Appropriate Assessment for Intensive Aquaculture (T06-202) in Kenmare River SAC [Site Code: 002158] and Deenish Island and Scariff Island SPA [Site Code 004175]

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Glossary of Acronyms

AA	Appropriate Assessment
CM	Conservation measure
CL	Conservation limit
COs	Conservation Objective(s)
DAFM	Department of Agriculture, Food and the Marine
DEHLG	Department of Environment, Heritage, and Local Government
EIAR	Environmental Impact Assessment report
European site	Natura 2000 site
FCS	Favourable conservation status
HPRA	Health Products Regulatory Authority
ICES	International Council for the Exploration of the Seas
IROPI	Imperative reasons of overriding public interest
MCT	Marine Community Type
NASCO	North Atlantic Salmon Organisation
Natura 2000	Network of nature protection areas, Including the SACs and SPA designated under the Habitats Directive
NIS	Natura Impact Statement
NSSSCIF	North South Standing Scientific Committee on Inland Fisheries
NPWS	National Parks and Wildlife Service
NTT	Notice to treat
MSY	Maximum sustainable yield
QIs	Qualifying Interest(s)
SAC	Special Area(s) of Conservation
SCI	Special Conservation Interest(s)
SFPA	Sea Fisheries Protection Authority
SPA	Special Protected Area(s)
t	Tonne (1,000kg)
TEGOS	Technical Expert Group on Salmon

1 Executive Summary

The Marine Institute has been requested to carry out an Appropriate Assessment on behalf of the competent authority for an aquaculture licence application (T06-202) (review and renewal), and a foreshore licence application, for intensive aquaculture activities on a site at Deenish Island, Kenmare River, Co. Kerry. The proposed site is situated within the Kenmare River SAC [002158] and Deenish Island and Scariff Island SPA [004175].

A Natura Impact Statement was prepared and submitted by the Applicant for this application. This Appropriate Assessment report assesses the potential for the proposed aquaculture activities to adversely affect the Qualifying Interests (QIs) of the Natura 2000 sites within the zone of influence of the activities.

The application documents for T06-202 (Deenish) present a proposed 24-month production cycle commencing in March of year 1 which is based on the growth cycle of S1 smolts. Sixteen months of the cycle are designated for growing of salmon with the harvest period occurring over a five-month period from July through November of year 2. The site is proposed to lie fallow for two months prior to commencement of next growth cycle. The proposed growth cycle is limited to a Maximum Allowable Biomass of 2,200 t and will produce approximately 2,672 t of salmon per growth cycle.

A Natura 2000 screening process identified that the proposed site overlaps with 1 SPAs and 1 SAC, and that 2 other SACs and 11 SPAs are within the zone of influence of the activity. The process identified the following QIs and associated conservation features of the Natura 2000 sites that the proposed aquaculture activities spatially overlap with and/or has the potential to significantly affect.

- Large Shallow Inlets and Bays [1160]
- Reefs [1170]
- Otter (*Lutra lutra*) [1355]
- Harbour Seal (*Phoca vitulina*) [1365]
- Salmon (*Salmo salar*) [1106]
- Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]
- Arctic Tern (*Sterna paradisaea*) [A194]
- Cormorant (*Phalacrocorax carbo*) [A017]
- Fulmar (*Fulmarus glacialis*) [A009]
- Gannet (*Morus bassanus*) [A016]
- Guillemot (*Uria aalge*) [A199]
- Herring Gull (*Larus argentatus*) [A184]
- Kittiwake (*Rissa tridactyla*) [A188]
- Lesser Black-backed Gull (*Larus fuscus*) [A183]
- Manx Shearwater (*Puffinus puffinus*) [A013]
- Peregrine (*Falco peregrinus*) [A103]
- Puffin (*Fratercula arctica*) [A204]
- Razorbill (*Alca torda*) [A200]
- Red-throated Diver (*Gavia stellata*) [A001]
- Shag (*Phalacrocorax aristotelis*) [A018]
- Storm Petrel (*Hydrobates pelagicus*) [A014]
- Common Tern (*Sterna hirundo*) [A193]
- Great Black-backed Gull (*Larus marinus*) [A187]
- Black Guillemot (*Cepphus grille*)

On the basis that likely significant effects of the proposed activity Natura 2000 sites cannot be excluded, these QIs were brought forward for full assessment in this Stage 2 Appropriate Assessment.

These were assessed with respect to the Conservation Objectives of each to determine if adverse effect will occur, taking into account possible in-combination effects with other projects or activities.

A number of preventative and mitigation measures are prescribed and detailed in the conclusions of this report.

Overall, it is determined that in light of the information presented, and the preventative and mitigation measures prescribed, it can be concluded that the proposed operations will not pose a risk of adversely affecting (either directly or indirectly) the integrity of the Natura 2000 sites, either alone or in combination with other plans and projects, and that there is no reasonable scientific doubt in relation to this conclusion.

2 Introduction

The Marine Institute has been requested to carry out an Appropriate Assessment on behalf of the Competent Authority for an aquaculture licence application (T06-202) (review and renewal), and a foreshore licence application, for intensive aquaculture activities at a site at Deenish Island, Kenmare River, Co. Kerry. The proposed site is situated within the Kenmare River SAC [002158] and Deenish Island and Scariff Island SPA [004175].

Intensive aquaculture is defined in the Aquaculture (Licence Application) Regulations, 1998 (as amended)[1] as "*aquaculture activities where the biomass produced is beyond that which could be naturally supported without the provision of additional feed*". Fed finfish aquaculture (e.g., salmon, trout) falls within this definition.

A Natura Impact Statement was prepared and submitted by the Applicant for this application. This Appropriate Assessment report, informing Stage 2 of the Appropriate Assessment process, assesses the potential for the proposed aquaculture activities to adversely affect the integrity of the Natura 2000 sites in the zone of influence of the proposed activities, considering if the proposed activities are likely to adversely affect the Qualifying Interests (QIs) of Natura 2000 sites in view of their Conservation Objectives (COs), individually or on a cumulative basis with other existing or planned activities or potentially disturbing activities.

2.1 Structure of Report

This Appropriate Assessment report provides:

1. An outline of the legislative context and the processes.
2. A description of the proposed activities.
3. Summary of the outcomes of the AA screening process.
4. Details of the Appropriate Assessment (AA) undertaken.
5. Responses to the issues raised from the consultation processes.
6. Conclusions from the AA process.

2.2 Legislative Context

Articles 3 - 16 of the European Community (EC) Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the **Habitats Directive**[2]) provide the legislative means to protect habitats and species of Community interest through the conservation of an EU-wide network of protected sites, known as **Natura 2000** sites[3].

The Habitats Directive was originally transposed into Irish law by the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997). The 1997 Regulations were subsequently replaced by the *European Communities (Birds and Natural Habitats) Regulations 2011*[4], as amended (referred to as the *2011 Birds and Natural Habitats Regulations*). Natura 2000 sites are referred to as European sites in these Regulations. The terms Natura 2000 sites and European sites are synonymous - the term Natura 2000 sites is used in this report. Natura 2000 sites in Ireland form part of the Natura 2000

[1] Aquaculture (Licence Applications) (Amendment) Regulations 2018 Regulation 3(iii) Link
[2] The Habitats Directive https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
[3] Natura 2000 https://ec.europa.eu/environment/nature/natura2000/index_en.htm
[4] European Communities (Birds and Natural Habitats) Regulations 2011 NPWS Link

European network of protected sites, these include Special Areas of Conservation (**SACs**) and Special Protection Areas (**SPAs**).

SACs are designated due to their significant ecological importance for habitats and for species protected under Annex I and Annex II respectively of the Habitats Directive. SPAs are designated for the protection of populations and habitats of bird species protected under the **Birds Directive**, EC 79/409/EEC[5]. The specific named habitats and/or (non-bird) species for which an SAC or SPA are selected are called the Qualifying Interests (**QI**), of the site. The specific named bird species for which an SPA is selected is called the 'Special Conservation Interests' (**SCI**). However, in practice, the common terminology of QI applies also to SCI. The term QI is used throughout this report.

Under Article 6(3) of the Habitats Directive any plan or project likely to significantly affect, either individually or in combination with other plans or projects (and it is not connected with or necessary for the management of a protected site), the integrity of a Natura 2000 site must be subject to an Appropriate assessment (AA). The AA focuses on the likely significant effects of a plan or project on a Natura 2000 site and considers the implications for the site in view of its **Conservation Objectives** (**COs**). Every Natura 2000 site has COs which are set out by the National Parks and Wildlife Service (**NPWS**) - the competent authority for the management of Natura 2000 sites in Ireland. The AA process must also consider any plan or proposal in combination with other activities that have the potential to significantly affect the integrity of the Natura 2000 site.

DAFM is the aquaculture licensing authority under the *Fisheries (Amendment) Act (1997)*[6] and has responsibility for foreshore licensing functions in respect of activities wholly or primarily for the use, development or support of aquaculture under the Foreshore Act (1933), as amended[7]. They determine applications for new, renewal, or review of aquaculture and foreshore licences. They are also the competent authority responsible for undertaking AA of aquaculture licence applications. As part of the licensing process DAFM must determine if the proposed aquaculture activities, individually or in-combination with other activities, are likely to significantly impact the Conservation Status of QIs and the integrity of the Natura 2000 site. DAFM must base its determination on an AA and is also responsible for ensuring that an AA is carried out.

If the AA process finds that the possibility of significant adverse effect cannot be discounted or that there is a likelihood of negative consequence for the conservation features for which a site is designated, then such activities will need to be mitigated if they are allowed to continue. The assessment reports are not always explicit on how this mitigation might be achieved but rather indicate whether mitigation is required or not and what results should be achieved.

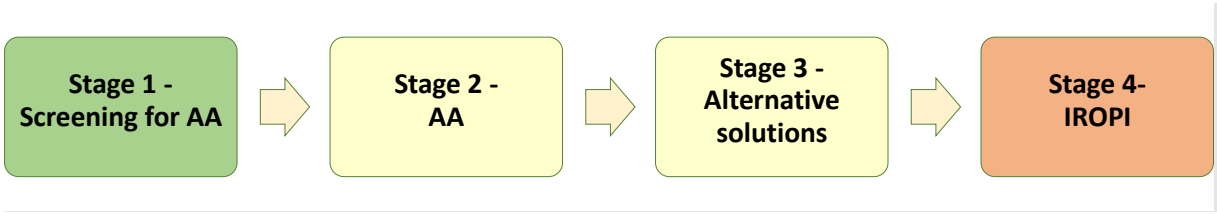
Aquaculture operations existed in coastal areas prior to the designation of areas as SACs and SPAs under the Directives. Ireland is undertaking AAs of existing and proposed aquaculture activities in SACs and SPAs. This is an incremental process, as agreed with the EU Commission in 2009, and will ultimately cover all aquaculture activities in all Natura 2000 sites. AA of aquaculture operations are carried out against the Conservation Objectives for the conservation features of the Natura 2000 site, as defined by the NPWS.

[5] The Birds Directive https://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm
[6] Fisheries (Amendment) Act, 1997 Lawreform.ie
[7] Foreshore Act 1933 Revised Acts (lawreform.ie)

2.3 Appropriate Assessment (AA) Process

The requirement for an AA derives directly from Article 6(3), which outlines the decision-making tests for considering plans and projects that may have a significant effect on a Natura 2000 site. No definition of the content or scope of AA is given in the Habitats Directive, but the concept and approach are set out in EC guidance[8]. The *Guidance on Appropriate Assessment of Plans and Projects in Ireland* document[9] published by the Department of Environment, Heritage and Local Government (DEHLG) in 2009, sets out how an AA of plans or proposals in Natura 2000 sites in Ireland should be carried out in alignment with EC guidance. In 2021, the Office of the Planning Regulator (OPR) published a practice note on AA Screening[10], which provides guidance on how a planning authority should screen an application for planning permission for AA.

The *Guidance on Appropriate Assessment of Plans and Projects in Ireland* document promotes a four-stage process to complete the AA. The four stages are:



The key procedures involved in completing the first two stages of the AA process are described below. Stage 3 and Stage 4 (IROPI) are not applicable here.

2.3.1 Stage 1: Appropriate Assessment Screening

Stage 1 AA Screening is the process that addresses and records the reasoning and conclusions in relation to whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of the site's COs. If the effects, on the basis of objective information, are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to *Stage 2 Appropriate Assessment*. Screening should be undertaken without the inclusion of mitigation. The triggers during appropriate assessment screening are based on the '*likelihood*' of a potential significant effect occurring and not on certainty. This test is based on the precautionary principle[11]. A high degree of evidence and justification is needed in circumstances when the process ends at screening stage on grounds of no likely significant effect.

2.3.2 Stage 2: Appropriate Assessment

This stage considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the integrity of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. This stage requires a targeted scientific examination of the plan or project and the relevant Natura 2000 sites, to identify and characterise any possible implications for the site in view of the site's QIs and COs, taking account of in combination effects.

[8] EC 2018. Guidance on Aquaculture and Natura 2000 Sustainable aquaculture activities in the context of the Natura 2000 Network Link
[9] DEHLG, 2009. Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Link
[10] OPR - Office of Planning Regulator (2021). Appropriate Assessment Screening for Development Management. March 2021. 43pp Link
[11] OPR - Office of Planning Regulator (2021). Appropriate Assessment Screening for Development Management. March 2021. 43pp Link

The sensitivity of identified QIs in relation to the proposed activities is assessed and the significance of any identified adverse effects is then determined. If adverse effects are determined to be likely, then their scale, magnitude, intensity, and duration are considered in light of the COs and relevant guidance documents. If the assessment is negative, then recommendations on mitigation measures or on licensing decisions will be made.

2.4 Data sources

This process and report relies on data and information from a broad range of diverse sources. Some of the key sources of information that are generally viewed, consulted and/or utilised to inform the screening and AA processes are listed below. Others are consulted as required, and significant sources are cited in the reports.

Reference documents and Sources of information used to inform this process include:

- The Application
- DAFM Aquaculture & Foreshore Management website
- DAFM - Aquaculture viewer – AquaMIS
- National Parks & Wildlife (NPWS) protected site, marine habitats and community type information
- NPWS Guidance documents
- BIM profiling reports
- Targeted scientific studies
- Primary research literature
- Grey literature, reviews and report documents
- Expert opinion
- Direct queries to applicants through DAFM
- Fisheries (Amendment) Act 1997
- Aquaculture (Licence Application) Regulations, 1998 as amended
- Aquaculture (Licence Application) (Amendment) Regulations 2018
- Ireland's Marine Atlas
- MI/BIM Inshore fishing reports
- DHLGH Foreshore licencing database
- INFOMAR
- EPA GeoHive
- EPA maps tool
- The Irish Wetland Bird Survey (I-WeBS)
- NPWS Status of EU Protected Habitats and Species in Ireland – Article 17 (Habitats & species
- EU Commission assessments of bird's population status and trends web tool
- National Biodiversity Data Centre
- Marine Life Information Network
- MarESA
- EPA Catchments.ie dashboard
- Ordnance Survey of Ireland (OSI)
- European Environmental agency
- OPR, 2021. Appropriate Assessment Screening for Development Management. March 2021; Office of Planning Regulator.
- DEHLG, 2009. Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. NPWS, 2009 – updated in 2010 with reference to Natura Impact Statement.

- Möckel, S., 2017. The European ecological network "Natura 2000" and the appropriate assessment for projects and plans under Article 6 (3) of the Habitats Directive. Nature Conservation, 23.
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.
- EC Article 6 - Managing and protecting Natura 2000 sites
- EC Management of Natura 2000 sites: Best Practice
- EC 2000. Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.
- EC 2002. Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.
- EC 2006. Nature and biodiversity cases: Ruling of the European Court of Justice. Office for Official Publications of the European Communities, Luxembourg.
- EC 2018. Guidance on Aquaculture and Natura 2000 Sustainable aquaculture activities in the context of the Natura 2000 Network.
- EC 2012. Common methodology for assessing the impact of fisheries on marine Natura 2000. Service Contract No. 070307/2010/578174/SER/B. DGEnv Brussels.
- Poelman et al., 2022. Study on state-of-the-art scientific information on the impacts of aquaculture activities in Europe.
- Federal Agency for Nature Conservation information for the FFH impact assessment
- ABPMer, 2013a – h. Tools for Appropriate Assessment of Fishing and Aquaculture Activities in Marine and Coastal Natura 2000 Sites. Marine Institute.
- AZTI's Marine Biotic Index - AMBI
- Marine Institute (2013). A risk assessment framework for fisheries in Natura 2000 sites in Ireland: with case study assessments. Version 1.3., Galway, 31pp.
- Open Street Maps, Google Earth, C-Map, AquaMap,, and Bing aerial photography.

2.5 Assumptions made for Appropriate Assessment Report

Certain assumptions are made for this report to ensure that it follows a precautionary approach when considering the extent, magnitude, intensity, and duration of the potential significant effects of the proposed activities. These are:

- All aquaculture sites considered in this assessment report are assumed to be fully operational and that the operations (as well as environmental impacts) are occurring across the entire area of the sites, according to their production plan.
- Any aquaculture applications which were submitted prior to that being considered here, but still pending decisions (e.g., in process, under appeal, etc.), are also assumed to be fully operational across the entire area of the relevant sites for consideration of in-combination effects.. This ensures a conservative approach; in that it assumes these activities will be operational to the maximum extent possible.
- Other assumptions identified on a case-by-case basis and clearly communicated in the AA report.

3 Description of Activities

3.1 Proposed Activities

The Deenish fish farm site is located in Kenmare River, to the east of Deenish island. The aquaculture site has been in operation since 1995, the licenced expired on 15/02/2007 and has been operational under Section 19A(4) of the Fisheries (Amendment) Act, 1997[12] since that time. The T06-202 proposed licence application requests to grow Atlantic salmon (*Salmo salar*) in open net pen aquaculture to:

- a maximum allowable biomass (MAB) of 2,200 t at the site, which is a change from the existing licence which allows for an annual harvest of 500 t.
- an expansion of the boundaries of the licensed area from 14.5 ha to 33.5 ha.
- a maximum number of 15 pens.

The net pens will be of heavy duty polyethylene structure and mesh nets, set out in a 5x3 grid arrangement. The pens will have a 126m circumference and a net wall depth of 11m and a depth to the cone of 20, except for two pens in the northwest of the site that will each have a net wall depth of 8m and a depth to cone of 12m, due to the water depth in that area. The total capacity will be in the region of over 250,000 m^3. These will be supported within heavy duty polyethylene or steel base frames set at regular intervals around the floatation ring, upon which stanchions will be mounted to support the heavy duty handrail that runs around the pen. Pen nets, mooring, bridles and sinker ropes will be supported off the base frames. Fence nets and bird (top) nets will be supported off the handrails and stanchions. The submerged mooring grid is a heavy-duty rope-work structure comprising a series of squares, each of which supports a pen, and is anchored to the sea bed. Each corner will be supported by a buoy. Each mooring will comprise a heavyweight braided nylon rope running from each grid corner, attached to a length of heavy-duty anchor chain and a 1 t to 1.5 t anchor. Radar reflectors and navigational lights (4 sec 2 mile) will be positioned on the four corners of the grid block, also corner buoys with navigation lights will mark the 4 outer comers of the proposed site. The lights will be attached to the stanchion of the pens, or moored independently.

The site will be operated under a 2-year production cycle. Month 1 (Mar y1) to month 16 (Jun y2) will be used for growing salmon, months 17 (Jul y2) to month 21 (Nov y2) will be for harvesting. There will be a fallow period of 2+ months from month 22 (Dec y2) through to month 24 (Feb). The proposed production cycle will produce approximately 2,672 T of salmon per growth cycle (of 22 months). The mean cycle Feed Conversion Rate for the stock held at the site is projected to be 1.25. The maximum stocking density of the applicants salmon farms in Ireland is 10 kg/m^3, in line with their organic standards - as stated in the Food and Agricultural Organisation Salmo Salar cultured aquatic species fact sheet “Maximum stocking densities of up to 20 kg/m^3 are usual.” (FAO-Salmo salar[13]). For comparison, RSPCA welfare standards for Farmed Atlantic salmon state a maximum of 17 kg/m^3 per pen and 15 kg/m^3 per site.

A feed barge (length 24 m x beam 10 m) would be used to feed the stock automatically via a pipe distribution system using compressed air.

[12] https://www.lawreform.ie/_fileupload/RevisedActs/WithAnnotations/HTML/en_act_1997_0023.htm#SEC19A
[13] https://www.fao.org/fishery/docs/CDrom/aquaculture/I1129m/file/en/en_atlanticsalmon.htm

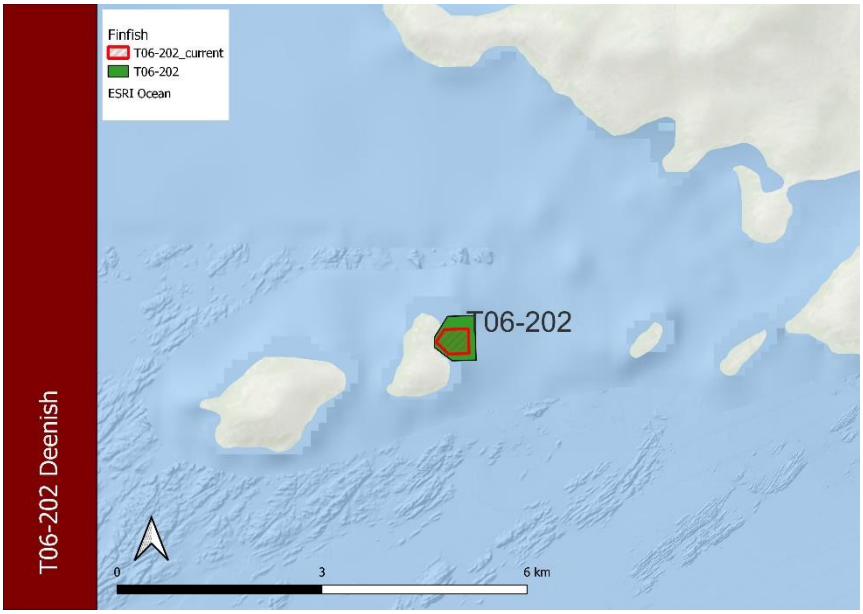


Figure 3-1 Location of the application site, and current site.

Nets will be made of knotless nylon sheeting, no net antifouling treatment will be used. The mesh size will range from 16mm to 24 mm depending on life stage of the stock. Nets will be cleaned *in-situ using* a pressure washer, with regular diver inspections for maintenance and condition. Top nets, used to protect stock from potential predators, have a mesh size of 80mm.

Harvesting will be on-board a dedicated harvest vessel moored alongside the pen, and the harvest vessel will transfer the fish (along with all the ice and water contained in the well tanks) into chilled tankers for road transit to the packing station in Letterkenny, Co. Donegal.

Freshwater treatments at Deenish would be carried out using a well-boat. The *Ronja Fjord* and *Aqua Transporter* well-boats have been used for this purpose at Deenish in the past. The *Aqua Transporter* has the capacity to desalinate saltwater and can transfer freshwater to the Ronja Fjord if that is needed.

The proposed Deenish operation will use the harbours at Westcove and Derrynane Pier in County Kerry and Ballycrovane, Travara, and Castletownbere in County Cork.

The operations since 2007 have been on the 14.5 ha site. This site is to be fully overlapped by this proposed application. Production cycles varied over the period, but all were equal or lessor impacting than the all-in-all-out 24 month, 2,200 t per cycle, currently proposed in this application. The information and the conclusions set out in this report are relevant and apply to both the assessment of the proposed aquaculture activities and the aquaculture activities undertaken since the licence went operational under Section 19A(4).

3.2 Overview of Existing Aquaculture Activities

To consider the effect of a proposed activity, it is important that the activity be considered in combination with other licenced aquaculture activities in the Natura site(s). To this end, a summary is provided of the existing activities in the SAC. Figure 3-2 shows the locations of all the aquaculture sites in the Kenmare River SAC, both licenced and applications.

Aquaculture within the Kenmare River SAC is focused on shellfish species (mussels, oysters, and scallops) and finfish (Salmon). Details of the locations, areas, and distances from the proposed project are shown in Figure 3-3**,** and Table 3-1.

Mussels are the predominant shellfish species cultured within the SAC. Small quantities of oysters are produced; while scallops, although licensed, are not currently produced in the bay. There are also four other locations licenced for the culture of Atlantic salmon.

A general overview of the aquaculture activities in the Bay is provided in the following sections.

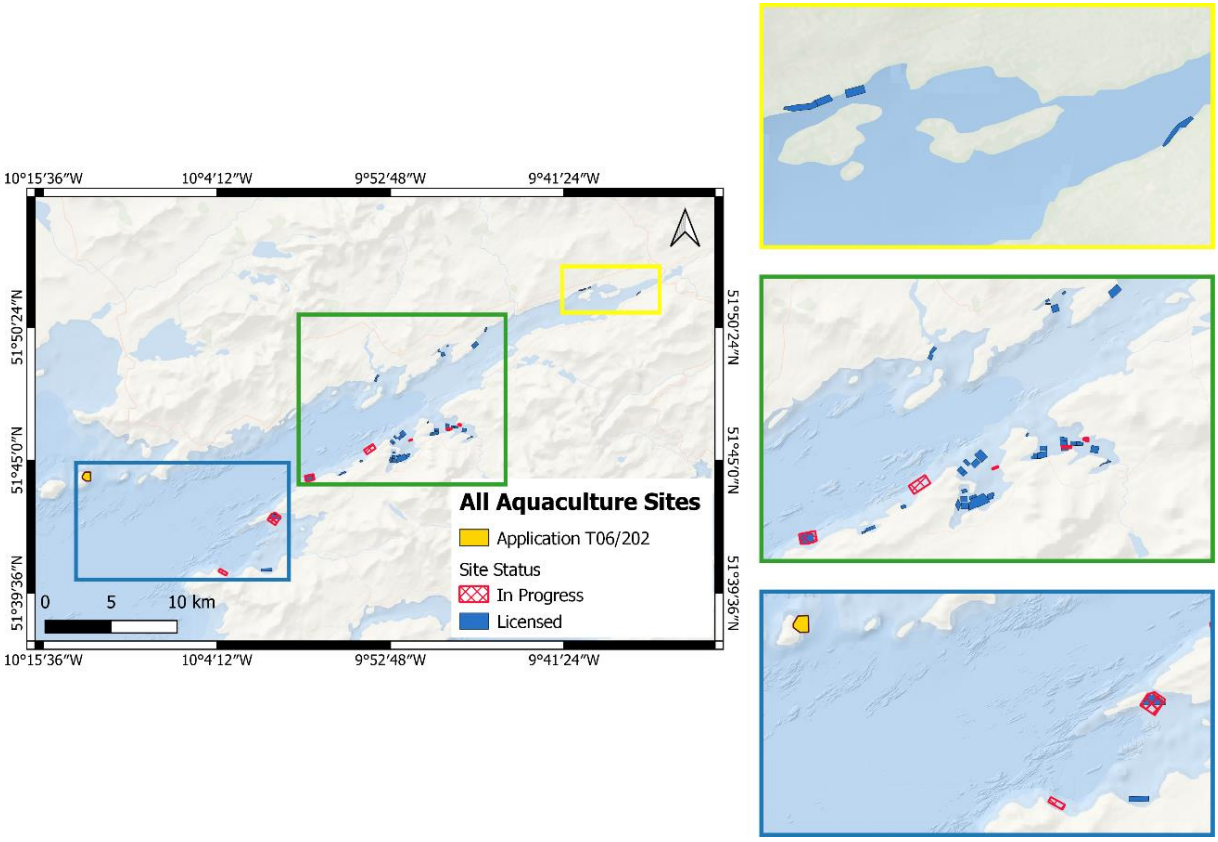


Figure 3-2 All Aquaculture Sites in the Kenmare River SAC by status.

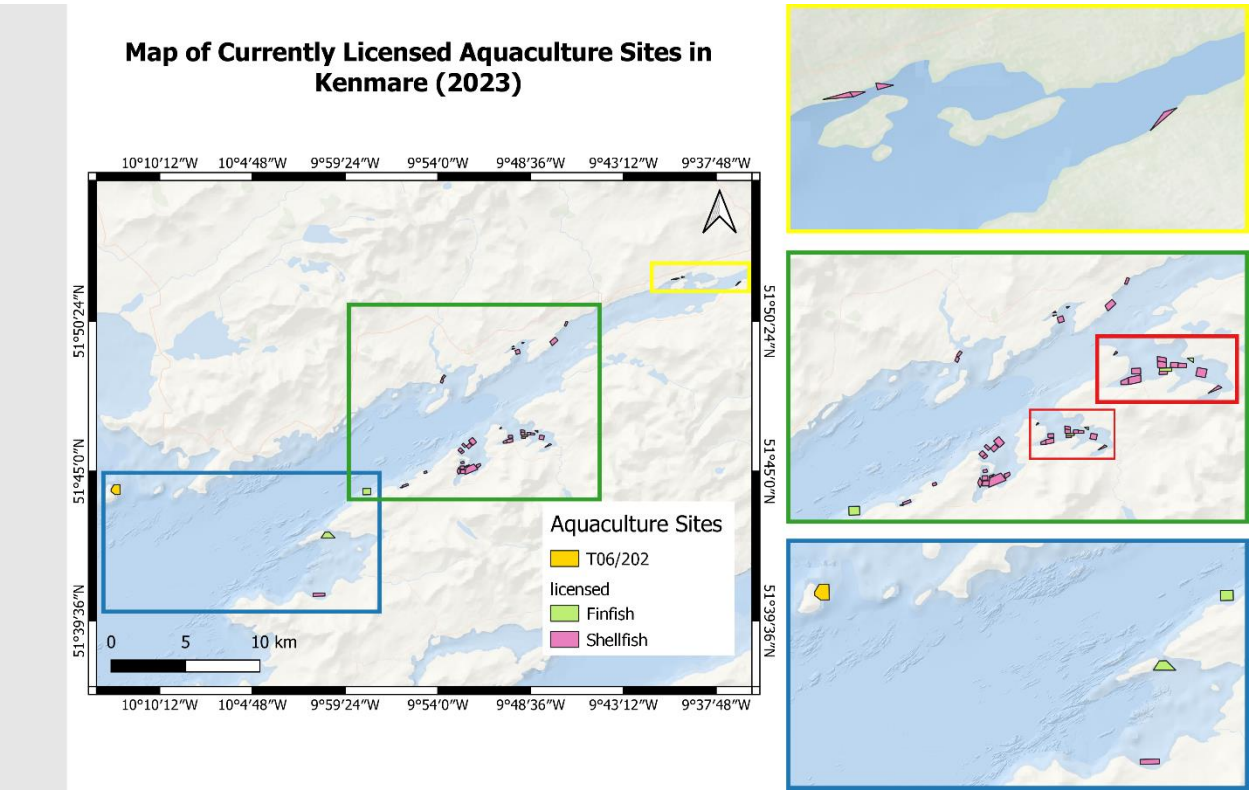


Figure 3-3 All Aquaculture Sites in Kenmare River SAC by type.

Table 3-1 Table of Existing Licensed Aquaculture Activities in Kenmare River SAC.

Site ID	Harbour	Species	Total Area (ha)	Approximate distance from Project (km)
T06-202	Deenish	Atlantic Salmon	14.48	0
T05-233	Inishfarnard	Atlantic Salmon, Rainbow Trout	25.94	14
T05-523A	Coulagh Bay	European Flat Oyster, Blue Mussel, Pacific Oysters, Stoney Sea Urchin, Red Seaweeds, Brown Seaweeds	16.31	14.5
T06-064-7	Doon Point	Atlantic Salmon	22.25	16.7
T05-369	Cleanderry Harbour	Blue Mussel	4.79	19
T05-399	Cleanderry Harbour	Blue Mussel	1.34	19
T05-340-1A	Kenmare River	Blue Mussel	2.6	20.4
T06-338A	Kenmare River	Blue Mussel	3.75	22.7
T05-225	Ardgroom Harbour	Blue Mussel	5.48	22.8
T05-041A	Ardgroom Harbour	Blue Mussel	8.05	22.9
T05-129	Ardgroom Harbour	Blue Mussel	5.99	22.9
T05-157	Ardgroom Harbour	Blue Mussel	5.47	22.9
T05-160A	Ardgroom Harbour	Blue Mussel	5.99	22.9
T05-160B	Ardgroom Harbour	Blue Mussel	3.06	22.9
T05-348B	Ardgroom Harbour	Blue Mussel	2.81	22.9
T06-039C	Kenmare River	Blue Mussel	3.64	23
T05-044	Ardgroom Harbour	Blue Mussel	31.72	23.2
T05-317A	Ardgroom Harbour	Blue Mussel	4.02	23.5
T05-317B	Ardgroom Harbour	Blue Mussel	3.04	23.5

T05-348A	Ardgroom Harbour	Blue Mussel	7.53	23.5
T05-258	Ardgroom Harbour	Blue Mussel	13.95	23.6
T06-024	Kilmakilloge Harbour	Blue Mussel	9.47	26
T06-033A	Kilmakilloge Harbour	Blue Mussel	5.29	26
T06-154	Kilmakilloge Harbour	Blue Mussel	4.38	26
T06-327A	Kilmakilloge Harbour	Great Atlantic Scallop	1.18	26
T06-035A	Kilmakilloge Harbour	Blue Mussel	2.63	27
T06-064A	Kilmakilloge Harbour	Atlantic Salmon	4.1	27
T06-106	Kilmakilloge Harbour	Blue Mussel	5.5	27
T06-114	Kilmakilloge Harbour	Blue Mussel	4	27
T06-131	Kilmakilloge Harbour	Blue Mussel	4.01	27
T06-190	Kilmakilloge Harbour	Blue Mussel	3.87	27
T06-332A	Coongar Harbour	Blue Mussel	7.84	28.2
T06-064B	Kenmare River	Atlantic Salmon	2.5	28.5
T06-149B	Kilmakilloge Harbour	Blue Mussel	8.49	29
T06-390A	Kenmare River	Pacific Oyster, European Flat Oyster	2.19	29
T06-280-2	Coongar Harbour	Pacific Oyster	0.89	29
T06-280A	Coongar Harbour	Blue Mussel	1.37	29
T06-280B	Coongar Harbour	Blue Mussel	1.37	29
T06-390A	Kenmare River	Pacific Oyster, European Flat Oyster	2.19	29
T06-356A	Kenmare River	Blue Mussel	14.77	31
T06-039A	Kenmare River	Blue Mussel	3.99	31.8
T06-179B	Templenoe	Pacific Oyster	2.37	40
T06-295A	Kenmare River	Pacific Oyster	1.38	40
T06-201	Kenmare River	Pacific Oyster	1.98	40.2
T06-388A	Kenmare River	Pacific Oyster, European Flat Oyster, Blue Mussel	2.25	43.5

3.2.1 Salmon Culture

Five sites are licensed to produce salmon, one of which is also licensed to produce Rainbow trout (*Oncorhynchus mykiss*). As of February 2024, there are currently four applications for renewal and review of salmon aquaculture licences - at the Inishfarnard, Deenish, Doon Point and Killmacillogue (x2) sites. This section details the current operational activities at the sites, for information. The appropriate assessment assumes that all sites are fully operational, and activities are occurring across the entire area of the sites, according to the stated production plans, including pending licences. Only aspects of finfish operations that have the potential to have in-combination effects on QIs of the Kenmare River SAC and the QIs of adjacent Natura 2000 sites are considered as part of the detailed assessment of potential significant effects in this section.

MOWI Ireland operates two sites: Deenish (T06-202) and Inishfarnard (T05-233). T06-202 is currently licensed for 500 t (400,000 smolts) production per annum on a 14.48 ha site. The renewal plans are to increase this to 2,200 t MAB on a 33.5 ha site, in 15 x 126 m circumference net pens (13 with depth to cone of 20m and 2 with depth to 12m).

T05-233 is currently licenced for 2,220 t MAB, with renewal plans to retain that tonnage and increase the site size to 52.7 ha, in 16 x 126 m circumference net pens (12 with depth to the cone of 20 m, and 4 to 17m).

The stocking plan for both sites is that smolts are introduced to the net pens and grown for 15 months, when harvesting starts from months 16 to 22. The site is then left fallow for 2 months before the next smolt input. The sites have a feed barge moored on site, which can feed the stock automatically throughout the day. Each net pen has cameras installed to monitor the fish, optimising the feeding, feed conversion rate and minimising waste. Both these sites are accessed from piers in Westcove, Derrynane Pier, Castletownbere, Travarra and Ballycrovane.

Murphy's Irish Seafood Ltd operates Doon Point (T06-64-7). This site has been fallow for a number of years but has a licenced harvest tonnage of 3,800 t per 2 year production cycle, on a 22 ha site. The renewal plans are to retain that tonnage and increase the site size to 29 ha, in 12 x 160 m circumference pens with depth to the cone of 20 m, with an approximate cubic capacity of over 30,000 m^3, this is an overall total volume of over 400,000 m^3.

St Killian's Harvest Limited operates 2 sites in Kilmakilloge Harbour: Spanish Island (T06-64A) and Battle Point (T06-064B). These sites have been fallow for nearly 10 years. T06-64A is licenced for 60 t annual harvest. The renewal plans are for a 2.5 ha site with 8 x 70m pens, of 7m depth. Similarly, Smolts will be inputted in Oct-Nov and transferred out of the sites in Mar-Apr (6 months later as part grown fish), when the sites remains fallow until the next input in Oct-Nov. T06-064B is licenced for 140 t annual harvest. The renewal plans are for a 4 ha site with 4 x 70 m pens, of 5 m depth. Smolts will be inputted in Oct-Nov and transferred out of the sites in Mar-Apr (6 months later as part grown fish), when the sites remains fallow until the next input in Oct-Nov.

Smolts (juvenile salmon) for these sites come from a number of sources. The smolts for the MOWI operation (Fanad/MOWI strain) are currently produced in the MOWI freshwater facilities in Donegal, namely Lough Altan and Pettigoe. Murphy's Irish Seafood Ltd, whilst producing most of their smolt requirements from their Borlin hatchery, also get smolt from Derrylea Holdings Ltd. All of these smolts are trucked from the freshwater facilities to a well boat for delivery to the sea sites. The smolts are initially fed by hand but as they grow, mechanical feed systems are used.

All sites (in Kenmare) are operating with a stocking density of less than 10 kg/m^3. The nets are made of knotless netting and no anti-fouling treatment is used, nets are either cleaned in-situ using pressurised water systems or alternatively when the need arises, the nets are changed. Regular dive inspections are carried out on the nets and moorings.

3.2.2 Oyster Culture

Oyster farming within Kenmare River has been taking place since the early 1990s. A single species, *Magallana gigas,* forms the basis of oyster aquaculture operation in the Kenmare River SAC. Cultivation is carried out using the bag and trestle method, either to half-grown or fully-grown size, using steel table-like structures which rise above the shore to just above knee height on the middle to lower intertidal zone, arrayed in double rows with wide gaps between the paired rows to allow for access. The trestles hold HDPE bags approximately 1m by 0.5m by 10cm, using rubber and wire clips to close the bags and to fasten them to the trestles. When first put to sea, there may be up to 2000 oysters in a single bag, but as they grow and are graded this number is gradually reduced. Over the course of the two to three years that it takes an oyster to reach saleable size, the density is reduced until market ready oysters of approximately 100g each (when grown to full size) are being grown in bags, at ~100 oysters per bag. The bags need to be shaken, turned and re-secured occasionally to prevent build-up of fouling and to ensure the growing oysters maintains a good marketable shape. This usually takes place once on each tidal cycle, when maximum exposure of the shore allows safe

access to the trestles. It is most important during the summer months when plankton (the oysters' food) is abundant, and oyster growth rates are at their optimum. Oysters are grown-on in these bags to half-grown or full-grown size for up to three years and will be graded two or three times over the course of each summer.

There are five active areas in operation, three in Templenoe, one in Killaha and one in Coongar Harbour. These operations are relatively small, currently producing less than 30 t annually, they are classified as free from the herpes virus and at the moment the operators are buying in seed from Seasalter, both diploid and triploid. There has been a recruitment of feral Pacific Oyster in Kenmare Bay, primarily in the inner bay, extending to the mid bay, but not the outer bay. Four of the licenced sites are permitted to use only triploid seed as a condition. One of the operators does not have a triploid condition in their licence as of this date.

Sites are accessed at low tide using a tractor and trailer, by a public road near Templenoe and Killaha and by boat in Coongar Harbour.

3.2.3 Rope Mussels

There are a number of locations used for suspended long-line mussel farming in Kenmare River, namely Killmakilloge Harbour (600 – 1000 t), Ardgroom Harbour, including Coosmore and Cleanderry Harbour (700 – 1100 t) and Coongar Harbour, including Sneem Harbour (150 – 200 t). All of the farms are locally owned. The main piers in use are located close to these growing areas.

The culture method involves placing settlement media (rope, strap, mesh) in the water column, known as a 'dropper' on which natural juvenile mussels settle. This takes place in April, May or June, depending on a number of seasonal and local factors. The naturally collected mussel seed is then on-grown for typically 18-24 months before being harvested as per market requirements and in line with shellfish and water quality parameters. For the most part the farmers work their own farms using smaller converted fishing vessels, although some of the larger farmers may operate as contract service providers, carrying out the harvesting for the smaller farmers, using their purpose built work barges. As these mussels grow the 'droppers' may remain *in-situ* or be moved to grow-out areas. Some farms grade the mussels during the 18-24 months, using the "New Zealand" continuous rope system, whereby the mussels are re-packed at a specific density using bio-degradable cotton mesh around the rope, the mesh degrades away after the mussels have re-attached using their byssal threads. All of the long-lines in use are double head-rope longlines, constructed from polypropylene mostly of 110 m in length, with typically 30 x 210-250 L floatation units (mostly grey in colour) are anchored at each end with 2.5 t concrete weights. In general, the long-line density is no greater than 3 lines per hectare. In Ardgroom Harbour, the mussel farmers set a self-imposed stocking density of 2 longlines per hectare and a dropper limit of 406 per line, through the CLAMS process. Three of the current oyster sites are proposing, in their licence renewal applications which are in progress, to add mussels to their existing oyster licence, for the mussels to be cultivated in bags on trestles.

3.2.4 Scallops

Within the Kenmare River SAC, there is a single site licensed for the production of native scallops. The 1.1803 ha site will produce scallops in frames (10) on the seafloor, covering a small portion of the site, and identified by marker buoys. Scallops are later distributed on the seafloor and maintained and harvested by diving. Site access is from Bunaw pier. It is not clear if the site is currently active, but it is assumed to be for assessment purposes.

4 Screening Process and Conclusions

The Department carried out an AA screening process to assess the potential likely significant effects of the proposed activity on Natura 2000 sites[14], or if there is a pathway of connectivity. The Source-Pathway-Receptor (S-P-R) method was used to assess the potential for likely significant effect. The source was identified as elements of the proposed activity that may affect ecological receptors. The ecological receptors were the Qualifying Interests in Natura 2000 sites within the Zone of Influence of the activity. The Zone of Influence is dependent on the species or habitat under consideration – broadly 15 km for SACs and 50 km for SPAs.

4.1 Natura 2000 sites identified

The proposed site overlaps with 1 SPAs and 1 SAC. Two other SACs and 11 SPAs are within the zone of influence of the activity. The Natura 2000 sites identified as being within the zone of influence of the activity are listed in Table 4-1 and Table 4-2 and displayed in Figure 4-1 and Figure 4-2

Table 4-1 List and details of SAC sites overlapping or adjacent to the area of the proposed activity.

Natura site	Site code	Distance from Natura site at nearest point (km)	Reference
Kenmare River SAC	002158	0	Link
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC	000365	5.44	Link
Ballinskelligs Bay and Inny Estuary SAC	000335	5.52	Link

Table 4-2 List and details of SPAs overlapping or adjacent to the area of the proposed activity.

