms, globally, and for being atypical of Scottish loch systems.”*

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Some marine finfish farm operators/developers recommended that an appropriate study be conducted in Scotland to validate the assumption that the proposed threshold is transferrable to Scottish conditions.

*“A sustained and coordinated programme of empirical work at a national scale must come prior to attempting to formulate any framework for regulation.”*

Many marine finfish farm operators/developer respondents thought that risk values used in the Norwegian Traffic Light system required further validation.

*“Literature referenced in the consultation document to support the proposed threshold, frequently cite the Taranger et al mortality threshold estimates as the means of scaling the lice thresholds identified for effects on individual smolts, to a population level... It is clear that multiple, independent sources (including the author) believe that the mortality threshold estimates proposed by Taranger et al require further refinement and validation. It is therefore entirely inappropriate to use literature which relies so heavily on the Taranger estimates to justify the proposed framework threshold, until such validation and verification has been undertaken.”*

However, there were respondents from environmental NGOs that agreed that risk thresholds can be fine-tuned but believed that the Norwegian science base is the best available for assessing risk, including in Scotland.

*“Science can always refine and improve its conclusions, and more research would certainly be valuable, to fine tune the mortality consequences. It is difficult in the field to assess the mortality of wild fish due to sea lice, so much of the research has been done in the lab., but the Norwegian science base (including Taranger’s thresholds) is still the best available basis for assessing the risk that sea lice will harm wild salmon. It would be wrong to conclude from the TLS evaluation report that the same threshold should not be used in Scotland, where there is no system in place to assess this risk at present, and without an alternative peer-reviewed and properly validated threshold for harm.”*

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**10.1.3 Suitability of sentinel cage and laboratory studies**

One individual (other) respondent suggested that the use of sentinel cages in the Norwegian study was flawed, and a finfish producer also questioned the validity of deriving a threshold from studies on fish held in sentinel cages rather than freely moving fish.

*“..... the model [the Norwegian researchers] used is flawed. Sentinel cages have a weakness in that they reflect the dynamic of a salmon cage with once a fish is infected, then the infection can be spread from within the cage rather than from the wider environment.”*

**SEPA comment**

It is true that any relationship between modelled sea lice concentrations in the sea and infection levels on fish held in the sentinel cages would have been confounded had sea lice infections spread within the cages. However, the Norwegian researchers designed their study such that the sentinel cages were not deployed for long enough for sea lice attaching to fish in the sentinel cages to complete their lifecycle and generate the next generation of infective-stage sea lice.

A marine finfish farm operators/developer also argued that the results of experiments in laboratories or sentinel cages were likely to be confounded by stressors not experienced by fish in the wild.

*“.... experiments undertaken in artificial conditions (laboratory or sentinel cages) present additional stressors that are not experienced by wild fish, which are likely to confound any observed effects such as stress, condition loss, mortality etc, and contributing to overall susceptibility to lice challenges”*

**10.1.4 Uncertainty and expert judgement**

Many representatives from the marine finfish farm operators/developers, trade bodies and aquaculture supply chain questioned if, or how, uncertainties about the threshold had been, or would be, dealt with.

*“We do, however, consider that there are fundamental underpinning issues with the overall sea lice framework which include the clarity of process to date. It is*

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*unclear how the proposed threshold has been derived and how expert opinion has informed this threshold.”*

One marine finfish farm operators/developer told us that uncertain thresholds must be established with caution and be easily updated with new evidence.

*“While ... recognises that thresholds must be utilised within any proposed framework, such uncertain thresholds must be established with caution and incorporated in such a way that new evidence can be easily assimilated, and thresholds updated.”*

## 10.2 Period when the threshold applies

Many consultees representing fishing/fishery interests told us that the proposed period over which the threshold would apply (April and May) was too short and did not reflect the variability of smolt run timings. They suggested that the period needs to:

start earlier than April on account of the operational timescale for finfish farmers to bring farm lice numbers to the required levels.

extend beyond May to reflect the delaying effect of warm, dry springs on smolt run timings; the later timing of runs from rivers with large loch systems; and the time taken for salmon post-smolts leaving rivers in the South to traverse protection zones in the North.

*“We do not believe that the protection of April to May is long enough. The aquaculture industry currently use 1st Feb - 30th June [Sector’s Code of Good Practice] as the sensitive period.”*

*“We are also conscious that recent and predicted warm, dry springs may mean that smolts are delayed in their migration to sea. For example, Ayrshire Rivers Trust in 2021 recorded that salmon smolts were still present in the middle reaches of the river Ayr on 16th June and would therefore be expected to be travelling up the West Coast until at least late June. We would also highlight work by the University of Glasgow which suggests that smolts leaving catchments where they*

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*must navigate large lochs, such as Loch Lomond, can be significantly delayed in their migration.”*

### 10.3 Potential exposure and transit times

Many representations from fishing/fishery interests groups asked how we propose to address the potential cumulative impact of wild salmon post smolts having to pass through multiple zones.