Natura site – SPAs	Site code	Distance from Natura site at nearest point (km)	Reference
Deenish Island and Scariff Island	004175	0	Link
Iveragh Peninsula	004154	3.3	Link
Beara Peninsula	004155	10.5	Link
Puffin Island	004003	16.1	Link
The Bull and The Cow Rocks	004066	16.4	Link
Skelligs	004007	20	Link
Sheep's Head to Toe Head	004156	32.8	Link
Castlemaine Harbour	004029	34.7	Link
Dingle Peninsula	004153	40.6	Link
Blasket Island	004008	41.2	Link
Eirk Bog	004108	43.4	Link
Killarney National Park	004038	46.5	Link

[14] https://www.gov.ie/en/publication/437d9-t06-202-silver-king-seafoods-ltd-aquaculturefore shore-licence-application-to-cultivate-salmon/

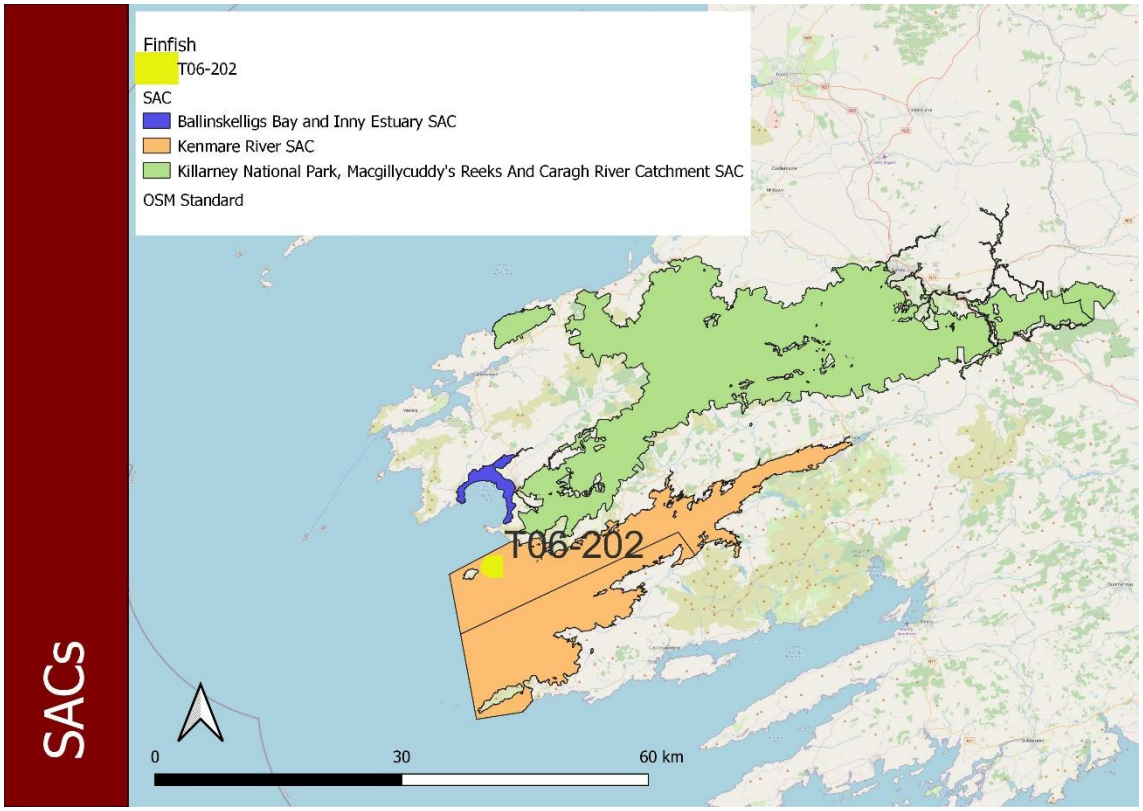


Figure 4-1 Map of Kenmare River SAC and all adjacent SACs within 15km of project site.

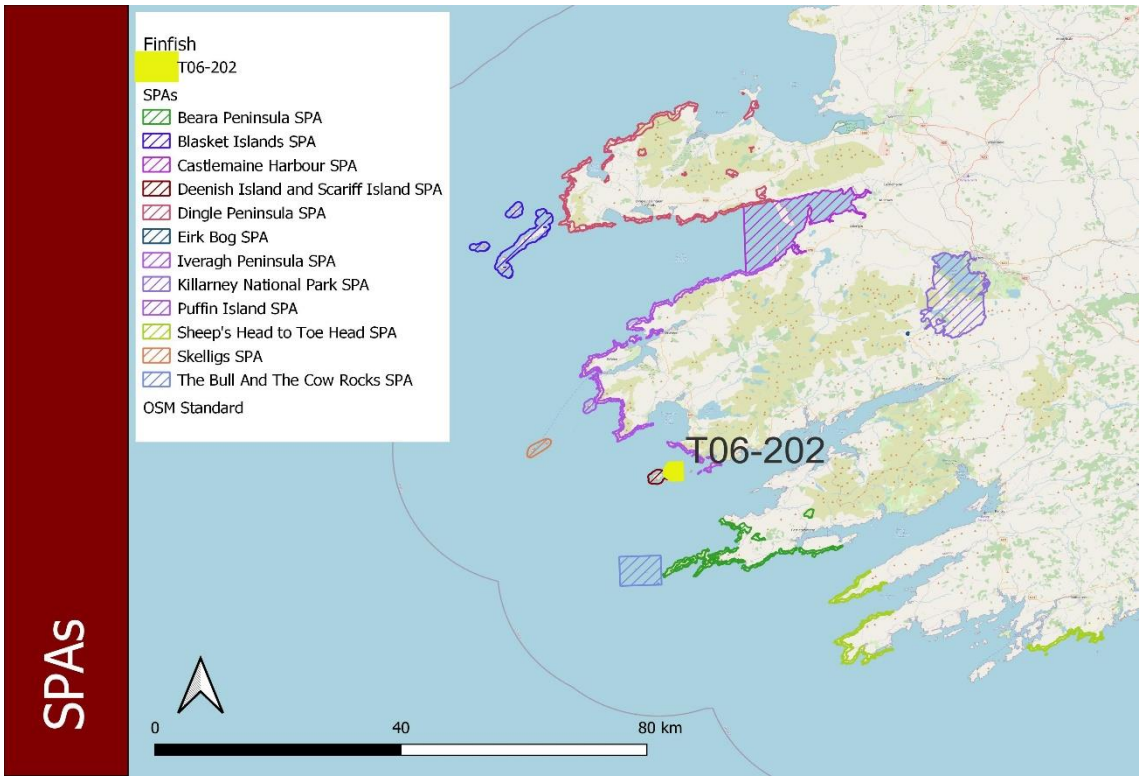


Figure 4-2 Map of SPAs overlapping or adjacent to the area of the proposed activity.

4.2 Appropriate Assessment Screening Conclusions

A report supporting the Appropriate Assessment Screening of intensive aquaculture in Kenmare River SAC and Deenish Island and Scariff Island SPA[15] was conducted as a precursor to this Appropriate Assessment report. That Stage 1 Screening process identified the following QIs and associated conservation features in the SACs that the proposed aquaculture activities spatially overlap with and/or has the potential to significantly affect.

- Kenmare River SAC (002158)
    - Large Shallow Inlets and Bays [1160]
    - Reefs [1170]
    - Otter (*Lutra lutra*) [1355]
    - Harbour Seal (*Phoca vitulina*) [1365]
- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365), Glanmore Bog SAC (001879), & Blackwater River SAC (0021730)
    - Salmon (*Salmo salar*) [1106]
    - Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]

The technical review conducted by WS Atkins Ireland Limited, on behalf of the Marine Institute, screened in the following list of QIs for SPAs:

- Arctic Tern (*Sterna paradisaea*) [A194]
- Cormorant (*Phalacrocorax carbo*) [A017]
- Fulmar (*Fulmarus glacialis*) [A009]
- Gannet (*Morus bassanus*) [A016]
- Guillemot (*Uria aalge*) [A199]
- Herring Gull (*Larus argentatus*) [A184]
- Kittiwake (*Rissa tridactyla*) [A188]
- Lesser Black-backed Gull (*Larus fuscus*) [A183]
- Manx Shearwater (*Puffinus puffinus*) [A013]
- Peregrine (*Falco peregrinus*) [A103]
- Puffin (*Fratercula arctica*) [A204]
- Razorbill (*Alca torda*) [A200]
- Red-throated Diver (*Gavia stellata*) [A001]
- Shag (*Phalacrocorax aristotelis*) [A018]
- Storm Petrel (*Hydrobates pelagicus*) [A014]
- Common Tern (*Sterna hirundo*) [A193]
- Great Black-backed Gull (*Larus marinus*) [A187]
- Black Guillemot (*Cepphus grille*)

Harbour Porpoise (*Phocoena phocoena*) [1351] became a qualifying interest of the Kenmare River SAC on 11 April 2024 (S.I. No. 143/2024), after the completion of the Stage 1 AA screening document. As a precaution this QI will be considered further in this Stage 2 document.

On the basis that likely significant effects of the proposed activity on the European sites cannot be excluded, these QIs are brought forward for full assessment in this Stage 2 Appropriate Assessment.

[15] Report supporting the Appropriate Assessment Screening of Intensive Aquaculture (T06/202) in Kenmare River SAC [Site Code: 002158] and Deenish Island and Scariff Island SPA [Site Code 004175]. 2023. Marine Institute.

5 Stage 2 – Appropriate Assessment

Stage 2 assesses the impact of the project or plan (alone and in combination with other projects or plans) on the integrity of Natura 2000 sites, with respect to the CO (conservation objectives) and the structure and function of the site. The European Commission methodological guidance on Natura 2000 sites states that: "*The integrity of a site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives*"[16]. Where it cannot be demonstrated that no adverse effects will occur, it is necessary to identify mitigation measures to avoid, where possible, those adverse effects. Mitigation measures need to be assessed against the adverse effect the project or plan is likely to cause (alone or in combination with other projects or plans). Mitigation should always be aimed at avoiding impacts at source.

As it was not possible at Stage 1 (screening for AA) to rule out, that the proposed project will not have a likely significant effect on Natura sites, an NIS has been prepared by the applicant. It examines and analyses how the proposed operations could impact on the Qualifying Features of Natura sites and whether the predicted impacts would adversely affect the integrity of protected sites.

The Stage 1 screening found that potential impacts on the following QIs require Stage 2 assessment:

- Large Shallow Inlets and Bays [1160]
- Reefs [1170]
- Otter (*Lutra lutra*) [1355]
- Harbour Seal (*Phoca vitulina*) [1365]
- Salmon (*Salmo salar*) [1106]
- Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]
- Arctic Tern (*Sterna paradisaea*) [A194]
- Cormorant (*Phalacrocorax carbo*) [A017]
- Fulmar (*Fulmarus glacialis*) [A009]
- Gannet (*Morus bassanus*) [A016]
- Guillemot (*Uria aalge*) [A199]
- Herring Gull (*Larus argentatus*) [A184]
- Kittiwake (*Rissa tridactyla*) [A188]
- Lesser Black-backed Gull (*Larus fuscus*) [A183]
- Manx Shearwater (*Puffinus puffinus*) [A013]
- Peregrine (*Falco peregrinus*) [A103]
- Puffin (*Fratercula arctica*) [A204]
- Razorbill (*Alca torda*) [A200]
- Red-throated Diver (*Gavia stellata*) [A001]
- Shag (*Phalacrocorax aristotelis*) [A018]
- Storm Petrel (*Hydrobates pelagicus*) [A014]
- Common Tern (*Sterna hirundo*) [A193]
- Great Black-backed Gull (*Larus marinus*) [A187]
- Black Guillemot (*Cepphus grille*)

[16] EC, DG ENV, Managing Natura 2000 sites – The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Publications Office, 2019, https://data.europa.eu/doi/10.2779/02245

5.1 Methodology

An Appropriate Assessment consists of a reasoned appraisal and a conclusion. It considers the proposed project and its impact on the QIs (assessed against their COs) and take account of possible in-combination effects with other projects. The process describes each aspect or effect of the project which could potentially impact on the QIs. It then evaluates those potential impacts in relation to the QIs affected and the overall effect on their COs - considering the duration of effect, the longevity, the proportion/importance of the interest affected, and the overall effect on the COs. There should be sufficient detail to ensure all impacts have been considered and sufficiently appraised.

The BioMar/LIFE project[17],[18] was a major ecological survey, focused on mapping and classifying marine and coastal and marine flora, fauna, and sites of importance in Ireland (and Britain). The project ran in the 1990s, reporting in 1997. Over 900 sites in Ireland were surveyed (including Kenmare Bay). It developed a classification system for marine biotopes and created a large database linked to geographical information systems for mapping and analysis. This data was used to identify areas of conservation importance and to help designate Special Areas of Conservation (SACs) under the EU Habitats Directive, and to provide a baseline for environmental assessment and biodiversity monitoring. Habitat surveys of Kenmare River SAC were undertaken in 2002[19] and 2009[20]. This data, along with further specific complementary surveys references in the NPWS documents, was utilised to inform the Natura sites, to identify Qualifying Interests, and to inform the Conservation Objectives applied.

Site specific COs have been prepared for each of the identified QIs, which form a key component of the assessment framework. The Conservation Objectives for Kenmare River SAC Version 1[21] was published in 2013. These COs cover the lifespan of the Natura 2000 sites, since their inception, and this assessment is carried out against these COs - over the lifetime of the activity and the proposed application activity. The potential ecological effects of activities on the COs for the site relate to the physical and biological effects of structures and human activities on designated species and habitats. The overall effect on the conservation status will depend on the spatial and temporal extent of activities during the lifetime of the proposed plan and the nature of each of these activities in conjunction with the sensitivity of the receiving environment.

A decision must be reached, based on there being no reasonable scientific doubt as to the absence of adverse effects, as to whether the proposal will affect the achievement of the COs of the QI, or whether the COs will be undermined if the project proceeds. If the project does not undermine the COs, then the integrity of the site can be expected to be able to be maintained (or have the ability to be restored).

[17] Picton, B.E. and Costello M. J. (1997). The BioMar biotope viewer: a guide to marine habitats, fauna and flora in Britain and Ireland, Environmental Sciences Unit, Trinity College, Dublin.

[18] Costell MJ, Connor DW, Slides E, Foster-Smith R & K Hiscock. 1997. Collecting and using data for management of marine and coastal biotopes – Final report of the BioMar project. Project number LIFE 92-1/IRL/001. Link

[19] Aquafact (2003). Broadscale mapping of candidate marine Special Area of Conservation. Kenmare River, Co. Cork and Co. Kerry cSAC (Site code 2158). Carried out by Seabed Surveys International Ltd. and Aquafact International Services Ltd. on behalf of NPWS, DEHLG and the MI.

[20] ERM (2009). Natura 2000 sub-tidal benthic surveys: Area 1. Carried out by ERM on behalf of the Marine Institute in partnership with NPWS, DEHLG

[21] NPWS (2013) Conservation Objectives: Kenmare River SAC 002158. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

This Section utilises the NIS report provided by the applicant, along with any supporting information added, to assess if it is a reasonable appraisal of likely significant effects and if the conclusions support the likelihood of adverse effects, considering mitigation, on the QIs screened in at Stage 1.

5.1.1 Pressures and Threats

The applicant's NIS report identifies the potential impact mechanisms (sources of impact) as organic enrichment, disturbance, entanglement, pest and disease risk, genetic impacts and introduction of therapeutants.

The general categories identified broadly align with the potential impactors identified from the primary literature. The likely environmental pressures from this proposed activity are detailed in Table 5-1 below. These are identified from a number of sources, key to these being a suite of report tools for appropriate assessment of fishing and aquaculture in marine and coastal sites developed by ABPmer[22], along with a number of other published sources[23,24,25,26,27,28]. The table relates the pressures to the activities arising from the project, the broad potential impacts, and duration of the effect with regard to the proposed project.

Table 5-1 Pressures from the proposed activity, identified from APBmer Tools for Appropriate assessment and other sources.

Type	Pressure	Activity	Potential effect	Duration
Physical damage	Siltation	Addition of faeces & fish food	Sediment organic enrichment, smothering	21-22 months out of each 2-year cycle, for duration of permit (10 years) (proportional to biomass on site)
	Changes to sediment composition- increased fine sediment proportion	Addition of faeces & fish food	Dissolved oxygen depletion	
Change in Habitat quality	Changes to water flow	Physical infrastructure	Sedimentation, alterations to local currents	
	Changes in turbidity/ increased suspended sediment	Addition of faeces & fish food	Sedimentation, smothering	
	Organic enrichment (eutrophication) - water column	Addition of faeces & fish food	Nutrient enrichment, Algal blooms	
	Organic enrichment of sediments- sedimentation	Addition of faeces & fish food	Sediment organic enrichment	
	Decrease in oxygen levels- sediment	Addition of faeces & fish food	Dissolved oxygen depletion	
	Decrease in oxygen levels - water column	Addition of faeces & fish food	Dissolved oxygen depletion	
	Genetic impacts on wild populations	Escapees	Genetic interactions	

[22] ABPmer. 2013. Tools for Appropriate assessment of Fishing and Aquaculture in Marine and Coastal sites, I to VIII. - Link
[23] Hargrave BT, Silvert W, Keizer PD. 2005. Assessing and Managing Environmental Risks Associated with Marine Finfish Aquaculture. In: Hargrave BT. (eds) Environmental Effects of Marine Finfish Aquaculture. Handbook of Environmental Chemistry, vol 5M. Springer, Berlin, Heidelberg. https://doi.org/10.1007/b136021
[24] FAO. Environmental impact assessment and monitoring in aquaculture. FAO Fisheries and Aquaculture Technical Paper. No. 527. Rome, FAO. 2009.
[25] Tett P, Benjamins S, Black K, Coulson M, Davidson K, Fernandes TF, Fox C, Hart M, Hicks N, Hughes A, Hunter DC, Nickell T, Risch D, Tocher D, Vare L, Verspoor E, Wilding T, Wilson B & Wittich A. 2018. Review of the environmental impacts of salmon farming in Scotland. Link
[26] Taranger GL, Karlsen Ø, Bannister RJ, Glover KA, Husa V, Karlsbakk E, Kvamme BO, Boxaspen KK, Bjørn PA, Finstad B, Madhun AS, Morton HC, Svåsand T. 2015. Risk assessment of the environmental impact of Norwegian Atlantic salmon farming. ICES Journal of Marine Science, Vol. 72(3), pp997–1021. https://doi.org/10.1093/icesjms/fsu132
[27] Merotto L. 2018. The environmental impacts of open-net salmon farming: A critical review and recommendations for policy in Canadian aquaculture. Journal of the Home Economics Institute of Australia, 25(1), 24–29.
[28] Rector ME, Weitzman J, Filgueira R, Grant J. 2021. Environmental indicators in salmon aquaculture research: A systematic review. Rev Aquacult. 14: 156–177. https://doi.org/10.1111/raq.12590

Biological pressures	Introduction of non-native species		Disease transference, Genetic interactions	
	Introduction of parasites/pathogens	Disease & parasites	Disease transference, parasite impacts	
	Introduction of antifoulants	Protection from fouling	Release of harmful/toxic chemicals, Deposition on sea bed	
Chemical pollution	Introduction of medicines	Disease management	Release of harmful/toxic chemicals, Deposition on sea bed, Antibiotic resistance	
	Introduction of hydrocarbons	Transport and equipment	Release of harmful/toxic chemicals, Deposition on sea bed	
	Prevention of light reaching seabed/features	Physical infrastructure	Alterations to local light regime	
Physical pressures	Barriers to species movement	Physical infrastructure & operational activity	Limit activity & distribution	
	Other species interactions (wrasse populations, marine mammals, birds, protected species, wild fish populations)	Cleaner fish, infrastructure, diseases/parasites, operational activities, feeding	Physical displacement, entanglement, disturbance from operational activity, impacts on wild fish and other species	
Others	Noise, lighting, fouling	Operations, infrastructure and machinery	Disturbance, displacement, impact from local fouling	

Anchoring of all types of moorings will cause physical loss and change of habitat in the direct footprint of the moorings (i.e. smothering). This pressure will continue for the entire length of time the structure is in place, but the anchor may become embedded and submerged beneath sediment in cases. Abrasion could also occur from the subtidal makers where the chain, shackle or rope could make contact with the seabed. Aids to Navigation (AtoNs) with sub-tidal markers pose an entanglement risk to diving bird species. AtoN markers have a lightning system to aid navigation which may pose a visual disturbance to species foraging at night-time. The lights may present a visual disturbance which can affect, particularly, nesting birds. Disorientation in Cory's Shearwater and Leaches Storm Petrel have been recorded[29].

[29] Miles, Will, Sarah Money, Richard Luxmoore, and Robert W. Furness. "Effects of artificial lights and moonlight on petrels at St Kilda." Bird Study 57, no. 2 (2010): 244-251.

5.2 SACs

5.2.1 Habitats

5.2.1.1 Conservation objectives

The Kenmare River SAC is designated for Large Shallow Inlets and Bays [1160] and Reefs [1170]. The proposed activities occur within the zone of influence of these features. The COs, targets and details for such are outlined in Table 5-2 and Table 5-3.

Table 5-2 Conservation objectives with attributes and targets for QI 1160 in Kenmare River SAC.

Attribute	Measure	Target	Notes (references within NPWS document[30])
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes	Habitat area was estimated as 39,322ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the Zostera- and Maërl dominated communities and the *Pachycerianthus multiplicatus* community subject to natural processes.	Based on the BioMar survey in 1995 (Picton and Costello, 1997), broadscale mapping survey in 2002(Aquafact, 2003) and a dive survey undertaken in 2009(MERC, 2009). See marine supporting document for further details
Community structure: Zostera density	Shoots/m²	Conserve the high quality of the Zostera-dominated community, subject to natural processes	Described from 2009 diver observation and underwater viewer (MERC, 2009). See marine supporting document for further details
Community structure	Biological composition	Conserve the high quality of the *Pachycerianthus multiplicatus* community, subject to natural processes	Estimated from a dive survey undertaken in 2009 (MERC, 2009). See marine supporting document for further details
Community structure	Biological composition	Conserve the high quality of the Maërl-dominated community, subject to natural processes	Based on broadscale mapping survey in 2002 (Aquafact, 2003) and 2009 diver observation and underwater viewer (MERC, 2009). See marine supporting document for further details
Community distribution	Hectares	Conserve the following communities in a natural condition: Intertidal mobile sand community complex; Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex; Fine to medium sand with crustaceans and polychaetes community complex; Coarse sediment dominated by polychaetes community complex; Shingle; Intertidal reef community complex; Subtidal reef with echinoderms and faunal turf community complex and Laminaria-dominated community complex.	Based on the BioMar survey in 1995 (Picton and Costello, 1997), broadscale mapping survey in 2002 (Aquafact, 2003) and intertidal and subtidal surveys in 2009 [31](ERM, 2009). See marine supporting document for further information

[30] NPWS (2013) Conservation Objectives: Kenmare River SAC 002158. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[31] ERM. 2009. Natura 2000 sub-tidal benthic surveys: area 1. Unpublished report on behalf of the Marine Institute

Table 5-3 Conservation objectives with attributes and targets for QI 1170 in Kenmare River SAC.

Attribute	**Measure**	**Target**	**Notes** (references within NPWS document[32])
Distribution	Occurrence	The distribution of reefs remains stable, subject to natural processes.	Likely distribution was established by the 1995 BioMar survey (Picton and Costello, 1997); broadscale mapping survey in 2002 (Aquafact, 2003) and 2009 subtidal reef survey and intertidal survey (ERM, 2009)
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes.	Habitat area estimated as 9196 ha from the 1995 BioMar survey (Picton and Costello, 1997); 2002 broadscale mapping survey (Aquafact, 2003) and 2009 subtidal reef survey and intertidal survey (ERM, 2009)
Community structure	Biological composition	Conserve the following community types in a natural condition: Intertidal reef community complex; Subtidal reef with echinoderms and faunal turf community complex; and Laminaria-dominated community complex.	The likely area of reef communities was derived from the 1995 BioMar survey (Picton and Costello, 1997); 2002 broadscale mapping survey (Aquafact, 2003) and 2009 subtidal reef survey and intertidal survey (ERM, 2009). See marine supporting document for further details

5.2.1.2 Applicant Report

The report, submitted by the applicant, identifies the potential source of impact to benthic habitats from operations at the site as predominately organic enrichment due to settleable solids discharged from the fish sites, which comprised fish faeces and feed waste. Solid wastes arising from the culture of fish can impact the seabed and associated benthic communities.

The assessment of potential impacts is based on the spatial overlap of the proposed site with community types identified in Annex I benthic habitats, and is supported by two other, more applied, assessments of potential impacts at the site that focus on changes in benthic communities and sediments. The first describes the findings of annual monitoring surveys carried out at the site and the second utilises the audit reports monitoring, and assessment undertaken regarding Aquaculture Stewardship Council Accreditation.

The QIs of the habitats Large Shallow Inlets and Bays [1160] and Reefs [1170] are identified from NPWS documentation, and the constituent community types are outlined. These are:

- Zostera-dominated community
- Maërl-dominated community
- *Pachycerianthus multiplicatus* community
- Intertidal mobile sand community complex
- Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex
- Fine to medium sand with crustaceans and polychaetes community complex
- Coarse sediment dominated by polychaetes community complex
- Shingle

[32] NPWS (2013) Conservation Objectives: Kenmare River SAC 002158. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

- Intertidal reef community complex
- *Laminaria*-dominated community complex
- Subtidal reef with echinoderms and faunal turf community complex

The Conservation objective attributes and targets are outlined for each.

Three-dimensional hydrodynamic simulation modelling is used to determine the transportation of settable solids (faeces and feed waste) around the site, at a rate of 3% wastage. Modelling data showed localised deposition immediately beneath the pens and within the proposed licensed site area.

The predicted maximum deposition rate at the farm is 1.4 mm/month, or 1.68 kg/m^2 of organic material per month. It showed slight migration of settleable solids outside of the licenced production area to the south and east - the predicted maximum deposition rate in this area is less than 0.2 mm per month.

The spatial overlap of the proposed site (T06-202) and the modelled sedimentation footprint with community types identified is shown in Table 5-4.

Table 5-4 The spatial overlap of the proposed site and the modelled sedimentation footprint with community types.

QI	**MCT**	**Site footprint overlap**		**Modelled sedimentation footprint overlap**	
		Ha	%	ha	%
Large shallow inlets and bays 1160	Zostera-dominated community	-	**0**		**0**
	Maërl-dominated community	-	**0**	-	**0**
	Pachycerianthus multiplicatus community	-	**0**	-	**0**
	Intertidal mobile sand community complex	-	**0**	-	**0**
	Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex	-	**0**	-	**0**
	Fine to medium sand with crustaceans and polychaetes community complex	-	**0**	-	**0**
	Coarse sediment dominated by polychaetes community complex	21.43	**0.26**	42.09	**0.51**
	Shingle	-	**0**	-	**0**
	Intertidal reef community complex	0.06	**<0.01**	0.26	**0.05**
	Laminaria-dominated community complex	9.4	**<0.01**	21.137	**0.63**
	Subtidal reef with echinoderms and faunal turf community complex	0.47	**<0.01**	35.37	**0.73**
Reefs 1170	Intertidal reef community complex		**0**		**0**
	Laminaria-dominated community complex	9.4	**<0.01**	21.137	**0.57**
	Subtidal reef with echinoderms and faunal turf community complex	0.47	**<0.01**	35.37	**0.73**

The report states that the proposed licenced area and sedimentation footprint overlaps with 4 of the 11 community types in 1160, and with two of three of the community types in 1170. In all cases the

percentage of each community type overlapped by the proposed licenced area and/or the sedimentation footprint is considered small, by the applicant's report.

The report concludes that, in light the COs defined for the Kenmare River SAC, the operations at the Deenish Island site will not significantly affect Annex I benthic habitats for which the SAC is designated.

5.2.1.3 MI Supplemental

Within the COs for the QI Large Shallow Inlets and Bays (1160) there are a number of attributes, with associated conservation targets, that relate to particular community types. The following sections address these attributes as they pertain to relevant community types within QI 1160 and 1170 within the Kenmare River SAC[33]. The range and occurrence of marine habitats or community types within the SAC is generally more spatially defined and not prone to spatial and temporal variability.

5.2.1.3.1 Attribute: Habitat Area - 'The permanent habitat area is stable or increasing'

It is not likely that the activities proposed will reduce the overall extent of permanent habitat within the feature large shallow inlets and bays. The habitat area is likely to remain stable.

5.2.1.3.2 Attribute: Community extent - 'Maintain the extent of the Zostera- and Maërl dominated communities and the *Pachycerianthus multiplicatus* community subject to natural processes condition'

The nearest mapped *Zostera* community is at a distance of >4.5 km, near the mainland, and the mapped Maërl dominated communities and *Pachycerianthus multiplicatus* community are at a distance of >15 km from the proposed site. Given these locations and that any material originating from the site is highly unlikely to travel these distances, the proposed project is not likely to affect the extent of these marine community types.

5.2.1.3.3 Attribute: Community structure: Zostera density - 'Conserve the high quality of the Zostera-/ *Pachycerianthus multiplicatus*/ Maërl-dominated communities, subject to natural processes'

The nearest mapped Zostera community is at a distance of >4.5 km, near the mainland, and the mapped Maërl dominated communities and *Pachycerianthus multiplicatus* community are at a distance of >15 km from the proposed site. Given these distances, the proposed project is not likely to affect the community structure of these communities.

5.2.1.3.4 Attribute: Community distribution - 'Conserve' a number of listed communities 'in a natural condition'

This attribute aims to conserve the following communities in a natural condition:

- Intertidal mobile sand community complex.
- Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex.

[33] NPWS (2013) Conservation Objectives: Kenmare River SAC 002158. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

- Fine to medium sand with crustaceans and polychaetes community complex.
- Coarse sediment dominated by polychaetes community complex.
- Shingle.
- Intertidal reef community complex.
- Subtidal reef with echinoderms and faunal turf community complex and *Laminaria*-dominated community complex.

On the basis of spatial analysis, it is considered given the localised nature of potential impacts of the project, that those MCT not subject to spatial overlap or within the near vicinity of the project are unlikely to result in any significant effect. Figure 5-1 maps those MCT which spatially overlap with or are within the near vicinity of the aquaculture site.

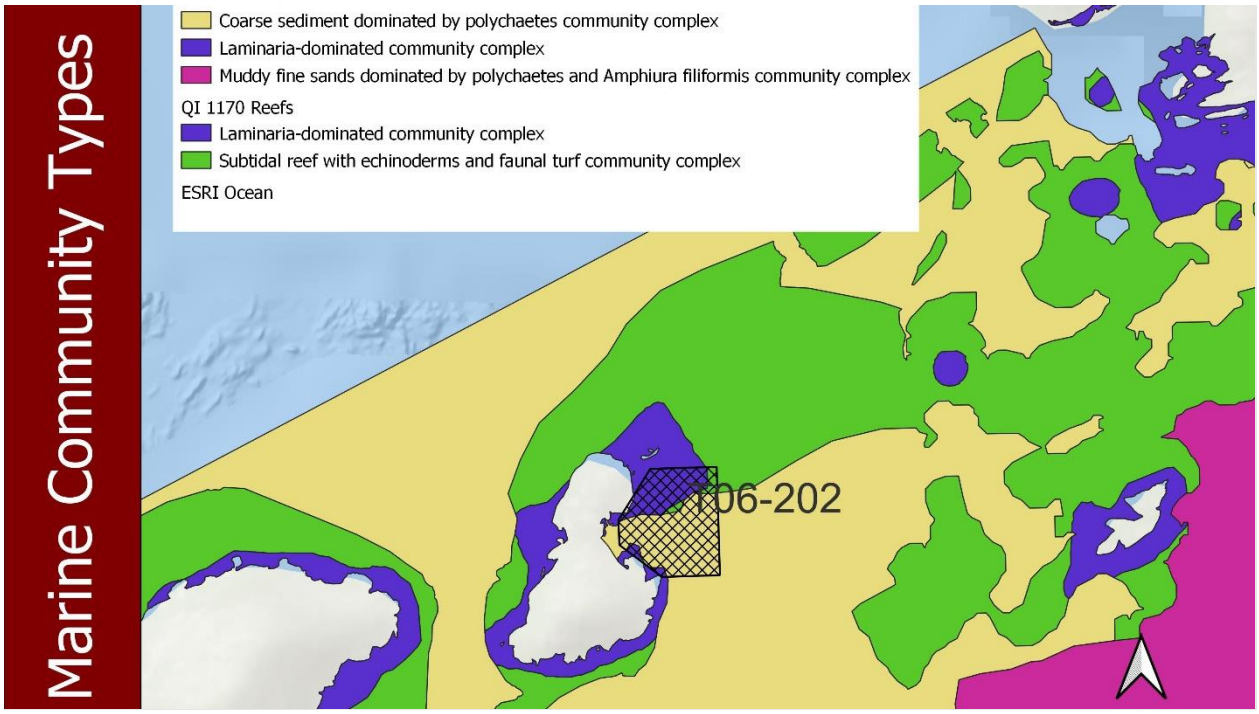


Figure 5-1 Map of QI habitats and MCT that spatially overlap with the proposed T06-202 site.

Those marine community types which overlap are identified for 1160 as:

- Coarse sediment dominated by polychaetes community complex.

Those marine community types which overlap are identified for 1170 as:

- Intertidal reef community complex.
- *Laminaria*-dominated community complex.
- Subtidal reef with echinoderms and faunal turf community complex and
- Laminaria-dominated community complex.

The extent, quality, structure, and function of all habitats and marine community types varies considerably in space and time and marine habitats are particularly prone to such variation. Habitats which vary naturally (i.e. biotic and/or abiotic variables are changing within an envelope of natural variation) must be considered to have favourable conservation condition.

Anthropogenic disturbance may be considered significant when it causes a change in biotic and/or abiotic variables in excess of what could reasonably be envisaged under natural processes. Disturbance is defined as that which leads to a change in the characterising species of the habitat (which may also indicate change in structure and function). The capacity of the habitat to recover from this change is an important consideration (i.e. habitat resilience). The sensitivity of a community to the pressures are key to its ability to absorb impacts from disturbance and maintain structure and function. Biological communities associated with sediment habitats will recover from the defaunation of a small area through the migration of adults of mobile species into the area from surrounding habitat, and through the mechanisms of larval supply, where disturbance does not impact the wider area.

The community types identified above will be exposed to differing ranges of pressures from finfish aquaculture activities. This activity may alter the current regime, cause shading, or provide organic enrichment due to settleable solids and fish waste discharged. Pressures on habitats are listed in Table 5-1. Increased siltation of organic matter from fish farms may occur at high levels beneath fish pens, with lower levels of siltation surrounding the pen where particles are moved by tides and currents. Features beneath the farm are therefore directly exposed to a higher degree of this pressure while surrounding features may be indirectly exposed to a lower degree of pressure.

Table 5-5 lists the marine community types (or surrogates) found within the zone of influence in this SAC and provides an estimate of sensitivity to a range of pressures. The risk scores are derived from the *Tools for AA of fishing and aquaculture activities in marine and coastal Natura 2000 sites* reports[34], which draw from a number of sources. The pressures are listed as those likely to result from the primary aquaculture activities carried out in the Kenmare River SAC.

[34] ABPmer. 2013. Tools for Appropriate assessment of Fishing and Aquaculture in Marine and Coastal sites, I to VIII. - Link

Table 5-5 Matrix showing the characterising habitats sensitivity scores x pressure categories for habitats in Kenmare River SAC, with code for the categorisation of sensitivity and confidence.

Pressure Type	Physical Damage	Disturbance		Change in Habitat Quality					Biological Pressures			Chemical/ Physical			Physical pressures	
Pressure	Siltation (addition of fine sediments, pseudofaeces, fish food)	Changes to sediment composition-increased fine sediment proportion	Changes to water flow	Changes in turbidity/ increased suspended sediment	Organic enrichment (eutrophication) - Water column	Organic enrichment of sediments-sedimentation	Decrease in oxygen levels- sediment	Decrease in oxygen levels-water column	Genetic impacts on wild populations	Introduction of non-native species	Introduction of parasites/pathogens	Introduction of antifoulants	Introduction of medicines	Introduction of hydrocarbons	Prevention of light reaching seabed/features	Barriers to species movement
Coarse sediment dominated by polychaetes community complex	L(*)	M-L(*)	L(*)	NS(*)	NS(*)	NS(*)	NS(*)	NS(*)	NE	H (*)	NE	NS(*)	NS(*)	NS(*)	NS(*)	NA
Intertidal reef community complex	NS (*)	NA	NS(*)	NS(*)	NS(*)	NE	NE	NS(*)	NE	NA (*)	NE	NS(*)	NS(*)	NS(*)	NS(*)	NA
Laminaria-dominated community complex	NS (*)	NA	NS(*)	NS(*)	NS(*)	NE	NE	NS(*)	NE	NS(*)	NE	NS(*)	NS(*)	NS(*)	NS(*)	NA
Subtidal reef with echinoderms and faunal turf community complex	NS(*)	NA	NS(*)	NS(*)	NS(*)	NE	NE	NS(*)	NE	NS(*)	NE	NS(*)	NS(*)	NS(*)	NS(*)	NA
Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex	L(*)	NS(*)	NS(*)	NS(*)	NS(*)	L(*)	L(*)	L(*)	NE	H(*)	NE	NS(*)	NS(*)	L(*)	NS(*)	NA

Species x Pressure Interaction Codes						
NA	Not Assessed	NS	Not Sensitive	*	Low confidence
Nev	No Evidence	L	Low	**	Medium confidence
NE	Not Exposed	M	Medium	***	High Confidence
		H	High		
		VH	Very High		

In general, the marine community types are identified as being not sensitive or of low sensitivity to the pressures identified. Two community types (*Coarse sediment dominated by polychaetes community complex* and *Muddy fine sands dominated by polychaetes and Amphiura filiformis community complex*) are identified as sensitive to the introduction of non-native species. As the stock used is finfish and the equipment and infrastructure used at the site is site specific and not transferred from other locations (or must be washed with detergent and then disinfected before transfer to storage or any other site), the risk of introduction of non-native species is low. Well-boats and other boats which come to the site from other locations will be required to follow disinfection procedures. Each well-boat/live fish carrier is responsible for cleaning and disinfection of their vessels between sites, and the site manager is to ensure a signed certificate of cleaning and disinfection is obtained prior to commencement of any work operations on site. This will ensure the risk of introduction is kept to a minimum.

The MCT *Coarse sediment dominated by polychaetes community complex* is recorded extensively in the western extreme of the SAC and into the bay along both shores, at depths of between 4m and 68m. This is the predominant community type beneath the aquaculture site. The predominant pressure on this community from the activity is likely to be organic enrichment due to settleable solids and fish waste discharged. The total disturbance from the proposed activity on this MCT is a direct footprint of 21.34 ha, and a modelled footprint of 42.09 ha. There represent, respectively, 0.26% and 0.51% of the total area of the community type in the SAC. This disturbance can be considered continuous and on-going, although it will be variable and there will be a fallow period in each 2-year production cycle which will facilitate some element of recovery. As this community type is considered not sensitive to this pressure, and the disturbance is to less than 0.5% of the mapped community type, it is not considered significant.

The aquaculture activities do not overlap *with Muddy fine sands dominated by polychaetes and Amphiura filiformis community complex*. This community type is considered not sensitive or of low sensitivity to these pressures. On the basis that the effects from the proposed activity are localised and are likely to be dispersed rapidly with distance from the site, as shown in benthic monitoring reports, it unlikely that the existing or proposed aquaculture activities will impact on this community type.

The MCT *Intertidal reef community complex* occurs extensively on both shores of the Kenmare River and along the mainland and islands at the western extreme of the site. The substrate is generally that of vertical rock walls, interspersed amongst flat and sloping bedrock and boulder fields. The dominant species are brown and red algae, with gastropods, anemone, sponges, barnacles, and lichens. This community type is considered not sensitive or not exposed to these pressures. The nature of the proposed activities, being permanently submerged in deeper waters, is such that there will not be

overlap with this community type. The aquaculture activities will not occur in these locations and are, therefore, unlikely to have significant impact on these communities. However, on the basis of mapped overlap, the potential disturbance from the proposed activity on this MCT is a direct footprint of 0.06 ha, and a modelled footprint of 0.26 ha. There represent, respectively, < 0.01% and 0.05% of the total area of the community type in the SAC. As any disturbance would be to less than 0.05% of the mapped community type, it is not considered significant.

The MCT *Laminaria-dominated community complex* is recorded extensively throughout the site from the inner reaches of Kenmare Bay to the western boundaries, at depths of 4 m to 22 m. The substrate here consists of ridges of bedrock often covered with a veneer of silt and shelly gravel. The biota is dominated by the kelp species and associated flora. The depths of the net pens are up to 20 m so significant activities are not likely to occur in this depth zone. Given the small overlap and the likely dispersive nature of the site, this community type is considered not sensitive to or exposed to these pressures. The total area from the proposed activity on this MCT is a direct footprint of 9.4 ha, and a modelled footprint of 21.14 ha. There represent, respectively, < 0.01% and 0.63% of the total area of the community type in the SAC. As any overlap is to less than 0.63% of the mapped community type, the activity is not sea-bed based, and the community type is considered not sensitive or not exposed, it is not considered significant.

The MCT *Subtidal reef with echinoderms and faunal turf community complex and Laminaria-dominated community complex* occurs from Ormond's Island in the east to the western boundaries of the site. The substrate ranges from flat or sloping bedrock, to a mosaic of cobble/boulder on bedrock or as cobble/boulder fields, in depths between 15m and 50m. Species associated with this reef community complex include anthozoans. Bryozoans, echinoderms, sponges, and branchipods. A variant of this community occurs within the surveyed seacaves on the vertical walls and overhanging bedrock. The depth of the seabed within surveyed caves does not exceed 4m. This community type is considered not sensitive or not exposed to these pressures. The total area subject to overlap from the proposed activity on this MCT is a direct footprint of 0.47 ha, and a modelled footprint of 35.47 ha. There represent, respectively, < 0.01% and 0.73% of the total area of the community type in the SAC.

For this assessment, we assume that that mooring block or anchor will be in place for the entire length of the aquaculture license. For moorings and AToNs, the footprint will be approximately the size of the mooring block or anchor, and that the rope and chains will be visible and have a taut mooring system. Given this small localised footprint, which will likely settle into the sediment following deployment, likely significant effects from physical loss or change of habitat, beyond normal sediment dynamics, on QIs or MCTs will be very local with negligible impact, and can be ruled out.

5.2.1.4 Conclusion

To ensure the risk of introduction of non-native species is eliminated, the following mitigation measures should be implemented:

- the equipment and infrastructure used at the site should be site specific and not transferred from other locations - or must be washed with detergent and disinfected before transfer to storage or any other site.
- Well-boats, and other boats, which come to the site from other locations should be required to follow disinfection procedures.
- Well-boat/live fish carrier should clean and disinfect their vessels between sites.

The proposed application is considered and likely impacts on the habitat QIs of these Natura sites are not considered significant, with the mitigation measures specified, there will not be adverse effect to the conservation objectives of these OIs.

5.2.2 Otter (*Lutra lutra*) [1355]

The Kenmare River SAC is designated for the QI Otter. The proposed activities occur within the Kenmare River SAC and therefore within potential otter habitat, commuting areas and foraging grounds. The COs, targets and details for such are outlined in Table 5-6.

Table 5-6 Conservation objectives with attributes and targets for QI otter in Kenmare River SAC.