*“Additionally, the duration of exposure needs to be considered on a cumulative basis as fish travel through multiple zones. It is currently possible to identify areas where smolts are likely to pass through several zones, particularly where these are adjacent to each other.”*

*“It is not clear from the consultation document whether the exposure time for these smolts will be calculated from the total time taken to traverse these adjacent zones. In our view, it is fundamentally important that the total exposure time across these zones is used.”*

*“... the duration of exposure needs to be considered on a cumulative basis as fish travel through multiple zones. The exposure of a salmon smolt to lice must be considered over its whole journey to sea, not artificially reset as it passes from one protection zone to the next.”*

Some consultees representing fishing and fisheries interests proposed that we should use data from the West Coasts Tracking Project as it becomes available to identify transit times of fish through protection zones.

Wild salmon post-smolts vary in size. The average length of Scottish post-smolts is about 12.5 cm and their average weight around 20 grams. From laboratory studies, average and smaller than average salmon post-smolts would be likely to show impaired swimming ability from infections of between two and three lice. The proposed sea lice exposure threshold corresponds to a low infestation pressure equivalent to up to one louse per fish.

### 10.4 SEPA response

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**10.4.1 Level of protection**

We recognise concerns about whether the proposed sea lice exposure threshold is set at the right level. In setting a risk threshold, our aim is to develop a threshold that will deliver proportionate protection of salmon populations. We recognise that environmental complexity and variability means there is always uncertainty about the most appropriate threshold value, and there is no perfect threshold that will prevent damage occurring.

As we prepare to implement the framework, we will consider the latest science before deciding on the appropriate risk threshold to use initially. We will also model the consequences of applying this threshold and we will publish this as part of the final consultation and this information will be used to inform an impact assessment so that the consequences of the final framework are fully considered and explained.

Once the framework is implemented, as further scientific information becomes available, we will review and revise the initial threshold as appropriate.

We will not consider breaches of any threshold on its own as sufficient evidence that the operation of existing farms is impacting on a particular wild salmon population. Instead, we will assess the weight of evidence overall in line with how we use environmental standards in other contexts to decide if a reduction in pressure on the environment is required.

**10.4.2 Use of Norwegian research**

Under Norway's traffic light system, sea areas are categorised as green, amber or red. The categorisation of sea areas uses a salmon lice risk index, originally proposed by Norwegian scientists in 2012 (Taranger et al). The index assumes different rates of fish mortality (eg 100 %, 50 %, 20 %) depending on the number of sea lice with which the fish are infected.

The framework we proposed does not use the salmon lice risk index. Instead, the proposed sea lice exposure threshold is set at the level judged by Norwegian experts as consistent with a low infestation pressure. Under this pressure, salmon post-smolt infections would be expected to average no more than one sea louse per fish.



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Based on peer reviewed research, an average sized wild salmon post-smolt of 12.5 cm (20 grams) would be expected to show substantial stress-related effects and impaired swimming ability when infected with more than one salmon louse. Such effects are likely to reduce survivability.

There are differences in the environmental conditions in the Norway study area from those in Scotland, as there are differences in environmental conditions across Scotland.

Environmental factors that determine sea lice survival, rate of reproduction and dispersion, which may vary from those in the Norwegian study area, include:

- Water temperature
- Salinity
- Turbulence

Water temperatures are typically slightly lower in Norwegian fjordic systems than in Scottish sea lochs resulting in proportionately faster rates of sea lice reproduction expected in Scotland. Salinities in Norwegian fjordic systems are typically slightly lower than in Scottish waters. Sea lice prefer full strength seawater and will reposition in the water column to avoid very low salinity water. Surface turbulence may be greater in less sheltered Scottish systems than in Norwegian fjords, increasing sea lice dispersal.

The modelling required under our proposed framework would be based on local environmental conditions and so account for the differences between Scottish environments and those in the Norwegian study area.

#### **10.4.3 Suitability of sentinel cage and laboratory studies**

We agree that laboratory studies and sentinel cage studies do not provide perfect analogues for understanding effects on fish in the wild. However, particularly in combination, they are the best analogues available and are valuable means of informing the identification of risk thresholds.

Laboratory studies are conducted in very controlled environments. After initial acclimation to that environment, sources of stress on salmon post-smolts may be lower than those on wild post-smolts at sea.

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**10.4.4 Uncertainty and expert judgement**

We agree that it is important that any system for assessing environmental risk must be responsive to new scientific evidence. The framework we have proposed is designed to easily incorporate new evidence, in particular evidence that improves assessments of risk.

The principle is the same across other risk frameworks, where environmental standards are reviewed and revised based on updated scientific evidence. Standards and thresholds are revised to be tighter or laxer, depending on that evidence.

**10.4.5 Period when the threshold applies**

We proposed that the sea lice exposure threshold would apply from the beginning of April to the end of May. The threshold relates to the concentration of infective stage sea lice in WSPZs.

We agree that, where there is evidence that impacted populations of wild salmonids post-smolts are using salmon protection zones outwith April and May, the period over which the sea lice exposure threshold applies should be adjusted accordingly. The framework, as proposed, is intended to be adaptive to such evidence.

In advance of implementation, we will engage with local fishery experts to ensure we base implementation on the most up-to-date evidence on the timings of smolt runs in different protection zones.

We will progress work to develop a simpler approach and with a view to expanding the definition of the sensitive period (for example from April to June). This would extend coverage to unusual years when, for example, drought might delay smolt migration and would extend the protection provided by WSPZ to sea trout populations. We will discuss this option with industry and stakeholders.

If the start of the defined sensitive period for WSPZ stays as 1 April, we agree that the regulatory regime must start at the beginning of March in order to protect salmonids in WSPZ from 1 April. Under this scenario, we propose that SEPA controls of sea lice will come into force on 1st March each year.

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#### 10.4.6 Potential exposure and transit times

We agree the estimated transit times for wild salmon post-smolts that we use in the framework should take account of local tracking studies, where available, including the results of the West Coast tracking Project.

Representatives of fishing/fisheries interest groups, environmental NGOs and others also told us that it was important that exposure times across multiple zones should be considered where there is evidence that post-smolts pass through multiple zones.

We agree that, where there is scientific evidence that populations of wild salmon post-smolts pass through multiple salmon protection zones, the framework should consider their cumulative exposure to infective-stage sea lice across the zones concerned. The framework is proposed to be adaptive and would be able to reflect improvements in understanding from scientific studies on the routes taken by wild salmon post-smolts and the time they spend within protection zones.

## 11 Modelling

Many consultation responses contained information and/or suggestions regarding the modelling protocols for the proposed framework. The consultation states that SEPA will use a screening model on development proposals that would determine whether that development is likely to increase infective-stage sea lice concentrations in a WSPZ. Where the screening models show that increase is likely, SEPA would require the developer to quantify the proposal's effects on sea lice concentrations in the protection zone using appropriately detailed 3-D hydrodynamic marine models. The results of this detailed 3-D hydrodynamic marine model from the developer, compared with the sea lice threshold, would determine the suitability of the proposal for authorisation.

The consultation responses regarding this modelling can be broadly separated into three categories:

- model validation and time implications; and
- modelling financial implications.
- standardised and transparent modelling;

These categories are detailed below.

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## 11.1 Model Validation and Time Implications

There were many responses to the consultation that raised concerns over the validation of SEPAs proposed screening models and the potential time implications from the requirement to validate the model against suitable real-world data. Many of these comments stated that other organisations that have used hydrodynamic modelling protocols to model sea lice dispersal spent many years developing these models, in contrast with SEPA's timetable to develop and introduce its screening model. These concerns were predominantly raised by marine finfish farm operators and developers as well as trade bodies.

*"Setting aside concerns about the fundamental justification for the framework, ... has serious concerns about the timescales proposed for implementation in Scotland. The Norwegian Institute for Marine Research spent many (ca. 15) years developing a coupled hydrodynamic and sea lice dispersal modelling system before the Traffic Light System was introduced. In contrast, the proposed framework in Scotland is planned for introduction within a year with no specific modelling system yet identified."*

*"Throughout this time ... has taken the view that the framework under discussion is completely new and remains, by definition, wholly untested; is based on many assumptions derived almost entirely and sometimes selectively from science that has carried out elsewhere and in circumstances that may not be relevant to Scotland; and that, even once a broad consensus has been reached, remaining uncertainties mean that it is reasonable to implement it only after a suitable period of validation and ground truthing to ensure that theoretical assumptions and predictions about any effects of lice on wild salmon match real time information and data gathered from the environment."*

## 11.2 Modelling Financial Implications

There were also a few consultation responses that brought up the financial implications of the additional modelling requirements proposed in the framework. Specifically, that smaller fish farm operators will be at a competitive disadvantage as they do not have specific modelling employees, and this framework will incur

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additional costs that may not be viable. These responses were primarily raised by marine finfish farm operators and developers and/or their trade bodies.