Attribute	**Measure**	**Target**	**Notes** (references within NPWS document[35])
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in south-west estimated at 74.5% (Bailey and Rochford, 2006).
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 268ha above high water mark (HWM); 40ha along river banks / around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along riverbanks) identified as critical for otters (NPWS, 2007).
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 2748ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006).
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 18.9km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 25.1ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007).
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)

[35] NPWS (2013) Conservation Objectives: Kenmare River SAC 002158. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999).
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

5.2.2.1 Applicant Report

The applicant's NIS report provides detail on the behaviour of the otter using various literature and reports [36,37,38,39,40,41,42,43,] detailing that:

- Otter forage and feed within 80 m to 100 m of the coastline
- Otter can travel distances up to 500 m across estuaries or between islands
- The diving depth of otters typically ranges from 10-12 m with the majority of dives being <3m and lasting <20 seconds
- Common prey for otters are small benthic fish, eels and crustaceans
- Otters appear to have a strong preference for hunting in areas with dense seaweed cover in shallow, rocky environments
- Otters are tolerant to human activity and less vulnerable to disturbance than previously thought
- Otters are omnivorous generalists with an ability to utilise a wide variety of species as food, adapting to whatever is available (which tends to vary seasonally)

The proposed site is considered too distant from the shoreline to be suitable habitat for otter to forage. The water depths are in excess of the diving range of otter and the habitat type at the site is not conductive to foraging. Considering the tolerance of otter to disturbance and the distance of the site to the coastline, the impact of noise and vibrations on otters will be insignificant. Considering otters are adaptable, omnivorous generalists they are not likely to be impacted by any project that might impact on salmonid populations, either in freshwater or marine environments.

Survey data for Irish otter populations indicated either a stable or increasing trend, resulting in the currently "Favourable" status under the Habitats Directive. The National Otter Survey of Ireland

[36] Kruuk, H., & Moorhouse, A. 1991. The spatial organization of otters (*Lutra lutra*) in Shetland. Journal of Zoology, 224, 41–57. https://doi.org/10.1111/J.1469-7998.1991.TB04787.X
[37] Kruuk. H., Glimmerveen, U. & Ouwerkerk. E. J. (1985). The effects of depth on otter foraging in the sea. A. Rep. Inst. terr. Ecol. 112–115.
[38] Kruuk, H. (2006). Otters – ecology, behaviour, and conservation. Oxford University Press, Oxford, UK
[39] De Jongh, A., O'Neill, L. & De Jong, T. (2010) Coastal otters (*Lutra lutra*) in Roaringwater Bay, Ireland. Unpublished Report to NPWS
[40] Chanin, P. 2003. Monitoring the otter *Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No. 10, English Nature, Peterborough
[41] Chanin, P. 2013. Otters. Whittet Books Ltd. Stansted.
[42] Kruuk, H. 1995. Wild otters: predation and populations. Oxford University Press, Oxford
[43] Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. & Montgomery, W.I. 2013. National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. NPWS, DAHG, Ireland

2010/12 in their evaluation of pressures on Irish otter populations conclude that "*None of the factors that significantly influenced otter occurrence (river size, substrate type, bank elevation and slope or salmonid biomass) are likely to be limiting or impacted detrimentally by human activities*"

The applicant NIS report concludes that it is extremely unlikely that otters will come into contact with the aquaculture pens or be impacted by the aquaculture activity. The likelihood of an impact occurring on otters is remote, the consequence of an impact if realised is negligible. It is therefore concluded that there will be no likely significant effects to otters.

5.2.2.2 MI Supplemental

Basic requirements for otter for aquatic prey and refuge from predators; also, coastal otters require sources of freshwater to wash their coats. An otter usually maintains numerous couches and holts within its (terrestrial) territory. In general, otters exploit a narrow strip of habitat at the aquatic – terrestrial interface[44]. Otters have been observed to not forage beyond 80m from the coast[45].

NPWS Conservation Objectives for Kenmare River SAC[46] maps an indicative otter commuting zone in the SAC, as mapped in Figure 5-2. The proposed aquaculture site overlaps with this identified zone.

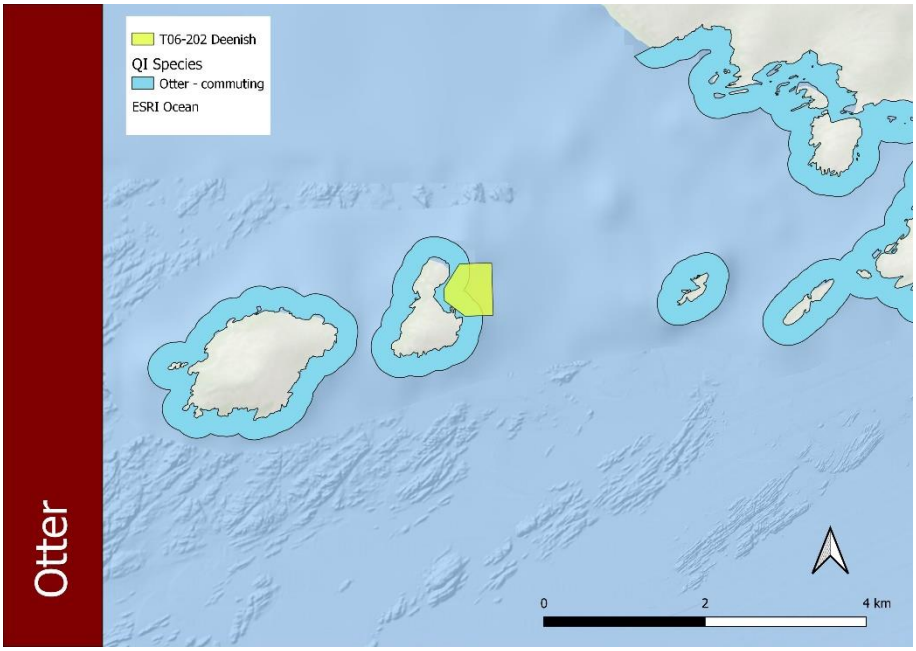


Figure 5-2 Mapped otter commuting in the vicinity of the site.

Interactions between otters and the aquaculture activities proposed must be ascertained. The risk of negative interactions between aquaculture operations and aquatic mammal species is a function of:

- the location and type of structures used in the culture operations.

[44] O'Neill L. (2008) Population dynamics of the Eurasian otter in Ireland. Integrating density and demography into conservation planning. PhD thesis. Trinity College, Dublin.
[45] NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin
[46] NPWS (2013) Conservation Objectives: Kenmare River SAC 002158. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

- whether or not there is a risk of entanglement or physical harm to the animals from the structures.
- if access to locations are restricted.
- the schedule of operations on the site – such as the frequency and potential that they can cause disturbance to the animals.

The structures to be used are 126 m circular pens, with a net depth of 11m plus a cone depth of 9m – therefore full depth of 20m (in most nets). The depth of the nets necessitates that the structures are placed at a distance from the shoreline. The 20m contour line is located greater than 100m from the shore in the site area, therefore the location of the pens will be in waters too deep for regular otter foraging and diving.

There are no reported incidents of otter entanglement in marine farms in Ireland, and due to the lack of spatial overlap and the design and tautness of the structures and netting, they pose very little risk to otter regarding entanglement.

The proposed culture operations are generally to be carried out in daylight hours. The interaction with the otter is likely to be minimal, given that otter foraging is primarily crepuscular. Disturbance associated with vessel traffic is unlikely to effect the distribution of otter at the site, as traffic will generally be away from the Island to the mainland, in waters unsuitable for otter foraging, and mainly in daylight hours.

It is noted that the current conservation status of the otter nationally is favourable and that aquaculture practices are not identified as threats either locally or nationally[47,48]. NPWS (2009)[49] identifies the significant threats to otter as habitat destruction, water pollution, accidental death, and persecution.

For moorings and AtoNs, the small localised footprint and minor likelihood for interaction means the they do not pose a significant barrier to movement or significant risk to animal species. Having taut mooring systems, reduces the chance of interactions and any significant risk. Navigational lighting has not been documented to cause harm, therefore, given its very targeted range (directional and broadly parallel with the surface of the water), and their above surface mounted location, means that AtoNs are unlikely to pose a risk.

Significant adverse effects on the QI Otter can be discounted on the basis of the points below:

[47] NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.
[48] NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill
[49] NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.

- The proposed activities will not lead to any modification of the extent of terrestrial, marine or freshwater habitat for otter.
- The number of couching sites and holts or, therefore, the distribution, will not be directly affected by aquaculture activities.
- The activity involves net input rather than extraction of fish biomass so that no negative impact on the essential food base (fish biomass) is expected.
- Finfish production activities are unlikely to pose any risk to otter populations through entrapment or direct physical injury.
- The structures and activities associated this form of finfish culture are in deeper waters than otter generally forage or commute in so otter are not likely within this site.

5.2.2.3 Conclusion

The proposed application is considered non-disturbing to Otter (*Lutra lutra*) [1355] and there will be no adverse effect to the conservation objectives of this QI.

5.2.3 Harbour Seal (*Phoca vitulina*) [1365]

The Kenmare River SAC is designated for Harbour Seal. The proposed activities occur within the Kenmare River SAC and therefore within potential Harbour Seal habitat The COs, targets and details for such are outlined in Table 5-7.

Table 5-7 Conservation objectives with attributes and targets for QI Harbour seal in Kenmare River SAC.

Attribute	**Measure**	**Target**	**Notes** (references within NPWS document[50])
Access to suitable habitat	Number of artificial barriers	Species range is not restricted by artificial barriers to site use. See map 11 Notes	See marine supporting document for further details
Breeding behaviour	Breeding sites	Conserve the breeding sites in a natural condition. See map 11	Attribute and target based on background knowledge of Irish breeding populations, review of data summarised by Summers et al. (1980); Warner (1983); Harrington (1990); Lyons (2004); Heardman et al. (2006); Roycroft et al. (2006); Cronin (2007) and unpublished National Parks and Wildlife Service records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	Conserve the moult haul-out sites in a natural condition. See map 11	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004); Cronin et al. (2004); Heardman et al. (2006); Roycroft et al. (2006); Cronin (2007); Cronin et al. (2007) and unpublished National Parks and Wildlife Service records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	Conserve the resting haul-out sites in a natural condition. See map 11	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004); Heardman et al. (2006); Roycroft et al. (2006); Cronin (2007); Cronin et al. (2008) and unpublished National Parks and Wildlife Service records. See marine supporting document for further details

[50] NPWS (2013) Conservation Objectives: Kenmare River SAC 002158. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the harbour seal population at the site	See marine supporting document for further details

Harbour Seal surveys[51,52,53] show the Kenmare River has maintained its importance on a regional and national scale in terms of Harbour Seal numbers, as indicated in earlier surveys[54,55]. More recent counts are 419 seals[56].

5.2.3.1 Applicant report

The applicant's NIS report provides detail on Harbour seal (*Phoca vitulina*), also referred to as Common seal, regarding foraging range and relevant Natura sites. Information from various literature, on pinniped species (seal) responses to disturbance are referenced. Locations of haul-out sites are detailed. Noise and vibration disturbance are considered. Acoustic Deterrent Devices have not been used at the site, and it is not envisioned that they will be used in the future. Potential entanglement is considered as an isolated risk, and the impact on the population would be considered similar in magnitude to natural variation.

The proposed site is considered distant from reported haul-out sites and no significant disturbance effects are considered likely – therefore no significant effects are expected. It is concluded that there will be no likely significant effect from operational noise and vibrations, or entanglement, that are likely to impact seal populations.

5.2.3.2 MI Supplemental

Harbour seals haul out in sheltered waters, typically on sandbanks and in estuaries, but also in rocky areas and may swim upstream into freshwater. They undertake smaller scale foraging movements (30km from the haul-out site) and migrations than grey seals. Pups remain in their natal area after weaning. A space use maps for Harbour Seals tagged in Kenmare River shows very limited movement outside of Kenmare River SAC (Figure 5-3) [57].

[51] NPWS 2010 Report on a pilot monitoring study carried out in southern & western Ireland, 2009 Link
[52] NPWS 2011 Harbour Seal Pilot Monitoring Project Link
[53] Duck, C. & Morris, C. (2013) An aerial survey of harbour seals in Ireland: Part 2: Galway Bay to Carlingford Lough. August-September 2012. Unpublished report to the National Parks & Wildlife Service, Department of Arts, Heritage & the Gaeltacht, Dublin.
[54] Cronin, M., Duck, C., Ó Cadhla, O., Nairn, R., Strong, D. & O' Keeffe, C. (2004). Harbour seal population assessment in the Republic of Ireland: August 2003. Irish Wildlife Manuals, No. 11. NPWS Link
[55] Heardman, C., O'Donnell, D., & McMahon, D. (2006). The Status of the Harbour Seal *Phoca vitulina* L. in Inner Bantry Bay, Co Cork and Inner Kenmare River, Co Kerry: 1964-2004. The Irish Naturalists' Journal, 28(5), 181–191 Link
[56] Morris CD & CD Duck. 2019 Aerial thermal-imaging survey of seals in Ireland, 2017-2018. Irish Wildlife Manuals, No. 111 NPWS Link
[57] Cronin, M. A., Kavanagh, A. and Rogan, E. (2008). The foraging ecology of the harbour seal in Ireland. Final Report of project ST/05/12. Marine Institute.

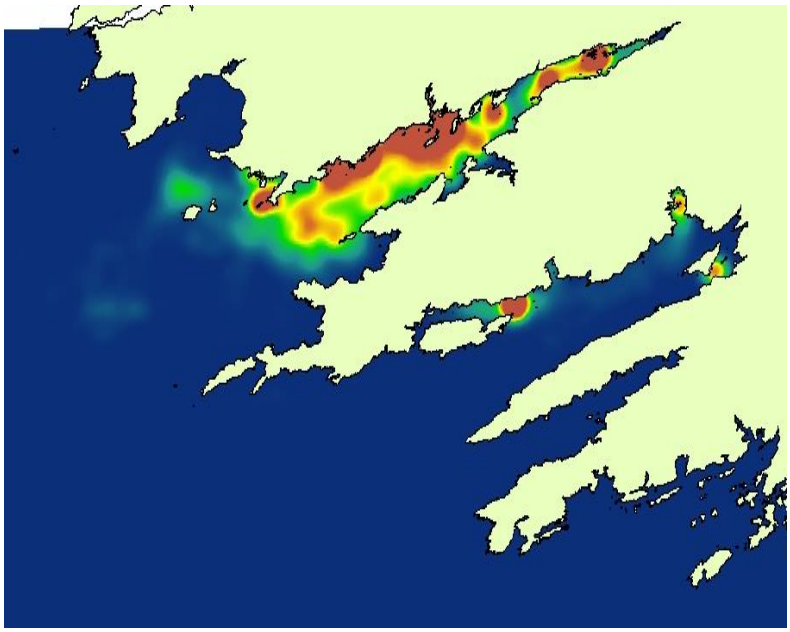


Figure 5-3 Space use maps for tagged Harbour Seals in Kenmare River.

The Aerial thermal-imaging survey of seals in Ireland, 2017 to 2018[58] report suggests that the populations of both species of seal in Ireland are either stable or increasing in all regions. Counts carried out (by NPWS) in 2018 recorded 419 harbour seals in the SAC, compared to 345 in 2011/2 and 391 in 2003. Research into the haul-out behaviour, movements and aquatic habitat use of a sample of seals tagged in Kenmare River indicated widespread use of the site by harbour seals that haul-out ashore within the SAC.

Harbour seals are vulnerable to disturbance during periods in which time is spent ashore or in shallow waters by individuals or groups of animals. This occurs immediately prior to and during the annual breeding season, pups are born on land and may be observed accompanying their mother close to shore in the early days or weeks of life. Seals must undergo a moult, where they generally spend more time on shore, at haul-out sites.

Harbour seals are a successful aquatic predator that feeds on a wide variety of fish, cephalopod and crustacean species.

Deenish Island, adjacent to the aquaculture site, is not recorded as a site for harbour seal breeding, moulting, or resting, and given its offshore location, is less likely to be used by Harbour seals. The size, permeability, and location of the proposed aquaculture site means it is not likely to pose an artificial barrier to the species range in the SAC.

Breeding and weaning occurs on land or close to the shoreline, as does moulting and resting behaviour. Considering the location of the aquaculture site, there is no likelihood of causing interference or displacement with these behaviours.

[58] C.D. Morris & C.D. Duck (2019) Aerial thermal-imaging survey of seals in Ireland, 2017 to 2018. Irish Wildlife Manuals, No. 111 National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland

Acoustic deterrent devices (ADDs), using various different conventional mechanisms (varying sound quality, signal types, duty cycles, etc.), have historically been utilised as a solution to managing pinniped predation. Studies investigating conventional ADDs have identified them as a conservation concern due to noise pollution and long-term impacts on both target and non-target species[59]. Todd et al (2021)[60] found that, depending on operational characteristics, ADDs were predicted to cause auditory impact to (very high frequency) cetaceans (e.g. harbour porpoise) at ranges of 4–31 km. This was dependant on the source level of the ADD. Findlay et al (2024)[61] found that harbour porpoises are either displaced from, or habitats degraded by intense ADD noise and/or they echolocate less.

The applicant states that "*Acoustic Deterrent Devices have not been used at the site, and it is not envisioned that they will be used in the future*." Considering the likely impact to non-target species from their use, it is advised that the use of ADDs at the site, as a seal control measure, is prohibited.

General noise from the proposed activity will be localised and dissipate quickly and will not be at a level to cause any significant negative impact on individuals or the population of harbour seal within the site. Activities will be primarily daytime so the introduction of artificial light will not be significant.

For moorings and AtoNs, the small localised footprint and minor likelihood for interaction means the they do not pose a significant barrier to movement or significant risk to animal species. Having taut mooring systems, reduces the chance of interactions and any significant risk. Navigational lighting has not been documented to cause harm, therefore, given its very targeted range (directional and broadly parallel with the surface of the water), and their above surface mounted location, means that AtoNs are unlikely to pose a risk.

At a local level, finfish aquaculture is generally an additive rather than a subtractive process (locally fish feed is added in a controlled manner to the system, so biomass is not removed), so is not likely to result in the deterioration of key resources upon which harbour seals depend. Entrapment or entanglement is rare especially in a well-maintained marine aquaculture site, so the risk of death or injury to individuals is rare and will not be to an extent that may affect populations.

5.2.3.3 Conclusion

Considering the likely impact of acoustic deterrent devices (ADDs) to non-target species from their use, it is advised that, if the Minister is minded to issue a Licence, that the use of ADDs at the site, as a seal control measure, is prohibited.

[59] Gordon J & SP Northridge. 2002. Potential impacts of acoustic deterrent devices on Scottish marine wildlife. F01AA404, Scottish Natural Heritage. 63 pp.
[60] Todd VLG, Williamson LD, Jiang J, Cox SE, Todd IB & Ruffert M. 2021. Prediction of marine mammal auditory-impact risk from Acoustic Deterrent Devices used in Scottish aquaculture.Mar. Pollut. Bull., 165 , pp. 1-13
[61] Findlay CR, Coomber FG, Dudley R, Bland L, Calderan SV, Hartny-Mills L, Leaper R, Tougaard J, Merchant ND, Risch D & Wilson B. 2024. Harbour porpoises respond to chronic acoustic deterrent device noise from aquaculture, Biological Conservation, Volume 293.

The likelihood of impact occurring to the QI Harbour seal [1365] is very remote, and the consequences if any interaction, if realised, is negligible; it is concluded that there will be no adverse effects to the conservation objectives of Harbour seal.

5.2.4 Salmon (*Salmo salar*) [1106]

5.2.4.1 Conservation Objectives

The Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365) and the Blackwater River SAC (002173) are designated for the QI Atlantic Salmon (*Salmo salar*). The proposed activities occur within the Kenmare River SAC but as salmon are a migratory species, that could pass within the zone of influence of the proposed site, it is considered here in this assessment. The COs, targets and details for this QI in both SACs are outlined in Table 5-8.

Table 5-8 Conservation objectives with attributes and targets for QI salmon in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, and Blackwater River SAC.

Attribute	**Measure**	**Target**	**Notes[62],[63]** (references within NPWS document)
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels migration, down to second order stretches and accessible from estuary.	Artificial barriers block salmons upstream thereby limiting species to lower restricting access to spawning areas. There are no artificial barriers on the Cummeragh/Finglas, Caragh, Ferta and Flesk/Laune systems; there are a number of natural waterfall barriers.
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee on Salmon (SSCS)/ Technical Expert Group on Salmon's (TEGOS) annual model output of CL attainment levels. Attainment of CL estimates are derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Ferta is currently exceeding its CL and the Cummeragh, Caragh, and Flesk/Laune are currently exceeding both the 1 sea winter and multi sea winter CL. Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The fish counter on the Blackwater River is used as the source of adult salmon run estimates. The Blackwater is currently below CL, meeting 40% of CL.
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	The target is the threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*). Marine salmon farming takes place in Kenmare River into which the Cummeragh discharges. There are no marine salmon farms in the Caragh, Ferta and Flesk/Laune estuaries

[62] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002173.pdf
[63] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000365.pdf

Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are not preventing salmon from accessing suitable spawning habitat in the Cummeragh/Finglas, Caragh, Ferta and Flesk/Laune systems
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

5.2.4.2 Applicant report

The applicant's NIS report states that the farm operation may directly impact wild salmon populations by:

- Increasing sea lice infection rate in wild salmon.
- Disease spread.
- The introduction of therapeutants into the environment.
- Genetic interactions between farmed and wild Atlantic salmon.

5.2.4.2.1 Salmon louse

The NIS report provides an overview of the salmon louse life cycle and a short literature review on the potential impacts of sea lice on wild salmonid populations[64,65,66,67,68]. In order to assess the threat posed to wild salmonids by lice infestations on the farm, 3D hydrodynamic simulation modelling was undertaken to determine the transport and dispersion of salmon lice larvae from the farm. The results indicated that larval sea lice numbers dramatically reduce in concentration with increasing distance from the farm and were generally not discernible from background concentrations. A full description of the model is provided in NIS Volume 2, Appendix 7.

The NIS provided information on sea lice monitoring from the statutory monitoring programme for two year-classes of fish, from 2015 and 2017. There were no breaches of the mandatory sea lice trigger-levels for both cohorts of fish during the production cycles. A copy of the Integrated Pest Management Plan for the Deenish site is included in NIS Volume 2, Appendix 5, which details how they intend to manage sea lice infestations at the site. This Plan also states that MOWI perform their own in-house monitoring of 10 fish from each pen on a weekly basis with their own internal trigger levels for determining when treatments to reduce lice levels should take place.

The applicant NIS report concludes that, through continuous weekly monitoring as well as coordinated treatments, the proposed operations at the site are unlikely to result in a significant impact of sea lice infestations on wild Atlantic salmon populations.

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[64] GarganP.G., FordeG., HazonN., RussellD.J.F., and ToddC.D.. 2012. Evidence for sea lice-induced marine mortality of Atlantic salmon (Salmo salar) in western Ireland from experimental releases of ranched smolts treated with emamectin benzoate. Canadian Journal of Fisheries and Aquatic Sciences. 69(2): 343-353. https://doi.org/10.1139/f2011-155

[65] Jackson *et al.*, 2013. Impact of *Lepeophtheirus salmonis* infestations on migrating Atlantic salmon, *Salmo salar* L., smolts at eight locations in Ireland with an analysis of lice-induced marine mortality. Journal of Fish Diseases 36: 273-281. https://doi.org/10.1111/jfd.12054

[66] Krkosek et al., 2013. Impact of parasites on salmon recruitment in the Northeast Atlantic Ocean. Proceedings of the Royal Society B 280: 20122359. https://doi.org/10.1098/rspb.2012.2359

[67] Vollset *et al.*, 2016. Impacts of parasites on marine survival of Atlantic salmon: a meta-analysis. Fish and Fisheries 17: 714-730. https://doi.org/10.1111/faf.12141

[68] ICES. 2016. Report of the Workshop to address the NASCO request for advice on possible effects of salmonid aquaculture on wild Atlantic salmon populations in the North Atlantic (WKCULEF), 1-3 March 2016, Charlottenlund, Denmark. ICES CM 2016/ACOM:42. 44 pp. https://doi.org/10.17895/ices.pub.19284671

5.2.4.2.2 Disease Spread

According to the applicant, the use of vaccines and effective veterinary supervision have brought the eradication and control of diseases on salmon farms to a level that surpasses accepted levels for other livestock. In MOWI's view any lower level of vigilance defeats the objectives of their business model. Given the control of diseases on the farm (see Section 2.12 for details), it is highly unlikely that the farm act as a significant source of disease; consequently, there will be no significant effects to salmonids.

5.2.4.2.3 Therapeutants

Concerning veterinary medicinal products other than those used to treat sea lice infestations, the applicant has concluded that the use of chemicals, including antibiotics, has been reduced with the introduction of vaccines and the application of organic standards. They have further stated that in-feed antibiotic treatments are never used prophylactically for farmed salmon. For the medicinal treatment of sea lice infestations, the applicant proposes to use deltamethrin (bath treatment) and emamectin benzoate (in-feed), both of which are prescription-only veterinary medicines authorised for use by the Health Products Regulatory Authority (HPRA). As with antibiotics, the use of these medicines is restricted under the current regulations on organic production[69] and the *Organic Food and Farming Standards in Ireland*[70].

5.2.4.2.4 Genetic interactions (escapes)

The NIS report provides an overview of the potential impacts of escaped farmed salmon on wild populations indicating that the long-term consequences of introgression can lead to changes in life-history traits, reduced population productivity and decreased resilience to future challenges[71]. The NIS states that the Deenish site has an improved standardised pen, net and mooring design and is classified as having a medium risk for susceptibility to storm damage based on the wave climate and hydrographic regime in Kenmare River. The NIS states that no farmed escapes have been reported at the site since MOWI began operations. A fish escape prevention policy is in place (SOP 36708; NIS Volume 2 Appendix 4) and the applicant follows the guidelines on containment of farmed salmonids, drawn up between the North Atlantic Salmon Organisation (NASCO) and the International Salmon Farmers Association (ISFA) [72]. A range of SOPs have been provided in the NIS Volume 2 Appendix 2 on net inspections (SOP 28941), maintenance (SOP 28646) and net strength tests (SOP 33176) amongst others e.g. pen moorings.

[69] Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007.
[70] Version 2.03. 2023. https://www.gov.ie/en/publication/fc7c8-organic-farming/
[71] Glover *et al.*, 2017. Half a century of genetic interaction between farmed and wild Atlantic salmon: status of knowledge and unanswered questions. Fish and Fisheries 18: 890-927. https://doi.org/10.1111/faf.12214
[72] NASCO. 2001. Guidelines on containment of farmed salmon. CNL(01)53

The NIS report concluded that the likelihood of an escape event occurring is remote and unlikely to result in a significant effect of wild Atlantic salmon populations.

5.2.4.3 MI Supplemental

5.2.4.3.1 Salmon louse

The Marine Institute operates the National Sea Lice Monitoring Programme on behalf of the State since it was first instigated in 1991. Over the years the monitoring programme has been refined and formalised through the government's Monitoring Protocol No. 3 in 2000 and the publication of the strategy for improved pest control in 2008[73]. All active marine farms are inspected 14 times per year, on a fortnightly basis from March to May and monthly from June to February (with December and January combined as one period). Inspection results are circulated monthly to stakeholders and all the data is published in an annual report[74]. Following an inspection, should salmon lice levels be above prescribed trigger levels, a notice to treat (NTT) is issued advising the farm to act in order to reduce their salmon lice levels. A follow up inspection is then arranged to determine the efficacy of such action and whether further action is required. A review of the data back to 2010, shows that salmon lice levels at the Deenish site have been below trigger levels and no NTT's have been issued in that period, illustrated below in Figure 5-4.

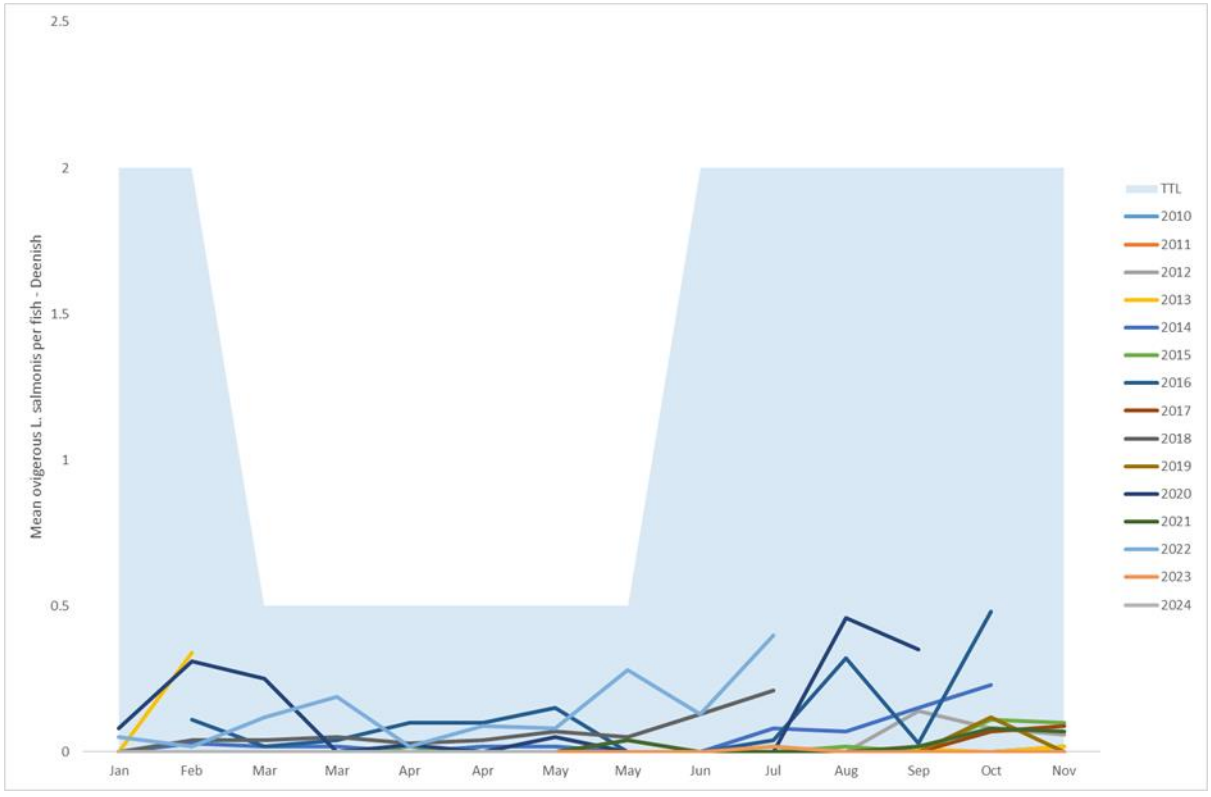

Figure 5-4 Mean ovigerous L. salmonis levels per fish at the Deenish site (2010 – 2024). Data taken from the national sea lice monitoring programme and trigger levels (TTL) are indicated by the shaded area.

[73] A strategy for improved pest control on Irish salmon farms. 2008. Link

[74] D'Arcy *et al.*, 2025. National survey of sea lice (*Lepeophtheirus salmonis* Krøyer and *Caligus elongatus* Nordmann) on fish farms in Ireland – 2024. Irish Fisheries Bulletin No. 55, Marine Institute, Ireland. http://hdl.handle.net/10793/2022

Following advice from the International Council for the Exploration of the Seas (ICES) and the North Atlantic Salmon Conservation Organisation (NASCO), Irish Atlantic salmon stocks have been managed on a river-by-river basis since 2007 with biological reference points or conservation limits (CL) based on maximum sustainable yield[75,76,77]. Independent scientific advice on the status of Irish stocks and catch advice for 144 designated salmon rivers, is provided by the Technical Expert Group on Salmon (TEGOS) and its parent body, the cross-border North South Standing Scientific Committee on Inland Fisheries (NSSSCIF)[78]. Several sources of information are used in the annual catch advice process, such as data from the wild salmon tagging scheme[79], fish counter and trap data[80] and electrofishing surveys[81]. Each river has an individual CL which is the number of adult salmon required to maintain a healthy population of wild Atlantic salmon. Rivers with estimated returns meeting or exceeding the CL with a 75% probability are open for exploitation by angling. Where river CL attainment probabilities are between 50–75%, rivers may be open to catch and release fisheries[82]. Rivers below 50% of CL are closed unless catchment wide electro-fishing surveys showing an average number of fry caught in 5 minutes of ≥ 17 warrants the opening of rivers on a catch & release basis only[83].

Of the 144 designated salmon rivers, there are currently 40 rivers or river tributaries in SACs where salmon have a qualifying interested under the EU Habitats Directive. These are listed in Appendix II of the annual TEGOS reports. The following rivers are of relevance to the current licence application (Table 5-9).

Table 5-9 Rivers assessed where salmon have a qualifying interest in SAC and status relative to conservation limit (CL) for the 2025 advice for SACs 000365 (Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment).

River	CL status 2025	Proportion of CL achieved	SAC
Caragh	Above	3.00 (1SW); 1.53 (2SW)	SAC 000365
Ferta	Above	1.01	SAC 000365
Mealagh	Above	2.66	SAC 000365
Owenreagh	Below	n/a	SAC 000365
Kerry Blackwater	Above	1.18	SAC 002173

[75] TEGOS, 2025. Appendix V River/stock specific information used in the salmon catch advice process for 2025 advice. Report of the Technical Expert Group on Salmon to the North-South Standing Scientific Committee for Inland Fisheries, 86 pp.
[76] Ó Maoiléidigh, N, *et al*., 2004. Application of pre-fishery abundance modelling and Bayesian hierarchical stock and recruitment analysis to the provision of precautionary catch advice for Irish salmon (*Salmo salar* L.) fisheries. ICES Journal of Marine Science 61: 1370-1378. https://doi.org/10.1016/j.icesjms.2004.08.014
[77] White *et al*., 2016. Incorporating natural variability in biological reference points and population dynamics into management of Atlantic salmon (*Salmo salar* L.) stocks returning to home waters. ICES Journal of Marine Science 73: 1513-1524. https://doi.org/10.1093/icesjms/fsw015
[78] TEGOS, 2025. The status of Irish salmon stocks in 2024 with catch advice for 2025. Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries, 61 pp.
[79] IFI, 2024. Wild salmon and sea trout statistics report 2023. Inland Fisheries Ireland, Report IFI/2024/1-4692.
[80] IFI, 2025. IFI consolidated fish counter summary report 2024. Inland Fisheries Ireland, Report IFI/2025/1-4752.
[81] IFI, 2024. Salmon monitoring programmes 2023 funded under the salmon and sea trout rehabilitation, conservation and protection fund. Inland Fisheries Ireland, Report IFI/2024/1-4742.
[82] White *et al*., 2023. Incorporating conservation limit variability and stock risk assessment in precautionary salmon catch advice at the river scale. ICES Journal of Marine Science 80: 803-822. https://doi.org/10.1093/icesjms/fsad006
[83] TEGOS, 2025. The status of Irish salmon stocks in 2024 with catch advice for 2025. Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries, 61 pp.

The status of each of these rivers i.e. open for angling with a harvestable surplus (O), catch and release only (R) or closed (C), since assessments began in 2007 is shown below in Table 5-10.

Table 5-10 Trends since 2007 in the status of rivers assessed where salmon have a qualifying interest in SAC for SACs 000365 (Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment), and 002173 (Blackwater River (Kerry)).

River	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Caragh	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Ferta	C	R	C	O	O	R	R	O	O	O	R	O	O	O	O	O	O	O	R
Mealagh	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Owenreagh	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Kerry Blackwater	O	O	O	O	O	O	R	R	R	R	R	R	R	R	R	R	R	R	O

Of the five rivers assessed by the TEGOS where salmon have a qualifying interest, three are open for angling, one is open on a catch and release basis and one remains closed. The Caragh and Mealagh Rivers have been classed as open since 2007. The Ferta river has varied and was open from 2014-2024 before being classed as catch and release for 2025. The Kerry Blackwater changed from open to catch and release in 2013, before being classed as open for 2025. The Kerry Blackwater is one of only two counters located on rivers in the southwest and is deemed to be operating well, with counter data gradually increasing in recent years from 400 in 2018 to 761 in 2024. The Owenreagh River has been closed since 2007, with the latest data indicating that the mean minimum threshold of $\geq$ 17 salmon fry/5 min electrofishing has not been met.

Overall, there has been no significant change in the status of the rivers assessed by the TEGOS where Atlantic salmon have a qualifying interest, since 2007, despite the Deenish site being operational since 2010.

5.2.4.3.2 Disease spread

Regulation (EU) 2016/429[84] of the European Parliament and of the Council on transmissible animal diseases ('Animal Health Law' (AHL)), is the European Regulation which sets out the legislative framework for the management and control of diseases of both terrestrial and aquatic animals in the EU.

Concerning Ireland's health status with respect to diseases of aquatic animals, Annex II to the AHL sets out the list of diseases to which the Regulation applies. Four diseases of salmonids (Epizootic haematopoietic necrosis (EHN), viral haemorrhagic septicaemia (VHS), infectious haematopoietic necrosis (IHN) and infection with HPR-deleted ISAV) are listed in that Annex. The whole territory of Ireland is officially recognised as being free from all four of those diseases, which means that Ireland has one of the highest health statuses concerning listed diseases of aquatic animals, in the EU. In addition, Ireland has been granted national measures for the salmonid diseases BKD and infection

[84] OJ L 84, 31.3.2016, p.1.

with *Gyrodactylus salaris* in accordance with Article 226 of the AHL, again, giving Ireland a superior health status when compared to most other EU Member States.

The high national health status referred to above, obviously also applies to the aquaculture establishment which is the subject of this application.

In accordance with the AHL, operators have significant responsibilities concerning the animals they keep and products they produce. Compliance with those responsibilities is checked when Veterinary Inspectors complete annual inspections on all marine finfish sites. Those inspections are carried out in accordance with the AHL, and also in accordance with Regulation (EU) 2017/625[85] ('Official Controls Regulation' (OCR)). Any non-compliances which are identified are notified to the operator and must be closed out in an agreed time-frame. Some of the requirements that are checked during such inspections are the nature and frequency of veterinary interventions at the establishment, disease investigations commenced and completed, treatments administered, records kept, biosecurity measures in place. In the past 7 years, no non-compliances have been raised during the annual inspections referred to above, concerning the establishment which is the subject of this application.

In addition, in accordance with Recital (30) of the AHL, for transmissible animal diseases that are not subject to measures laid down at Union level, but which are of importance for the private sector at local level, the sector has, with the assistance of the competent authority and other State Agencies, taken action to prevent or control such diseases, through the development of a Code of Practice for Salmonid Aquaculture in Ireland and the associated Farmed Salmonid Health Handbook[86]. The Handbook covers best practices concerning fish health and welfare, environmental requirements, general husbandry and biosecurity measures and creates a framework for the prevention and control of both listed and non-listed diseases of salmonids. The Code of Practice and the Handbook were launched by Minister Simon Coveney in 2011, and continue to be supported by the salmonid industry, including the applicant.

Concerning the matter of disease interactions between farmed and wild aquatic animals, the following general points are relevant:

- Salmon farming is still a young sector, and so it is probably safe to assume that the diseases by which it is impacted, originated in wild populations of salmonids (this is in contrast to diseases which have co-evolved in humans and domesticated animals[87]).
- In all situations where animals are farmed intensively, be they terrestrial or aquatic, the prudent approach is to reduce the occurrence of disease in kept animals through good health management, proactive veterinary intervention, high biosecurity levels, and where possible,

[85] OJ L 95, 7.4.2017, p.1.
[86] Management of Non-listed Aquatic Diseases | Marine Institute
[87] Emerging Infectious Diseases of Wildlife-Threats to Biodiversity and human Health, Peter Daszak, Andrew Cunningham, Alex D.Hyatt, Science Vol 287 21 January, 2000.

through vaccination. Such actions will minimise the spread of disease, both within and outside the establishment. This approach aligns with the fish health management measures which are proposed by the applicant.

Although there is a substantial amount of research available concerning the general characteristics and impacts on diseases on salmonids, they largely relate to aquaculture stock[88]. The incidence of diseases in wild fish is, on the other hand, not extensively documented in the scientific literature. However, in a historical review of the key pathogens BKD, Furunculosis, IPN, ISAV, SAV and VHS in Scottish wild fish, Wallace et al. (2017)[89] concluded that despite the large number of samples taken over time, there is limited evidence for clinical disease in wild fish due to these pathogens (although BKD and Furunculosis historically occurred), and that they are likely to have had minimal impact on Scottish wild fish. This limited impact is comparable to the situation in Norway, where despite infection on farms, a review of published literature found that there is limited infection of wild fish with most viral and bacterial pathogens [90]. As a result, viral and bacterial diseases are assessed as low risk to wild fish [91].

Although such data are not available from Ireland, it could be reasonably expected that a similar situation exists here.

The operation of this site should comply with all statutory legislation and regulation to ensure the management and control of diseases, and should ensure good standards of animal health and welfare.

5.2.4.3.3 Therapeutants

In Ireland, veterinary medicinal products such as vaccines, antibiotics and antiparasitics are administered under veterinary supervision, and in compliance with relevant EU[92] and national[93] legislation. Vaccination against relevant diseases is part of the disease management strategy of the applicant, and this assists with decreasing infection pressure at various points throughout the life-cycle of the aquaculture animal, thereby ensuring good standards of animal health and welfare.

5.2.4.3.4 Genetic interactions (escapes)

Information held by the Marine Institute since 2007 indicates that there have been no reports of farmed Atlantic salmon escapes from the Deenish site. Prior to that time, a study on the incidence of escaped farmed salmon in the United Kingdom and Ireland indicated that they occur at a low

[88] Eiras JC, Segner H, Wahli T, Kapoor GB: Fish diseases Volume 1 and 2. Science Publishers, Enfield, Jersey, Plymouth; 2008:1312. ISBN (set): 978-1-57808-438-8. ISBN (Vol. 1): 978-1-57808-527-9. ISBN (Vol. 2): 978-1-57808-528-6

[89] I.S. Wallace, P. McKay, A.G. Murray. A historical review of the key bacterial and viral pathogens of Scottish wild fish. Journal of Fish Diseases, 2017:1-16.

[90] Johansen L-H., Jensen, I., Mikkelsen, H., Bjorn, P.A., Jansen, P.A., & Bergh, O. (2011). Disease interaction and pathogen exchange between wild and farmed fish populations with special reference to Norway, Aquaculture, 315, 176-186.

[91] Taranger, G.L., Karlsen, O., Bannister, R.J., Glover, K.A., Husa, V., Karlsbakk, E., Svasand, T. (2015). Risk assessment of the environmental impact of Norwegian salmon farming. ICES Journal of Marine Science, 72,997-1021.

[92] Regulation (EU) 2019/6 of the European Parliament and of the Council of 11 December 2018 on veterinary medicinal products and repealing Directive 2001/82/EC

[93] SI 36 of 2022. European Union (Veterinary Medicinal products and Medicated Feed) Regulations 2022.

frequency of < 5%[94]. A more recent European wide study on the causes of farmed finfish escapes from European aquaculture identified structural failure as a significant cause of fish escapes[95]. Appropriate moorings and routine net monitoring and maintenance were identified as key factors which could reduce the incidence of escapes. Advances in cage design, which includes robust pen structures, strong net material and improved mooring components, have dramatically reduced unintentional escapes. Maintenance and management practices, as detailed in the NIS Vol. 2 appendix, will aid in minimising the risk of escape potential. The farm should be designed to meet the standard and requirements set out in the *Protocol for Structural Design of Marine Finfish Farms*, at a minimum.