*“We have no specific area of expertise regarding modelling. As a small company ... does not have the financial headroom to employ or engage a member of staff specifically in the role of modeller. If we end up with a framework that requires repeated remodelling of data then this will present a financial burden on the company. If SEPA progress with this or similar framework we consider it imperative that a standardised model is developed, validated and utilised in such a way that consistent and comparable modelling results can be obtained by modellers operating on behalf of Industry, regulators or external parties such that time consuming debate over output results can be avoided.”*

*“Secondly, the proposed approach would create significant obligations for smaller businesses like ours, especially in relation to the costs and resources likely to be required where complex and sophisticated environmental modelling is necessary. Such a resource does not currently exist and costs would be additional to those already being borne by marine trout farming businesses.”*

### **11.3 Standardised and Transparent Modelling**

Some of the consultation responses stated that the modelling approach described in the proposed framework should be standardised to ensure that it is transparent, inclusive and can be replicated by all stakeholders. There were also concerns raised around fish farm operators developing their own modelling protocols without this being independently verified and published. These comments are found in responses from fisheries interest groups, individual stakeholder as well as community groups. Examples can be seen below:

*“For adaptive management to work, there must be no significant knowledge gaps, so high quality and frequent environmental and on-farm monitoring is essential, supported by excellent modelling of sea lice dispersion and density, to determine which areas pose the highest risk, and the necessary on-farm ceilings. The modelling must be based on much better and more timely data, independently checked and transparently published.”*

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*“For these reasons, sea lice modelling must be standardised. Relying on the industry to do its own modelling is to invite bias, so SEPA should set all the modelling protocols and do the modelling itself, as happens in Norway. This should be paid for by a levy on the developers. SEPA’s modelling should not just be limited to screening. As mentioned above, it should include annual hindcast modelling of lice from all farms, to inform the next year of production.”*

*“We are concerned that the consultation document appears to imply that applicants construct the requisite models and undertake the modelling. There appears to be no requirement for independent verification or validation of this. This is not acceptable and provides no oversight of the data collection and modelling.”*

There were a few responses that stated the need for the real time publishing of sea lice data for modelling and monitoring purposes.

*“In Norway, the state modellers produce weekly lice forecasts. Crucially, they also produce an annual hindcast. This is of higher quality, as late-reported farm data can be included. The hindcast is vital for informing the next year’s Traffic Light ratings and farm management practices. This ought to be part of SEPA’s plan and is one reason why its sea lice modelling capability must not be limited to simple screening modelling, such as its modelling of the cumulative impacts of bath chemicals.”*

## **11.4 SEPA Response**

### **11.4.1 Model validation and time implications**

It should be stressed that models are, by definition, approximations of reality and can always be improved.

Marine Scotland Science, SEPA and the aquaculture industry have, over the last decade, been developing our experience with sea lice modelling. We have also been liaising directly with Norwegian modellers. We are therefore building upon considerable experience; however, we do agree that there are challenges in developing the models.

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Our priority over 2022/23 is the development of screening models that will help us understand the dispersion of sea lice from marine finfish farm developments and where require further assessment is required to understand potential impacts.

We will engage with stakeholders, including modelling experts from finfish producers and interest groups, to help develop our work. We expect to produce a consultation in 2023 which will provide the details of the screening model and the results of its application. This will allow stakeholders to understand the implications of the use of the model.

On the basis of the feedback of the consultation, SEPA will make a judgement about whether the model is sufficiently well developed to provide a suitable tool for screening. We will not implement the regime until we have achieved this objective. It should be noted that screening models do not require high levels of precision but should be able to define relative impacts within acceptable orders of magnitude.

The development of the hydrography part of the screening model will form the basis upon which screening models could be also developed to assess the cumulative impacts of nutrients and bath treatments.

#### **11.4.2 Modelling financial implications.**

The larger companies have already developed modelling capabilities for sea lice and our expectation is that they will be able to undertake further modelling where screening indicates that this is required.

We recognised the technical and financial challenges posed by the development of modelling capabilities for smaller companies and other interested parties. We are therefore attracted to the idea of developing standard models which can be used where it is required by screening. These models would be accessible to companies and interest groups and would have the advantage of engendering confidence and transparency. They would support the modelling of the cumulative impacts of sea-lice, nutrients and bath treatments.

Our initial focus would be to create a group of modellers from industry and interest groups who could develop more precise hydrographic models. To do this we would

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need to enter in to joint trials and validation work, which we hope to do in partnership. We would expect to do this in 2023/24.

Standardised and transparent modelling;

SEPA intends to develop screening models that are open, transparent and freely available. In particular, we are developing visualisation tools which will allow stakeholders to modify inputs to a model and understand how this affects the outcome. This will be a big step away from models as “black boxes”.

We believe that open sharing of modelling and data will strengthen work in this area. This approach will benefit the smaller companies which find it difficult to access modelling expertise. It will also engender more confidence in the regulation of the industry.

Clearly people could develop alternative models in situations where they have concerns about the output.