5.2.4.4 Mitigation

To ensure control and management of sea lice numbers on the proposed farm, mandatory adherence to the following protocols is advised:

- *Monitoring Protocol No. 3 for Offshore Finfish Farms – Sea Lice Monitoring.*
- The *Strategy for improved pest control on Irish salmon farms,* and the.
- The *Protocol for Fallowing at Offshore Finfish Farm*s.

In terms of preventing escape incidences from occurring, compliance with the *Protocol for Structural Design of Marine Finfish Farms* should be a mandatory requirement.

5.2.4.5 Conclusion

The operation of this site should comply with all statutory legislation and regulation to ensure the management and control of diseases, and should ensure good standards of animal health and welfare. The likelihood of impact occurring to the QI Atlantic salmon [1106] is possible; however, with the stated mitigation measures in place, it is concluded that there will be no significant adverse effects to the conservation objectives of this QI.

5.2.5 Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]

The Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365), Glanmore Bog SAC (001879), and the Blackwater River SAC (002173) are designated for the QI Freshwater Pearl Mussel (*Margaritifera margaritifera*). The proposed activities occur within the Kenmare River SAC but as host species for the juvenile stage of this QI are migratory species that could

[94] Walker *et al*., 2006. Monitoring the incidence of escaped farmed Atlantic salmon, *Salmo salar* L., in rivers and fisheries of the United Kingdom and Ireland: current progress and recommendations for future programmes. ICES Journal of Marine Science 63: 1201-1210. https://doi.org/10.1016/j.icesjms.2006.04.018

[95] Jackson *et al*., 2015. A pan-European valuation of the extent, causes and cost of escape events from sea cage fish farming. Aquaculture 436: 21-26. https://doi.org/10.1016/j.aquaculture.2014.10.040

pass within the zone of influence of the proposed site, it is considered here in this assessment. The COs, targets and details for this QI in both SACs are outlined in Table 5-11.

Table 5-11 Conservation objectives with attributes and targets for QI freshwater pearl mussel in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Glanmore Bog SAC, and Blackwater River SAC.

Attribute	Measure	Target	Notes[96],[97] (references within NPWS document)
Distribution	Kilometres	See targets below and map 8. Note that the distribution target lengths include the perimeters of lakes in each catchment. Kerry Blackwater system - Maintain distribution at 18.95km. Glanmore Bog SAC - Maintain distribution at 4.5km.	The conservation objective applies to the Caragh, Currane and Gearhameen freshwater pearl mussel populations, which are listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (Statutory Instrument No. 296 of 2009). The targets are for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems (see further information below); the Kerry Blackwater system; The Caragh and Currane are amongst eight Irish populations prioritised for conservation action (Moorkens, 2010). Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC covers most of the Caragh, Currane and Gearhameen catchments. The SAC also covers upper parts of the Kerry Blackwater population and catchment (Blackwater River (Kerry) SAC (002173)), which is also selected for freshwater pearl mussel. See the Kerry Blackwater Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015) (SBMP; NPWS, 2010) for further information. Further relevant information on all attributes and targets may be available from the KerryLIFE project (LIFE13 NAT/IE/000144 - http://kerrylife.ie/). The distribution and abundance of the freshwater pearl mussel in the Ownagappul catchment was mapped by Ross (1999, 2005). The species extends through the Ownagappul from c.200m downstream of Glenbeg Lough to the brackish water c.100m downstream of the confluence of the Barrees Stream. It is also found in the lower stretch of the Lough Fadda Stream and through the Barrees Stream from above the Lough Fadda Stream confluence to the Ownagappul confluence. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Ownagappul system.
Distribution: Caragh	Kilometres	Maintain Caragh distribution at 35.06km	The widespread distribution of the freshwater pearl mussel in the Caragh catchment was mapped by Ross (1999). The distribution was re-examined as part of baseline monitoring in 2004 (Ross, 2004). The distribution extends through the Owenroe, Caragh, Glashawee, Caraghbeg and Meelagh Rivers, and Loughs Cloon and Acoose. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Caragh system. See NPWS (2010) for further information
Distribution: Currane	Kilometres	Maintain Currane distribution at 14.90km	The known distribution of the freshwater pearl mussel extends through the Cummeragh, Cappal and Isknagahiny Lough Rivers of the Currane catchment. This may be an underestimate, however, as the system has not been fully surveyed. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Currane system. See NPWS (2010) for further information
Distribution: Gearhameen	Kilometres	Maintain Gearhameen distribution at 4.45km	The known distribution of the freshwater pearl mussel is from the base of a section of falls in the Owenreagh River at Looscaunagh to the Bridge on the Gearhameen River at Lord Brandon's Cottage (Ross, 2007). Ross (2016) found small numbers of mussels in 800m surveyed downstream of the Bridge. The species may also extend further upstream in the Owenreagh and a 1994 record for Knocksallagh bog requires further investigation. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Gearhameen system. See NPWS (2010) for further information
Population size	Number of adult mussels	Restore populations to at least: 2.8 million adult mussels in the Caragh, 100,000	The estimated Caragh population was 2,805,071 (Ross, 1999). Mussel density was variable and maximum abundance was 268/m² (Ross, 1999). E. Ross found a large population in the Cummeragh River, Currane with mussels abundant (>1,500/100m) in parts (Ross, 2008, 2009, 2017). NPWS (2010) estimated the Currane population as c.100,000. NPWS staff counted over 20,000 adult mussels in an 800m stretch of the Owenreagh, Gearhameen in 2005. Ross

[96] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002173.pdf
[97] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000365.pdf

		in the Currane and 100,000 in the Gearhameen Kerry Blackwater system - Restore population to at least 2.7 million adult mussels Glanmore Bog SAC - Restore Ownagappul population to at least 200,000 adult mussels	(2007) recorded a very large population in the Owenreagh, with high mussel density in places (up to 272/m²). Ross (2017) estimated the Owenreagh population is well in excess of 100,000 mussels. NPWS (2013) assumed the Caragh and Currane populations had declined at a rate of 1%/year and the Owenreagh at 3%/year. The improved 2014 estimate for the Caragh was 2.1 million. The target is for the species to be sufficiently abundant to maintain itself on a longterm basis as a viable component of the Caragh, Currane and Gearhameen systems. Ross (1999) estimated the Blackwater population as 2,765,333. Mussel density was variable; maximum abundance was 360/m² (Ross, 1999). Very high densities continue to be recorded, particularly in the Kealduff (up to 270/m² in 2016/17); however, significant declines have also been documented (Ross, 2004, 2006, 2009, 2011; Moorkens, 2015, 2016, 2017). NPWS (2010) predicted that, based on rate of decline, the population would be extinct by c.2100. NPWS (2013) assumed the Kerry Blackwater population had declined at a rate of 1% per year to c.2.54 million. Moorkens (2015) recorded an 8% decline in adult numbers between 2004 and 2014 at 6 transects. Moorkens (2017) recorded a 60% decline at one Kealduff transect between 2014 and 2016. A population estimate of 862,920-2,030,400 was used for the 2013-18 Article 17 period (NPWS, 2019). The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Kerry Blackwater system. The Ownagappul population was estimated as 200,598 (Ross, 1999). Mussels were categorised as abundant along much of the Ownagappul channel, occasional in the Lough Fadda Stream and rare to abundant in the Barrees Stream (Ross, 1999, 2005). The maximum densities recorded in 1999 and 2005 were c.84/m² and c.184/m² (Ross, 1999, 2005) and average density in transects ranged from 1/m² to 28.6/m² (Ross, 2005). NPWS (2013) assumed that all priority populations had declined at a rate of 1% per year 2007-2012. Ross (2017) recorded a dramatic decline in adults in the lower Ownagappul. A kill of both adult and juvenile mussels was recorded in April 2015 resulting from hydromorphological changes and emersion of mussels (Killeen and Moorkens, 2015). The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Ownagappul system.
Population structure: recruitment	Percentage per size class	Restore to at least 20% of each population no more than 65mm in length; and at least 5% of each population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and are found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. See the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The Sub-basin Management Plans (NPWS, 2010) summarise demographic work up to 2010. The Caragh failed both targets in 2011, 2014 and 2016 (Ross, 2011; Moorkens, 2015, 2016). The Currane failed both in 2014 (Ross, 2017). The Gearhameen failed the targets in 2015 (Ross, 2017). The Caragh, Currane and Gearhameen populations are unsustainable owing to lack of survival of juvenile mussels. NPWS (2010) predicted that, based on current rates of decline, all three populations would be extinct by 2100. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems. The Blackwater failed both targets in 2009 (2.2% ≤65mm, 0% ≤30mm)(Ross 2009). It failed again in 2011, 2014 and 2016/2017-19.13%≤65mm, 8.09%≤30mm), no juvenile were recorded in the main Blackwater in 2016/17 (Ross, 2011; Moorkens, 2015, 2017). The Blackwater population is unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Blackwater system. In 2009, the Ownagappul failed the ≤30mm target, with no juveniles recorded, but passed the young mussel target with 34.5% ≤65mm (Ross, 1999; NPWS, 2010). In 2014, the Ownagappul failed both targets and the smallest mussel (64.9mm) was the only mussel ≤65mm (Ross, 2017). The Ownagappul population is unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Ownagappul system
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses.

		adults counted; dead shells less than 1% of the adult population and scattered in distribution	The Caragh failed the live adult target in 2011, with declines of 100% and 74% at 2 transects (Ross, 2011). The average decline 2004-2014 was 24% of live adults across 6 transects (Moorkens, 2015). The Currane failed the dead shells target in 2014, with 18%, 3% and 5% dead shells in 3 transects (Ross, 2017). The Gearhameen passed both targets in 2009 and 2015 (Ross, 2009, 2017; NPWS, 2010). The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems. The Blackwater failed the targets in 2009: adults decreased at the 3 transects examined; high numbers of dead shells at Kealduff transect (Ross, 2009; NPWS, 2010). It passed the targets in 2011, but increases in adult numbers at 2 of 3 transects were likely a result of 'wash-in' during flood flows (Ross, 2011). In 2014, it failed the live adult target (8% decline since 2004), but passed the dead shell target (Moorkens, 2015). It failed both targets in 2016: live mussels at T10 declined from 212 in 2014 to 84 in 2016 (60% in 2 years) (Moorkens, 2016, 2017). 68 dead shells were recorded in T10 and 253 in KA5 (Moorkens, 2016, 2017). The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Blackwater system. The Ownagappul passed both targets in 2009 (Ross, 2009; NPWS, 2010). It failed both in 2014, when declines of 34% and 54% were recorded from the 2005 baseline, as well as 15% and 8% dead shells, at Transects 7 and 8 respectively (Ross, 2017). In 2015, a significant kill of both adult and juvenile mussels was recorded (Killeen and Moorkens, 2015). The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Ownagappul system.
Suitable habitat: extent	Kilometres	See targets below and map 8. Note that the suitable habitat target lengths include the perimeters of lakes in each catchment. Kerry Blackwater system - Maintain habitat extent at 18.26km in the Blackwater system (see map 4) and any additional stretches necessary for salmonid spawning Glanmore Bog SAC - Restore suitable habitat in more than 4.5km in the Ownagappul system (see map 5) and any additional stretches necessary for salmonid spawning	The habitat is a combination of the area of 1) habitat adult and juvenile mussels can occupy; 2) spawning and nursery habitats host fish can occupy. Fish nursery and mussel habitat typically overlap. Fish spawning habitat is generally adjacent to mussel habitat but may lie upstream of the generalised mussel distribution. Only spawning areas that regularly contribute juvenile fish to adult mussel habitat should be considered. Availability of mussel and fish habitat is determined by flow and substratum conditions. It is highly sensitive to hydromorphological changes, sedimentation and nutrient enrichment. Pressures throughout the catchment add to such impacts. Habitat in the Caragh, Currane and Gearhameen is unsuitable for juvenile recruitment (Moorkens, 2015, 2016; Ross, 2011, 2017). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems. See below. The widespread extent of the mussel habitat in the Blackwater system is well-documented; it was first mapped in 1999 (Ross, 1999) and full baseline monitoring took place in 2004 (Ross, 2004). Most of the available habitat in the Blackwater system is occupied by adult mussels (e.g. 85.5% surveyed area occupied in Kealduff, 42% in main Blackwater in 2016/17); however, the habitat is unsuitable for juvenile recruitment (Ross, 2009, 2011; NPWS, 2010; Moorkens, 2015, 2017). Moorkens (2017) surveyed habitat quality and condition in six stretches; 54% of the Kealduff was good juvenile habitat, with only 13% in good condition; 31.5% of the main Blackwater was good juvenile habitat, 62% of it in good condition. The extent of the mussel habitat in the Ownagappul system is well-documented; it was first mapped in 1999 (Ross, 1999) and full baseline monitoring took place in 2005 (Ross, 2005). Most of the available habitat in the Ownagappul system is occupied by adult mussels; however, it is unsuitable for juvenile recruitment (Ross, 2009, 2017; NPWS, 2010; Killeen and Moorkens, 2015). Hydromorphological changes are a particular concern. The target is for the species' habitat to be sufficiently widespread to allow the species to maintain itself on a long-term basis as a viable component of the Blackwater system
Suitable habitat: extent - Caragh	Kilometres	Restore suitable habitat in more than 33.18km in the Caragh and	The extent of the mussel habitat in the Caragh system is well-documented; it was first mapped in 1999 (Ross, 1999) and full baseline monitoring took place in 2004 (Ross, 2004). Most of the available habitat in the Caragh system is occupied by adult mussels; however, it is unsuitable for juvenile recruitment

		any additional stretches necessary for salmonid spawning	(NPWS, 2010; Ross, 2011; Moorkens, 2015, 2016). There is evidence for localised loss of habitat as a result of land drainage and bank erosion (Ross, 2011; Moorkens, 2015). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Caragh system
Suitable habitat: extent - Currane	Kilometres	Restore suitable habitat in more than 6.86km in the Currane and any additional stretches necessary for salmonid spawning	Further survey is required to accurately map the extent of mussel habitat in the Currane system. The habitat polyline is likely to underestimate habitat extent, particularly in the Cummeragh River. Suitable habitat appears to be widespread in the Cummeragh River from Lough Derriana to Lough Currane, but the river hasn't been comprehensively surveyed (Ross, 2008, 2009, 2017; NPWS, 2010). Ross (2008) recorded suitable habitat throughout the Cappal River, but found only four mussels. There has been no dedicated survey of the Isknagahiny Lough Stream, other tributaries or lakes. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Currane system
Suitable habitat: extent - Gearhameen	Kilometres	Restore suitable habitat in more than 4.45km in the Gearhameen and any additional stretches necessary for salmonid spawning	Further survey is required to accurately map the extent of mussel habitat in the Gearhameen system. The habitat polyline is likely to underestimate habitat extent in the Owenreagh River, and more survey is required upstream of the falls at Looscaunagh. The Gearhameen River appears to have limited mussel habitat, being dominated by torrential flow and unstable, mobile cobble and gravel substrate; however, further investigation is recommended (Ross, 2009, 2017; NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Gearhameen system
Suitable habitat: condition	Kilometres	Kerry Blackwater system - Restore condition of suitable habitat	The habitat is a combination of the area of 1) habitat adult and juvenile mussels can occupy; 2) spawning and nursery habitats host fish can occupy. Fish nursery and mussel habitat typically overlap. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only spawning areas that regularly contribute juvenile fish to adult mussel habitat should be considered. Mussel and fish habitat availability is determined by flow and substratum and is highly sensitive to hydromorphological, sedimentation and enrichment pressures from throughout the catchment. See I.S. EN 16859:2017. Mussel habitat is widespread in the Blackwater and abundant in the lower Kealduff, but is unsuitable for juvenile recruitment (NPWS, 2010; Ross, 2009, 2011; Moorkens, 2015, 2016, 2017). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the systems.
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	The EQR targets correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). Reaching these targets does not, however, guarantee achieving the targets for the other attributes. In 2009, the habitat in the Caragh, Currane and Gearhameen systems failed the macroinvertebrate target (Conservation Services, 2009; Williams, 2009; NPWS, 2010). The Currane and Gearhameen also failed the phytobenthos target (NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems. In 2009, the habitat in the Blackwater system failed both targets (Conservation Services, 2009; NPWS, 2010). The Environmental Protection Agency (EPA) recorded Q5 or Q4-5 in all sites sampled in 2015. KerryLIFE has monitored macroinvertebrates at 20 locations. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Blackwater system.
Substratum quality: filamentous algae (macroalgae); macrophytes	Percentage	Restore substratum quality - filamentous algae: absent or trace (less than	The Caragh failed the targets in 2009, 2011, 2014 and 2016 (Ross, 2009, 2011; Moorkens, 2015, 2016). Extensive algae have been recorded since monitoring began; macrophytes appear to have increased over time (Ross, 2004, 2006, 2009, 2011). The Currane failed the targets in 2009 and 2014 (NPWS, 2010; Ross, 2017). Significant crowfoot abundance has been recorded, but algal abundance tends to be relatively low (Ross, 2009, 2017). The Gearhameen

(rooted higher plants)		5%); macrophytes: absent or trace (less than 5%)	failed the algal target in 2009; excessive algae have been recorded since 1996 (NPWS, 2010) and the Gearhameen failed both targets in 2015 (Ross, 2017). Excessive fungal/bacterial production is also a concern in the Caragh and Gearhameen. Sufficient recruitment of juvenile mussels is being prevented by the poor condition of the river substratum. The Blackwater failed the macroalgal target in 2009, 2011, 2014, and 2016/17, with 100% cover in places including on occasion the Kealduff (Ross, 2009, 2011; Moorkens, 2015, 2017). An increase in algae was first noted in the Blackwater by the EPA in 2003 and significant algal cover has been recorded on each monitoring occasion since 2004 (Ross, 2004, 2006, 2009, 2011; Moorkens, 2015, 2017). The macrophyte target was failed (marginally) in 2009, but passed in 2011, 2014 and 2016/17 (NPWS, 2010; Ross, 2011; Moorkens, 2015, 2017). KerryLIFE also monitored algae and macrophytes. Elevated bacterial and fungal growths have also been recorded indicating increased organic load is a problem (Moorkens, 2015). Sufficient recruitment of juvenile mussels is being prevented by the poor condition of the river substratum. In 2009, the habitat in the Ownagappul system failed the macroinvertebrate target, but passed the diatom target (Conservation Services, 2008; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the systems.
Substratum quality: sediment	Occurrence	Restore substratum quality - stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The Caragh failed the target in 2009, 2011 and 2014, and sedimentation has increased throughout the system since monitoring began (Ross, 2004, 2006, 2009, 2011; Moorkens, 2015). The Currane failed the target in 2009 and 2014 (NPWS, 2010; Ross, 2009, 2017). The abundance of crowfoot suggests sedimentation has been a feature of the Currane for some time. The Gearhameen passed the target in 2009 and sedimentation appeared to be localised (NPWS, 2010). It failed in 2014/15, with some silt plumes (Ross, 2017). Sufficient recruitment of juvenile mussels is being prevented by the poor condition of the river substratum. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems. The Blackwater failed the target in 2009, 2011 and 2014, but passed in 2016/17 (Ross, 2009, 2011; NPWS, 2010; Moorkens, 2015, 2017). Patchy sand deposition has been recorded since monitoring began, but sedimentation with finer fractions appears to have increased over time (averages of 7%, 29% and 100% silt at the 3 transects monitored in 2011) (Ross, 2004, 2006, 2009, 2011). Severe silt plumes were widespread in 2014, demonstrating infiltration of fine sediments to the substratum (Moorkens, 2015). Sufficient recruitment of juvenile mussels is being prevented by the poor condition of the river substratum. Although silt plumes were not recorded at the two transects examined in 2009, overall, the Ownagappul failed the target as peaty-silt was recorded at a number of locations (Conservation Services, 2008; NPWS, 2010). A heavy silt plume and silt cover of up to 80% were recorded at Transect 7 in 2014 (Ross, 2017). Killeen and Moorkens (2015) recorded silt, along with decaying algae and iron/faecal bacterial growths, in acutely anoxic substrate. Sufficient survival of juvenile and adult mussels is being prevented by the poor condition of the river substratum. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Blackwater system
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. The Caragh failed the redox target in 2009, with an average decline of 23.8% (NPWS, 2010). It failed with an overall decline of 22% in 2014 (Moorkens, 2015). The Currane failed with 24% in 2015 (Ross, 2017). The Owenreagh failed with 23% in 2015 (Ross, 2017). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems. The Blackwater failed the redox target in 2009, with an average decline of 22.7% (NPWS, 2010). Four of five monitoring stations passed in 2014; however, silt plumes were widespread in the system (Moorkens, 2015). While results

			were good overall (average decline 17.4% (averages of 16-19% across sites), 81% of readings passed (63-100% across sites)), there was marked deterioration in redox in the Kealduff from May 2016 to July 2017 (Moorkens, 2017). Redox was not measured in the Ownagappul in 2009. In 2015, the average redox was 23.4% in the Ownagappul, with few patches of habitat having values below 20% (Ross, 2017). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of systems.
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regime	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum; 2) high flows are not artificially increased so as to cause excessive scour of mussel habitat; 3) low flows do not exacerbate the deposition of fine sediment or growth of algae/macrophytes and 4) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle; see Moorkens and Killeen (2014) and I.S. EN 16859:2017. Velocity data from the Kealduff indicate drainage impacts (Moorkens, 2017). Groundwater inflow to the substratum also contributes to water-cycling and favourable habitat condition. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the systems.
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval stage of the freshwater pearl mussel and essential to completion of the life cycle. 0+ and 1+ fish are typically used, both because of habitat overlaps and the development of immunity with age in fish. Fish presence is sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for mussels and a lack of mussel recruitment, while significantly lower host fish density and biomass were associated with high juvenile mussel numbers. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. In 2009, glochidia were found on salmon, but not trout, in the Caragh, Currane and the Blackwater system, but on neither salmonid in the Gearhameen and Ownagappul (Johnston, 2009; NPWS, 2010).
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the population	Riparian habitats, including those along lake fringes, particularly natural/semi-natural woodlands and wetlands, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. Fringing habitats aid in the settlement of fine suspended material, protect banks from erosion, contribute to nutrient cycling and to the aquatic food web (e.g. allochthonous matter such as leaf fall) and provide habitat for certain life-stages of fish, birds and aquatic invertebrates. Shade may also be important in suppressing algal and macrophyte growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the systems.

5.2.5.1 Applicant report

The applicant's NIS report considers that the activity of the proposed site may have potential indirect impacts on freshwater pearl mussel populations via direct impacts on wild salmonid populations. Therefore, the applicant considered impacts on Atlantic salmon and freshwater pearl mussel together and the information provided above in Section Salmon (*Salmo salar*) [1106] is also relevant here.

The applicants NIS report concludes that as there will be no likely significant direct effects on Atlantic salmon there will consequently be no likely significant indirect effects on freshwater pearl mussel

populations in the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC [000365].

5.2.5.2 MI Supplemental

Protection of the freshwater pearl mussel in Ireland is governed by, among others, SI No. 296 of 2009 The European Communities environmental objectives (freshwater pearl mussel) Regulations 2009 and a total of 27 populations were identified within 19 SAC areas for the freshwater pearl mussel (SI 296 of 2009 First Schedule). Monitoring data of these populations has shown a significant decline in the species population both in terms of individual numbers and decreased population viability. Only one population was classified as being in a favourable condition, one has become extinct and the remaining 25 classified as unfavourable[98]. The number of populations has since been reduced to 26 through SI 355 of 2018. As all of the SAC catchments have widespread, multiple stressors presenting significant technical challenges, a conservation strategy[99] was developed which aims to achieve the maximum conservation outcome with resources available. A prioritisation process took place which categorised all the catchments into eight categories, with those in categories one and two, receiving priority in terms of conservation effort.

The following SACs and freshwater pearl mussel populations, including NPWS priority classification, are of relevance to this application:

- SAC 000365 Killarney National Park, McGillycuddy Reeks & Caragh River Catchment
- Caragh[100] (priority class 1)
- Currane[101] (priority class 2)
- Gearhameen (Laune)[102] (priority class 4)
- Blackwater River (Kerry) SAC [002173]
- Kerry Blackwater[103] (priority class 1)
- Glanmore Bog SAC [001879]
- Ownagappul[104] (priority class 2)

The freshwater pearl mussel produces glochidial larvae which use a temporary salmonid host, typically juvenile (0+ and 1+) Atlantic salmon or brown trout in Ireland. Brown trout are not a protected species under Natura 2000. Studies have shown that populations of the freshwater pearl mussel have evolved host specificity i.e. they preferentially infest either Atlantic salmon or brown trout and that this plays

[98] NPWS, 2019. The status of EU protected habitats and species in Ireland. Volume 3: Species assessments. Unpublished NPWS report. Edited by: D. Lynn & F. O'Neill.
[99] NPWS, 2011. A strategy for conservation of the freshwater pearl mussel in Ireland. National Parks & Wildlife Service, Dublin. 17 pp.
[100] EPA, 2010. Freshwater Pearl Mussel *Second Draft* Caragh sub-basin management plan
[101] EPA, 2010. Freshwater Pearl Mussel *Second Draft* Currane sub-basin management plan.
[102] EPA, 2010. Freshwater Pearl Mussel *Second Draft* Gearhameen sub-basin management plan.
[103] EPA, 2010. Freshwater Pearl Mussel *Second Draft* Kerry Blackwater sub-basin management plan. www.catchments.ie/download/freshwater-pearl-mussel-plans-2009-2015/
[104] EPA, 2010. Freshwater Pearl Mussel *Second Draft* Ownagappul sub-basin management plan. www.catchments.ie/download/freshwater-pearl-mussel-plans-2009-2015/

an important role in the mussel life history and population genetic structure[105]. Limited data is available on host specificity in Ireland, however it has been proposed that mussel populations in the south-west, west and north-west primarily infest Atlantic salmon, while those in central and eastern regions infest brown trout[106]. This would suggest that Atlantic salmon are an important host for the freshwater pearl mussel in the region of relevance to this application which supports the findings of earlier NPWS surveys in this region, details of which can be found in the sub-basin management plans for each catchment. Within the sub-basin catchment management plans, it has been stated that host presence is sufficient for the Caragh, Currane and Gearhameen catchments [SAC 000365][107], the Kerry Blackwater [SAC 002173][108] and the Ownagappul river [SAC 001879][109]. This is further supported by electrofishing surveys performed by Inland Fisheries Ireland which reported the presence of juvenile Atlantic salmon in the Caragh catchment in 2017[110], the Cummeragh River (Currane) in 2010[111] and 2013[112], the Owenreagh (Laune) in 2008[113] and 2010[107] and the Kerry Blackwater in 2021[114].

The sub-basin management plans for each of the catchments listed above highlighted the need to restore the juvenile freshwater pearl mussel habitats to an appropriate condition to support survival through reducing nutrient and silt inputs to the rivers. The key risks identified for these catchments were hydro-morphological pressures resulting in increased sediment load, erosion and deposition within the rivers primarily due to agricultural practices, water abstraction, forestry and wastewater treatment systems. Direct impacts also arise from in-stream works such as channelization, construction work and recreational fishery structures[115]. These are freshwater or terrestrial pressures.

5.2.5.3 Mitigation

Mitigation measures in place to protect wild Atlantic salmon populations, as an important host for the freshwater pearl mussel in the region, also apply here. These are outlined in Section 5.2.4.4.

[105] Wacker, S. *et al.*, 2019. Host specificity drives genetic structure in a freshwater mussel. Scientific Reports 9: 10409. https://doi.org/10.1038/s41598-019-46802-8

[106] Geist, J. *et al.*, 2018. Genetic structure of Irish freshwater pearl mussels (*Margaritifera margaritifera* and *Margaritifera durrovensis*): validity of subspecies, roles of host fish, and conservation implications. Aquatic Conservation Marine and Freshwater Ecosystems 28: 923-933. https://doi.org/10.1002/aqc.2913

[107] NPWS, 2017. Conservation Objectives: Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365. Version 1. National Parks & Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

[108] NPWS, 2019. Conservation Objectives: Blackwater River (Kerry) SAC 002173. Version 1. National Parks % Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

[109] NPWS, 2017. Conservation Objectives: Glanmore Bog SAC 001879. Version 1. National Parks & Wildlife Service, Department of Arts, Heritage, Rural and Gaeltacht Affairs.

[110] Matson *et al.*, 2018. Sampling fish in rivers 2017 – Caragh Factsheet No. 20. National Research Survey Programme, Inland Fisheries Ireland.

111 Kelly et al., 2011. Water Framework Directive fish stock survey of rivers in the South Western River Basin District, 2010. Inland Fisheries Ireland, 72 pp.

[112] Kelly *et al.*, 2014. Water Framework Directive fish stock survey of rivers in the South Western River Basin District, 2013. Inland Fisheries Ireland, 71 pp.

[113] Kelly *et al.*, 2009. Sampling fish for the Water Framework Directive – Rivers 2008. The Central and Regional Fisheries Boards, 60 pp.

[114] Gordon *et al.*, 2021. Sampling fish in rivers 2021 – Kerry Blackwater Catchment, Factsheet No. 2021/10. National Research Survey Programme, Inland Fisheries Ireland.

[115] NPWS. 2019. The status of EU protected habitats and species in Ireland. Volume 1: Summary Overview. National Parks & Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

5.2.5.4 Conclusion

Conclusion

The likelihood of impact occurring from the finfish aquaculture at Deenish on the QI Freshwater Pearl Mussel [1029] is very remote; it is concluded that, with the stated mitigation measures in place, there will not be significant adverse effects to the conservation objectives of the QI Freshwater Pearl Mussel.

5.2.6 Harbour Porpoise (*Phocoena phocoena*) [1351]

5.2.6.1 Conservation objectives

The Kenmare River SAC was designated for Harbour porpoise (*Phocoena Phocoena)* in April 2024, post the drafting of the Stage 1 Screening document. At the time of preparation of this document there are no defined conservation objectives stated for Harbour porpoise in the Kenmare River SAC. The Belgica Mound Province SAC [002327] is the nearest SAC to the Kenmare river SAC with Cos detailed for Harbour porpoise, therefore these will be used for this assessment. The COs, targets and details for such are outlined in Table 5-12.

Table 5-12 Conservation objectives with attributes and targets for QI Harbour porpoise in West Connacht Coast SAC.

Attribute	Measure	Target	Notes (references within NPWS document[116])
To maintain the Favourable conservation condition of Harbour Porpoise (*Phocoena phocoena*) in Belgica Mound Province SAC, which is defined by the following list of attributes and targets:			
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.	See the Belgica Mound Province SAC conservation objectives supporting document - Bottlenose Dolphin and Harbour Porpoise for further details (NPWS, 2024)
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the Harbour Porpoise community at the site	See the Belgica Mound Province SAC conservation objectives supporting document - Bottlenose Dolphin and Harbour Porpoise for further details (NPWS, 2024)

Contemporary sightings of Harbour porpoises indicate a wide occurrence of this species primarily through Irish coastal waters and those overlying the continental shelf and continental slope, they occur widely and throughout the year[117]. The overall status of Harbour porpoise in Ireland remains Favourable[118]. The most recent ObSERVE aerial survey programmes[119] for Irish cetaceans and seabirds

[116] NPWS (2024) West Connacht Coast SAC (site code 002998) Conservation objectives supporting document - Harbour Porpoise V1. Conservation objectives supporting document series. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Dublin, Ireland

[117] NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report.

[118] NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report.

[119] Rogan, E., Breen, P., Mackey, M., Cañadas, A., Scheidat, M., Geelhoed, S. & Jessopp, M. (2018). Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2015-2017. Department of Communications, Climate Action & Environment and National Parks and Wildlife Service (NPWS), Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland. 297pp.

estimated Harbour Porpoise abundance to be (corrected designed based methods); 33,396 (summer 2015), 21,294 (winter 2015), 47,264 (summer 2016), 26,498 (winter 2016), 26,567 (summer 2021), 9,495 (summer 2022) and 8,836 (winter 2022)[120]. Although there are not enough data points to delineate a trend there would appear to be both a decline in abundance as well as a shift in distribution towards the eastern part of Irish waters[121]. There are numerous records of sightings of the species in the Kenmare bay area,[122]. Broad scale aerial surveys targeting the 2021 summer across an offshore area including Belgica Mound Province SAC and surrounding waters delivered a corrected design-based approach for Harbour Porpoise abundance estimate of 597 (95% Confidence Intervals: 374-953, Coefficient of Variation=73.20)(Giralt Paradell *et al*., 2024). However, it must be noted that these estimations are from a low number of records [123].

5.2.6.2 Applicant report

The applicant's NIS report provides detail on the Harbour porpoise *(Phocoena phocoena*) and its records in Kenmare Bay. SAC designated for this QI (at the time of writing) are considered in the applicants report. The impact mechanisms identified are the direct effects of disturbance and entanglement.

The report states that given that harbour porpoise have been reported in area there is potential that the species may occur near the site during operations. However, cetaceans rarely interact with marine farm sites and so the report considers that disturbance and entanglement impacts can be discounted. In addition, for the reasons outlined for pinnipeds, the impact of noise and vibrations on cetaceans will be insignificant. As a result, no impact on cetacean species is expected as it is extremely unlikely that the impacts mechanisms identified would significantly impact cetacean species.

5.2.6.3 MI Supplemental

The species range within the site should not be restricted by artificial barriers to site use. The proposed structures are small scale and not significant in the context of the SAC and the surrounding waters. Movement between and around these structures is possible, although this being a shy species there is likely to be some avoidance especially during the operational hours of the site. However, the proposed structures will not be considered a significant artificial barrier to the movement of the species. The size, permeability, and location of the proposed aquaculture site means it is not likely to pose an artificial barrier to the species range.

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[120] Giralt Paradell, O., Cañadas, A., Bennison, A., Todd, N., Jessopp, M., Rogan, E. (2024). Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2021-2023. Department of the Environment, Climate & Communications and Department of Housing, Local Government & Heritage, Ireland. 260pp

[121] Giralt Paradell, O., Cañadas, A., Bennison, A., Todd, N., Jessopp, M., Rogan, E. (2024). Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2021-2023. DECC & DHLGH, Ireland. 260pp

[122] https://maps.biodiversityireland.ie/Map

[123] NPWS (2024) Belgica Mound Province SAC (site code 002327). Conservation objectives supporting document - Bottlenose Dolphin and Harbour Porpoise V1. Conservation objectives supporting document series NPWS, DHLGH. Dublin

Harbour Porpoises are wary of human contact and rarely interact with boats or aquaculture facilities[124]. They feed mostly on small pelagic schooling fish but will eat squid and crustaceans in certain places. They tend to generally feed close to the sea bottom but this varies also. General noise from the proposed activity will be localised and dissipate quickly and will not be at a level to cause any significant negative impact on individuals or the population of harbour porpoise within the area. Activities will be primarily daytime so the introduction of artificial light will not be significant. It is advised that the use of Acoustic deterrent devices (ADDs) at the site, as a predator control measure, is prohibited.

At a local level, finfish aquaculture is generally an additive rather than a subtractive process (locally fish feed is added in a controlled manner to the system, so biomass is not removed), so is not likely to result in the deterioration of key resources. Entrapment or entanglement is rare especially in a well-maintained marine aquaculture site, so the risk of death or injury to individuals is rare and will not be to an extent that may affect populations. It is recommended that any mortalities are quantified and reported to inform risk.

For moorings and AtoNs, the small localised footprint and minor likelihood for interaction means the they do not pose a significant barrier to movement or significant risk to animal species. Having taut mooring systems, reduces the chance of interactions and any significant risk. Navigational lighting has not been documented to cause harm, therefore, given its very targeted range (directional and broadly parallel with the surface of the water), and their above surface mounted location, means that AtoNs are unlikely to pose a risk.

Considering the location of the aquaculture site, there is no likelihood of causing significant interference or displacement of this species.

5.2.6.4 Conclusion

The likelihood of impact occurring to the QI Harbour porpoise [1351] is very remote, and the consequences of any interaction, if realised, is negligible; it is concluded that there will be no adverse effects to the conservation objectives of Harbour porpoise.

It is recommended that any mortalities are quantified and reported to inform risk.

Considering the likely impact of acoustic deterrent devices (ADDs) to Harbour porpoise and other non-target species from their use, it is advised that, if the Minister is minded to issue a Licence, that the use of ADDs at the site, as a control measure, is prohibited.

[124] Bath GE, Price CA, Riley KL. & Morris Jr JA. (2023). A global review of protected species interactions with marine aquaculture. Reviews in Aquaculture, 15(4), 1686–1719. https://doi.org/10.1111/raq.12811

5.3 SPA

The following species have been brought forward by the applicant for the stage 2 appropriate assessment.

- Arctic Tern (*Sterna paradisaea*) [A194] – Deenish Island and Scariff Island SPA (0 km)
- Common Tern (*Sterna hirundo*) [A193] - Castlemaine Harbour SPA (004029) (34.7km)[125]
- Fulmar (*Fulmarus glacialis*) [A009]- Deenish Island and Scariff Island SPA (0 km)
- Gannet (*Morus bassanus*) [A016] - The Bull and the Cow Rocks SPA (004066) (16.4km)
- Guillemot (*Uria aalge*) [A199] - Iveragh Peninsula SPA (004154) (3.3km)
- Herring Gull (*Larus argentatus*) [A184] - Blasket Islands SPA (004008) (41.3km)
- Kittiwake (*Rissa tridactyla*) [A188] - Skelligs SPA (004007) (20.0km)
- Lesser Black-backed Gull (*Larus fuscus*) [A183] - Deenish Island and Scariff Island SPA (0 km)
- Manx Shearwater (*Puffinus puffinus*) [A013] - Deenish Island and Scariff Island SPA (0 km)
- Puffin (*Fratercula arctica*) [A204] - Puffin Island SPA (004003) (16.1km)
- Razorbill (*Alca torda*) [A200] - Puffin Island SPA (004003) (16.1km)
- Storm Petrel (*Hydrobates pelagicus*) [A014] - Deenish Island and Scariff Island SPA (0 km)

The following species and nearest SPAs have been additionally included by the Marine Institute for stage 2 appropriate assessment.

- Peregrine (*Falco peregrinus*) [A103] – Iveragh Peninsula SPA (004154) (3.3km)
- Cormorant (*Phalacrocorax carbo*) [A017] – Castlemaine Harbour SPA (004029) (34.7km)
- Red-throated Diver (*Gavia stellata*) [A001] – Castlemaine Harbour SPA (004029) (34.7km)
- Shag (*Phalacrocorax aristotelis*) [A018] – Blasket Islands SPA (004008) (41.3km)
- Great Black-backed Gull (*Larus marinus*) [A187] – No SPA designated for this species
- Black Guillemot (*Cepphus grille*) – No SPA designated for this species

5.3.1.1 Conservation Objectives

The overarching conservation objective of SPA QIs for bird species is:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for each SPA

The definition of favourable conservation status may vary depending upon whether the species is breeding or wintering at the site to be protected.

Favourable conservation status for breeding populations (Arctic Tern, Lesser Black-backed Gull, Manx Shearwater, Storm Petrel, Common Tern, Fulmar, Gannet, Puffin, Kittiwake, Peregrine, Herring Gull, Shag, Razorbill, Guillemot, Black Guillemot) is listed as achieved when:

[125] NB Common Tern is not listed as a SCI in Castlemaine Harbour SPA

- Breeding population size (Number of apparently occupied nests) is stable or increasing
- Productivity rate (number of fledged young per breeding pair) is sufficient to maintain a stable or increasing population
- Sufficient nests are available at the site to maintain a stable or increasing population
- Number of locations, area of suitable habitat and available forage biomass will support the population target
- Disturbance occurs at levels that do not significantly impact on the birds at the breeding site
- Disturbance at areas ecologically connected to the colony does not occur at levels that do not significantly impact on breeding populations
- Barriers do not significantly impact the populations access to the SPA or other ecologically important sites outside the SPA.

The definition of favourable conservation status for wintering species (Cormorant, Red-throated Diver) is listed as achieved when:

- The long-term population trend is stable or increasing
- No significant decrease in the number or range of areas used by waterbird species other than that occurring from natural patterns or variations.

5.3.1.2 Applicant report

The applicant highlights three main pressures for marine birds: disturbance risk, entanglement/ mortality risk, and impacts on foraging and licenced area habitat suitability.

5.3.1.2.1 Disturbance

Disturbance is listed as coming from either avoidance of the farm structures (when they interfere with habitat requirements such as flight paths and predator detection views) or avoidance of activity associated with the salmon farm (such as from vessel and human activity in the vicinity of the farm during maintenance and harvesting works). The scale of the farm site is small enough such that avoidance of farm structures is unlikely to be an issue. Disturbance from vessel activity is likely to occur daily at a low level and at greater levels during larger scale activities such as maintenance, stock grading, stock treatment and harvesting. Following the harvest period large scale maintenance will also be carried out.

5.3.1.2.2 Entanglement/ Mortality Risk

Entanglement/ mortality risk occurs when bird species predate on farmed fish and get entangled in pens or nets. Mitigation against predation is listed in the NIS as the best way to deal with this risk such as proper installation and fixing of bird nets, which should be kept taut. Gull species are likely to follow farm vessels and may use infrastructure to perch. Cormorants are the most persistent predators of farmed salmon and can breach nets underwater as well as bird nets above. It is concluded that the

use of bird nets to protect stock, and the correct installation of pens and nets on the infrastructure, will be sufficient to minimise the risk of entanglement.

5.3.1.2.3 Impacts on foraging and licenced area habitat suitability

If the farm directly overlaps with suitable foraging areas the farming operation may directly or indirectly effect bird foraging success. The farm itself may act as a fish aggregator, increasing bird prey availability. Bird foraging success may also be positively affected through the provision of resting/roosting locations and/or the creation of sheltered waters in the lee of structures. Additionally, organic enrichment may indirectly affect the foraging behaviour of bird species by changing the prey community in the vicinity of the farm. The predation of farmed stock may also cause changes to the foraging of birds.

5.3.1.2.4 Methodology and conclusion

The risk assessment follows four criteria to score species against these pressures. They are:

1. Disturbance risk
2. Species population sensitivity
3. Licenced area habitat suitability
4. Habitat flexibility

These criteria are then combined into an assessment of impact significance which contains a level of impact category and an impact significance category.

All species were recorded to have Negligible level of impact and therefore a 'Not Significant' significance score; apart from Herring Gull (*Larus argentatus*) which scored as 'Minor' level of impact and 'Not Significant' significance score.

The final conclusions therefore are that there will be no impact on bird species from the proposed activities.

5.3.1.3 MI Supplemental

There are six species (Peregrine, Cormorant, Red-throated Diver, Shag, Great Black-backed Gull, and Black Guillemot) which were included following a review by the Marine Institute. There are two further pressures (exclusion from foraging habitat, and competition for prey resources) arising from finfish aquaculture to be considered.

5.3.1.3.1 Exclusion from foraging habitat

If finfish aquaculture is situated in area that is suitable habitat for foraging bird species, then its presence could exclude foraging birds from that area. The criteria for 'licenced area habitat suitability' and 'habitat flexibility' in the assessment ensures that this pressure is considered in the impact assessment.

5.3.1.3.2 Competition for prey resource

Competition for prey resource occurs when the activity extracts available prey (food biomass) from the environment. For the proposed finfish aquaculture, this may occur with the extraction of cleaner fish by fishery, from the environment. Wrasse species are a prey item of Cormorant. Cormorant and other birds have high levels of flexibility in prey items[126,127,128]. The records of fish movement (based on fish movement approvals from MI data) for the Deenish site indicate the use of wild caught cleaner fish has substantially decreased over the last 3 years, and there is a target to source all cleaner fish from farmed sources, which is likely to be achieved in the short term, thereby removing any risk to prey availability.