We will learn from Norway’s work on lice forecasting, and the wider Sea Lice modelling community, and assess whether we can develop similar tools in Scotland.

## 12 Monitoring

Most respondents commented on one or more aspects of monitoring. There was a common theme across these responses that monitoring should do more than just assess compliance against licence conditions imposed by the framework. It should also answer the wider question of whether the framework is effective. As a result, the comments have been divided into the following two categories:

- monitoring to assess compliance;
- monitoring to determine the effectiveness of the regime.

These categories have been further subdivided to reflect specific response areas.

### 12.1 Monitoring to assess compliance

Permits are likely to include conditions which require operators to limit the average number of lice on fish to ensure that lice levels do not exceed prescribed levels within WSPZs. SEPA is likely to require operators to monitor and report on the



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number fish and counts of lice present to demonstrate that they are complying with their obligations.

### 12.1.1 Regulatory efficiency

Marine Scotland Fish Health Inspectorate is responsible for protecting the health of farmed fish. It does this by requiring operators to report lice counts to the inspectorate. This information is subsequently made available on Scotland's Aquaculture Web site. The inspectorate takes action against operators if lice counts exceed nationally set thresholds.

Marine Finfish Farm Operators and Developers highlighted the importance of avoiding duplication with other regimes in particular the Fish Health Inspectorate functions. The importance of this in the context of the Griggs review was stressed. For example, the expectation was that SEPA would use the reporting of sea lice numbers, currently reported to Marine Scotland, as the basis of their regulatory actions. They also raised concerns that the two regulators may impose conflicting obligations.

*“Must avoid duplication of other regimes. Specifically Marine Scotland Fish Health Inspectorate functions, Fish Farming Businesses (Reporting) (Scotland) Order 2020 & Aquaculture & Fisheries (Scotland) Act 2007 and Scottish Government's Sea lice policy (reporting and enforcement).”*

*“The proposed framework presents a clear risk of duplication in the monitoring and regulation of sea lice on both farmed fish and wild salmonids, as the consultation document fails to distinguish the remit of the framework, in relation to other regimes under control of different organisations (Fish Health Inspectorate (FHI), local government).”*

### 12.1.2 Lice counts

Some representations, from fishing/fishery interest groups, community groups and individuals (others), stated that the monitoring in the proposed framework should be based on sea lice counts of all adult females attached to fish within the farms. The reasoning behind this is that it would be a more robust method of assessing whether

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the sea lice exposure threshold has been breached, as females will appear as non-gravid once egg strings are released.

*“Salmon can also be infected directly by pre-adult *L.salmonis* from marine sticklebacks, on which they can only develop to pre-adult stage (Jones et al 2006). Pre-adults can easily overwhelm even larger farm-size smolts, but chalimus and adults are less damaging, so stage of lice as well as number must be considered with small fish. Adult females produce several pairs of egg strings and will appear non-gravid after every one, so it makes much more sense to count adult females than gravids.”*

*“Within section C11 (and mentioned elsewhere), SEPA have indicated that the intention is to use gravid female lice numbers as the starting datapoint for calculating the juvenile sea lice emanating from a given farm site. Whilst we accept that it is gravid female lice that produce eggs, we believe that it would be sensible to use the data which is collected currently (adult female lice per fish) as the basis for these calculations. This would also build in a degree of precaution within the modelling.”*

### 12.1.3 Confidence

A consistent theme in responses from fishing/fishery interest groups as well as other individual responses was the importance of maintaining confidence in the data used to assess compliance. Dependence upon industry data was not considered sufficient. Many respondents considered that independent audit and unannounced inspections were essential.

*“We are of the opinion that the only effective way of assessing compliance will be for unannounced visits by SEPA personnel to monitor sea lice concentrations at individual farms. Allowing fish farms to “mark their own homework” would not, we feel, be effective.”*

*“a degree of compliance monitoring by SEPA, including unannounced audit inspections, is important to ensure transparency in the process.”*

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*“The monitoring approach must include compliance monitoring by SEPA and greater frequency of unannounced monitoring visits.”*

*“The industry should be encouraged, if not required, to undertake monitoring of lice levels on wild fish at identified locations within protection zones/management areas. SEPA will need to consider whether there is a need for additional infrastructure or to rely on industry monitoring. We would suggest that independent verification of monitoring should be considered.”*

#### **12.1.4 Transparency**

Some respondents also stressed the importance of making the information collected on compliance available. Transparency was an important factor in maintaining confidence in the data. Reference was frequently made to the use of the Scotland's Aquaculture website to provide information.

*“Independent scrutiny of the sea lice data. Involvement of the Outer Hebrides Fisheries Trust in analysing the data”*

*“Information and data need to be made publicly available and readily accessible in a much timelier manner than is currently the case.”*

## **12.2 Monitoring to determine the effectiveness of the regime**

We will want to understand whether our controls over sea lice numbers in fish farms are protecting wild salmon populations. Being able to determine the effectiveness of the regime is difficult as there are a wide range of factors affecting salmon populations. We will need to find ways of distinguishing the effects of sea lice from those caused by climate change, pollution, barriers and habitat change. This is an area of work where we were looking for ideas from consultees.

Some consultees raised concerns about the practical difficulties of monitoring the effectiveness of the regime. For example, one marine finfish farm operator/developer was concerned about how a monitoring programme would disentangle the impact of aquaculture on fish stocks from the other pressures on the water environment:

*“If assessing the framework's success in an area where waterbodies are failing to achieve good ecological status (GES) for salmonids, a holistic*

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*approach must be adopted to consider the proportionate and relative contribution of all local pressures (i.e. forestry, exploitation, infrastructure) on a given receptor, and use this to inform adaptive management of the appropriate sector.”*

### **12.2.1 Monitoring salmonid populations**

Some responses from a variety of respondent categories, and primarily in response to question 15 of the consultation (*Do you think there are components that should be included in an effectiveness monitoring programme that you would be able to help deliver?*) stressed the need to define and monitor the current baseline of salmonid populations in order to understand future change:

*“It is, therefore, essential to have a good understanding of current population health, and also the capacity to monitor changes in the number of salmon leaving and returning to rivers over time to see if there is an increase in the number of salmon returning to rivers and, subsequently, healthier populations.”*

*“Long term monitoring of salmon smolts migrating to sea from the major rivers. If there is to be a recovery it will start with many more smolts going to sea. This needs to be measured and monitored annually.”*

*“Capturing out migrating smolts and checking for lice. Difficult to attribute any lice found to a salmon farm or farms and danger that smolts with lice may be compromised and easier to catch thereby skewing the results.”*

*“While monitoring sea trout will not provide the same results as monitoring salmon within the marine environment, it may be possible to gather valuable data on lice levels occurring on wild salmonids. These data could be used to assess changes occurring and understand direct relationships between sea lice levels recorded on nearby aquaculture sites and those occurring on wild salmonids within the Firth of Clyde”*

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**12.2.2 Monitoring sea lice in protection zones for model calibration**

Some respondents emphasised the importance of monitoring sea lice within the protection zones in order to calibrate the models and to link trends in lice loss from farms with infestation of salmonids and the health of salmonid populations.

*“Monitoring of lice levels in the marine environment may provide one mechanism to determine the effectiveness of the framework in terms of validating model outputs and predictions. It is likely this may require plankton monitoring or towed sentinel cages”.*

*“Auditable reporting of the number of sea lice on both farmed fish and wild fish at selected monitoring locations, using an agreed protocol, during the high-risk period (April-May)”*

*“the framework must be capable of: Providing validation of free living (infective) lice abundance within the proposed protection zones, independent of farm data capture, to calibrate modelling approach and regulatory decisions. A similar approach as above needs to be applied in non-aquaculture zones to validate differences in lice abundance and thus need for regulatory framework.”*

*“Direct measures of sea lice larvae in the environment and the collection of data on sea lice burdens of wild salmonid fish. These data may be used to monitor effectiveness of the framework and further inform the modelling approach”*

*“it is important that the lice numbers within the protection zones are also monitored to ensure that the measures in place are sufficient to maintain the number of infective lice stages within the wild at below threshold level”*

*“Monitoring the distribution and densities of infective-stage sea lice in the environment, and infestation pressure on wild fish where possible, will be crucial”*

**12.2.3 Detailed comments**

More detailed comments on monitoring techniques and locations were provided and are listed in the [Appendix 3](#). These will inform the next phase of monitoring development.

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## 12.3 SEPA Response

### 12.3.1 Monitoring to assess compliance

#### 12.3.1.1 Regulatory efficiency

In developing its new responsibilities, SEPA is conscious of the importance of building a joint understanding of how SEPA and the Fish Health Inspectorate can both collect the information each organisation needs (on sea lice numbers) to inform their respective regulatory functions.

In order to assess the levels of lice loss from farms, we will require operators to monitor and report to us:

- lice numbers per fish;
- number of fish.

We will require this information throughout the sensitive period and for one month before the start of the sensitive period.

Our expectation is that we will use sea lice count information currently reported to the Fish Health Inspectorate. We will work with the Inspectorate to ensure that the generic requirements for monitoring are kept the same for both regulators. This will include considering whether the counts should be adult females or adult gravid females.

We will want access to the raw data from the counts rather than just the average numbers per count. We want the raw data because it will allow us to:

- assess whether the level of monitoring is sufficient given the level of variability; and
- calculate overall statistics of performance with more precision.