Bird monitoring data for the area is limited. Some of the species considered have monitoring data available from iWEBs counts. Limited data is available for the closest monitored site Ballinskelligs Bay. Red-throated diver latest count was 5 individuals (2022/23) with the peak count of 65 in 1996/97, suggesting numbers are low. Cormorant and shag numbers were 27 and 50 respectively in the 2022/2023 winter which was also the peak for this site. Lesser Black-blacked Gull 2022/23 count was 2 with a peak count of 5 in 1996/97 and Great Black-backed Gull count was 9 in 2022/23 and a peak count of 88 in 1996/97. Given the sparse data available it is not possible to delineate trends from these data.

The level of disturbance from vessels trips are likely to be generally 2 trips daily and then additional trips during harvesting and maintenance activities. The number of trips is not given, but can be taken to be conducted by 2 to 3 boats operational daily. The licenced site, whilst bordering Deenish Island, will not be fully utilised - the area close to the shore will not contain pens since the depth requirements are >20m for such infrastructure. Boat activity therefore will primarily be beyond the 20 m contour, which is greater than 100 m from the shoreline, so is not likely to disturb roosting or nesting bird species. Boat activity will be regular, relatively predictable daily, and channelled (using the same routes), all which facilitate habituation by local bird populations.

Detail has been given in Table 5-13 for each species in relation to the four assessment criteria. Disturbance score ranges from 1 to 5, with 1 representing hardly any escape/avoidance behaviour and/or non/very low fleeing distance (low disturbance susceptibility), and 5 representing a strong escape/ avoidance behaviour and/or large fleeing distance (high disturbance susceptibility). The determination of population sensitivity considers tolerance to change/ recoverability /adaptability/

[126] Grémillet, D., Argentin, G., Schulte, B. & Culik, B.M. (1998), Flexible foraging techniques in breeding Cormorants *Phalacrocorax carbo* and Shags *Phalacrocorax aristotelis*: benthic or pelagic feeding?. Ibis, 140: 113-119.
[127] Gagliardi, A., Preatoni, D. G., Wauters, L. A., & Martinoli, A. (2015). Selective predators or choosy fishermen? Relation between fish harvest, prey availability and great cormorant (Phalacrocorax carbo sinensis) diet. Italian Journal of Zoology, 82(4), 544–555.
[128] Hansen, O. K. (2021). Can cormorants be used as indicators of local fish abundances? : A diet study of cormorants on Gotland. Dissertation. Retrieved from https://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-447637

importance/rarity (ranked as Green/Amber /Red). The Licenced area suitability follows the following code [129]:

1. habitat conditions include specific features (substrate type, upwellings, etc.) identified as being important for the species.
2. habitat conditions generally suitable (e.g. within depth range) but lack specific features identified as being important for the species.
3. habitat conditions include some features identified as unsuitable in some studies.
4. habitat conditions generally unsuitable.

The habitat flexibility score[130], ranging 1 to 5, has 1 representing very flexible habitat use by the species and 5 representing the species is reliant on specific habitat characteristics. Note that species that are coded low, occupy on large sea areas with no specific habitat preferences, while species that are coded high rely on specific habitat features.

Table 5-13 Impact assessment for the additional species screened in.

Qualifying Feature	**Peregrine (*Falco peregrinus*) [A103]**	**Cormorant (*Phalacrocorax carbo*) *[A017]***	**Red-throated Diver (*Gavia stellata*) [A001]**	**Shag (*Phalacrocorax aristotelis*) [A018]**	**Great Black-backed Gull (*Larus marinus*) [A187]**	**Black Guillemot (*Cepphus grille*)**
Disturbance[131]	Not available	4	4	4 [132]*	2	3 [133]**
Population sensitivity BoCCI[134]	Green	Amber	Amber	Amber	Green	Amber
Licenced Area Suitability[135]	4	2	2	2	2	3
Habitat Flexibility Score [136]	Not available	3	4	3 *	2	3 *
Overall Impact	None (Habitat unsuitable)	Minor (Moderate disturbance, moderate Habitat flexibility)	Moderate (Moderate disturbance, low habitat flexibility)	Minor (Moderate disturbance, Habitat flexibility)	Low (Moderate disturbance, Green list)	Minor (Moderate disturbance, Moderately suitable habitat, habitat flexibility)

[129] Furness R, Wade H, Robbins A & Masden E. (2012). Assessing the sensitivity of seabird populations to adverse effects from tidal stream turbines and wave energy devices. ICES Journal of Marine Science: Journal du Conseil. 69. 1466-1479. 10.1093/icesjms/fss131. & Furness R, Wade H, Robbins A & Masden E. (2013). Assessing vulnerability of seabird populations to offshore wind farms. Journal of environmental management. 119C. 56-66. 10.1016/j.jenvman.2013.01.025.

[130] Garthe, S., and Huppop, O. 2004. Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. Journal of Applied Ecology, 41: 724–734.

[131] Garthe, Stefan, and Ommo Hüppop. "Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index." *Journal of applied Ecology* 41.4 (2004): 724-734.

[132] * based on Cormorant

[133] ** based on Guillemot

[134] Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 –2026". Irish Birds 9: 523—544

[135] BoCCI - Birds of Conservation Concern in Ireland

[136] Garthe, Stefan, and Ommo Hüppop. "Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index." *Journal of applied Ecology* 41.4 (2004): 724-734.

Impact significance	None	Potential Slight Impact (NOT SIGNIFICANT)	Moderate Impact (SIGNIFICANT)	Potential Slight Impact (NOT SIGNIFICANT)	Potential imperceptible Impact (NOT SIGNIFICANT)	Potential Slight Impact (NOT SIGNIFICANT)

Great Black-backed Gull and Black Guillemot have low/moderate disturbance susceptibility suggesting these species show low response to disturbance. Cormorant, Shag and Red-throated Diver have higher susceptibility to disturbance. Daily trips can help habituate birds to vessel presence. It is important that disturbance is combined with the habitat flexibility score as the individual's ability to find suitable foraging habitat elsewhere will affect the overall impact disturbance has on the species.

The possibility of impacts on individual Cormorant and Shag cannot not be ruled out. However, their current population status from recent surveys is positive and their BoCCI Amber status suggests they have minor capacity to absorb change. The possibility of isolated entanglement events cannot be ruled out, but numbers impacted are likely to be very low, and population level effects are unlikely. In addition, the site is at the edge of the reported foraging range of these species form Castlemaine Harbour SPA and the Blaskets Islands SPA, for which the Cormorant and Shag are designated respectively. In conclusion, the proposed activities are unlikely to affect the Conservation Objectives for Cormorant in Castlemaine Harbour SPA nor Shag in the Blasket Islands SPA. Population level effects on Cormorant and Shag can be ruled out.

The possibility of impacts on individual Red- throated diver from finfish aquaculture cannot be ruled out. The overall impact is listed as moderate and the impact significance score is listed as significant. Population counts of the species at Castlemaine Harbour SPA are variable and yearly coverage is inconsistent making it impossible to delineate trends. Numbers range from 22 in 1996/97 to 1 in 1998/99. The latest count was 8 in 2021/22 indicating that in recent years within the timeframe of the existing activities the species was present in Castlemaine Harbour SPA. Castlemaine Harbour SPA is 34.7km from the aquaculture site and the maximum foraging range for Red-throated diver is 9 km[137]. Therefore, there is unlikely to be overlap between the foraging range of this species and the site, and the natural range of the species is unlikely to be affected. Overall, given the distance from the proposed activities and the foraging range of Red-throated diver we can conclude that population level effects on this species can be ruled out, conservation status in the SPA will not be affected.

Bird netting is primarily to protect stock from damage due to birds and is therefore, not a mitigation measure for birds. While the presence of the bird nets may themselves cause entanglement, when suitably deployed they deter interactions between birds and stock, and ensure that birds do not become habituated to predating on farmed stock, which may in turn reduce the potential for entanglement of individuals becoming an issue.

[137] Woodward, I. D., Thaxter, C. B., Owen, E., Bolton, M., Ward, R. M., & Cook, A. S. (2024). The value of seabird foraging ranges as a tool to investigate potential interactions with offshore wind farms. Ocean & Coastal Management, 254, 107192.

The NIS states that the fish farm may increase prey availability for some bird species by acting as a fish aggregating device. Whilst salmon farms may act as fish aggregators, this does not create increased prey availability but rather changes the distribution of prey. Attracting birds to the farm in this way may increase other risks such as entanglement, which has been dealt with elsewhere in this section.

There will not be any significant impacts on Peregrine from the proposed activity. There will not likely be any significant adverse impacts on Black Guillemot, Great Black-backed Gull, Red-throated diver, Cormorant and Shag.

For this assessment, we assume that that mooring block or anchor will be in place for the entire length of the aquaculture license. Sub-tidal markers can pose an entanglement risk to diving bird species. However, for moorings and AToNs, the footprint will be approximately the size of the mooring block or anchor, and that the rope and chains will be visible and have a taut mooring system. Given this small localised footprint and marginal likelihood for interaction means the mooring blocks do not pose a significant barrier to movement or entanglement, and therefore no significant risk to bird species.

AtoN markers have a lightning system to aid navigation which may pose a visual disturbance to species foraging at night-time. The lights may present a visual disturbance which can affect, particularly, nesting birds. Disorientation in Cory's Shearwater and Leaches Storm Petrel have been recorded, Light attraction is not a cause of high mortality. Impacts appear to predominately effect juveniles and numbers attracted are low - and distance to the light source and intensity of the light is also a factor. The lights used have a 2 mile (3.2km) range. The lighting is yellow with a wavelength greater than 500 nanometres which is above the sensitive range for seabird species[138]. The lights are distributed across the 33ha site. These low level, directed and shielded light sources are not of sufficient intensity or quantity to cause sky-glow, and are not likely to cause significant attraction or effect on any sensitive species. Marker buoys may act as a perching site for birds, primarily species such as Cormorant or Shag. This will have a positive or neutral effect on bird SCIs. They can also act as fish aggregating devices which will redistribute fish species and attract piscivorous feeding birds, having an overall neutral to positive effect.

5.3.1.4 Conclusion

The proposed activity will not significantly reduce the natural range available, or the size of habitat available, for the ornithological QIs and it will not hinder the ability of these QIs to maintain their populations as a viable component of the natural habitat on a long-term basis. There will therefore be no significant adverse effects on the conservation objectives for these ornithological QIs.

[138] Syposz et al 2021. Avoidance of different durations, colours and intensities of artificial light by adult seabirds. Nature Scientific Reports 11:18941

5.4 In-combination effects

5.4.1 Applicant report

In the Applicants NIS report, 4 salmon farm sites within Kenmare Bay are identified as the sources of in-combination effect. Cumulative effects with sites T06-064-7 and T06-064A (in Kilmakillogue Harbour) are discounted due to the distance and the hydrography of the Bay, with a deep channel separating northerly and southerly flows in the bay.

Furthermore, the AA Screening, NIS, and the EIA prepared for the T05-233 site concludes that operations will not result in significant environmental effects on the site or the wider surrounding environment. Discharge from the site is identified as the in-combination impact.

5.4.2 MI Supplemental

5.4.2.1 Aquaculture

In-combination effects must consider permitted activities (discharge or extraction consents), approved plans or projects in progress, applications, activities for which no consent is given or required, and natural processes. The effects from aquaculture activities are site specific. A pressure-based approach is used, based on the pressures from this project, with equivalent pressures from other plans or projects where exposure can be assessed, based on the combined significance of each effect.

There are 4 other licensed salmon farm sites within the bay. These are identified in Figure 5-5.

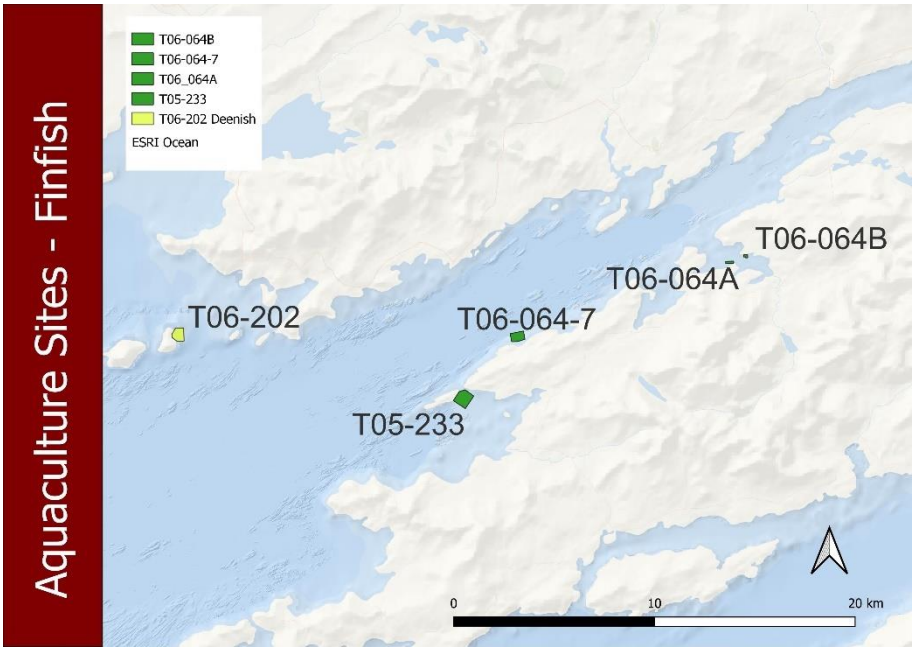


Figure 5-5 All finfish sites in Kenmare Bay.

The total licenced production from the currently licenced sites within the bay is displayed in Table 5-14. All the sites are in the renewal phase of their licences, and have requested amendments to the

area and production volumes, which are also summarised in this table. All these sites are wholly situated within the Kenmare River SAC.

Table 5-14 All current licenced area and tonnage for finfish within the SAC, compared against proposed applications.

Site	Current licenced area	Proposed licenced area	% Change	Current licenced tonnage	Proposed licenced tonnage	% Change
	ha	ha		t	t	
T06-202	14.48	33.5	+ 131	500	2200	+ 340
T06-064B	4.1	4.1	+ 0	140	140	0
T06-064A	2.5	2.5	+ 0	60	60	0
T06-064-7	22	29	+ 30	(3800/2) 1900	(3800/2) 1900	0
T05-233	26.6	54.7	+ 104	2200	2200	0
Total in SAC	**69.68**	**123.8**	**+ 78 %**	**4800**	**6475**	**+ 35 %**

If all proposed applications are active, there would be a 78% increase in licenced area and a 35% increase in licenced tonnage. It should be noted that the listed tonnage in the above table may not be reflective of actual production for all sites due to various licencing conditions – one site had temporary amendment with greater tonnage for a period, and 3 of the sites have been fallow for a number of years, so production tonnage in the bay may be different than listed above.

All the sites are currently in the licence renewal phase. The modelling submitted with each application shows no interaction between sites and no path for additive effects on water or benthic habitats. However, spatial overlap on QIs (and MCT) from all licenced salmon farms may result in cumulative effects. The combined licenced sites within the Kenmare River SAC have the potential for cumulative effect on QIs and marine community types, there are compiled in Table 5-15

Table 5-15 Spatial overlap of all licenced sites combined with OIs and MCTs in Kenmare River SAC.

MCT	Area in SAC	Area overlap with T06-202		Areas overlap with all Finfish sites (T06-202, T05-233, T06-064A, T06-064B, T06-064-7)	
	ha	ha	%	ha	%
1160	39,322	33.48	0.09	123.29	0.31
1170	9,196	9.87	0.11	9.87	0.11
Coarse sediment dominated by polychaetes community complex.	8,314	21.43	0.26	69.39	0.83
Intertidal reef community complex.	526	0.06	0.01	0.1	0.02
Laminaria-dominated community complex	3,358	9.4	0.28	9.62	0.29
Subtidal reef with echinoderms and faunal turf community complex and Laminaria-dominated community complex.	4,808	0.47	0.01	5.72	0.12
Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex.	20,150	0	0	6.6	0.03

Considering the total finfish licenced area in the SAC, the total overlap across the SAC, and total combined effect on each feature and marine community type, all overlaps are less than 1%. The greatest MCT affected is *Coarse sediment dominated by polychaetes community complex*. This community type is considered not sensitive to the pressure from the proposed activity. The cumulative

disturbance is to >1% of the mapped community types, therefore it is not considered significant[139] and there will not be a significant cumulative adverse effect on the habitats in this SAC.

The proposed activity does not propose a likely significant threat to the Annex II species that screened in, and considering the location of the activity and distances to and between the current licenced areas there is not likely to be a significant cumulative effect on the Annex II species in this SAC.

Competition for prey resource with bird species may occur with the extraction of cleaner fish by fishery, from the environment. Wrasse species are a prey item of Cormorant, along with other species. The records of fish movement (based on fish movement approvals from MI data) for the Deenish site are set out below, and demonstrate that the percentage of farmed cleaner fish used has increased from 0 % in 2021, to 100% to date, in 2024 (Table 5-16).

Table 5-16 Sources of cleaner fish in use at the Deenish site, and nationally in Ireland.

Deenish - Year	% Wild	% Farmed
2021	100	0
2022	29	71
2023	47	53
2024 (to July)	*0*	*100*

National - Year	% Wild	% Farmed
2021	42	58
2022	36	64
2023	33	67
2024 (to July)	*29*	*71*

It is the stated objective of Mowi to source 100% of all cleaner fish from farmed supplies, and substantial progress has been made in a relatively short period of time towards this target. Indications are that this target can be achieved in the short term, as capacity increases, thereby minimising any risks associated with these cleaner fish both from an ecological and a disease perspective. To this end, the health status of the cleaner fish is known and as they are of farmed origin, there will be less impact on wild cleaner fish stock numbers. Cormorant and other birds have high levels of flexibility in prey items and are unlikely to be impacted.

There are 4 other licenced salmon production sites in the Kenmare River SAC, and 41 licenced shellfish or seaweed sites. The nearest extensive aquaculture site is >11 km from the proposed site. The main cultured species are mussels, with some oysters and proposed seaweed sites. There are no clear interactions between the extensive aquaculture sites and the proposed sites and no clear S-P-R link to conservation features in the SAC from those activities that may act in combination with the impacts of finfish culture. Therefore, there is not likely to be any in-combination effects with these activities.

The nearest finfish site is > 13km from the site, on the other side of the Kenmare River SAC with other licenced or applications further in the Bay, within the SAC. Potential in-combination risk factors include farm discharge (feed waste, fish excretion, and release of chemoterapeutants) and biological dispersion (parasites such as sea lice, diseases). The modelling detailed in the Environmental impact Assessment accompanying the application indicates that there is a separation between the north and south of the Bay by the deep Kenmare River channel, and that there is limited northerly or southerly

[139]NPWS. 2013. Kenmare River SAC. Conservation objectives supporting document – marine habitats and species. Ver. I Link

flows (i.e. limited hydrological connection between the sites). The report indicated that the spatial footprints of discharges from the sites do not overlap. Given the distance and lack of hydrological connectivity, the potential for direct in-combination effects between the application site and current and planned finfish sites is minimal.

The impacts from parasites and disease are discussed in Section 5.2.4 and while likelihood of impact occurring to the QI Atlantic salmon [1106] is possible, mitigation measures are proposed. These would apply to all salmon production in the bay. With these in place it is concluded that there will be no significant adverse effects to Atlantic salmon in the relevant SACs.

5.4.2.2 Wild Fisheries Review

5.4.2.2.1 Overview of Existing Fisheries Activities in the Kenmare River SAC

Detail of the fishing in the area and risk assessment methodologies are elaborated from the Appropriate assessment document for extensive aquaculture for Kenmare River SAC[140] and from Ireland's Marine Atlas[141].

Six vessels of less than 8m in length fish for lobster and crab (pot fisheries) along the coast from Ballinskelligs into Kenmare River, using 1,500 pots. A further 8 vessels under 10 m in length fish 2500 pots in inner Kenmare. A further 19 vessels fishing 9,500 pots fish for shrimp (*Palaemon serratus*) in inner Kenmare. Potting for prawns (*Nephrops*) occurs at the edge of trawling ground in outer and mid Kenmare. Scallops are fished with dredges on the south shore of inner Kenmare.

Tangle netting (set net Fisheries) for crayfish occurs at the outer edges of the SAC, both in the area around Deenish and Scariff Islands in the north west of the SAC and in the south west of the SAC west of Cods Head and Ballydonegan Bay.

Bottom trawl fisheries, targeting Nephrops and mixed demersal fish, occurs on the muddy fine sand sedimentary habitats in outer Kenmare River, all year round. Pelagic trawling for sprat occurs in winter in inner Kenmare River. Fishing in the eastern part of the SAC by vessels >12m is close to zero. Inshore fishing vessels fish for Mackerel and Pollack (hook and line fisheries) in outer Kenmare River SAC in summer and autumn.

5.4.2.2.2 Fisheries Risk profile - Marine Community types

5.4.2.2.2.1 Trap fisheries for lobster, crab, shrimp and *Nephrops*

Trap fisheries may pose a risk to sensitive habitats such as *Zostera* and Maerl due to abrasion and disturbance caused by pots, ropes and anchors. The effect will depend on the intensity and frequency of the activity and the gear configuration in terms of pot spacing, number of anchors used, type of

[140] Report Supporting Appropriate Assessment of Extensive Aquaculture in Kenmare River SAC [Site Code: 002158] 2022. Marine Institute Link.
[141] Ireland's Marine Atlas https://atlas.marine.ie/#?c=51.7281:-10.2317:11

rope etc. Trap fisheries for Nephrops will not occur on this ground. Shrimp fisheries may occur on the *Pachycerianthus* community and there is a low risk of impact to this species.

Trap fisheries may pose some risk to kelp reef communities and to sub-tidal faunal turf reefs depending on the intensity of the potting activity. This risk is likely to be low however against background variability in these communities', pot fisheries pose no risk to sedimentary habitats.

5.4.2.2.2.2 Dredge fisheries for scallop

Dredge fisheries for scallop occurs on sedimentary habitats in the mid bay area, on the south of the bay, at a distance of >15 km from the proposed site.

5.4.2.2.2.3 Set net fisheries

Gill nets, tangle nets and trammel nets are used to capture mixed fish, crayfish and bait respectively. If they are used, the associated anchors and footropes may impact *Zostera*, Maerl beds, and kelp reefs. The associated impact on *Zostera* is likely to be low as found from a study in Kilkieran Bay on abrasion from ropes and anchors in pot fishing[142]. Tangle nets and gill nets are likely to be used in deeper waters away from kelp reefs or *Zostera* and Maerl beds.

5.4.2.2.2.4 Bottom trawl fisheries

The proposed site area and the areas in the lee of Deenish Island are in rocky and course grounds, which are not likely to be unsuitable for this type of fishing, and there is little fishing activity recorded here. Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex, particularly suspension feeders and crustaceans, are sensitive to fishing pressure from trawls but this depends on intensity of the fishing pressure. The community is not considered sensitive to low levels of trawling (a single pass for instance). The intensity of trawling by vessels over 12m in length in outer Kenmare River could be classed as medium (using scales provided by the Beaumaris approach to sensitivity assessment, ABPMer 2013[143]), and low in the area of the site. On this basis the community is considered not disturbed.

5.4.2.2.2.5 Mid-water trawl fisheries and hook and line fisheries

These fisheries are not expected to impact marine habitats in Kenmare River.

5.4.2.2.2.6 Hand gathering of periwinkles

Hand gathering of periwinkles occurs on intertidal reef communities. There is a low risk of impact in such communities due to trampling pressure. However, although the intensity of the activity is

[142] Breen P, Ó Cuaig M., Guilfoyle F., Hannon C., Tully O. (In press) A Before After Control impact experiment on a historically fished seagrass (Zostera marina) bed. Conservation Science and Practice.

[143] ABPMer 2013. Tools for Appropriate Assessment of Fishing and Aquaculture Activities in Marine and Coastal Natura 2000 sites - Report III: Intertidal and Subtidal Muddy Sands and Sandy Muds. Marine Institute. 704pp.

unknown it is unlikely to be such that significant effects would occur and there is no route for in-combination effect with the proposed activity.

5.4.2.2.2.7 Conclusion

5.4.2.3 Habitats

The proposed project is not likely to affect the community structure of *Zostera*, Maërl, or *Pachycerianthus* communities, and there is no likelihood of cumulative effect with the impacts from fishing activities.

The proposed activities do not overlap with Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex and it is unlikely that the existing or proposed aquaculture activities will impact on this community type. As the community is considered not disturbed from fishing activities, there is no likelihood of cumulative effect with the impacts from the proposed activities.

The nature of the proposed activities means it is not sea-bed based and impacts on reef communities are not considered significant, so there is no likelihood of cumulative effect with the impacts from fishing activities.

There are no clear cumulative effects identified with fishing activities in this SAC, and there will not be cumulative adverse effects to the conservation objectives of the QIs in the relevant Natura sites.

5.4.2.4 Marine mammals

There is a low risk of capture of otters in lobster pots and trammel nets set in shallow water (<5m). Such mortality has been documented elsewhere. Because of the intensity of pot fishing, unknown levels of associated use of trammel nets and documented accounts of mortality of otter in parlour creels in particular there is some likelihood of capture of individual otters. As creels and trammels are unlikely to be deployed within the preferred dive range of otters in the Irish lobster fishery the likelihood of capture is thought to be unlikely.

The proposed activities are considered non-disturbing to Otter and there is unlikely to be any significant cumulative effect identified with fishing activities in this SAC.

Tangle nets are used at the mouth of Kenmare River within the foraging range of seals at the site. Gill net use is reported by vessels over 15m in Kenmare River within the foraging range of seals from Kenmare River. Pelagic trawling for sprat (with herring by-catch) occurs in Kenmare River and east to the upper reaches of the Bay. Demersal trawling occurs in outer Kenmare River but within the Kenmare River SAC. Potting for shrimp occurs in inner Kenmare River while lobster and crab potting, with the possible use of trammel nets for bait, occurs along the south and north shores of the outer Bay. By-catch risk is highest for large mesh tangle nets and to a lesser extent in inner Kenmare River. Bycatch is higher closer to haul out sites. There may be a by-catch in gill nets and trammel nets. The

pelagic fishery for sprat and pot fisheries may cause disturbance at haul out locations which are mainly in the inner Bay on north and south shores.

Cumulative risk posed by fisheries may result in sub-lethal and lethal effects on individual seals but the risk to the population may be relatively low. However, total annual by-catch of Harbour Seal in Kenmare River is unknown. Risk of by catch, prey depletion and disturbance is considered to be low.

The likelihood of impact to the QI Harbour seal from the proposed activities is considered very remote and there is no route for in-combination effect with the proposed activity.

5.4.2.5 Other Plans or Projects

Activities reviewed are accessed at the following locations:

- DECC Foreshore Licencing - Link – accessed 21/01/2026.
- Kerry County Council planning - Map Viewer Link - accessed 21/01/2026.
- EPA pressures maps - Link – accessed 21/01/2026.
- Maritime Area Regulatory Authority (MARA) - Link – accessed 21/01/2026.

The review of these sources has identified no existing activities on the foreshore or adjacent to the foreshore that may interact with the proposed culture activities resulting in an additive or synergistic cumulative effects, on the QIs assessed.

The result of this search has meant that assessment conclusions identified above are considered valid and there will not be a cumulative adverse effect on the Natura sites within the zone of influence of the project.

5.5 Summary of Mitigation Measures

To ensure the risk of introduction of non-native species is eliminated, the following mitigation measures should be implemented:

- the equipment and infrastructure used at the site should be site specific and not transferred from other locations - or must be washed with detergent and disinfected before transfer to storage or any other site.
- Well-boats, and other boats, which come to the site from other locations should be required to follow disinfection procedures.
- Well-boat/live fish carrier should clean and disinfect their vessels between sites.

The operation should comply with all legislation and regulation to ensure the management and control of diseases, and should ensure good standards of animal health and welfare.

There is a potential effect on the QI Atlantic salmon [1106] identified, and mitigation measures are proposed. These include mandatory adherence to the following protocols:

- *Monitoring Protocol No. 3 for Offshore Finfish Farms – Sea Lice Monitoring and Control*.

- The *Strategy for improved pest control on Irish salmon farms.*
- The protocol for *Fallowing at Offshore Finfish Farms*.

In terms of preventing escape incidences from occurring, compliance with the *Protocol for Structural Design of Marine Finfish Farms* should be a mandatory requirement.

Acoustic Deterrent Devices (ADDs) to protect the stock from seals (which have a potential to disturb seals, dolphins, whales and porpoises) are not planned to be used at the site, but considering the likely impact to non-target species from their use, it is advisable to prohibit the use of ADDs as a seal control measure at the site.

6 Public Consultation

A public consultation was held on the proposed aquaculture and foreshore application. The consultation period ran from 11th December 2023 to 8th February 2024. The issues raised, as well as responses from the applicant (under the aquaculture licence regulation process), are presented in the following tables. Comments are categorised by the applicant, grouped by similar topics, and compiled to facilitate a succinct response (as in Table 6-1). These topics are addressed in the following sections. Some of the more detailed issues are addressed individually to elaborate detail. These detailed responses reflect and incorporate the issues raised in a number of other responses. Other issues raised are addressed individually and not incorporated in Table 6-1. The Marine Institute provides further commentary on some issues.

The topics are referenced regarding the sections within the applicant's NIS that address these issues. Issues that do not have a reference or merit further elaboration, are addressed in the text boxes below.

Table 6-1 Issues raised and broad category assignment, with details of the section in the Applicants NIS which address these topics.

Issues Raised	Broad Topic	NIS Section
Biodiversity loss on seabed	Benthic impact	3.3.2
Destroys all life beneath the farm	Benthic impact	3.3.2
Malfunctioning feed equipment	Benthic impact	3.3.2
Open-pen farms allow fish faeces, excess food and sea lice chemicals to drop to the sea bed under the pens, these areas then become barren and toxic to other forms of sea life	Benthic impact	3.3.2
Barren and toxic seabed due to faeces, food, and sea lice chemicals dropping to the seabed.	Benthic impact	3.3.2
Anecdotal accounts of divers observing the mountains of excrement under the salmon cages.	Benthic impact	3.3.2
Deenish failed its last benthic test.	Benthic impact	3.3.2
EIA claims that there will be no impact on the environment around, under or at distance from the cages and yet it also says "The fallowing of the site at the end of harvest will see no smolts present at the site which will allow time for the marine environment to recover"	Benthic impact	3.3.2
Having dived on the reefs adjacent to the fish farms I have seen toxic bottom sludge spread into the adjoining areas.	Benthic impact	3.3.2
Waters around Deenish identified as a high biodiversity "Area of Interest" by June 2022 Fair Seas publication	Biodiversity	NIS documents
Disturbance to cetaceans due to noise/anchor chains/traffic.	Cetaceans	2.2.6
Wild cleaner fish being taken from bays without any proper assessment of impact	Cleanerfish management	Vol. 2 - App. 3.3
Wrasse like sprat isn't a quota species however the unsustainable nature of the sprat and wrasse fisheries, connected to fin fish farming is undeniable.	Cleanerfish management	Vol. 2 - App. 3.3
Escape/interbreeding risk	Escapes	3.5.6
Genetics damaged by escapees (in general - not Deenish)	Escapes	3.5.6
High risk of escape	Escapes	3.5.6
Escapes generally occur during transfers in and out of farms but also due to adverse weather conditions-threat due to interbreeding with wild fish	Escapes	3.5.6
Escapee fish can spread AGD which is at epidemic levels at Deenish and there's no reason to believe that they haven't escaped	Escapes & Disease	2.1.15.6/3.5.6

No fallow period with Deenish and Inishfarnard being open 12 months a year	Fallowing	2.1.9
AGD potentially being passed to wild salmonids	Fish health & Welfare	2.1.13/3.5.4
Impacts on wild salmon and sea trout	Impact on salmonids	2.3/3.5
Natura Impact Statement submitted is inadequate in that it relies on a narrow field of scientific data, such as Jackson et al	Inadequate EIAR	
The developer has carried out an Environmental Impact Assessment (EIA), a Natura Impact Statement (NIS), an Annex IV Risk Assessment, and a screening for an AA, however since the Minister's determination of November 2023 no AA has been carried out. The Annex IV Risk Assessment did not look at species such as the Otter (*Lutra lutra*) and the Harbour seal (*Phoca vitulina*) which are protected under the Habitats Directive for Kenmare River SAC (Special Area of Conservation)	No AA	2.2.7/3.5.1
The Currane system and Kerry Blackwater are home to populations of otter and freshwater pearl mussels, both being protected as individual species and existing within a local network of sites covered by SACs. Anything that reduces the numbers of salmon and sea trout (such as this proposal) in the rivers will directly damage mussel populations, so is illegal within the Habitats Directive.	Otters & FPM	2.2.7/3.5.1
Freshwater pearl mussels are in poor conservation status within the catchment and due to salmonids being a glochidial host within their life cycle the continued decline of seatrout populations due to the impact of salmon farming is most likely to affect their regeneration.	FPM	3.5.1
Having an open pen salmon farm in such a rich marine biodiverse area, (SAC, NHA and more recently recognised globally for its contribution to international marine biodiversity with the Greater Skellig Coast Hope Spot designation) really goes against the Nature Restoration Law if we are already seeing detrimental effects to local fish populations and potential to impact the endangered Pearl Mussel which is found in the local salmon rivers.	FPM	3.5.1
What method do Silver King Seafoods Limited/Mowi propose to use to control the lice on their salmon. Chemical or Cleaner fish or Hot water? All equally cruel.	Sea lice	3.5.3
Open-pen salmon farming produces vast numbers of sea lice, because of the warm and relatively static water movement, these parasites feed on the salmon in the pens.	Sea lice	3.5.3
Lepeophtherius salmonis lice Protocol levels are arbitrary, have no direct association with potential lice level impacts on wild fish and are not related to the number of salmon on licensed sites. Potential impact of Caligus elongatus, a species which may also impact on salmon and sea trout smolts should be taken into account in the assessment of risk	Sea lice	3.5.3
Modelling shows no potential sea lice issue but serious impact on wild fish is already evident. Real world evidence is needed.	Sea lice	3.5.3
Our local Coastwatch group and other eNGOs in west Cork have highlighted their experience and of the Deenish salmon farm as one of repeat sea lice infestations and disease, a devastating loss of wild salmonids and damage to the tourist and angling business around Waterville.	Sea lice	3.5.3
Frequent and uncontrolled levels of sea lice during wild smolt migrations	Sea lice	3.5.3
Impacts of sea lice eggs/larvae being carried in currents not taken into consideration	Sea lice	3.5.3
Sea trout not taken into account in NIS Sea trout Antibiotic overuse	Treatments	3.5.5/ Vol. 2 App 3.1
Treatments with antibiotics and poisons	Treatments	2.1.13
The use of Nuvan and other pesticides at the fish farm sites creates living clouds of sea lice	Treatments	2.1.13
Information on types and quantities of chemicals used on fish farms to combat pests and diseases in Ireland, are held by the developers as they are commercially sensitive, how can a regulatory authority allow an industry to self-police itself in such a way?	Treatments	2.1.13
Chemical treatment on an overwhelming scale	Treatments	2.1.13.2.1
High level of pesticide use	Treatments	2.1.13.2.1
Vast quantities of toxic compounds are tipped into the sea to try and control sea lice infestations in the farmed stock.	Treatments	2.1.13.2.1
Arguments for and against but there is a need to adopt the Precautionary Principle to protect wild fish	Wild fish	3

6.1.1.1 Benthic Impact

Points addressed by the applicant

As required by Benthic Monitoring Guidelines laid down by the DAFM (December 2008), annual benthic audits are undertaken at the Deenish site to monitor the benthic environment. The benthos at Deenish farm has been surveyed for 15 years with all reports submitted to the Department of Agriculture, Food and Marine. These audits show that the seabed at the stations located at the edge of the pens and beyond appear to be in good condition and showed no signs of impact from the adjacent finfish activities. The benthic community in the vicinity of the site can tolerate the proposed biomass and the farm operations as proposed together with the application of a fallow period at the end of each cycle, will not significantly affect benthic ecology.

Page 1, Bullets 2 – 8. These comments relate to the destruction of life on the seabed due to "toxic sludge on the seabed." Results of seabed surveys over a long time period of many years and at numerous sites around the Irish coast and specifically at Deenish Island clearly indicate that this is not the case, with at least species of polychaete worms being recorded under the pens.

These AQUAFACT surveys include:

- Environmental Survey beneath Finfish Pens at Deenish Aquaculture Site (T6/202) Kenmare Bay, County Kerry 2023,
- Environmental Survey beneath Finfish Pens at Deenish Aquaculture Site (T6/202) Kenmare Bay, County Kerry 2022,
- Environmental Surveys beneath Finfish Pens at Deenish Aquaculture Site T6/202 Kenmare Bay, County Kerry 2021,
- Environmental Survey beneath Finfish Pens at Deenish Aquaculture Site (T6/202) Kenmare Bay, County Kerry 2020,
- Environmental Survey beneath Finfish Pens at Deenish Aquaculture Site (T6/202) Kenmare Bay, County Kerry 2019
- Environmental Survey beneath Finfish Pens at Deenish Aquaculture Site (T6/202) Kenmare Bay, County Kerry 2018,
- Environmental Survey beneath Finfish Pens at Deenish Aquaculture Site (T6/202) Kenmare Bay, County Kerry 2017,
- Environmental Surveys beneath Finfish Pens at Deenish Aquaculture Site T6/202 Kenmare Bay, County Kerry 2016,
- Environmental Survey beneath Finfish Pens at Deenish Aquaculture Site (T6/202) Kenmare Bay, County Kerry 2015,
- Environmental Survey beneath Finfish pens at Deenish, Kenmare Bay 2014,
- Environmental Surveys beneath Finfish pens at Deenish and Inishfarnard, Kenmare Bay, County Kerry 2013,
- Environmental Surveys Beneath Finfish cages at Deenish and Inishfarnard, Kenmare Bay 2012,
- Environmental Surveys beneath Finfish cages at Deenish and Inishfarnard, Kenmare River, County Kerry 2011 and
- Environmental Survey of Silver King Seafoods Ltd. Aquaculture Site at Deenish Island, Kenmare River, County Kerry 2008).

At no stage throughout the years did the surveys provide evidence of azoic (no oxygen) conditions.

While the effects of organic enrichment were at times evident within the footprint of the pens and out to 10 metres, fauna was always present and there was no evidence of outgassing (methane production that occurs in azoic condition). Opportunistic species such as the polychaete worms *Capitella* spp. and *Malacoceros vulgaris* were frequently present in high numbers in this footprint and served to increase bioturbation and oxygenation of the sediment as they feed on the organic matter. Mobile epibenthic scavengers such as fish, starfish and crabs can also help in removing large amounts of organic matter and these were frequently evident within the footprint of the pens.

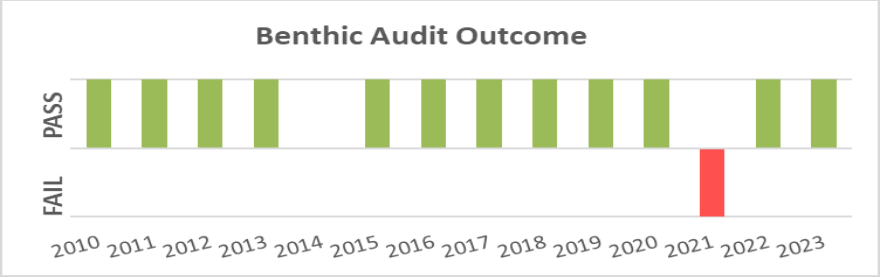
The Allowable Zone of Effect (AZE) under the benthic monitoring protocols is an area out to 30m from the surveyed pens. At the Deenish site impact was typically evident at the Under and edge pens surveyed and occasionally at the 10m stations. More commonly at the 10m and 20m stations, species that are very sensitive to organic enrichment e.g., the burrowing anemone *Cerianthus lloydii* and the brittle star *Amphipholis squamata* have been recorded.

The limited area impacted by the organic enrichment and is reflective of the dynamic nature of the site with mean ebb and flood currents of 0.1m/sec, whilst periods of peak currents of 0.25 –0.35m/sec during the tidal cycle on both Springs and Neaps. This indicates the potential for rapid dispersal and dilution of settleable solids away from the site, even during still weather conditions.

The reference to the 15% threshold and overlay with disturbing activities is taken from NPWS guidance and is used extensively by the competent authority to assess screening for appropriate assessment. The Kenmare River SAC – Conservation objectives supporting document – Marine habitats and species (NPWS, 2013) outlines the Department's view that "licensing of activities likely to cause continuous disturbance of each community type should not exceed an approximate area of 15%"

MI - Further comments or requests

Monitoring Protocol No. 1 for Offshore Finfish Sites - Benthic Monitoring[144] requires each finfish farm to carry out an annual benthic survey. A review of the historic surveys audits for the site shows that the site has had a pass result on all occasions, with the exception of 2021.



Historic outcomes of the Benthic Audits for Deenish site.

The contributing factor to the "fail" in 2021 was the presence of bacterial mats for greater than 50% of the (sampled) area under and close to the pen. Bacterial mats are a visual indicator of benthic enrichment at the site. There was feed pellets present in the sample under and at the edge of the pens. This result would have occurred within the zone of maximum effect for the site (which extends to 20m from the edge of the pens), and inside the allowable zone of effect. The sample corresponded to comparatively low stocking tonnage and after a 19-week fallow period – suggesting the impacts were a result of a transient, husbandry related issue rather than a more chronic event.

Current licensing regulates benthic effects in terms of an allowable zone of effect (AZE) - where some degradation of seabed conditions is permitted. The impact criteria are laid out in *Monitoring Protocol No.1 for Offshore Finfish Farms Benthic Monitoring* and the size of the zone is determined on an individual site basis. [While not detailed in the current version of the Protocol document, this AZE can extend to 100m from the fish pens, and impacts should be reducing with distance from the pen and not detectable beyond the AZE]. While an effect is allowable, it is expected that even at the cage-edge, and under, some invertebrates are to be found to bioturbate. As the impacts are localised, disturbance experienced will be temporary with the species characterising the community types recovering to pre-disturbed state following cessation of activities. Spatial overlap with any community type at this site is <1%. This point is further addressed in Section 5.2.1 above.

The Protocol for Fallowing at Offshore Fin Fish Farms[145] requires sites to fallow for a minimum 30 continuous days at the end of each production cycle. The primary aim of this fallowing is for the control of disease and parasite populations - whilst benthic recovery is not the objective, this fallow period also serves to, in some way, mitigate benthic impacts by providing a break in the organic inputs and a period to assist recovery. Full recovery of a benthic community post disturbance can be a lengthy process (from months to years depending on duration, location and habitat types). Considering the size of the footprint of the site, and the localised impacts of the activity ensuring a strong and functioning benthic community is found adjacent to the site, full recovery from disturbance can be expected to be achieved with cessation of activities.

Observations regarding the 15% threshold are addressed in Section 6.1.1.14 below.

6.1.1.2 Cetaceans

Points addressed by the applicant

While 15 species of odontocetes (toothed whales and dolphins), including the Habitats Directive Annex II Species Bottle-nosed Dolphin (*Tursiops truncatus*) and Common Porpoise (*Phocoena phocoena*), and three species of *mysticetes* (baleen whales) have been recorded in Kenmare Bay, cetaceans rarely interact with marine farm sites and so disturbance and entanglement impact can be discounted.

Fixed equipment on site is confined to a generator on the feed barge. This is housed in a heavily insulated container below deck, which greatly limits noise transfer into the environment. Whilst noise can travel some distance over the sea surface in calm weather conditions, the noise profile of net pen farm operations is regular, low in register and is rapidly attenuated, thereby creating little disturbance. Thus, noise is not considered a significant feature of such an operation, or a likely or significant environmental impactor.

[144] Monitoring Protocol No. 1 for Offshore Finfish Sites - Benthic Monitoring Link
[145] Protocol for Fallowing at Offshore Fin Fish Farms Link

In addition, the farm at Deenish operates under organic farming principles so does not employ the use of acoustic deterrent devices. There are no other significant sources of noise on site. Thus, the impact of noise and vibrations on cetaceans will be insignificant. As a result, no impact on cetacean species is expected.

MI - Further comments or requests

There are several marine mammals (dolphins, whales and porpoises) that intersect, in some way, with the Kenmare River SAC (identified from the National Biodiversity Data Centre Ireland, and the applicants NIS).

The main impacts associated with the proposed project on dolphins, whales and porpoises are related to:

- Noise disturbance - the increase in marine vessels resulting from the proposed project is considered minimal and would not be a significant increase, when compared to the existing movements in the area from fishing boats and recreational vessels. Noise associated with marine vessels is considered low. Noise from the pens during operation is considered to be not significant as the sound pressure would be low and with rapid attenuation. Acoustic Deterrent Devices to protect the stock form seals (which have a potential to disturb dolphins, whales and porpoises), have never been required at the licenced site, and the applicant states they are not likely to be required [these will be prohibited through licence conditions]. Predator control will be through sufficiently weighted and taut netting to prevent attacks.
- Collisions or entanglement - the small number of vessels that will be required will not significantly increase vessel traffic in the area. These vessels will be travelling at slow speeds, in a predefined trajectory, allowing for animals to predict movement of the vessels and avoid collisions. There have not been a significant number of studies undertaken on the interactions between dolphins, whales and porpoises and salmon farms. However, in Ireland reports of dolphins, whales and porpoises becoming entangled or trapped in salmon pens are extremely rare, and this is not expected to occur with moorings and netting which are appropriately tensioned and weighted, which is the case in this project.
- Obstruction and displacement – the potential for the infrastructure to cause obstruction to dolphins, whales and porpoises is considered low. These mobile species can avoid and go around any obstructions without any significant disturbance. The size of the project is relatively limited and not significant when considered against the overall area and is not likely to cause loss of habitat to these wide-ranging species.
- Attraction – some dolphins, whales or porpoises may be attracted to the farm sites as the infrastructure can act as artificial reefs and encourage fish aggregation. This would be limited to the direct vicinity of the site and would be considered small scale. Feed management and stock management will reduce the effect, minimising the potential attraction.
- Water quality – there is the potential deterioration in water quality due to build-up of waste feed or faeces, but the site is well flushed and exposed to waves and currents, so significant build-up is unlikely. Organic status ensures lower stocking density which helps avoids this. The use of veterinary products and chemical is possible. Concentration of these in the water or food chain are considered likely to be very low and well diluted.
- Commissioning and decommissioning - Most of the infrastructure will be assembled and disassembled on land and floated to and from the site. Activities will be short term and with low impact.

The potential for impact from the listed hazards is generally unlikely or of low intensity. While there may be some changes present in the environment, they are not likely to be significant, and impact on dolphins, whales and porpoises can be ruled out.

6.1.1.3 Cleaner Fish Management

Point raised

In Section 2.1.13.2.1 Treatments in the Screening for Appropriate Assessment and Natura Impact Statement Volume 1 – Main Report (and the corresponding section in the EIA), the main focus of sea lice control treatments is the use of cleaner fish sourced from wild caught wrasse from Kenmare Bay and hatchery reared lumpfish with such cleaner fish intended to be deployed from the first June post transfer at a ratio of 7 cleaner fish per 100 salmon which are to be further supplemented with locally caught wrasse during summer months. With a stocking abundance of 619,250 salmon in the first June as stated in the proposed production cycle, this equates to in the region of 43,000 cleaner fish at the proposed ratio of 7 cleaner fish per 100 salmon. However, elsewhere in the consultation documentation, it is stated that, "This will involve the stocking of hatchery-reared wrasse and lumpsucker at a rate of 6% of the salmon pen population", which equates to 619,250 @ 6% = 37,155 cleaner fish.

The EIA states that, "It is MOWI's objective to have 100% supply of hatchery-reared cleaner fish available to all sites by 2021". It is unclear whether this has been achieved by MOWI and is at odds with the intentions stated for the proposed operations to also use locally caught wild wrasse for sea lice control. Data from 2017 report that 25,361 wrasse were introduced as cleaner fish at the Deenish island site for sea lice control purposes; and at its sister salmon farm, Inishfinnard, between 2016 and 2018, 48,619 wrasse were introduced. The potential consequences of using wrasse harvested from the wild as cleaner fish in salmon aquaculture is highlighted in the draft National Strategic Plan for Sustainable Aquaculture Development 2030 and its associated SEA Environmental report and Natura Impact Statements an ongoing concern. IFI have serious concerns regarding the impact to marine ecosystems from the stated intention of removing large numbers of locally caught wild wrasse for extensive use as cleaner fish for the Deenish operation regarding any potential knock-on impacts to biodiversity, qualifying features, and indeed recreational fisheries.

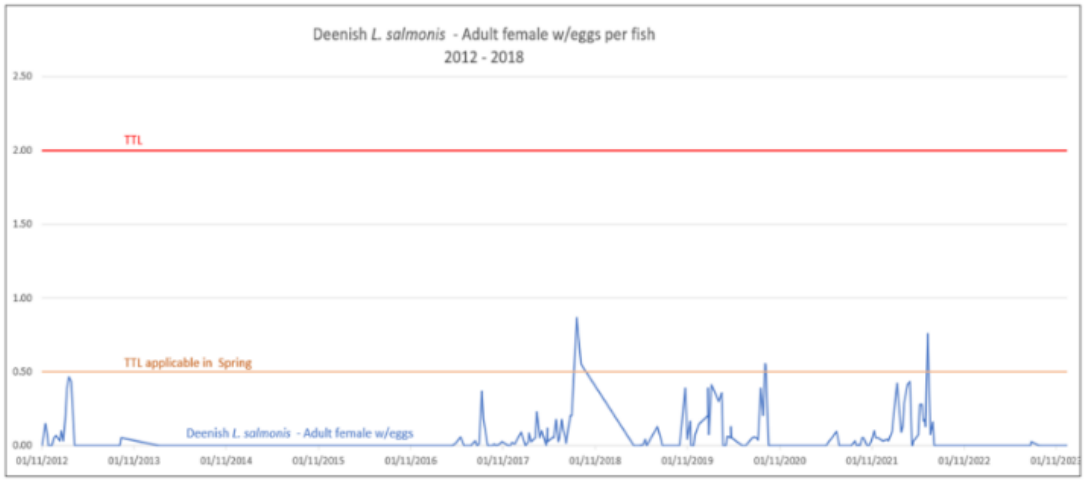
No such assessment on this matter appears to be made in either the NIS or EIA and no scientific stock assessment on the current status of the wild wrasse population to ascertain whether the rates of intended harvest would be sustainable were presented.

Further to the above, in Table 2.7 of both the NIS and EIA, it is noted that SLICE has been used in two or three years at the site in the period 2010-2018. However, this cannot be established as there is an apparent error in the years in the final row of the table. Indeed, it is unclear whether SLICE has been used more recently to this at Deenish Island operation and no more up to date information was presented in relation to this in the consultation documentation

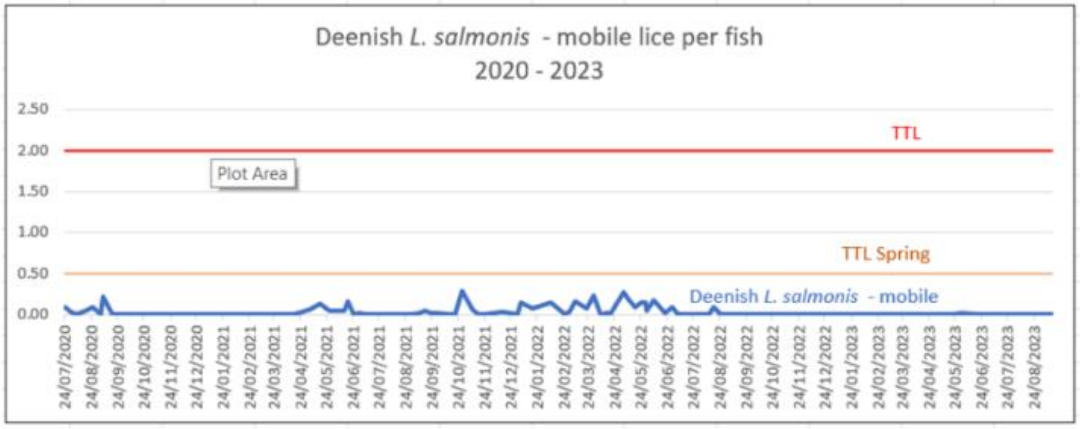
Points addressed by the applicant

Mowi Ireland has developed a non-medicinal strategy to control sea lice using cleaner fish. This is the preferred strategy for managing sea lice infestations. Results to date illustrate that cleaner fish will maintain ovigerous lice levels on salmon in pens at or below 0.1 lice per fish. It also has the beneficial effect of radically reducing the use of chemical treatments and, therefore, treatment dispersal. Mowi Ireland sources hatchery reared lumpfish from two hatcheries in Ireland and Wales in addition to hatchery reared wrasse supplemented with locally caught wrasse.

The National Survey of Sea Lice (*Lepeophtheirus salmonis* Krøyer and *Caligus elongatus* Nordmann) on Fish Farms in Ireland 2010 to 2022 shows that in the Southwest (all farms) there were no recorded instances of *L. salmonis* infestation levels greater than the treatment trigger level (see figures below).



Adult ovigerous female L. salmonis reported at Deenish 2012-2023 (blue). TTL Spring (orange) is the treatment trigger level set by the Marine Institute for the Spring period and TTL (red) is the treatment trigger level set for all other times. Note that at no time were the TTL levels breached and for most of this period the levels were significantly lower than the trigger levels.



All mobile L. salmonis reported at Deenish 2020-2023 (blue). TTL Spring (orange) is the treatment trigger level set by the Marine Institute for the Spring period and TTL (red) is the treatment trigger level set for all other times. Note that in the sea lice monitoring protocol TTL thresholds apply to adult ovigerous female L. salmonis, but at no time were the TTL levels breached even for all mobile sea lice and for most of this period the levels were significantly lower than the trigger levels.

With reference to the use of treatments to control sea lice, the use of therapeutics for the control of parasites and infections is strictly controlled by Organic standards. Only treatments approved by the Irish Health Products Regulatory Authority (HPRA) and organic regulations are permitted for use in organic farms. Treatments, if required, are always under veterinary supervision and must comply with veterinary written directions, and notification is made to the organic certification bodies as well as observing mandatory withdrawal periods.

Regarding the use of SLICE (Emamectin benzoate) this is applied in the first few months post transfer to sea with only one treatment in a full production cycle. Thus since 2017, there have been three treatments with SLICE, one in June 2019, June 2021 and June 2023.

The use of wild cleaner fish for sea lice control is still relevant in Ireland due to demand outweighing supply. It is the intention of Mowi in future to develop facilities that will allow for 100% use of hatchery reared cleaner fish. Wild fish are sustainably harvested by local fishermen when required. Further details on cleaner fish management can be found in the EIAR and NIS Vol. 2 appendix 3.3.

MI - Further comments or requests

Cleaner fish are addressed in Section 5.4.

We note the observations from the Sea Fisheries Protection Authority (SFPA) on this aquaculture licence application which states that there will be “No negative impacts on existing wild fisheries in the area and no foreseeable implications for the SFPA conducting official controls and possible non-compliance issues that could arise”.

The use of Veterinary medicine at the site is limited to prescription-only medicines authorised by HPRA and administered under veterinary supervision. This is highlighted above in Section 5.2.4.3.3. The use of wild-caught wrasse is discussed in Section5.4.2.

6.1.1.4 Escapees

Point raised

The Screening for Appropriate Assessment and Natura Impact Statement Volume 1 – Main Report states that, "large escape events have the potential to have a significant effect on wild salmon populations in the area especially considering the low returns within many salmon rivers" and that, "While escapees display considerable potential for long-distance dispersal/migration the incidence of farmed escaped salmon in rivers is correlated with the volume of farming within that region". The report concludes that, "the likelihood of an escape event occurring is remote and MOWI have adopted a range of measures to prevent such an occurrence; consequently, significant direct effects to the Qualifying Feature salmon and indirect effect to the Qualifying Feature freshwater pearl mussel can be excluded". The EIA notes that the selection of the Deenish site has considered fish escape risk, which increases, for example, in areas exposed to excessively heavy seas or heavy boat traffic and in its Fish Escape Prevention Policy (Appendix 4), MOWI identify the proposed operation at Deenish Island as a "high risk site" for fish escapes, further noting in the NIS that there is, "a High Risk for susceptibility to storm damaged based on the wave climate and hydrographic regime in the locality". In addition, the assessment of the screening AA (Report supporting the Appropriate Assessment Screening of Intensive Aquaculture (T06/202) in Kenmare River SAC [Site Code: 002158] and Deenish Island and Scariff Island SPA [Site Code 004175), notes that, "A literature review regarding escapees is provided and the potential for significant effect is recognised." Based on all these statements with regard to the potential for an escape event, a comprehensive assessment should have been made in the NIS and EIA of the potential impact of a large escape event from the up to 650,000 input farm stock on wild salmon stocks in the vicinity of the proposed operation. Indeed, an escape of c. 230,000 farmed salmon occurred from a site in Bantry Bay in 2014 due to storm damage, highlighting the potential for an escape event to occur regardless of the mitigation measures proposed.

There are numerous publications on the impacts of salmon farm escapes on wild salmon stocks (see supporting literature appended). The International Council for the Exploration of the Sea (ICES) workshop to address the NASCO request for advice on possible effects of salmonid aquaculture on wild Atlantic salmon populations in the North Atlantic (ICES 2016) clearly summarises these in their conclusions as follows:

- The spawning success of escaped farmed salmon is much lower than wild salmon. Despite this, genetic studies have demonstrated that farmed salmon have displayed widespread introgression in a large number of Norwegian populations where this has been investigated.
- Farmed salmon are domesticated and display significant genetic differences to wild salmon in a wide range of fitness-related traits. Whole-river experimental studies have demonstrated that the offspring of farmed and cultured salmon in general, display lower fitness than their wild counterparts in the wild.
- Juvenile escapees and the offspring of farmed salmon compete with wild salmon for territory and food. Therefore, their presence in the natural habitat will reduce the total production of wild fish. Studies have also shown this can result in a decreased overall productivity of the population.
- Where farmed salmon have successfully interbred with natural populations, it is likely that recipient populations will display changes in life-history traits. These changes are likely to be maladaptive for the wild population.
- Wild populations that are already under evolutionary strain from other challenges such as disease pressure, sea lice infection, over exploitation, habitat destruction and poor water quality are more likely to be sensitive to the potential negative effects of genetic introgression and loss of fitness.
- While recognising that there were still uncertainties, the Workshop considered that the evidence relating to the impacts of escapees / genetic introgression provided a clear indication of impacts on wild salmon populations. A substantial reduction of escaped farmed salmon in the wild, or sterilisation of farmed salmon, would be required in order to minimize effects on native populations.

The lack of any environmental impact assessment of the potential threat of an escape of up to 650,000 salmon to salmon stocks in the vicinity of the proposed operation is unacceptable and a major deficit in the consideration of potential impacts in the NIS and EIA documentation.

The risk of farmed salmon escaping from their pens to interbreed with wild salmon is a significant ecological concern. However, the NIS discounts the risk thus:

> *"By and large, escapees are more likely to die or be preyed upon at sea than to enter a river system, in particular if they are immature, which is the most likely prospect"*

But instances of farmed salmon being caught in inland rivers would cast doubt on this assertion. Indeed, IFI were quoted in this article saying:

> *"This large number of escaped farmed salmon, with a high proportion of males likely to be sexually mature, presents a potential threat to local wild salmon populations,"*

The NIS relies on standard Mowi operating procedures to minimise the risk:

> *"Preventing the escape of fish is a priority for MOWI Ireland. MOWI has an improved standardised pen, net and mooring design adopted on all farms. They have classified their sites in Kenmare Bay as having a High Risk for susceptibility to storm damage based on the wave climate and hydrographic regime in the locality. Pen, mooring and anchor design within Kenmare Bay reflects this and strongly mitigates against storm damage thus reducing the risk of an escape event"*

It should be noted that MOWI Ireland are responsible for circa 80% of farmed salmon production in Ireland, and in its report to NASCO in 2019 Ireland reported that 800,000 farmed salmon had escaped from marine sites between 1996 and 2017. Elsewhere in Europe, MOWI protocols do not appear to be enough to withstand increasing storm events, with an incident at a Scottish MOWI salmon farm in 2020 seeing the escape of almost 50,000 farmed salmon in one instance. Despite this, the risk of future climate disruption in the guise of increased storm strength does not appear to have been factored into their risk analysis for this farm.

Furthermore, the applicant seeks to minimise the seriousness of escapees, highlighting that large escapes have greater potential for impact:

> *"Large escapes (tens of thousands of individuals) of mature fish in the spawning season have a greater potential for impact significance than small escapes of smolts. Large escape events have the potential to have a significant effect on wild salmon populations in the area especially considering the low returns within many salmon rivers. However, the likelihood of an escape event occurring is remote and MOWI have adopted a range of measures to prevent such an occurrence; consequently, significant direct effects to the Qualifying Feature salmon and indirect effect to the Qualifying Feature freshwater pearl mussel can be excluded"*

While accurate, that does not diminish the risk from a smaller escape event. The risk is based not just on the number of escapees, but also on their level of maturity and the time of year of the escape event. The obligation on the decision maker in this instance is to determine if there is any risk to the integrity of the SAC, not to consider the acceptability of the quantum of risk posed. If there is any risk that the integrity of the SAC will be undermined, then the licencing body is obliged to not licence the activity. In Case C-258/11, Sweetman & Others v An Bord Pleanála & Others, it was held that:

"authorisation for a plan or project ....may therefore be given only on condition that the competent authorities ....are certain that the plan or project will not have lasting adverse effects on the integrity of the site. That is so where ***no reasonable scientific doubt remains*** *as to the absence of such effects" [emphasis added].*

Points addressed by the applicant

No farmed escapees have been reported in Deenish since Mowi began operating the site in 2008. MOWI have implemented a fish escape prevention policy for all farm sites. As well as being fully aware of the potential impact risks of escapees on local wild fisheries (subject to species in question and season), it is essential to the company's commercial viability to contain its fish for harvest. In respect of fish farm escapes, Mowi follows the guidelines on containment of farmed salmonids, drawn up between the North Atlantic Salmon Organisation (NASCO) and the International Salmon Farmers Association (ISFA) (NASCO, 2010).

All floating pen equipment, nets and associated structures are specified to withstand local current and wave climate conditions. Mooring systems are designed to withstand predicted 50-year local wave climate conditions and thus to protect the integrity of the pens. Mooring grid components are inspected annually. Preventative strategies include operating procedures for the use of vessels around pens and the provision of adequate navigational lighting and radar reflectors to prevent damage arising due to navigational errors by noncompany vessels.

Comprehensive net management and maintenance plans and procedures are in place to include regular in-situ net inspections by divers and remote operated inspection vehicles in addition to full net strength testing, inspection and repair after washing in a dedicated net management facility.

MI - Further comments or requests

There is always the potential for fish to escape as a result of weather events like severe storms, from damaged nets, or during husbandry operations. The exposed nature of this site means there is a real risk of equipment failure, which could result in fish escapes. Advances in cage design, which includes robust pen structures, strong net material and improved mooring components, have dramatically reduced unintentional escapes. Management practices (as detailed in the NIS Vol. 2 appendix) aid in the reduction of escape potential.

Escapes of fish present both ecological and genetic risks. The primary concern is that they could adversely impact wild stocks, either through competition for food or habitat, disease, or through reproductive mixing (Glover *et al*., 2017[146]; Bradbury *et al*., 2020[147]). Typically, domesticated fish raised in captivity are poor performers and have low fitness in the wild. Escapees quickly become prey to other predators, lessening their potential for food and habitat competition. If farmed fish were to escape and interbreed with wild populations, there could be potential for negative effects on wild populations, such as negative genetic consequences for the mixed population, lowering fitness and potentially limiting the ability of the wild fish to respond to changing environmental conditions. Baskett *et al* (2023)[148] states that long-term consequences of steady, low-level escapes are more detrimental than is the case if the same quantity escape in large numbers at rare intervals or otherwise is highly variable in time. Although minimizing the frequency of very large escape events such as net-pen loss in storms remains crucial, their results suggest that increasing efforts to monitor and prevent constant, low-level leakage from aquaculture operations deserves analogous consideration. Management practices (as detailed in the NIS Vol. 2 appendix) address this concern.

The *Protocol for Structural Design of Marine Finfish Farms (2016)*[149] sets out standards for structural design which a farm must adhere to, and outlines procedures for design-associated record keeping and for review of the design during the operational life of a marine finfish farm.

Fish escapes are addresses in Section 5.2.4.

Disease risk is addressed in Section 5.2.4.

6.1.1.5 Fallowing

Point raised

According to the consultation documentation, the proposal for the farm is to have a production cycle of 24 months long that includes fallowing which will operate under a policy of strict separation of generations, with an 'all in all out' model (fish are added to pens and there is no movement from time of entry to time of harvest) and no movement of fish during the grow-out phase. The production cycle at the site will be 24 months long beginning in March and includes fallowing of the site during the winter months of the second year (December – February) or a minimum of one month after harvest. The proposed fallowing period is unclear in the consultation documentation. For instance, in Section 2.1.11.4 of the Screening for Appropriate Assessment and Natura Impact Statement Volume 1 – Main Report the fallowing period is stated as, "the Deenish site will lie fallow for a minimum of one month following the completion of harvest." However, elsewhere including in the EIA Volume 2 – Main Report it is stated that the site will be fallow for three months at the end of the harvest period. The consultation documentation further states that the fallowing of the site at the end of harvest will see no smolts present at the site which will allow time for the marine environment to recover and rest between cycles and input of the next generation of smolts.

Wild salmonids & Fallowing - The consultation documentation states that it is intended that c. 650,000 smolts with an average weight of 75 g will be added to the pens in March at the beginning of the 24-month production cycle, that these will grow out to a c. mean weight of 2.5 kg in approximately 13-14 months post-transfer and thereafter, will be counted, graded and redistributed among the pens in preparation for harvest. In addition,

[146] Glover KA, Solberg MF, McGinnity P, Hindar K, Verspoor E, Coulson MW, Hansen MM, Araki H, Skaala Ø & Svåsand T. 2017. Half a century of genetic interaction between farmed and wild Atlantic salmon: Status of knowledge and unanswered questions. Fish and Fisheries 18: 890-927.

[147] Bradbury IR, Burgetz I, Coulson MW, Verspoor E, Gilbey J, Lehnert SJ, Kess T, Cross TF, Vasemägi A, Solberg MF, Fleming IA & McGinnity P. 2020. Beyond hybridization: the genetic impacts of non-reproductive ecological interactions of salmon aquaculture on wild populations. Aquaculture Environment Interactions 12: 429-445.

[148] Baskett ML, Burgess SC & Waples RS. 2013. Assessing strategies to minimize unintended fitness consequences of aquaculture on wild populations. Evolutionary Applications. pp 1090-1108.

[149] Protocol for Structural Design of Marine Finfish Farms. 2016. DAFM. Link

the proposed site is projected to hold a maximum total biomass on-site of c. 2,200 tonnes at a peak stocking density of ≤10kg/m3 of salmon with peak biomass occurring between June and July of Year 2 in each production cycle and the mean harvest weight is expected to range between 4.5 and 5.6 kg with harvesting taking place in the period July to December approximately 16 or 17 months after the smolts were initially transferred to the site.

The production cycle set out above will approach peak biomass from late spring to mid-summer which overlaps with wild salmonid smolt runs which typically occur from late March to early June. The biennial fallow period proposed from December to February (or for a "minimum of one month following the completion of harvest") will be of little benefit to wild salmonids as: a fallow period immediately prior to and during the principal period of wild smolt runs over the March to May period is somewhat more likely to better protect wild fish from sea lice infestation emanating from the farm; and there will be no such fallowing in year 2 of the production cycle.

Harvesting will also likely take place in late summer which will impose increased sea lice infestation pressure on wild salmonids as fish will presumably be subjected to a period of starvation prior to harvest during this time. This starvation period will likely preclude chemical treatment, if high sea lice infestation levels warranting treatment are breached. With the efficacy of cleaner fish that may instead be present to control lice levels under such a scenario unclear, heightened sea lice levels may prevail and pose substantial risks to wild salmonids. IFI are particularly concerned that this has the potential to negatively impact wild salmonids (Atlantic salmon and sea trout) and indeed, this has been well documented in numerous published studies in Ireland and elsewhere as set out herein. It is also of particular concern to Ireland's under-threat sea trout stocks which commonly inhabit the coastal environment during their marine phase. Recent acoustic tagging data for sea trout smolts from the adjacent Currane catchment undertaken by IFI has shown that post-smolts utilise the waters around Deenish Island. Therefore, from a wild fish perspective, the proposed production cycle poses considerable threat to out-migrating wild salmon smolts and indeed, post-smolt and adult sea trout. Further observations in relation to the proposed operation are made in some of the following sections on the risk of sea lice associated with salmon farming to the continued sustainability of wild salmonids stocks.

A further point to note, is that the use of the term "biannual" in the consultation documentation in relation to the stocking of smolts is confusing and potentially misleading as it means that smolts will be stocked twice a year. This is at odds with the production cycle stated elsewhere.

Points addressed by the applicant

As is required in all finfish farm licences, the Deenish farm always fallows after a crop has been harvested. The minimum fallow requirement is four weeks per production cycle. In practice the Deenish farm has been fallowed for a minimum period of 8 weeks to a maximum of 24 weeks, over the three most recent crop cycles.

IFI states that the proposed harvest period from March – July will impose increased lice infestation on wild salmonids. This is incorrect as lice on farmed fish will continue to be controlled both with cleaner fish (wrasse) and with hyposaline baths. Both these methods are very effective in treating not only adult lice but also all juvenile lice stages (McDermott et al., 2021).

IFI also states that the proposed production cycle poses a considerable threat to out- migrating salmon smolts in spring. This again is incorrect as outwardly migrating smolts from the nearest rivers to the Deenish salmon farm, the Emlaghmore, Inny and Currane/Waterville Rivers, will swim ca 5 km northwest from the farm site towards the open sea. It is also known that salmon smolts swim directly out to sea and do not remain in coastal, inshore waters. Costelloe et al. (1996b) shows that within ca 1 km from a salmon farm, due to dilution and dispersion effects, larval densities decline to what is regarded as a background density of ca 1 larva/4m^3 or 0.25 larva/m3. For these reasons, it is not possible that the smolts will be subjected to any higher levels of lice to which they are naturally subjected.

Fallowing

As is required in all finfish farm licences, the Deenish farm always fallows after a crop has been harvested. The minimum fallow requirement is four weeks. In practice the Deenish farm has been fallowed for a minimum period of 8 weeks to a maximum of 24 weeks, over the three most recent crop cycles. Refer to the Fallowing of Offshore Fish Farms protocol [150].

MI - Further comments or requests

The *Monitoring Protocol for Fallowing at Offshore Fin fish Farms, 2000* requires that all production sites are fallowed annually for a minimum of 30 continuous days, which is satisfied by the stated fallowing period in

[150] Protocol for Fallowing at Offshore Fin fish Farms. 2000. Link

the documentation, where they will fallow for well in excess of the 30-day statutory minimum, with an expected fallow period of up to 24 weeks. Fallowing is a recognised management strategy for the control of disease and parasitic infestations, according to the World Organisation for Animal Health's (WOAH) Aquatic Animal Health Code[151,152]. Fallowing reduces the risk of reinfection through the removal of the host, reducing transmission of the pathogen/parasite and breaking the disease cycle[153]. A 30 day fallow period is generally sufficient to prevent reinfection of a site with *Lepeophtheirus salmonis* originating from the site, and to minimize the transmission of pathogens between production cycles for those viral and bacterial pathogens which form associations with farm structures (fomites)[154].

Impacts on salmonids are addressed elsewhere in the document.

Note - the term biannual can refer to occurring twice a year or occurring every two years and is used commonly for both. The latter is the meaning in this report as is clear from the production plan detailed.

6.1.1.6 Fish Health & Welfare management & Treatments

Points addressed by the applicant
The application of good husbandry and management practices, biosecurity standards and veterinary health plans, all under the supervision of our dedicated fish health team which includes a veterinary practitioner, contribute to the optimisation of fish welfare, their well-being and propensity to thrive. All our farms are certified to the highest possible standards, namely Global GAP, and EU Organic Aquaculture, which address fish welfare aspects related to feed, water quality, health management, transport and harvesting. Smolt quality and effective vaccines are the cornerstones of our fish health management strategy. We vaccinate 100% of our fish to reduce the risk of disease and compromised welfare, and we apply the utmost care to ensure the highest quality and robustness of our smolts, to reduce health risks. Our procedures on plankton monitoring and mitigation practices, together with continuous training on plankton surveillance, risk management and response plans, contribute to reducing losses. We apply monitoring protocols adapted to seasonal risk, ensuring that surveillance is carried out on a frequent basis during high-risk periods. During harmful algal bloom events we follow a management and response plan to protect our fish and use measures such as aeration systems and cessation of surface feeding. Promoting fish welfare, resilience and well-being remain integral in our feeding strategy and feed development. We have elevated the use of functional ingredients to support fish welfare when exposed to conditions that may compromise the skin and gills.
We use sound farming practices, proven policy principles and keep our fish in good conditions that satisfy their biological needs for food, clean water, space and habitat. Our fish health management focus is on disease prevention which includes vaccination and builds on control approaches, supervised by our fish health professionals. The use of therapeutics for the control of parasites and infections is strictly controlled by Organic standards. Only treatments approved by the Irish Health Products Regulatory Authority (HPRA) and organic regulations are permitted for use in organic farms. Treatments, if required, are always under veterinary supervision and must comply with veterinary written directions, notification to the organic certification bodies as well as observing mandatory withdrawal periods.
MI - Further comments or requests
Regulation (EU) 2016/429[155] of the European Parliament and of the Council on transmissible animal diseases ('Animal Health Law' (AHL)), is the European Regulation which sets out the legislative framework for the management and control of diseases of both terrestrial and aquatic animals in the EU. Although the AHL sets out certain measures which are specific to aquatic animals, and certain other measures which are specific to terrestrial animals, very many of the measures set out in that Regulation, apply to both terrestrial and aquatic animals. For example, requirements concerning veterinary intervention, disease investigation, notification

[151] Werkman M, Green DM, Murray AG, Turnbull JF. 2011. The effectiveness of fallowing strategies in disease control in salmon aquaculture assessed with an SIS model. Preventive Veterinary Medicine. Vol 98(1):64-73.

[152] Bron JE, Sommerville C, Wootten R, Rae GH. 1993. Fallowing of marine Atlantic salmon, Salmo salar L., farms as a method for the control of sea lice, Lepeophtheirus salmonis (Kroyer, 1837). J Fish Dis 16(5):487–493.

[153] Hamre LA, Bui S, Oppedal F, Skern-Mauritzen R & S Dalvin. 2019. Development of the salmon louse *Lepeophtheirus salmonis* parasitic stages in temperatures ranging from 3 to 24°C. Aquacult Environ Interact. Vol. 11: 429–443. https://doi.org/10.3354/aei00320

[154] DFO. 2022. Fallowing as a Tool for Disease Mitigation in Marine Finfish Facilities in British Columbia. DFO Can. Sci. Advis. Sec. Sci. Resp. 2022/023.

[155] Regulation (EU) 2016/429 - OJ L 84, 31.3.2016, p.1.

and reporting, are broadly the same for the terrestrial species referred to by certain members of the public, as they are for aquatic species.

Concerning Irelands health status, Annex II to the AHL sets out the list of diseases to which the Regulation applies. Four diseases of salmonids (Epizootic haematopoietic necrosis (EHN), viral haemorrhagic septicaemia (VHS), infectious haematopoietic necrosis (IHN) and infection with HPR-deleted ISAV) are listed in that Annex. The whole territory of Ireland is officially recognised as being free from all four of those diseases, which means that Ireland has one of the highest health statuses concerning listed diseases of aquatic animals, in the EU. In addition, Ireland has been granted national measures for the salmonid diseases BKD and infection with *Gyrodactylus salaris* in accordance with Article 226 of the AHL, again, giving Ireland a superior health status when compared to most other EU Member States.

The high national health status referred to above, obviously also applies to the aquaculture establishment which is the subject of this application.

In accordance with the AHL, operators have significant responsibilities concerning the animals they keep and products they produce. Compliance with those responsibilities is checked when Veterinary Inspectors complete annual inspections on all marine finfish sites. Those inspections are carried out in accordance with the AHL, and also in accordance with Regulation (EU) 2017/625[156] ('Official Controls Regulation' (OCR)). Any non-compliances which are identified are notified to the operator and must be closed out in an agreed time-frame. Some of the requirements that are checked during such inspections are the nature and frequency of veterinary interventions at the establishment, disease investigations commenced and completed, treatments administered, records kept, biosecurity measures in place. In the past 7 years, no non-compliances have been raised during the annual inspections referred to above, concerning the establishment which is the subject of this application.

In addition, in accordance with Recital (30) of the AHL, for transmissible animal diseases that are not subject to measures laid down at Union level, but which are of importance for the private sector at local level, the sector has, with the assistance of the competent authority and other State Agencies, taken action to prevent or control such diseases, through the development of a Code of Practice for Salmonid Aquaculture in Ireland and the associated Farmed Salmonid Health Handbook[157]. The Handbook covers best practices concerning fish health and welfare, environmental requirements, general husbandry and biosecurity measures and creates a framework for the prevention and control of both listed and non-listed diseases of salmonids. The Code of Practice and the Handbook were launched by Minister Simon Coveney in 2011, and continue to be supported by the salmonid industry, including the applicant.

Concerning the matter of disease interactions between farmed and wild aquatic animals, the following general points are relevant:

- Salmon farming is still a young sector, and so it is probably safe to assume that the diseases by which it is impacted, originated in wild populations of salmonids (this is in contrast to diseases which have co-evolved in humans and domesticated animals: Dazsak et al., 2000)[158].
- In all situations where animals are farmed intensively, be they terrestrial or aquatic, the prudent approach is to reduce the occurrence of disease in kept animals through good health management, proactive veterinary intervention, high biosecurity levels, and where possible, through vaccination. Such actions will minimise the spread of disease, both within and outside the establishment. This approach aligns with the fish health management measures which are proposed by the applicant.

Although there is a substantial amount of research available concerning the general characteristics and impacts on diseases on salmonids, they largely relate to aquaculture stock (Eiras, 2008)[159]. The incidence of diseases in wild fish is, on the other hand, not extensively documented in the scientific literature. However, in a historical review of the key pathogens BKD, Furunculosis, IPN, ISAV, SAV and VHS in Scottish wild fish, Wallace et al. (2017)[160], concluded that despite the large number of samples taken over time, there is limited evidence for clinical disease in wild fish due to these pathogens (although BKD and Furunculosis historically occurred), and that they are likely to have had minimal impact on Scottish wild fish. This limited impact is comparable to the situation in Norway, where despite infection on farms, a review of published literature

[156] OJ L 95, 7.4.2017, p.1.

[157] Management of Non-Listed Diseases of Aquatic Animals - Fish Health | Marine Institute

[158] Emerging Infectious Diseases of Wildlife-Threats to Biodiversity and human Health, Peter Daszak, Andrew Cunningham, Alex D.Hyatt, Science Vol 287 21 January, 2000.

[159] *Eiras JC, Segner H, Wahli T, Kapoor GB: Fish diseases Volume 1 and 2. Science Publishers, Enfield, Jersey, Plymouth; 2008:1312. ISBN (set): 978-1-57808-438-8. ISBN (Vol. 1): 978-1-57808-527-9. ISBN (Vol. 2): 978-1-57808-528-6*

[160] *A historical review of* the key bacterial and viral pathogens of Scottish wild fish, I.S. Wallace, P. McKay, A.G. Murray, Journal of Fish Diseases, 2017:1-16.

found that there is limited infection of wild fish with most viral and bacterial pathogens (Johansen et al., 2011)[161]. As a result, viral and bacterial diseases are assessed as low risk to wild fish (Taranger et al., 2015)[162].

Although such data are not available from Ireland, it could be reasonably expected that a similar situation exists here.

Specifically, concerning the risk Amoebic Gill Disease might pose to wild salmonid stocks, in their response to the public consultation, the applicant has stated that they:

- apply good husbandry and management practices under the supervision of a dedicated fish health team, which includes a veterinary practitioner; and
- periodically bathe fish in freshwater to repair gill damage caused by marine amoeba, phytoplankton, zooplankton and jellyfish.

Whilst the objective of such practices and treatments is to protect the health and welfare status of the aquaculture animals in the establishment, strong veterinary supervision and appropriate treatments, will also serve to mitigate any potential impact on wild stocks, including any posed by *Neoparamoeba perurans*, the causative agent of AGD.

Finally, concerning the impact of water temperatures, the applicant has responded saying that they have operated several farm sites along the coast of Ireland since 1979, with differing temperature profiles and have experience of elevated summer temperatures over that period of operation. It seems reasonable to conclude therefore, that given the substantial investment required to operate a marine farm, the applicant would not jeopardise their investment if the risk associated with elevated water temperatures was deemed to be too high. The applicant further points out that wild salmon and sea trout are exposed to the same temperature profiles as farmed salmonids, and as such, are exposed to the same potential risks.

6.1.1.7 Sea lice model & impact on migration routes

Point raised

Deficiencies in sea lice modelling to assess risks to wild salmonids

Modelling was undertaken to examine the transport and fate of farm origin lice which may be released from the proposed site of operation. The purpose of the modelling was to ascertain if farm origin lice were capable of reaching estuaries or migration routes in sufficient numbers to infest wild stocks. The numerical model utilised particle-tracking analysis to simulate the dispersal of the lice larvae from the farm sites.

However, the fidelity of the model simulations to actual hydrodynamic conditions in Kenmare Bay are not satisfactorily conveyed. That is to say, to have confidence in the output of the model, it is essential to validate it against different observations. The model methodology as currently outlined in section 5.1 Appendix 7 is unlikely to stand-up to standard scientific peer-review without major revisions. For example, the results from the hydrodynamic model are vaguely compared as “reasonable” to a single 1997 drogue survey yet it is also stated that the drogue releases were strongly influenced by winds that occurred specifically during that brief survey. Therefore, it is unclear how representative this is of year-round hydrodynamic conditions in Kenmare Bay, with variable (time-varying) wind conditions.

Furthermore, drogue surveys are only representative of surface currents whilst figures of mid-depth and bottom current velocities are also shown without rigorous model validation. The minimum acceptable criteria for quantifying the accuracy of a hydrodynamic model would be to give at the very least some statistical quantification of model error (e.g. Root Mean Square Error & Mean Absolute Error) by comparing model simulations to in-situ- observations of water currents at different depths throughout the water column (e.g. observations obtained from an acoustic current profiler) and/or hydrographic properties (observations obtained from temperature/salinity profiles), carried out over meaningful time periods (seasonal and interannual). Without such statistical measures of model performance, it is not possible to objectively evaluate the accuracy of the hydrodynamic model described in the EIA and subsequently used to model lice dispersion. The statement in section 5.1 of Appendix 7 that: “The predicted hydrodynamics are considered to reasonably reproduce the mixing characteristics of the Bay and the [sic] generally reflect the moderately slack flow conditions at the mouth of Kenmare Bay" is unsubstantiated and not validated using any observational data.

[161] Johansen L-H., Jensen, I., Mikkelsen, H., Bjorn, P.A., Jansen, P.A., & Bergh, O. (2011). Disease interaction and pathogen exchange between wild and farmed fish populations with special reference to Norway, Aquaculture, 315, 176-186.
[162] Taranger, G.L., Karlsen, O., Bannister, R.J., Glover, K.A., Husa, V., Karlsbakk, E., Svasand, T. (2015). Risk assessment of the environmental impact of Norwegian salmon farming. ICES Journal of Marine Science, 72,997-1021.

The modelling of dispersal of sea lice from Deenish as submitted by MOWI is certainly flawed as the following study carried out by the Marine Institute and MOWI demonstrated substantially different outcomes. The study demonstrates a radically different outcome and the modelling presented in the NIS as submitted by MOWI should be viewed as unreliable and misleading. It should be noted that the Marine Institute study is a physical study rather that a computer generated study.

Points addressed by the applicant

Impacts on Sea lice

The IFI document makes several references to the impacts of sea lice, presumably emanating from salmon farms, on salmonids without any supporting empirical evidence to support such potential interactions and indeed, the document makes no reference to publications that indicate the potential for this to occur is low e.g., a Norði et al.,2015[163]; Byrne et al., 2018[164]; Costelloe et al.,1995[165]; Costelloe et al., 1996a[166]; Costelloe et al., 1998a[167]; Costelloe et al., 1998b[168]; Crosbie et a., 2019[169]; Morton et al., 2011[170]; Nelson et al.,2017 [171].

Hydrodynamic model used

The model used to predict the hydrodynamic conditions in the vicinity of the Deenish Island salmon farm and in the wider area of Outer Kenmare Bay is known as TELEMAC which was original developed by the Laboratoire National d'Hydraulique, a department of Electricité de France's Research and Development Division (see Galland et al., 1991).

The software is maintained by the OPEN Telemac-Mascaret Consortium (www.opentelemac.org). This is a partnership of the following users and developers:

• Electricite de France (France) ;

• SOGREAH (France) ;

• HR Wallingford (UK) ;

• Centre d'tudes Techniques Maritimes et Fluviales (France) ;

• Bundesanstalt fur Wasserbau (Germany).

• Daresbury Laboratory (UK).

Since its inception TELEMAC has been used extensively around the world to model hydrographic processes in shelf, coastal and estuarine environments and has become one of the major standards of computational modelling of free surface flow in its field. TELEMAC is built on sophisticated algorithms that use a finite-element approach to perform numerical simulation on an unstructured triangular mesh (Hervouet, 2007). This allows complex coastlines and estuaries to be represented more accurately than using regular grids.

The outputs from the model have also been extensively validated against in situ data and peer review. For example, TELEMAC, is used extensively in the UK National Network of Regional Coastal Monitoring Programmes and models produced are routinely validated against the network of tidal gauges and wave observation stations maintained by the Network.

The TELEMAC model has also been used extensively in Ireland to model water quality, water currents, tidal heights and sediment transport in a variety of environments including lagoons, estuaries, coastal waters, harbours and ports. These individual studies often include comparisons to measured, in situ data, for example

[163] a Norði, G., Simonsen, K., Danielsen, E., Eliasen, K., Mols-Mortensen, A., Christiansen, D., Steingrund, P., Galbraith, M, and Patursson, Ø. 2015. Abundance and distribution of planktonic *Lepeophtheirus salmonis* and *Caligus elongatus* in a fish farming region in the Faroe Islands. Aquaculture Environment Interactions. 7, 15-27

[164] Byrne, A., Pearce, Cross, S., Jones, S., Robinson, S., Hutchinson, M., Millar, M., Haddad, C., and Johnson, D. 2018. Planktonic and parasitic stages of sea lice (Lepeophtheirus salmonis and Caligus clemensi) at a commercial Atlantic salmon (Salmo salar) farm in British Columbia, Canada. Aquaculture. 468, 130 – 138

[165] Costelloe, J., Costelloe, M. and Roche, N. 1995. Variation in sea lice infestation on Atlantic salmon smolts in Killary Harbour on the West Coast of Ireland. Aquaculture International, 3: 379 – 393.