Modelling indicates that the projected impact of farms upon lice levels in WSPZ is very sensitive to the number of lice per fish. We will therefore consider whether the reported data indicates that additional levels of sampling is required in order to achieve the required statistic precision. We will only do this for the farms which are modelled to contribute significant numbers of infective-stage sea lice to protection zones where lice concentrations are high. Improving the accuracy of counts for these critical farms will deliver benefits for both operators and SEPA. Where we require

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enhanced sea-lice counts in farms, it will only apply during the period when controls are needed to protect the WSPZ.

The response of the Fish Health Inspectorate and SEPA to high sea lice counts will be different. The Inspectorate is interested in ensuring that farm levels of lice throughout the year do not affect the health of the farmed fish by exceeding the national thresholds. SEPA will be interested in the cumulative load of lice upon wild salmonids during the sensitive period. This means that SEPA regulation will be site-specific, depending upon the contribution that each site makes to infective-stage sea lice within the WSPZ.

#### **12.3.1.2 Confidence and transparency**

It is the responsibility of operators to understand the effect of their activities on the environment. We typically require operators monitor compliance with their permit conditions and to report this data to us. This ensures we have a much more detailed understanding of the situation than if we were dependent solely on our own sampling.

Stakeholders expect us to audit the data that is submitted so that they can understand whether the monitoring accurately describes the situation. Engendering confidence in operator data is important for all parties.

We will use data analytics, record auditing and independent or witnessed sampling to audit the data provided by operators. Different forms of audit pose different challenges. Lice numbers is one of the easier forms of aquaculture data to audit.

#### **12.3.2 Monitoring the effectiveness of the regime**

Over 2022, SEPA and Marine Scotland will be developing a monitoring strategy that will be based upon working with fishery interests and industry. This will require the application of existing monitoring methods and the development of new monitoring tools.

SEPA's initial focus in 2023, will be to develop methods of assessing lice numbers within WSPZs. This might involve measuring free swimming lice numbers (e.g. plankton trawls) and/or indirect measurement of likely impact (e.g. sentinel cage) within WSPZs. We will do this by selecting a small number of WSPZs using the

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output from our screening models. We will also monitor WSPZs potentially affected by new farms to assess whether it would be possible to assess increases in lice levels.

The models will predict the lice concentrations within WSPZ resulting from the cumulative loss of lice from farms. We will focus our monitoring on these WSPZ and use the output to help us develop the next generation of models.

SEPA and Marine Scotland Science will develop a monitoring strategy and will be working with others to develop/improve these areas of monitoring.

The Table below summarises the key areas of interest. SEPA and Marine Scotland Science will develop a monitoring strategy will be working with others to develop/improve these areas of monitoring.

Key areas of interest		
Lice in WSPZ	Lice on fish passing through WSPZ	Trends in fish populations.
Purpose		
Validate the model predictions	Validate exposure assumptions	
Monitor trends in lice over years	Monitor trends in lice counts on fish over years.	Monitor trends in fish populations over years.
Method		
Plankton trawls and identification of lice by eye or using AI or eDNA.	Tracking of salmonid migration (Marine Scot)	Salmonid population surveys Fish counters
	Sentinel cages with farmed fish (industry)	
Lead organisation		
Marine Scotland/SEPA	Marine Scotland	Marine Scotland

**13 Resources**



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Some comments, from a wide range of respondent groups including marine finfish farm operators/developers, public bodies, environmental NGOs and others, stated that that the implementation of the framework would need to be properly and fully resourced.

*“It is very important to ensure transparency and trust in monitoring and reporting processes e.g. assessing compliance, such as auditing gravid sea lice counts on farmed fish. It is hoped that the ability to charge for these measures under CAR will enable SEPA and the industry to deliver best practice.”*

*“If more resources are necessary, SEPA should raise licence charges on fish farmers to pay for any resources SEPA needs.”*

*“Any framework must be appropriately resourced in order that compliance can effectively be assessed; as well as staffing, the proposed framework as it stands would require significant knowledge development for SEPA as an entirely new area of responsibility. Alongside the more familiar aspects of the framework – modelling, data handling, returns - additional elements to site and record inspections would need to be covered. This would require knowledge of fish health monitoring for involved parties, and a sound understanding of wider fish health management. While sea lice are the central focus of the proposed framework, sea lice management is not an isolated topic and sits within an often-complex fish health context”*

*“It is reasonable that the costs of this could be funded from a levy on the industry as part of a licence.”*

### **13.1 SEPA Response**

SEPA consulted on proposals to increase charges to cover new regulatory duties. Ministers approved this increase in June 2022. This funding will cover the additional resources that we need.