[166] Costelloe, M., Costelloe, J., Coghlan, N. and O'Connor, B. 1996a. Studies on sea lice larvae

[167] Costelloe, M., Costelloe, J., Coghlan, N. O'Donohoe, G., and O'Connor, B. 1998a. Distribution of the larval stages of Lepeophtheirus salmonis in three bays on the West coast of Ireland. ICES Journal of Marine Science, 55: 181 – 187

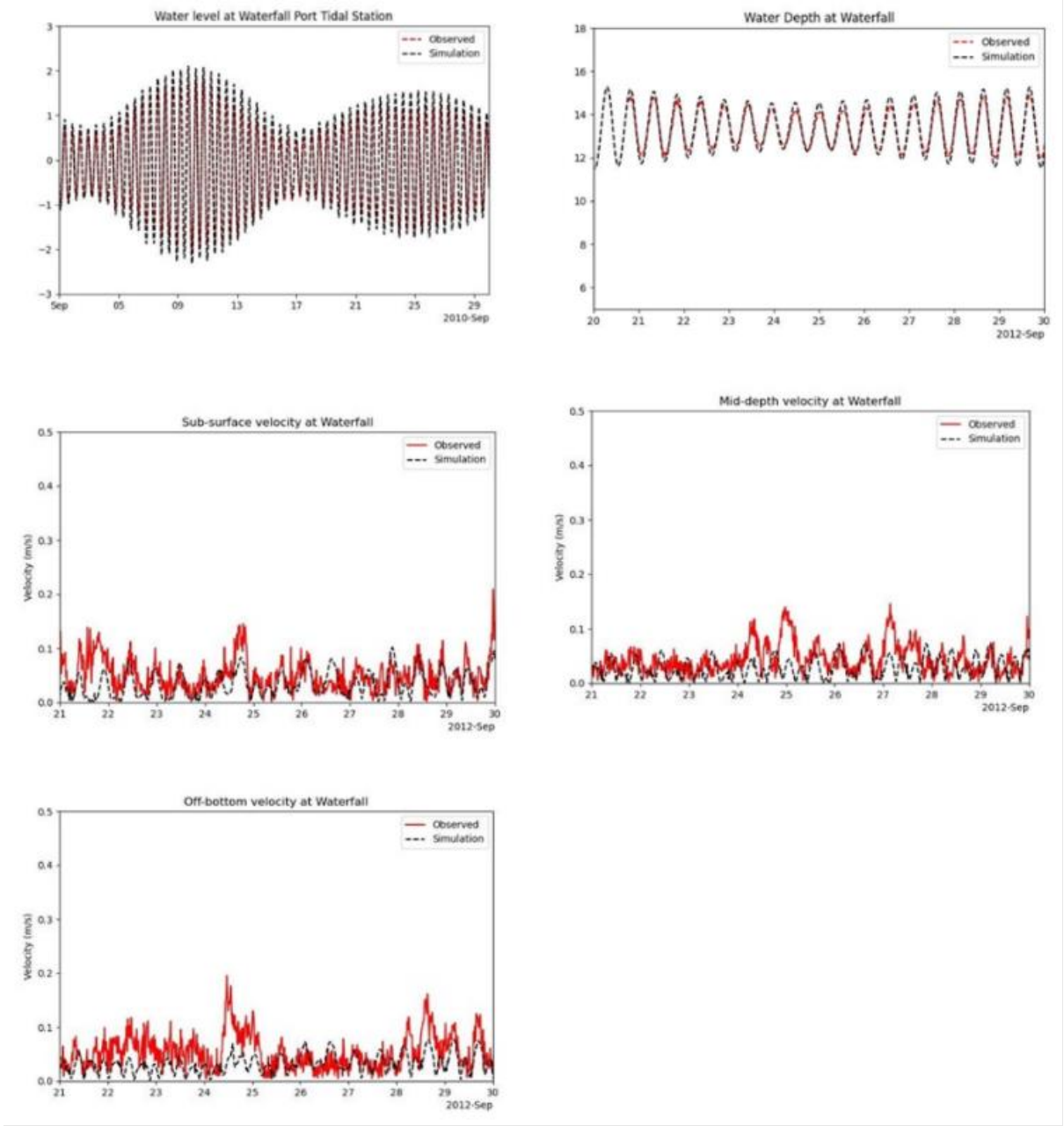
[168] Costelloe, M., Costelloe, J., O'Donohoe, G., Coghlan, N. Oonk, M. and van der Heiden, Y. 1998b. Planktonic distribution of sea lice larva, Lepeophtheirus salmonis Killary Harbour, West coast of Ireland. Journal of Marine Biological Association, U.K. 78: 853 – 874.

[169] Crosbie, T., Wright, D.W., Oppedal, F., Johnsen, I.A., Samsing, F. & Dempster, T. 2019. Effects of step salinity gradients on salmon lice larvae behaviour and dispersal. Aquaculture Environment Interactions 11: 181-190.

[170] Morton, A., Routledge, R., McConnell, A., and Krkošek, M. 2011. Sea lice dispersion and salmon survival in relation to salmon farm activity in the Broughton Archipelago. ICES Journal of Marine Science. 68: 144 - 156.

[171] Nelson, E. Robinson, S., Feindel, N., Sterling, A., Byrne, A., and Pee Ang, K. 2017. Horizontal and vertical distribution of sea lice larvae (Lepeophtheirus salmonis) in and around salmon farms in the Bay of Funday Canada. Journal of Fish Diseases. 41: 855 – 899

on tidal heights and water velocities. Most recently, TELEMAC was used to model the hydrodynamics of Bantry Bay in southwest Ireland with the outputs of the model showing very good agreement with measured current velocity data measured at different depths and variation in tidal height and water depth (see the figures below)



It can be concluded that the TELEMAC model is an effective tool for accurately modelling tidal elevation and water velocity and given that tidal forcing is by far the most important physical attribute causing water movement and the dilution and dispersion of solutes e.g., nitrogen, phosphorus and therapeutics, it is not surprising that modelled output values of such parameters are in close agreement with measured data.

Sea lice modelling

The outputs from the 3-D hydrodynamic model produce results which are in very good agreement with in-situ observations of sea lice densities across several different locations in Ireland and in other countries. This indicates that the model has effectively predicted the concentration of sea lice larvae emanating from the salmon farm. The dramatic decline in sea lice numbers as one travels away from the farm site is also consistent with empirical evidence.

Morton et al. (2011) report larval lice densities from the west coast of Canada (Broughton Archipelago) as ranging from < 0.1 m^3 - < 0.4 m^3 and state that there were no lice in samples from control sites or sites with pens but no fish. á Norði et al. (2015) present abundant data on planktonic stages of *L. salmonis* in a salmon farming region in the Faroe Islands and record densities of 0 m^3 for nauplii and 0 – 0.21 m^3 for copepodids. Nelson et al. (2017) studied the distribution of *L. salmonis* around salmon farms in the Bay of Fundy, Canada and recorded

larval densities of 1.5 m³ at the edge of the farm and 0.4 m³ 100 m away from the farm. They also recorded densities of 0.5 m³ at a reference site. Byrne et al. (2018) examined larval densities of *L. salmonis* at a salmon farm in British Columbia, Canada and record densities of c. 1 m³ both in the farm and at a reference site. Adams et al. (2021) worked on *L. salmonis* abundances in a bay with salmon farms in the northwest coast of Scotland and recorded naupliar densities ranging from 0 – c. 0.6 m³ and copepodid densities from 0 – c. 3.5 m³.

In Ireland, Costelloe et al. (1996;1998) were the first to publish data on this topic and they recorded densities ranging from c. 70 larvae/m³ within the pens, to c. 3 larvae/m³ outside the pens, to c. 1 larva/m³ 100 m away from the pens and less than 1 larva/m³ 1 km away from the farm. They speculate that currents speeds within pens is lower than the surrounding waters due to:

1. The mesh of the pens,

2. Any biofouling on the mesh

3. The concentrated biomass of the farmed fish.

The larval *Lepeophtheirus* densities recorded by Costelloe et al. (1988) are like those recorded more recently by Morton et al (2011), á Norði (2015), Nelson et al., (2017), Byrne et al., (2018) and Adams et al. (2021).

These values are relatively like one another, and they also cover a broad geographical extent ranging from the northeast to the northwest Atlantic and further west to the northeast Pacific, all these data show that outside the farm area, larval densities are low. This very much follows a simple dilution model with increased distance from the source. It is considered that because these data are so like one another and cover such a broad geographic extent, they are suitable to be used as model validation data.

As the output data of the hydrodynamic model regarding predicted larval densities fall within the range of the empirical data, it is clear therefore that the model is generating valid data. Another important reason why larval densities outside pens are low is that once the copepodid stage has been reached (which is the first potentially infective stage (Hamre et al., 2013)), the larvae can then metamorphose directly into the adult stage and infect the fish in the pens. They do not therefore have to go through the other larval stages and do not leave the pen.

Given all the above, the arguments raised by IFI regarding the impact of lice from salmon farms on wild salmonids fall are not in any way supported by numbers of sea lice larvae escaping from the farm.

MI - Further comments or requests

Whilst TELEMAC is a widely used, renowned numerical model and an application of its 3D version is appropriate in this region, it should be noted that validation plots for the currents are not presented in the EIA. The above Figures included in the response by the applicant concern a different model domain, namely Bantry Bay. There is no guarantee that the TELEMAC model of Kenmare Bay used in this EIA represents currents equally well. Reference is made to previous surveys carried out in 1990 and 1997 and statements are made that the model agrees reasonably well with the findings from those surveys. However, this statement is not supported by any figures comparing the observed currents and modelled currents at specific locations and specific stages of the tide or weather conditions. It is thus difficult to verify to what extent the modelled currents agree with those observed.

Section 3.2 of Appendix 8: A hydrographic survey of the tidal currents in outer Kenmare Bay carried out by Irish Hydrodata (Aug 1990) indicated weak tidal stream velocities throughout the outer bay area and under the slack tidal streams that characterise the outer Kenmare Bay area, the dominant influence on hydrodynamics will be meteorological conditions in respect to variable wind conditions. The mean wind condition is a 5.5m/s wind speed from the southwest. The hydrodynamic model and dispersion modelling that underly Section 8.2 Impacts on Water Quality lack wind forcing, which is an important component. It is therefore important to include wind forcing in the numerical modelling study in this area. The coastal waters in the southwest of Ireland is a region known for upwelling events. In the neighbouring Bantry Bay we do observe upwelling and downwelling events, whereby near-bed and surface waters, respectively, are transported into the bay. These events are wind-driven and the lack of wind forcing in the model is considered a serious shortcoming.

Whilst wind generated currents would likely cause quicker dispersion, i.e. more dilution and thus lower concentrations (in the context of EQS), they may at the same time transport water masses over longer distances, which is an important consideration in the sea lice dispersion study. However, wind forcing was not applied in the model underlying sea lice dispersion assessment.

With regard to local impacts, e.g. nutrient enrichment, the lack of wind forcing can be deemed acceptable, as it will result in less dispersion and thus a worse-case scenario than it will be in reality. However, as regards far field effects e.g. sea lice dispersion, then the lack of wind forcing is a shortcoming. For example, under sustained wind, a plume of water containing sea lice can be quickly transported over a large distance if sea lice are present at the surface. However, one can only speculate on the distance without measuring or modelling it. The applicant

states that "the dominant influence on hydrodynamics will be meteorological conditions in respect to variable wind forcing" and then surprisingly do not account for it in the model. This is deemed as a serious shortcoming, as the presented model may not represent hydrodynamics well. We are not presented with any validation figures that would suggest that the presented model without the wind forcing is acceptable and raises questions regarding the accuracy of the model.

Models are used to provide an estimate of risk in order for the regulators to come to a decision on the acceptability, or not, of that risk. Models therefore need to provide a close representation of the observations of the underlying processes at play and their interactions. While we conclude that it is deemed reasonable to assume that planktonic lice stages are positively buoyant (Section 6.1.1.7.2), in areas without strong haloclines, we also conclude that wind forcing then becomes a more important factor which should be included. Wind-forced surface currents could potentially transport planktonic lice stages over relatively large distances (i.e. compared to tide only) and while it may tend to disperse them over a larger area and so dilute the density in the water column we cannot rule out the possibility of it also concentrating them at near-shore areas such as the mouths of rivers and putting them into contact with migrating salmonids.

Comment on 'study carried out by the Marine Institute'.

It is unclear which 'study' performed by the Marine Institute is being referred to and what is meant by 'a physical study'. For the purpose of this report we assume that the study in question refers to work done for the AquaPlan[172] project. Within this project, a prototype disease transport model was developed and run weekly for a period of 12 months. Within the model, Lagrangian tracks (floats) were released every two hours from 23 sites over the first two days of each week and then tracked for the rest of the week with a lifespan for each float of five days. The information collected was then used to develop statistics about the overall transport of a potential generic pathogenic organism, with the aim of providing information for the development of epidemiological units. The methodology used in no way reflects the life cycle of the salmon louse and it is therefore not appropriate to use the outputs of the model to determine risk related to the spread of planktonic stages of the salmon louse from salmon farms.

6.1.1.7.1 Wind forcing

Point raised

Finally, and perhaps most pertinently, the boundary conditions used to force the hydrodynamic model, which in turn was utilised to predict lice dispersion, did not use wind data (see section 2.2 Boundary conditions and section 4.1. under 4 Water Quality Dispersion Modelling – only tidal forcing (namely tidal elevation and velocities) was specified. Specific use of Valentia wind data only appears to have been used in section 3.3, to derive extreme wind conditions with a 50-year (or greater) return interval specifically for the purposes of assessing the exposure of the fish farm to damage from extreme wave events). This is particularly troublesome when considering the ability of the model to simulate realistic lice dispersal in the region, as wind-driven surface circulation is the dominant influence on the dispersion of surface particles, including the distribution of sea lice, which tend to occur at depths of 0-4 m from the surface. In addition, the particle tracking model used lice discharge at mid-cage depth (> 4m below the surface) which is unlikely to capture the primary mode of lice dispersion, which are typically constrained to surface layers. As shown in Figure 17 of Appendix 7, the predominant wind limatology in the region is comprised of winds coming from the south-southwest-west meaning that the primary direction of surface particle dispersion from the Deenish site would be landward and greatly increase the exposure of salmonid smolts leaving river mouths to sea lice infestation. This same concern also relates to other farm-related water quality issues (soluble pollutants, nitrogen, phosphorus & BOD), all of which may compromise nearshore water quality impacting migrating salmonids and other inshore biodiversity. Before any firm conclusions can be drawn about the insignificance of fish farm lice dispersals (e.g. section 3.5.3.3), a hydrodynamic model should be presented with appropriate quantification of model performance and incorporating realistic wind-driven surface currents in this region. Some examples of the requisite scientific rigour associated with executing and validating such lice-dispersal models (and highlighting the requirement for wind-forcing data) include: Gillibrand and Willis (2007); Amundrud and Murray (2009); Salama et al. (2018); Skarðhamar et al. (2018); Asplin et al. (2020); Cantrell et al. (2021); and Murray et al. 2022.

Given some of the plausible limitations of the hydrodynamic and particle-tracking model used to predict lice dispersal listed under point 4 above, it is very likely that actual dispersal distance of sea lice from the farm could be greater than that shown in Figure 3-10 and 3-11 in Screening for Appropriate Assessment and Natura

[172] Ruane N, Geoghegan F, Rodger H, Murphy K & O Sullivan C. 2015. AQUAPLAN: Health management for finfish aquaculture (PBA/AF/08/003(01)). Marine Research Sub-Programme 2007-2013, Marine Institute, 34 pp.

Impact Statement Volume 1 – Main Report. The actual potential dispersal distance of lice in km is not directly listed but numerous studies using hydrodynamic models coupled to particle tracking or statistical models based on observed lice densities at distance from farm sources or combinations of both have shown typical lice dispersal distances from salmon farms of tens of kilometres away (see Harrington et al. 2023 and references therein). Given that the majority of these studies are based in sheltered sea lochs, fjords and coastal inlets it is highly plausible that the higher energy coastal currents around Deenish may contribute to similar lice dispersal distances of up to and beyond 10 km, with the predominant surface dispersal direction being landward toward the aforementioned salmon and sea trout rivers owing to prevailing onshore wind conditions in this region.

Points addressed by the applicant

Wind forcing may result in a more complete picture of the spatial distribution of sea lice larvae, but it will also lead to the further dilution of sea lice densities which are already well below background levels (less than 0.1 larvae/m^3) a short distance from the farm site. The same point can be made about the concentration of the water quality parameters (nitrogen, phosphorus and BOD): wind forcing is likely to result in the concentration of these parameters being further diluted.

In effect, the tidally forced model produces a more conservative view of larval densities and water quality parameters with wind forcing resulting in reduced larval densities and water quality parameter concentrations and a reduced impact of the Deenish Island salmon farm on the surrounding marine environment.

It should also be noted, as was indeed noted in the IFI document, that sea lice are capable of some form of vertical movement in the water column. It follows therefore that wind forcing will be less important if this is the case and indeed larvae have the capacity to move away from the surface layer. Furthermore, lice larvae may also become 'trapped' at discontinuities such as pycnoclines and thermoclines, which further emphasises the importance of subsurface flows, which are determined more by tidal forcing, in determining larval distributions.

MI - Further comments or requests

Issue addressed in Section 6.1.1.7.

6.1.1.7.2 Particle Tracking

Point raised

Furthermore, the fundamental premise of the particle-tracking model assumes that sea lice particles are passive ("treated as passive particles being advected and dispersed by the ambient currents"), where in reality they are not. Sea lice exhibit a vertical movement in the water column and therefore, consideration of the vertical position of sea lice in the water column is necessary in order to simulate realistic lice dispersal.

It is known that sea lice in the water column can avoid freshwater layers, move towards host fish, away from predators and are attracted to light near the surface during the day and sink away from the surface during the night. It is important to consider the active vertical behaviour of sea lice in the water column as a component of any model as it will influence dispersal where typically currents are not uniform across the water column. Assuming that sea lice are passive particles is an incorrect assumption to make and thus compromises the output of the sea lice particle tracking simulations in providing an accurate reflection of their potential dispersal in the wider area (Murray et al. 2022). Indeed, the EIA Section 6.5.3. Sea Lice states, "Copepodids have limited strategies to assist in seeking out hosts. They can dart by up to 10cm on sensing a passing host fish. They may also be able to adjust their position in the water column, sinking towards the seabed in response to the ebbing tide (geotaxis), to assist in maintaining their position and population density, close to estuaries and inshore margins, through which their target hosts migrate".

Points addressed by the applicant

The model treats the larvae as passive particles whose distribution is determined by the hydrodynamics of the three-dimensional model. Providing the particles with behavioural characteristics (i.e., the ability to vertically migrate in the water column) and life-cycle characteristics would more than likely improve the accuracy of the model in predicting the spatial distribution of larvae emanating from the farm.

However, improved modelling of sea lice behaviour is unlikely to significantly change the fundamental outputs of the model which show that relatively low source inputs of larvae from the farm are quickly diluted and

dispersed by tidal currents and reach densities that are like background concentrations observed in reference sites without salmon farms.

MI - Further comments or requests

Models need to provide a close representation of the observations while being as simple as possible to give a clear vision of the underlying processes at play and their interactions. Initially, models had treated the planktonic stages of lice as neutrally buoyant particles based on studies which showed that infestations of lice primarily occur at depths of 0m to 4m (Hevrøy *et al*., 2003[173]). These models assumed that sea lice dispersal is mainly achieved by circulation of surface water since their swimming capacity is limited compared to the horizontal advection of currents (Murray & Gillibrand, 2006[174], Amundrud & Murray, 2009[175], Jackson et al., 2012[176]). Sea lice modelling has gradually increased in complexity by incorporating a range of more realistic biological behaviours based on recent studies investigating nauplii and copepodid responses to environmental parameters (Crosbie *et al*., 2019[177], 2020[178], Szetey *et al*., 2021[179]). These studies can give new insights into how sea lice behaviour can impact dispersion patterns; however they will require further experimental studies and validation in order to determine whether they actually improve model predictions (ICES, 2020[180], Stige *et al*., 2021[181].

Studies in Norway showed a shorter dispersion distance for sea lice fixed at the surface compared to those that applied diel vertical migration (Johnsen *et al*., 2014[182]. Amundrud & Murray (2009) found that as long as sea lice experience surface circulation, introducing a diel vertical migration behaviour produced a horizontal dispersion pattern that did not differ much to the one resulting from particles transported by surface motion. Local winds were found to be the dominant influence on the dispersion patterns of the particles in this study. However, since fjordic systems in Norway and Scotland often experience stratified water and wind-driven circulation with strong current shear of surface water (Murray & Gillibrand, 2006[183], Asplin *et al*., 2014[184]), vertical migration behaviour should be considered for horizontal dispersion of sea lice in these systems.

In areas without strong haloclines it is deemed reasonable to assume that planktonic lice stages are positively buoyant maintaining themselves in surface waters (Murray *et al*., 2022[185]).

6.1.1.7.3 Migration Routes

Point raised

Further to this, no specific consideration was given to the potential migration routes and residence areas of salmon and sea trout in the wider area around the proposed operations which is a key consideration when assessing potential impacts on wild salmonids from increased sea lice loads associated with the salmon farm.

The modelling of dispersal of sea lice from Deenish as submitted by MOWI is certainly flawed as the following study carried out by the Marine Institute and MOWI demonstrated substantially different outcomes. The study demonstrates a radically different outcome, and the modelling presented in the NIS as submitted by MOWI

[173] Hevrøy EM, Boxaspen K, Oppedal F, Taranger GL & Holm JC. 2003. The effect of artificial light treatment and depth on the infestation of the sea louse Lepeophtheirus salmonis on Atlantic salmon (Salmo salar L.) culture. Aquaculture 220: 1-14.
[174] Murray, A.G. & Gillibrand, P.A. 2006. Modelling salmon lice dispersal in Loch Torridon, Scotland. Marine Pollution Bulletin 53: 128-135.
[175] Amundrud, T.L. & Murray, A.G. 2009. Modelling sea lice dispersion under varying environmental forcing in a Scottish sea loch. Journal of Fish Diseases 32: 27-44.
[176] Jackson D, O'Donohoe P, Kane F, Kelly S, McDermott T, Drumm A, Lyons K & Nolan G.. 2012. Result of an epidemiology study of sea lice infestation in South Connemara, West of Ireland. Aquaculture 364-365: 118-123.
[177] Crosbie T, Wright DW, Oppedal F, Johnsen IA, Samsing F & Dempster T. 2019. Effects of step salinity gradiants on salmon lice larvae behaviour and dispersal. Aquacultue Environment Interactions 11: 181-190.
[178] Crosbie T, Wright DW, Oppedal F, Dalvin S, Myksvoll MS & Dempster T. 2020. Impact of thermoclines on the vertical distribution of salmon lice larvae. Aquaculture Environment Interactions 12: 1-10.
[179] Szetey A, Wright DW, Oppedal F & Dempster T. 2021. Salmon lice nauplii and copepodids display different vertical migration patterns in response to light. Aquaculture Environment Interactions 13: 121-131.
[180] ICES. 2020. Working group on environmental interactions of aquaculture (WGEIA). ICES Scientific Reports 2: 112.
[181] Stige LC, Helgesen KO, Viljugrein H & Qviller L. 2021. A statistical mechanistic approach including temperature and salinity effects to improve salmon lice modelling of infestation pressure. Aquaculture Environment Interactions 13: 339-361.
[182] Johnsen IA, Fiksen Ø, Sandvik AD & Asplin L. 2014. Vertical salmon lice behaviour as a response to environmental conditions and its influence on regional dispersion in a fjord system. Aquaculture Environment Interactions 5: 127-141.
[183] Murray, A.G. & Gillibrand, P.A. 2006. Modelling salmon lice dispersal in Loch Torridon, Scotland. Marine Pollution Bulletin 53: 128-135.
[184] Asplin L, Johnsen IA, Sandvik AD, Albretsen J, Sundfjord V, Aure J & Boxaspen KK. 2014. Dispersion of salmon lice in the Hardangerfjord. Marine Biology Research 10: 216-225.
[185] Murray AG, Shephard S, Asplin L, Adams T, Ådlandsvik B, Gallego A, Hartnett M, Johnsen IA, Jones SRM, Moriarty M, Nash S, Pert CC, Rabe B & Gargan PG. 2022. A standardised generic framework of sea lice model components for application in coupled hydrodynamic-particle models. In Sea Lice Biology and Control, J. Treasurer, I. Bricknell & J. Bron (Eds). 5M Books, Great Easton, p 167-187.

should be viewed as unreliable and misleading. It should be noted that the Marine Institute study is a physical study rather that a computer-generated study.

Points addressed by the applicant

IFI note that no specific consideration was given to the potential migration routes and residence areas of salmon and sea trout in the wider area around the proposed site.

Regarding returning salmon, it is thought that the fish seek out the scent of their nascent rivers. In the Kenmare River area, the Coriolis effect will cause plumes from rivers that enter the bay to try to flow in a northerly direction. The three rivers that enter via Ballinskelligs Bay (Emlaghmore, Inny and Currane/Waterville) will initially travel in an anticlockwise direction and then head northwards once past Bolus Head and thereby have no interaction with the site at Deenish. Plumes of rivers on the south shore of Kenmare Bay e.g., the Cloonee, will flow northwards across the bay and deflect westwards before turning to the northwest at Lamb's Head and thereby have no interaction with the Deenish site. The rivers that enter the bay on its north shore will flow westwards before also turning to the northwest at Lamb's Head and thereby have no interaction with the Deenish site.

Returning salmon will therefore not pass close to the Deenish site. Departing adult salmon and smolts are thought to follow the plumes of their nascent river and move out into deeper water off the coast as quickly as possible. For this reason, they will therefore not pass close to the Deenish site and even if they did, the likelihood of the fish interacting with larval lice is considered as being very low given the low densities of larvae in the water at distance from the fish farm.

Sea trout are considered to have relatively shorter migration patterns than salmon and are thought to stay close to the mouths of their nascent rivers, or typically inhabit the coastal environment during their marine phase (see IFI document, p.7, end of para. 3).

MI - Further comments or requests

Although marine survival can vary between years and regions, many Atlantic salmon populations in the North East Atlantic area are currently recording record low numbers of returning adult salmon to their rivers (ICES, 2021[186]). This has led to an increased research focus on the salmon post-smolt life stage and migration trajectories at sea however data on marine distribution of salmon is limited in Ireland, although a number of possible feeding and migration routes have been inferred through recaptures at sea. The trends in return rates for one sea winter salmon populations in the North East Atlantic area (of which Irish salmon rivers are a significant contributor) are declining and currently at record low levels ranging between 3-6% in recent years in comparison to 14% in the 1980's, as reported by ICES. In general, progression through rivers and estuaries is fast with timing and speed of movement into coastal waters varying only marginally between regions (Barry et al., 2020[187], Lilly et al., 2024[188]). Subsequent movements away from inshore coastal regions to the open ocean are poorly understood with limited empirical research data available. The current literature suggests that post-smolts travel in small groups and remain close to the surface where they are strongly influenced by environmental conditions such as wind and currents. There are very few empirical studies of salmon post-smolt migration in Ireland however inferences can be made from recent studies undertaken in the Irish Sea, and Clew Bay on the west coast of Ireland. Mortality levels during the outmigration period can be high, with in river mortality levels of 18% for the River Bann and 23% for the Castletown River (Barry et al., 2020). In the Burrishoole system on the west coast of Ireland, the overall percentage survival was 63% for wild smolts and 58% for hatchery smolts, in studies performed between 2017-18 (Doogan et al., 2023[189]). An additional study performed between 2020-2022 (Waters et al., 2024[190]), showed that of 217 salmon smolts tagged and released, only 175 were successfully detected on one or more estuarine receivers beyond the lake exit of Lough Furnace. In a study of Atlantic salmon post-smolts entering the Irish Sea from rivers in Northern Ireland, Scotland and England, overall minimum migration success ranged from 6% to 95% (Lilly et al., 2024). These studies proposed that the most likely source of mortality during the early phase of outmigration was predation (in addition to any possible tagging mortality). These studies also provide strong evidence that smolts progress quickly from the coast into deeper offshore waters with reported speeds, from the various studies, ranging

[186] ICES. 2021. Working group on North Atlantic Salmon (WGNAS). ICES Scientific Reports 3:29. 407 pp.
[187] Barry, J. et al. 2020. Atlantic salmon smolts in the Irish Sea: first evidence of a northerly migration trajectory. Fisheries Management and Ecology 27: 517-522.
[188] Lilly, J. et al. 2024. Migration patterns and navigation cues of Atlantic salmon post-smolts migrating from 12 rivers through the coastal zones around the Irish Sea. Journal of Fish Biology 104: 265-283.
[189] Doogan, A. et al. 2023. Partitioning survival during early marine migration of wild and hatchery-reared Atlantic salmon (*Salmo salar*) smolts using acoustic telemetry. Animal Biotelemetry 11: 39.
[190] Waters, C. et al. 2024. The use of predator tags to explain reversal movement patterns in Atlantic salmon smolts (*Salmo salar*). Journal of Fish Biology (in press).

from 7 km/d up to 40 km/d. Doogan et al. (2023) proposed that the migrating smolts follow the strongest currents out of Clew Bay through the channel north of Clare Island in order to take the most direct route out of the bay towards feeding grounds to the north. It has been suggested that salmon may be drawn to fish farms encountered on their seaward migration, where predators can also accumulate. However, Doogan et al. (2023) found that smolts showed no preference for the route closest to the fish farm receiver and there was no evidence that the presence of the fish farm significantly impacted movements to Clare Island. A collaborative study across multiple jurisdictions (Lilly et al., 2023) has shown that post-smolts from Clew Bay (and possibly by inference, any smolts from the western coast of Ireland), did not migrate through the Minch waters (between mainland Scotland and the Outer Hebrides) but most likely migrated broadly west in the waters between the Hebridean islands and the island of Ireland, thus avoiding the aquaculture zone along the west coast of Scotland.

It is therefore possible to hypothesise that post-smolts from Kenmare Bay will migrate through the Bay quickly, not be attracted to the farm at Deenish and also not be exposed to salmon louse copepodids emanating from farms along their migration route up the West coasts of Ireland and Scotland.

6.1.1.8 Sea Lice Monitoring

Point raised

Concerns and deficiencies in regard to proposed sea lice monitoring

In Section 3.8 Mitigation in the Screening for Appropriate Assessment and Natura Impact Statement Volume 1 it is stated that, “Habitats Directive Annex II Species salmon maybe [sic] affected by the proposed farm through lice infestation, disease spread and the introduction of therapeutants…. the breaking of disease and parasite life cycles with the effect of enhancing the efficacy of lice control and reducing the overall incidence of disease in the stocks and the use of therapeutants, thereby reduces) risks to wild population of salmon.”

The consultation documentation sets out the envisaged sea lice monitoring and control protocols for the proposal which is based on the standard existing lice monitoring and control protocols used already in salmon farms in Ireland with some minor additional sampling proposed by the applicant. The code of practice for this pest control is not, in the view of IFI, adequately robust to ensure the protection of wild sea trout and salmon smolts from sea lice emanating from the salmon farm. The applicant is requesting a licence for a substantial increase in existing salmon farm production over the original licence and therefore, we consider that the total level of stocking and production should be the key consideration when assessing lice loads in relation to determining treatment trigger levels in the context of their consequent risks to wild salmonids rather than using an average measure of lice levels on the farmed salmon to make such determinations. The North Atlantic Salmon Conservation Organisation (NASCO) developed ‘Guidance on Best Management Practices to address impacts of sea lice on wild salmon stocks’ in 2009 (NASCO 2009). This guidance was intended to supplement previous NASCO resolutions and to assist the Parties and jurisdictions in managing salmon aquaculture. The NASCO international goal is that 100% of farms are 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. This is not clearly demonstrated in the consultation documentation. Ireland is a member of NASCO through its membership of the European Union and is required to demonstrate progress at achieving this international goal through setting out specific associated actions in five-year Implementation Plans, the progress and achievement of which is reported on via Annual Progress Reports.

Indeed, the guidance notes that, “Lice control management programmes” should be “appropriate to the number of fish in the management area”. Further to this, the review of Ireland’s Implementation Plan found that the standard existing lice monitoring and control protocols used already in salmon farms in Ireland to attempt to fulfil the NASCO goal is, “is not specific in protecting wild salmon” and “it is not clear…how this action will enable progress towards achievement of the goals for effective sea lice management” to ensure wild salmonids are protected. Indeed, we consider that to properly evaluate ongoing risks to wild salmonids, a sampling programme focused on wild salmonids in the vicinity of fish farms would be a necessary approach to comply with these NASCO obligations and focusing solely on the lice levels in farms and inadequate fallowing periods is wholly insufficient in this regard. This is supported in the review of the Implementation Plan which “recommended that such monitoring also takes place on wild salmonid populations”, as also outlined in NASCO goals.

Points addressed by the applicant

Monitoring Protocol No.3 for Offshore Finfish Farms – Sea Lice Monitoring and Control by the Department of Marine and Natural Resources, is the minimum requirement for sea lice monitoring on salmon farms. In

practice, Mowi Ireland monitors sea lice weekly in all pens, which is not minor additional sampling as alleged. A minimum of 20 fish per pen is sampled and all stages of sea lice present are counted. Management decisions are based on numbers of all adult females and not on the subset of egg bearing females which is the trigger for treatment in the above referenced protocol.

MI - Further comments or requests

Monitoring of salmon lice infestation levels on marine salmonid farms in Ireland was first initiated on an experimental basis in 1991. Monitoring of selected sites continued in 1992 and was increased in intensity and extent in 1993. The purpose of the initial monitoring was to obtain an objective assessment of infestation levels on farms and to provide scientific information on the nature of these infestations. Since 1994, monitoring has been carried out in accordance with the recommendations of the Sea Trout Task Force and its successor body, the Sea Trout Management Advisory Group. In 2000, the monitoring programme was formally adopted as one of a number of Monitoring Protocols (Monitoring Protocol 3 – Sea Lice Monitoring & Control) and an integrated approach to sea lice control was further developed with the publication in 2008 of the Strategy for Improved Pest Control on Irish Salmon Farms.

The Irish sampling strategy was developed through a consultation process with national and international experts in the field. It has been refined and modified as a result of the recommendations of the Sea Trout Working Group, Sea Trout Task Force and the Sea Trout Management Advisory Group. The resulting programme meets the exacting scientific requirements of a national monitoring programme and the diverse concerns of sectoral interests, as expressed through various Ministerial committees and through direct representations. The current sampling strategy:

- Provides a robust and reliable objective measure of salmon lice numbers.
- Operates within a framework which is cost effective and flexible to operate over a range of active farms.
- Takes account of weather conditions, fish health and welfare considerations.

The sea lice monitoring programme was also considered as part of a legal complaint to the EU Commission (EU Pilot Case 764/09/ENV) which was closed in favour of the State with the commission stating that they were satisfied that the Irish authorities are adequately addressing issues, including the national sea lice monitoring programme.

Most of the major Atlantic salmon farming countries have a sea lice monitoring programme in place and the setting of appropriate treatment triggers is an integral component of all monitoring programmes. Although variations exist within each programme, they are all based on estimating the abundance of sea lice on each farm i.e. the number of salmon lice per fish. A comparison of trigger levels in each country shows that the trigger levels in Ireland are comparable to those used in all other monitoring programmes. In addition, Ireland is one of only two countries to have an independent monitoring programme in place.

The applicant states that they perform their own in-house salmon lice monitoring with a lower threshold for treatment, demonstrating a commitment to go beyond current licence conditions. This is reflected in low level of salmon lice recorded by the national Sea Lice Monitoring Programme at the site (see Section 5.2.4).

6.1.1.9 Sea lice impacts on wild salmonids

Point raised

IFI have specific concerns in relation to the lack of sufficient consideration given in the EIA and NIS to the issue of potential impacts of sea lice associated with salmon farming on wild Atlantic salmon and sea trout stocks and consider that this is not at all adequately assessed in either document. The consultation documentation states that, “Evidence suggests that sea lice induced mortality has an impact on Atlantic salmon returns, which may impact the achievement of conservation limits in salmon rivers” and concludes that, “Consequently it can be concluded that the proposed operations at the site are unlikely to result in significant impact in sea lice infestations in wild salmon populations; consequently there will be no likely significant direct effects to the Qualifying Feature salmon and no likely significant indirect effects to the Qualifying Feature freshwater pearl mussel” principally as a result of the proposed mitigation measures to control sea lice on the farm. IFI consider that the consultation documentation provides a very limited, unbalanced and wholly inadequate synopsis and evaluation of the extensive relevant peer-reviewed and published scientific literature available, the vast majority of which support that sea lice emanating from fish farms have the potential to be detrimental to wild salmonids stocks. Due to the potential consequences for the sustainability of wild salmonid stocks in the region

around the proposed operation, many of which are in a vulnerable state, it is recommended that comprehensive evaluation of the extensive evidence already available should have been undertaken.

The consultation documentation primarily relies on selected extracts from the eight-year-old ICES (2016) WKCULEF report to support the conclusions made. There is a paucity of critical or objective appraisal apparent in the context of the wider literature now available in order to make a comprehensive, more balanced and objective assessment of the potential effects on wild salmon stocks from increased sea lice loads that may arise as a consequence of the proposed farm operation. Indeed, the ICES (2016) WKCULEF report also states that it is, "also true that a small incremental increase in marine mortality due to sea lice (or any other factor) can result in losses of salmon abundance that are relevant for fisheries and conservation management". Furthermore, the consultation documentation relies heavily on Jackson et al. 2013 through its citations in the ICES (2016) WKCULEF report as its principal source to provide doubt as to the impacts of sea lice associated with salmon farming on wild salmon stocks. Indeed, Krkošek et al. (2014) [*Comment on Jackson et al. 'Impact of Lepeophtheirus salmonis infestations on migrating Atlantic salmon, Salmo salar L., smolts at eight locations in Ireland with an analysis of lice-induced marine mortality' Journal of Fish Diseases*] noted that there are methodological errors in the Jackson et al. (2013) paper which contented that sea lice play a minor, perhaps even negligible, role in salmon survival. Krkošek et al. (2014) states, "Our foregoing reanalyses depart substantially from those reported and interpreted by Jackson et al. (2013), and in their previous publications that utilized the same data (Jackson et al. 2011a,b). Whereas they assert that sea lice cause 1% of mortality in Atlantic salmon, the correct estimate is actually a one-third loss of overall adult recruitment. To further illustrate, if, in the absence of parasites, final adult recruitment is 6% of smolt production, then the effect of parasite mortality reduces that recruitment to 4%. According to interpretations used by Jackson et al. (2013), that is a change of 2%, which we agree is a small number. However, the realized effect is that it reduces the abundance of adult spawners returning to a river from, say, 6000 down to 4000; this one-third loss of salmon returns could have significant conservation or fishery implications". Indeed, Jackson et al. (2013) in their own paper did find that sea lice-induced mortality on outwardly migrating smolts can be significant, and found an odds ratio of 1.14:1, which equates to a 12.3% decrease in returning adult salmon due to sea lice infestation from local salmon farms.

In the Irish context, a number of key studies on the impact of sea lice from marine salmon farms on wild salmon have been published. In a study in the Erriff river, Gargan et al. (2012) demonstrated that hatchery salmon smolts treated against sea lice infection were 1.8 times more likely to return than control fish, with a 44.4% mortality of untreated salmon. The results suggested that sea lice induced mortality can significantly negatively impact adult salmon returns and that sea lice larvae emanating from salmon farms may influence individual survivorship and population conservation status of wild salmon in Irish rivers. Shephard and Gargan (2017) used a 26-year record from the Erriff River to evaluate the contribution of sea lice from salmon aquaculture to declining returns of wild one-sea-winter (1SW) salmon. Statistical models suggested that wild salmon returns were >50% lower in years following high lice levels on nearby salmon farms during the smolt out-migration. Shephard and Gargan (2020) showed that wild Atlantic salmon exposed to sea lice from aquaculture in Ireland had a reduced marine survival and modified response to ocean climate. Annual counts of 1SW fish were studied from ten rivers in Ireland, including five "control" systems without salmon aquaculture. Rivers with aquaculture showed lesser returns (mean 33%, range 19–46%) in years following high lice levels on nearby salmon farms. These published studies in Ireland contradict the conclusions in the NIS and EIA that farm origin lice are very unlikely to impact on wild salmon smolts migrating through areas of salmon aquaculture and further highlight the wholly inadequate assessment made in the consultation documentation to reach the conclusions made that significant impacts are unlikely.

A synopsis of some of the relevant published peer-reviewed literature to support the potential for impacts of increased sea lice loads associated with salmon farming on migratory salmonid stocks is provided below. Although not a qualifying species under the Habitats Directive, the additionally presented studies focusing on sea trout are also relevant to provide an indication of the likely potential effects to wild salmon due to their similar biology and life histories as salmon, and indeed sea trout may be particularly susceptible to such effects as they typically inhabit the coastal environment during their marine phase.

- Shephard, S. and Gargan, P. (2021). System-specific salmon louse infestation thresholds for salmon farms to minimize impacts on wild sea trout populations. Aquacultural Environment Interactions, 13: 377-388.
  - Main finding: Salmon farm louse production in spring can have a strong system-specific regulating effect on wild sea trout populations. Regulations relying on a generic louse threshold to trigger treatment are not sufficient to protect sea trout populations — stocking density and site characteristics must be considered to evaluate system-specific infestation pressure and impacts on wild salmonids.

- Shephard, S. and Gargan, P. (2020). Wild Atlantic salmon exposed to sea lice from aquaculture show reduced marine survival and modified response to ocean climate. ICES Journal of Marine Science, 78: 368–376.
  - Main finding: Examined annual counts of on-sea-winter salmon from ten rivers in Ireland, including five "control" systems without salmon aquaculture. Most counts showed a downward trend, consistent with declines in Atlantic salmon populations. Rivers with aquaculture showed lesser returns (mean 33%, range 19–46%) in years following high lice levels on nearby salmon farms.
- Gargan, P.G., Shephard, S. and MacIntyre, C. (2017). Assessment of the increased mortality risk and population regulating effect of sea lice (Lepeophtheirus salmonis) from marine salmon farms on wild sea trout in Ireland and Scotland. In: (Harris, G, ed.) Sea Trout: Science & Management. Proceedings of the 2nd International Sea Trout Symposium, pp. 507–522.
  - Main finding: Undertook an assessment of the increased mortality risk and population regulating effect of sea lice from marine salmon farms on wild sea trout in Ireland and Scotland in relation to the mortality risk thresholds used to assess potential impacts on wild salmonids of salmon aquaculture in Norway. Analysis of this large international sea trout dataset from Ireland and Scotland revealed levels of lice infestation on sea trout that imply increased mortality risk in the early years of monitoring in both countries. Lice loads on sea trout have reduced in recent years, likely reflecting improved lice control and changes in salmon farming practice. Results reveal that the likely sea trout population regulating effect of sea lice varied among locations; with many sites recording lice levels likely to result in strong population regulating effects over a prolonged period, particularly in the west of Ireland.
- Shephard, S. and Gargan, P.G. (2017). Quantifying the contribution of sea lice from aquaculture to declining annual returns in a wild Atlantic salmon population. Aquacultural Environment Interactions, 9: 181–192.
  - Main finding: A 26-year study from the Erriff River to evaluate the contribution of sea lice from salmon aquaculture to declining returns of wild one-sea-winter salmon. Statistical models suggested that returns were >50% lower in years following high lice levels on nearby salmon farms during the smolt out-migration.
- Gargan, P.G., Kelly, F.L., Shephard, S., and Whelan, K.F. (2016). Temporal variation in sea trout (Salmo trutta L.) life history traits in the Erriff river, Western Ireland. Aquacultural Environment Interactions, 8: 675–689.
  - Main findings: analysed a 20 year time series (1985−2004) using 15 sea trout population response variables. Over this period, important life history changes were observed. The most dramatic of these changes corresponded with the period immediately after the commencement of salmon farming in the local estuary, with significant decreases in the number and length of sea trout kelts, the estimated number of eggs deposited, the sea trout rod catch, the proportion of older (1+ and 2+ sea age) fish and the frequency of repeat spawners. A significant positive relationship was found between the number of salmon lice in the local salmon farm and the number of lice found on sea trout collected contemporaneously in local rivers.
- Shephard, S., MacIntyre, C., and Gargan, P.G. (2016). Aquaculture and environmental drivers of salmon lice Lepeophtheirus salmonis infestation and body condition in sea trout (Salmo trutta L.). Aquacultural Environment Interactions, 8: 597–610.
  - Main findings: 25 year dataset was collated comprising lice counts from > 20 000 sea trout sampled from 94 separate river and lake systems in Ireland and Scotland at varying distances from marine salmon farms. Sea trout captured closer to salmon farms had significantly higher levels of lice infestation, and that this effect was exacerbated in warmer years. Sea trout sampled closer to salmon farms also had significantly reduced weight at length (impaired condition), with the strongest impact in dry years.
- Gargan, P.G., Forde, G., Hazon, N., Russell, D.J.F. and Todd, C.D. (2012). Evidence for sea lice-induced marine mortality of Atlantic salmon (Salmo salar L.) in western Ireland from experimental releases of ranched smolts treated with emamectin benzoate. Canadian Journal of Fisheries and Aquatic Sciences, 69: 343–353.
  - Main findings: Hatchery salmon smolts treated against sea lice infection were 1.8 times more likely to return than control fish, with a 44.4% mortality of untreated salmon. The results suggested that sea lice induced mortality can significantly negatively impact adult salmon returns and that sea lice larvae emanating from salmon farms may influence individual survivorship and population conservation status of wild salmon in Irishrivers.