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## 14 Appendix 1

The below table shows the proportionality of consultation responses received and the word choice used to illustrate those numbers in this document. It should be noted that this method of analysing the responses involved a degree of subjective categorising of responses to achieve the counts. As a result, this may mean that certain responses could be categorised differently changing the word used in this document. For this reason, the below table should only be used as a reference:

A few	<8%	1 - 5
Some	9% to 16%	6 - 10
Many	17% to 50%	11 - 31
Most	51% to 100%	32 - 62

## 15 Appendix 2

List of WSPZ technical input to be considered. Table of what to be considered

<b>Additional zones to be considered</b>
Entire Scottish West Coast
Orkney coastal waters
Shetland coastal waters
The Pentland Firth
All coastal areas northwards from Skye.
Eigg
Canna
Muck
Gruinard Bay
East coast rivers
Relevant Special Areas of Conservation
Existing zones should be extended further - 30km further from existing WSPZs
Increased proportion of the Firth of Lorne (river Awe and river Etive).

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Loch a' Chairn Bhain and Loch Glencoul
River Barbreck.
Upper Loch Long
Croe Water
South and East of Isle of Arran (Blackwater, Kilmory Water Glenashdale Burn)
The North and East coasts of Scotland
Existing zones in the Firth of Clyde should be extended beyond the river mouths of Ayrshire rivers
Camas Uig
Loch Erisort
Rivers and existing zones with minimum swimming distances to open sea of less than 5km
Eddrachillis Bay
Outer edge of the Sound of Arisaig (Including Loch Ailort & Loch Moidart)
Area between Loch Laxford & Scourie
Summer Isles
Areas in the Sound of Mull not already included in a zone
Gaps between North Skye, Sound of Raasay, Inner Sound and Loch Torridon zones
Merging of the three zones in the West of Mull
Loch Kishorn
Loch Ainhort
Gare Loch
Loch Long (North)
Loch Striven
The Daill, Grudie and Dionard Rivers
Firth of Lorn (South)
The Minch (East, North East & South East)
Scourie
Cape Wrath
West Sutherland

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Inner Hebrides
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<b>Zone to be considered for removal</b>
Sound of Harris
Bagh nam Faollean
Grimsay and Ronay
Sound of Gigha
Loch Tuath

## 16 Appendix 3

### 16.1 How to monitor

*“Examine existing EMPs to identify areas of good practice in terms of monitoring”*

*“Effectiveness of the framework can be informed by automated systems quantifying sea lice counts that indicate the efficacy of managing sea lice levels”*

*“Identify a realistic timeframe for determining whether the sea lice framework is being effective, and the number of wild salmon returning to rivers is increasing. It is likely that different rivers will experience different levels of success and, therefore, it is important to have a plan in place that contains an agreed set of actions if the sea lice framework is found to be ineffective”*

*“Assessing the health of the wild Atlantic salmon population. There is a mechanism through the National Electrofishing Programme for Scotland (NEPS) to deliver this. However, long-term funding must be assured for NEPS to be delivered on an annual basis. It is worth noting that the watercourses in several relevant Special Areas of Conservation are relatively small and can fall outwith NEPS. A means of monitoring them needs to be included. It is also important that any estimated of sea lice impacts on post-smolt Atlantic salmon be assessed at the population level and not simply on individual fish.”*

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**16.2 Where to monitor and by whom**

*“Monitor control rivers that are immune from any potential pressures placed on them by salmon farms. East Coast rivers perhaps”*

*“Monitor across multiple river systems and catchment areas in Scotland, to enable the impact of the sea lice framework to be identified and to differentiate between sea lice and other pressures on wild salmon populations”*

*“Establishing base line data may still be possible within the Firth of Clyde prior to the planned expansion of the aquaculture industry within this area. The Ayrshire coastline has never been included in any sea lice monitoring on sea trout that we are aware of. The entire Ayrshire coastline included within any wider monitoring strategies”*

*“As the new framework is focused on salmon conservation rivers, the conservation status of these populations needs to be assessed, with resulting data being used to inform the adaptive management approach”*

*“Ayrshire Rivers Trust have experience of netting procedures and knowledge of the coastline where netting operations may be possible. This is something we may be able to assist with and are keen to do so.”*

*“... note that existing monitoring undertaken by Fisheries Trusts does not include all relevant areas, and we would welcome further discussion with SEPA on the monitoring approach to be adopted”*

*“An agreed approach for effectiveness monitoring must be developed prior to implementation of any new framework. There should be an opportunity for the public to comment on the proposed effectiveness monitoring approach ahead of it being finalised”*

*“... suggests it should be developed in coordination with the Outer Hebrides Fisheries Trust as they have the knowledge and expertise to monitor. It is important that the aquaculture companies are also involved and coordinate / cooperate with the Trust.”*

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*“... has experience of monitoring sea lice levels on wild fish and in the analysis of plankton samples for juvenile sea lice.”*

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