- Krkošek, M., Revie, C.W., Gargan, P.G., Skilbrei, O.T., Finstad, B. and Todd, C.D. (2013). Impact of parasites on salmon recruitment in the Northeast Atlantic Ocean. Proceedings of the Royal Society B, 280: 20122359.
  - Main findings: A meta-analysis concerning the influence of parasitism by crustaceans on the marine survival of Atlantic salmon. The data include 24 trials in which tagged smolts (totalling 283 347 fish; 1996–2008) were released as paired control and parasiticide-treated groups into 10 areas of Ireland and Norway. All experimental fish were infection-free when released into freshwater, and a proportion of each group was recovered as adult recruits returning to coastal waters 1 or more years later. Treatment had a significant positive effect on survival to recruitment, with an overall effect size (odds ratio) of 1.29 that corresponds to an estimated loss of 39 per cent of adult salmon recruitment.
- Gargan, P.G., Tully, O. and Poole, R. (2003). The Relationship Between Sea Lice Infestation, Sea Lice Production and Sea Trout Survival in Ireland, 1992-2001. In: Salmon on the Edge (ed. D. Mills), pp. 119–135. Blackwell Science, Oxford, UK.
  - Main findings: Found a statistically significant relationship between lice infestation on sea trout and distance to the nearest salmon farm in Ireland over a 10 year period, with highest infestations and variation in infestation seen close to fish farms and showed that sea lice associated with salmon farming can affect sea trout stocks up to 30km from the farms. It showed a significant negative relationship between sea trout survival and the level of lice infestation. The results indicated that sea lice from marine salmon farms were a major contributory factor in the sea trout stock collapse observed in aquaculture areas in the west of Ireland.
- Tully, O. Gargan, P.G., Poole, W.R., and Whelan, K.F. (1999). Spatial and temporal variation in the infestation of sea trout (Salmo trutta L.) by the caligid copepod Lepeophtheirus salmonis (Kroyer) in relation to sources of infestation in Ireland. Parasitology 119: 41−51.
  - Main findings: demonstrated that the presence of salmon farms significantly increased the level of sea lice infestation on sea trout post smolts in Ireland.
- Thorstad, E.B., Todd, C.D, Uglem, I., Bjørn, P.A, Gargan, P.G, Vollset, K.W., Halttunen, E., Kålås, S., Berg, M. and Finstad, B. (2015). Effects of salmon lice Lepeophtheirus salmonis on wild sea trout Salmo trutta—a literature review. Aquacultural Environment Interactions, 7: 91–113.
  - Main findings: An international review of over 300 papers. In an extensive review of the impacts of the salmon louse on sea trout, it was concluded that salmon farming increases the abundance of salmon lice in the marine habitat, and there is extensive published evidence that salmon lice in intensively farmed areas have negatively impacted wild sea trout populations by increasing marine mortality, changes in migratory behaviour, reduction of marine growth and reduced population sizes. This review paper also reviews literature on the impacts to wild salmon and finds that mortality attributable to salmon lice can lead to an average of 12−29% fewer salmon spawners.

The studies reviewed demonstrate that salmon farming increases the abundance of salmon lice in the marine habitat and there is extensive published evidence that salmon lice in intensively farmed areas have negatively impacted wild sea trout populations. The effects of salmon lice on sea trout include increased marine mortality, changes in migratory behaviour, reduction of marine growth of individual fish, and reduced population sizes.

These conclusions are based on:

(1) Studies of salmon lice impacts on individual sea trout in laboratory and field studies documenting host tissue damage, osmoregulatory dysfunction and other physiological stress responses, reduced growth, and increased susceptibility to secondary microbial infections and reduced disease resistance.

(2) Documentation of premature return to fresh- water of sea trout carrying high levels of salmon lice. Premature return may facilitate individual survival and recovery from infestation in the short term, but does compromise growth potential, and thereby future fecundity, as well as impairing the immune defence system;

(3) Catch statistics and routine population monitoring utilizing in-river traps that have indicated changes in population abundance, age structure and altered life history characteristics in association with the onset and development of salmon farming in the adjacent environment;

(4) Monitoring of salmon lice levels on wild fish in relation to spatiotemporal variation in salmon farming intensity and biomass production;

(5) Indications of population-level effects on sea trout derived from monitoring of salmon lice levels on wild fish in relation to experimentally determined threshold levels known to induce physiological compromise and mortality of individual fish.

- Thorstad. E.B. and Finstad, B. (2017). Impacts of salmon lice emanating from salmon farms on wild Atlantic salmon and sea trout. Norwegian Institute for Nature Research (NINA), 13 pp.

https://wildfish.org/wpcontent/uploads/2022/06/Thorstad-Finstad-2017-Summary-of-impacts-of-salmon-lice.pdf

- Summary: "Results from scientific studies on the impacts of salmon lice on Atlantic salmon and sea trout are summarized here. Considerable evidence exists that that there is a link between farm-intensive areas and the spread of salmon lice to wild Atlantic salmon and sea trout. Several studies have shown that the effects of salmon lice from fish farms on wild salmon and sea trout populations can be severe, ultimately reducing the number of adult fish due to salmon lice induced mortality, resulting in reduced stocks and reduced opportunities for fisheries. Depending on the population size, elevated salmon lice levels can also result in too few spawners to reach conservation limit."

In addition to the above, the prevalence of another fish louse *Caligus elongatus* in this area and its impact on wild and farmed salmon and wild sea trout is another risk factor for wild salmonids. Research activity on *C.elongatus* , in relation to its impact on wild salmonids in marine waters, which is challenging to investigate due to the parasite's life history and mobility, is increasing. Nonetheless, the precautionary principle should apply given the risks posed by the presence of a likely *C. elongatus* reservoir in the form of a large marine finfish installation.

As stated previously, IFI consider the EIA and NIS provide a very limited, unbalanced and wholly inadequate synopsis and evaluation of the extensive relevant peer-reviewed and published scientific literature available, some of which is presented above.

In the Screening for Appropriate Assessment and Natura Impact Statement Volume 1, it is stated that its purpose, "is to provide the competent authority (DAFM) the necessary information required to conduct the AA and determine in view of best scientific knowledge, and in the view of the Conservation Objectives of the site, whether the proposed project, either individually or in combination with other plans and projects is likely to have a significant effect on a Natura 2000 site and, where necessary, to ascertain whether any such effect would adversely affect the integrity of Natura 2000 sites." In addition, EC (2021). Commission notice. Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC advises that, "The assessment must be based on the best available scientific knowledge in the field. This means that the information must be complete and up-to-date." Furthermore, the European Union's Environmental Impact Assessment Directive aims to ensure that projects that are likely to have a significant impact on the environment are identified and assessed, within an appraisal process, before these projects proceed to development. Under Article 3 the 2011 Directive an EIA process must identify, describe and assess likely effects (positive and negative) of a proposed development on among other elements, fauna and flora which includes wild salmonids. It is considered that the wholly inadequate assessment of the impact of sea lice from salmon farms on wild salmonids made in this NIS and EIA as outlined above fails to meet the stated objectives of the NIS (and indeed fulfil the official scope provided in standard guidance documents for the preparation of NISs) and the requirements of the EU Environmental Impact Assessment Directive.

Points addressed by the applicant

In paragraph 1 of the IFI submission document, it is noted that there is no reference to a large volume of peer reviewed scientific publications that "clearly" demonstrate that salmon farm origin sea lice can play an important role in causing large increases in marine mortality of salmon and sea trout stocks. The IFI document fails to reference literature that demonstrates the opposite e.g., Costelloe et al. 1995, 1996a, 1996b, 1988a and 1998b.

The IFI documents states (p.6 para.1) that "the consultation documentation provides very limited, unbalanced and wholly inadequate of the relevant peer reviewed and public scientific literature available, the vast majority of which support that sea lice emanating from fish farms have the potential to be detrimental to wild salmonid stocks" and on pages 7 - 10, provides a list and a summary of the findings of each of 12 publications.

As previously pointed out, the IFI document chooses to ignore publications that present larval sea lice density data at distance from the farm and biasedly only quote papers that suits its opinion.

On p.10, para. 3, the IFI document refers to another louse, *Caligus elongatus*. However, the IFI document fails to note is that the behaviour of *Caligus* is extremely different to that of *Lepeophtheirus salmonis*. This is because *L. salmonis* is a specialist salmonid ectoparasite and has only been recorded on 4 non-salmonid taxa while *C. elongatus* has been recorded on ca 80 taxa including elasmobranchs and teleosts (Kabata, 1979; Revie et al., 2002). *Lepeophtheirus* adults stay attached to salmon for most of their lives whereas Caligus adults arrive on farms in swarms and then depart after a short period of time. Their impact therefore on *host* fish is of a far lower impact than *L. salmonis*.

The submission by Inland Fisheries Ireland largely relates to the topic of sea lice levels on farmed salmon and the transmission of sea lice on farmed salmon to wild salmon and sea trout, particularly sea trout. This topic of discussion is now more than three decades old and first arose in Ireland after the well documented collapse of

sea trout populations in river systems throughout the west of Ireland. It should be noted that prior to the sea trout collapse in the west of Ireland there were no measurements of sea lice levels on farmed salmon. These measurements commenced in 1991 and many observers subsequently retrospectively associated the sea trout collapse with lice levels on farmed salmon. Editors of peer reviewed articles allowed this retrospection to flourish. A number of peer reviewed articles proved controversial, and this controversy was largely associated with the interpretation of the results of return rates of reared salmon control groups and groups treated with therapeutants against infestation with sea lice. Basically, opposed viewpoints argued for and against the interpretation of the results with one argument relating the differences in survival to the numbers of smolt released and the other relating differences in survival to the numbers of adult fish returning. What is clear is that for both arguments and release groups, more than 95% of test / control fish suffered mortality and there was a general failure to look at this bigger picture.

When it comes to the bigger picture with respect to salmon aquaculture, Ireland is rarely referenced in the same terms as Scotland and Norway. The bulk of the scientific literature relating to impacts of salmon aquaculture on wild salmonids emanates from these countries.

Accordingly, relevant issues are addressed in a supplement to this document (Appendix 1).

With regard to Atlantic salmon most rivers throughout the British Isles have witnessed a decline in smolt to 1SW adult return from in the region of 20% during the 1980s to 5% and similar rates of decline (albeit with lower percentages) have been witnessed for MSW fish.

Should we expect that sea trout return rates would differ from the above? The fish counter information for Waterville indicates that the number of sea trout entering the Cummeragh River system during the mid-1990s was in the region of 30,000 fish. That number, for the years 2015-2022 is less than 5000. Other river systems in Ireland e.g. the River Erriff in Co. Mayo has shown high variation in annual sea trout counts during the years 1986-2022 while another river system in Co. Mayo, the Burrishoole, has more or less lost its sea trout population with the numbers of sea trout smolt counted downstream and sea run counted upstream each year more or less flatlined.

It would be useful to have a concerted effort undertaken to assess the reduced survival of salmon and sea trout in river systems throughout Ireland and to tease out whatever differences may be apparent between river systems.

Ireland currently has technical expert groups for European eel and Atlantic salmon. The Technical Expert Group on Eel (TEGE) has been in existence since 2010 and was formerly known as the Standing Scientific Committee on Eel and since 2017 as the Technical Expert Group on Eels which reports on eel matters to the north-south standing scientific committee on inland fisheries (NSSSCIF). The Technical Expert Group on Salmon (TEGOS) also reports to the North South Standing Scientific Committee for Inland Fisheries (NSSSCIF) and has been in existence for many years.

A Sea Trout Working Group (1993-1995) reported to the Minister for the Marine, Marine Institute, Fisheries Research Centre, Abbotstown, Co. Dublin during these years. However, there has not been a 'technical expert group' deliberating on sea trout matters in Ireland since those years. Inland Fisheries Ireland participates in both the TEGE and TEGOS.

Inland Fisheries Ireland initiated Currane STAMP in 2019 (as reported in The Irish Times (23 Dec 2019)) as follows:

• An assessment and monitoring project entitled Currane Stamp has commenced in the Lough Currane catchment in Waterville, Co Kerry to identify factors contributing to the decline of sea trout populations.

• Research staff will use traditional techniques to examine aspects of sea trout ecology while habitat surveys will map important spawning and nursery areas. Electrofishing will also be conducted to assess juvenile fish population trends against previous studies.

• Tracking the movement of juveniles tagged with acoustic tags is already under way in Ballinskelligs Bay and the Currane system with a view to uncovering their freshwater movement and inshore migratory routes.

• The research will be co-ordinated and conducted from Met Éireann's Valentia Observatory in Cahersiveen where Inland Fisheries Ireland (IFI) research officer Ryan Murray will be based and supported by local fisheries staff.

• In addition to sea trout assessment, the team will work on a salmon-monitoring plan to determine if population trends between the two species are related. At the time of writing, no information relating to IFI's Currane STAMP is available on **www.fisheriesireland.ie**

Lough Currane sea trout

There is a long history of sea trout investigations on Lough Currane and all of those investigations are referenced in Fahy and Rudd (1988). Fahy (1980) reported on an analysis of rod caught sea trout on Lough Currane during the years 1973-1974.

Subsequently, Fahy and Rudd (1988) examined a total of 1191 sea trout taken on rod and line during the months of July and August in the years 1980-1986, inclusive.

The following is a summary of their findings:

Table 1 Summary of sea age groups recorded among rod caught sea trout on Lough Currane during the years 1980-1986

Year	Number	%0SW	%1SW	%PS
1980	214	33.6	50	16.4
1981	340	82.1	10.2	7.7
1982	108	59.2	24.8	16
1983	86	93.9	2.3	3.8
1984	88	70.9	17.5	11.6
1985	183	78.7	12.1	9.2
1986	172	64.3	24.6	11.1
Mean		69.0	20.2	10.8
SE		7.33	5.8	1.7
95% C.I.		17.9	14.2	4.1

The main finding was that 0SW or finnock predominated in rod catches made during the months of July and August during these years.

Cummeragh River system specimen sea trout

The Irish Specimen Fish Committee (www.specimenfish.ie) has maintained a record of a wide variety of freshwater and marine species of angling interest and sea trout is one of the species included. An examination of the record for specimen sea trout (weighing 6lb / 2.721kg or higher) shows that since 1973 a total of 588 specimen sea trout has been certified for Lough Currane / Cummeragh River / Waterville and other lakes in the Cummeragh River system (Derriana / Namona / Cloonaghlin / Cappal) as detailed in Figure 1. No specimen sea trout taken on rod and line on the Cummeragh River system have been certified by the ISFC since 2017.

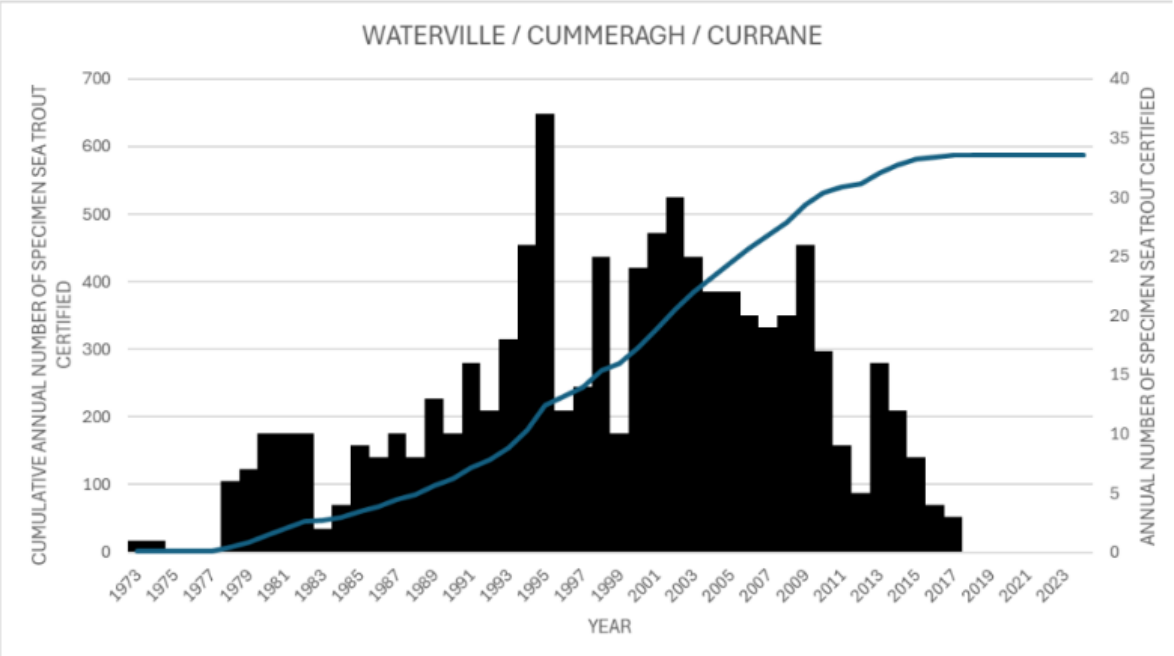


Figure 1 Number and cumulative annual number of specimen sea trout certified by the Irish Specimen Fish Committee for the years 1973-2017.

It was believed at the time that the 1989-1990 sea trout collapse in the west of Ireland extended to the south-west of Ireland also. On page 20 of Anon. (1995) it is stated: 'In 1993, conflicting sets of rod catch information were examined and it was reported (Anon 1993) that the stock (in Lough Currane and the Waterville Fishery) had probably suffered a serious decline. Later in the season a by-law was introduced which enforced anglers to

return all sea trout taken on rod and line back to the water alive. In order to establish the status of the Waterville sea trout population in 1994, an automatic video counting system was installed in Waterville to estimate the total run of sea trout. The counter indicated a minimum population size of 29,000 fish in the Currane system in 1994 comprising all the major sea age classes. It was concluded (Anon 1994) that in light of this evidence the Waterville sea trout stock had not suffered a serious decline.

The total count corrected for downstream fish in 1995 was 32,520 compared to 29,000 in 1994.The rod catch in Waterville in 1995 was estimated to be 5410 sea trout or approximately 18% of the total stock counted entering the system.

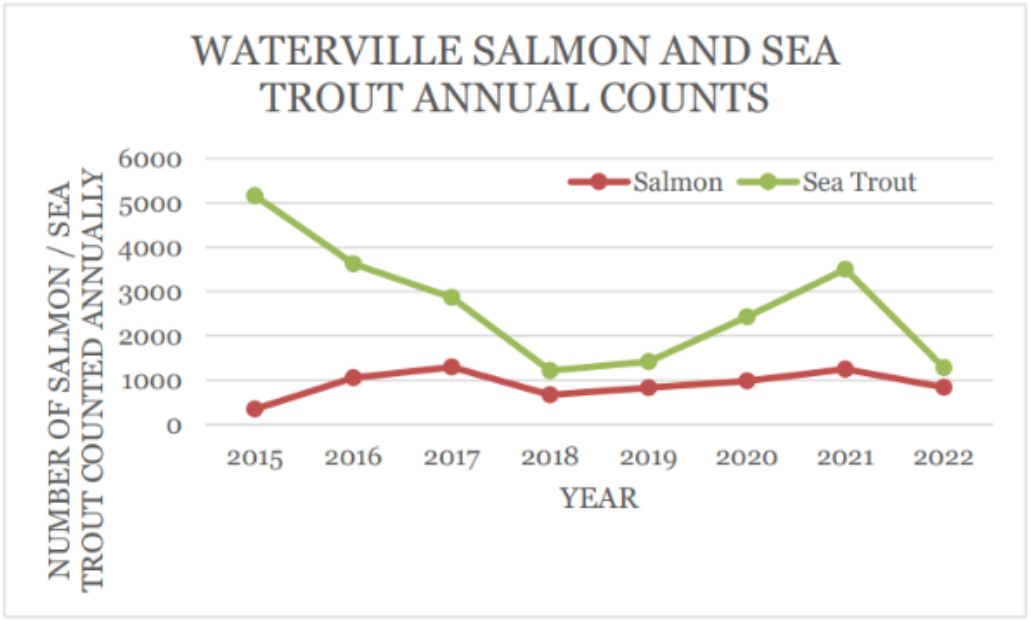
Cummeragh River system salmon and sea trout census and assessment

Moving forward three decades, Inland Fisheries Ireland now manages the resistivity fish counter at Waterville as part of the National Fish Counter Programme and has also carried out catchment wide electrofishing surveys (CWEF) on the Cummeragh River system and the neighbouring Inny River system. Catchment wide electrofishing surveys involve the deployment of battery powered electric fishing equipment at numerous stream sites throughout a catchment for 5 min periods per site and assessing the average number of 0+ salmon recorded at each site. In the absence of fish counter information on adult salmon numbers, if the average number of 0+ salmon recorded per five minutes exceeds 17 the system is deemed to be above its Conservation Limit for salmon.

Data for the Waterville fish counter have been obtained from various annual reports e.g. Anon. (2021). In these reports the categories of salmonid are as follows:

- Spring salmon
- Summer 1SW fish
- Late running salmon
- Sea trout

For the purposes of this document all salmon categories have been combined and thus there are two categories shown in the figure below, namely, salmon and sea trout.



Annual salmon and sea trout counts at Waterville (2015-2022).

The above data is included in the table below.

Annual counts of salmon and sea trout at Waterville (2015-2022)

Year	Salmon	Sea Trout
2015	345	5161
2016	1051	3624
2017	1293	2862
2018	669	1216
2019	829	1414
2020	982	2426
2021	1247	3500
2022	837	1280
Mean	907	2685
SE	109.7	491.3
95% CI	259.5	1161.9

The above counts for salmon (combining MSW early running spring salmon) and 1SW salmon (grilse) have been estimated to be above the Conservation Limit for salmon in the Cummeragh River system (Anon. 2023).

The TEGOS report for 2023 (Anon. 2023) described the salmon Conservation Limit for salmon in the Cummeragh River system as follows

75% predicted return	524 1SW and 165 MSW salmon
Conservation Limit (median)	119 1SW and 83 MSW salmon
Catch option at 75% probability of attaining the Conservation Limit	237 1SW and 83 MSW salmon
Proportion of Confidence Limit Attained	3.00 for 1SW and 1.98 for MSW

The TEGOS report for 2023 (Anon. 2023) also detailed CWEF survey results for the Cummeragh River system and the neighbouring Inny River system as follows:

• Cummeragh River system: average number of 0+ salmon per five-minute survey in:

- 2014 – 24.51

• Inny River system – average number of 0+ salmon per five-minute survey in:

- 2007 – 24.63
- 2009 – 19.78
- 2018 – 17.67
- 2022 – 22.67
- (Average for these four years – 21.19)

Thus, the CWEF surveys for both catchments indicated that salmon were above the estimated Conservation Limit in both river systems

Angling regulations for Atlantic salmon and sea trout

According to the 2024 salmon and sea trout angling regulations there are basically three types of river system:

- Those which are open to angler harvest.
- Those which are open for catch and release angling.
- Those which are closed to angling for salmon and sea trout over 40cm long.

For the bearers of valid annual salmon angling licences there is a national angling bag limit of 10 salmon (any size) or sea trout (over 40cm) per person on rivers where you may catch and retain salmon.

Subject to the above, there is a daily bag limit as follows:

- 1st January to 11th May - A total of one salmon (any size) or sea trout (over 40cm) per day (three fish in total may be retained for this period).
- 12th May to 31st August - Three salmon (any size) or sea trout (over 40cm) per day
- 1st September to the close of the season: One salmon (any size) or sea trout (over 40cm) per day.
- There is a daily bag limit of three sea trout (under 40cm) per angler per day.
- It is an offence to kill any sea trout in the following waters:
- Galway, Connemara or Ballinakill Fisheries Districts including at sea from Hags Head in County Clare to Clew Bay (and in any waters flowing into Clew Bay) in the Bangor Fishery District south of a line drawn due east and west through Achill Head (this byelaw has been in place since the early 1990s)

- Kerry District, in that part of the sea east of a line between Bolus Head and Lambs Head and all the waters discharging into it (i.e. Waterville area).

After the daily bag limit has been taken, anglers are permitted to fish catch and release, using single or double barbless hooks and anglers may not use worms. This also applies to anglers who have utilized their allocation of blue tags (or brown tags where they apply – Brown tags applied in the Cummeragh River system in 2023) or who are not in possession of an unused blue or brown tag for the river concerned.

Also, the killing and possession of foul hooked fish is prohibited.

On rivers where catch and release is permitted anglers may not use worms and anglers must use single or double barbless hooks. On all other rivers angling for salmon (any size) and sea trout (over 40cm) is prohibited. It is not clear exactly how angling for sea trout less than 40cm long is permitted / controlled.

There are seventeen fishery districts in the Republic of Ireland, one of which is the Kerry Fisheries District. With regard to the salmon and sea trout angling regulations for 2024 a total of 43 river systems (or parts thereof for all or part of the angling season) are open for harvest, another 43 river systems (or parts thereof for all or part of the angling season) are open for catch and release and a total of 68 river systems (or parts thereof for all or part of the angling season) are closed to angling with the exception of angling for sea trout less than 40cm long

In the Kerry Fisheries District, a total of 10 river systems (or parts thereof for all or part of the angling season), including the Cummeragh River system, are open for harvest; a total of five river systems (or parts thereof for all or part of the angling season), including the Inny River system, are open for catch and release angling while a total of 12 river systems (or parts thereof for all or part of the angling season) are closed to angling, with the exception of angling for sea trout less than 40cm long.

The regulations surrounding salmon and sea trout angling in the Republic of Ireland have become increasingly complex and enforcement of these regulations through court proceedings / fixed charge notices has also become the norm. On the Richter scale of illegal fishing who could have envisaged that a Cork angler would be prosecuted in 2023 for using barbed fishing hooks where barbless hooks were required!

With regard to all of the above, when it comes to sea trout, the basic philosophy on the part of Inland Fisheries Ireland and their parent government department appears to be to introduce a bye-law preventing the retention of sea trout on a particular river system or throughout one or more fisheries districts.

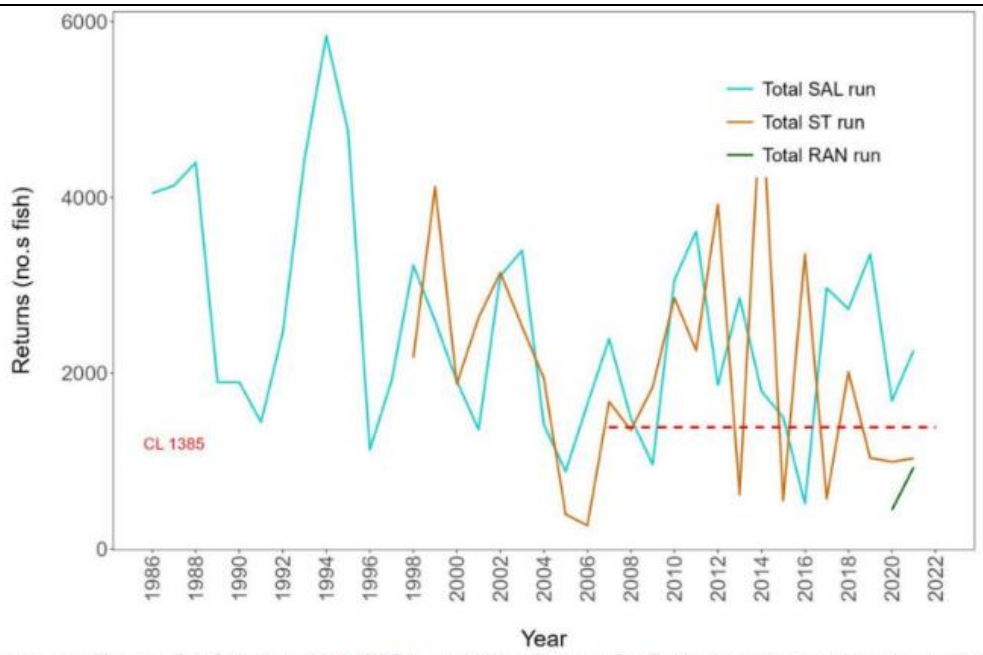
Regulation of sea trout angling

Legally, Atlantic salmon and sea trout are the one and the same in Ireland. For salmon and sea trout angling regulation, salmon and sea trout longer than 40cm are one and the same. Anglers who decide to harvest sea trout shorter than 40cm (maximum daily bag limit of three fish) are not required to attach a blue tag to the harvested fish.

A bye-law prohibiting the retention of all rod caught sea trout has been in place in the Cummeragh River system since 2019 and in the Galway, Connemara and Ballinakill fishery districts since the early 1990s. Apart from the Sea Trout Working Group which reported to the Minister for the Marine during the years 1992-1996 it would appear that no national advisory group for sea trout has been established since. Technical Expert Groups for European eel (TEGEE) and Atlantic salmon (TEGOS) are in existence, but none has been established for the national management of sea trout.

Conservation Limits for Atlantic salmon are available for every river system in Ireland, but no such documentation exists for sea trout. It would appear that sea trout are managed on a reactionary basis and that recreational fisheries are summarily closed to harvest and can remain closed to harvest for decades without adequate review as in the case of recreational sea trout fisheries in the Galway, Connemara and Ballinakill fisheries districts.

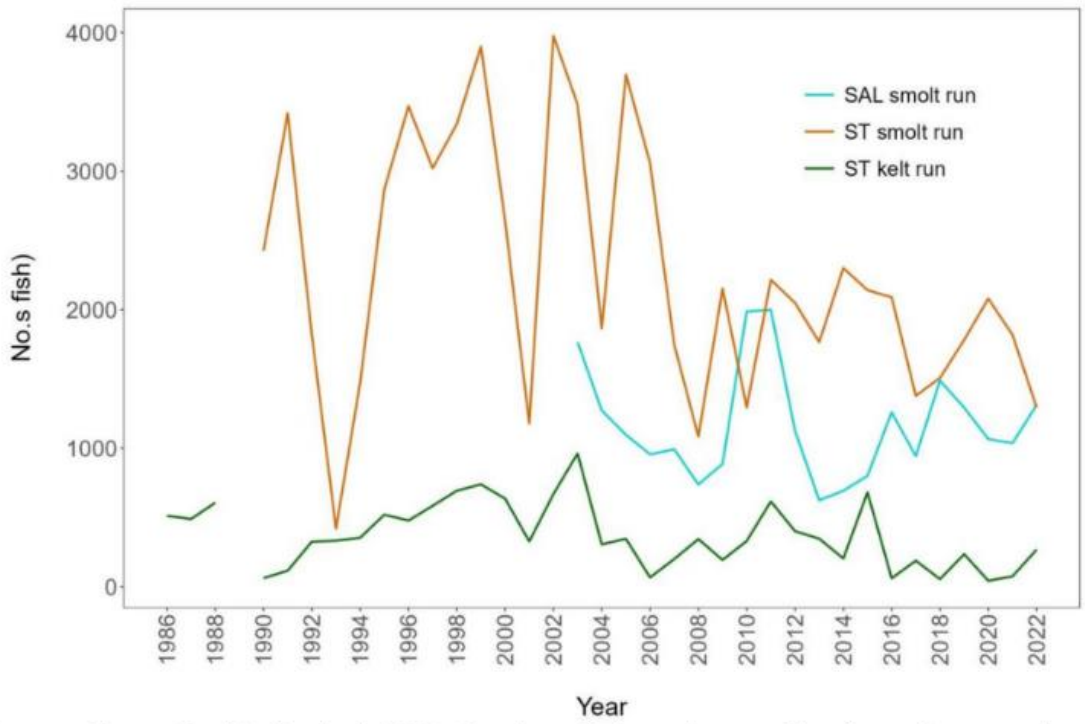
While some information on sea trout counts on fisheries in available on IFI's consolidated fish counter annual reports, the only long term data series available in the public domain is that for the Erriff River (Kelly et al. 2004) which details sea trout counts (upstream) for the Erriff River and also downstream (kelt and immature sea run fish) from the Tawnyard Lough subcatchment (see figure below)



Source: Figure 8 of Kelly et al. 2024. Adult returns of wild salmon, sea trout and ranched salmon to River Erriff since 1986 (conservation limit for wild salmon of 1385 indicated)

In the figure above, salmon counts were at or below the estimated CL in 1996,2001,2005,2009 and in 2016. The years of low sea trout counts were 2005,2006,2013,2015 and 2017. Kelly et al. (2024) do not provide any reasoning for the annual variations in salmon and sea trout counts nor do they provide any commentary on the biological meaningfulness of these sea trout counts as there is no measure of Conservation Limit available for sea trout.

Another long-term data set is also presented in Kelly et al. (2024) which relates to the numbers of salmon and sea trout smolt and sea trout kelt and immature sea run fish migrating downstream from Tawnyard Lough each year since 1986.



Source: Figure 10 of Kelly et al. 2024. Number of downstream migrating salmon and sea trout smolts and sea trout kelts (and immature sea run fish) recorded at the Tawnyard trap since 1986.

The graph above shows large annual variations in the number of sea trout smolt and kelt (and immature sea run fish) the lowest sea trout smolt recorded in 1993, 2001,2008,2010,2017 and 2022. The highest sea trout kelt etc numbers were recorded in 1999,2003,2011 and 2015.The above graphs show that annual numbers of sea trout

entering the Erriff River are quite variable as are the annual numbers of sea trout smolt and kelt (and immature sea run fish) migrating downstream from Tawnyard Lough in the Erriff system.

There is one other river system in Ireland, namely the Burrishoole, where upstream and downstream movements of salmon and sea trout have been recorded since the early 1970s. However, since the 1989 / 1990 sea trout collapse in the west of Ireland, the number of sea trout smolt migrating from the system and the number of sea run fish returning to the system have more or less flatlined and no explanation has ever been provided for this catastrophic situation. Anon. (2023) reported that a total of 22 wild sea trout and a further 61 non-silvered trout migrated upstream through the traps in 2022. Of the silvered trout, 8 were adults and 14 (64%) were finnock and that the sea trout smolt run in 2022 amounted to 240 smolts (down from an average of over 4000 during the 1970s).

Clearly, a national effort is required to provide a better understanding of the status of sea trout populations throughout the country and to attempt an explanation as to why some river systems appear to have lost their sea trout population and why others support active recreational fisheries.

MI - Further comments or requests

Wild Atlantic salmon populations from many North Atlantic rivers have declined over the last decades and while many of the issues and challenges related to the freshwater stage are known and managed, the continuing population declines are thought to be driven by a reduced marine survival coincident with a reduced body size (De Eyto *et al*., 2022[191], Vollset *et al*., 2022[192]). Several factors affecting marine survival have been proposed from increasing water temperatures (Almodóvar *et al*., 2019[193]), change in abundance of predators (Strøm *et al*., 2019[194]) and food webs (Tyldesley *et al*., 2024[195]), to illegal fishing (Dadswell *et al*., 2022[196]). Many of these factors can in turn be compounded by climate change. The Technical Expert group on Salmon (TEGOS) which provide advice on the management of salmon stocks illustrate in their annual reports the range of factors which individually and synergistically affect marine survival, of which parasites and disease is just one (TEGOS, 2024[197]). To investigate the potential effect of sea lice (*Lepeophtheirus salmonis*) on Atlantic salmon survival, randomised control trial (RCT) studies have been performed in Ireland. These trials use releases of hatchery-raised Atlantic salmon smolts, half of which were treated against sea lice using an antiparasitic medicinal product. The results have shown that sea lice can have a negative effect on survival, although the impact is highly variable and relatively small compared to the overall variation in marine survival[198,199, 200,201,202].Research from Norway suggests that the scale of Atlantic salmon farming in Norway may have a population regulating effect on wild

[191] De Eyto E, Kelly S, Rogan G, French A, Cooney J, Murphy M, Nixon P, Hughes P, Sweeney D, McGinnity P, Dillane M & Poole R. 2022. Decadal trends in the migration phenology of diadromous fishes native to the Burrishoole Catchment, Ireland. Frontiers in Ecology and Evolution 10: 915854

[192] Vollset KW, Urdal K, Utne K, Thorstad EB, Saegrov H, Raunsgard A, Skagseth Ø, Lennox RJ, Østborg GM, Ugedal O, Jensen AJ, Bolstad GH & Fiske P. 2022. Ecological regime shift in the Northeast Atlantic Ocean revealed from the unprecedented reduction in marine growth of Atlantic salmon. Science Advances 8: eabk2542.

[193] Almodóvar, A, Ayllón D, Nicola GG, Jonsson B & Elvira B. 2019. Climate-driven biophysical changes in feeding and breeding environments explain the decline of southernmost European Atlantic salmon populations. Canadian Journal of Fisheries and Aquatic Sciences 76: 1581-1595.

[194] Strøm JF, Rikardsen AH, Campana SE, Righton D, Carr J, Aarestrup K, Stokesbury MJW, Gargar P, Caballero Javierre & Thorstad EB. 2019. Ocean predation and mortality of adult Atlantic salmon. Scientific Reports 9: 7890.

[195] Tyldesley E, Banas NS, Diack G, Kennedy R, Gillson J, Johns DG & Bull C. 2024. Patterns of declining zooplankton energy in the northeast Atlantic as an indicator for marine survival of Atlantic salmon. ICES Journal of Marine Science (in press).

[196] Dadswell M, Spares A, Reader J, McLean M, McDermott T, Samways K & Lilly J. 2022. The decline and impending collapse of the Atlantic salmon (Salmo salar) population in the North Atlantic Ocean: a review of possible causes. Reviews in Fisheries Science & Aquaculture 30: 215-258.

[197] TEGOS. 2024. The status of Irish salmon stocks in 2023 with catch advice for 2024. Report of the Technical Expert Group on Salmon to the North-South Standing Scientific Committee for Inland Fisheries

[198] Jackson D, Cotter D, O Maoileidigh N, O Donohoe P, White J, Kane F, Kelly S, McDermott T, McEvoy S, Drumm A, Cullen A & Rogan G. 2011. An evaluation of the impact of early infestation with the salmon louse Lepoephtheirus salmonis on the subsequent survival of outwardly migrating Atlantic salmon, Salmo salar L., smolts. Aquaculture 320: 159-163.

[199] Gargan PG, Forde G, Hazon N, Russell DJF & Todd CD. 2012. Evidence for sea lice-induced marine mortality of Atlantic salmon (Salmo salar) in western Ireland from experimental releases of ranched smolts treated with emamectin benzoate. Canadian Journal of Fisheries & Aquatic Sciences 69: 343-353.

[200] Jackson D, Cotter D, Newell J, McEvoy S, O Donohoe P, Kane F, McDermott T, Kelly S & Drumm A. 2013. Impact of Lepeophtheirus salmonis infestations on migrating Atlantic salmon, Salmo salar L., smolts at eight locations in Ireland with an analysis of lice-induced marine mortality. Journal of Fish Diseases 36: 273-281.

[201] Krkosek M, Revie CW, Gargan PG, Skilbrei OT, Finstad B & Todd CD. 2013. Impact of parasites on salmon recruitment in the Northeast Atlantic Ocean. Proceedings of the Royal Society B 280: 20122359.

[202] Gargan PG, Millane M, Lennox RJ & Vollset KW. 2025. Salmon lice from aquaculture reduce marine survival of Atlantic salmon. Journal of Animal Ecology 94: 1346-1360.

salmonids, at least in an area with particularly intensive production (Vollset *et al*., 2023[203]). However, production in Norway is orders of magnitude higher than in Ireland (ca. 1,400,000 t v 12,000 t).

The International Council for the Exploration of the Sea (ICES) is the oldest intergovernmental organisation in the world concerned with marine and fisheries science. Since its establishment in 1902, ICES has been a leading scientific forum for the exchange of information, the promotion and coordination of marine research and the provision of scientific advice. It is deemed appropriate for the applicant to base their review on advice provided by ICES through the WKCULEF report (ICES, 2016[204]) which provides a succinct and informative review of the information available at that time. On occasion, scientific journals publish comments on previously published articles when scientific opinions may differ. This does not imply that the original article is incorrect, but merely reflects the differing opinions within the profession., as Krkošek *et al*. 2014[205] did regarding the Jackson *et al*. 2013 report[206], which concluded that 'the results of the combined data suggest that while sea lice-induced mortality on outwardly migrating smolts can be significant, it is a minor and irregular component of marine mortality'. The public consultees however failed to acknowledge that the comment by Krkošek *et al*. 2014 was responded to, and defended in Jackson *et al*., 2014[207] which pointed out that, in their opinion, a number of the claims made were 'based on flawed inference'. Similar examples in relation to sea lice publications include Jansen & Gjerde (2021[208]) and Johnsen *et al*. (2021[209]) as well as Jones & Beamish (2012[210]) and Price & Reynolds (2012[211]), amongst others.

From the references provided by the consultees above, specific to the Irish context, the following points should be noted :

- The studies are based on statistical models with a number of assumptions included and the data used in developing the models are not provided e.g. sea lice numbers, fish numbers.
- At best, the models suggest a correlation with sea lice levels on the farms, however no measurements of sea lice levels on wild salmonids have been performed to corroborate the findings.
- The studies show an overall decline in the number of wild Atlantic salmon returning to the rivers. This was also reported in Jackson *et al.* (2013) however the above listed publications do not refer to any of the Jackson publications (Jackson *et al*., 2011. Aquaculture 320: 159-163; Jackson *et al*., 2011. Aquaculture 319: 37-40; Jackson *et al*., 2013. Journal of Fish Diseases 36: 273-281).
- Atlantic salmon numbers are in decline in many regions, irrespective of whether marine Atlantic salmon farming is present or not.
- In 2022, a total of 26,715 wild salmon were caught by all methods (commercial and angling). Of angling, 22,661 salmon were caught of which 10,348 were harvested with only 54% of salmon caught by angling released.

The fact that Ireland has a national sea lice monitoring programme in operation since 1991 indicates the commitment the State has, to managing any potential impact sea lice may have on wild salmonids.

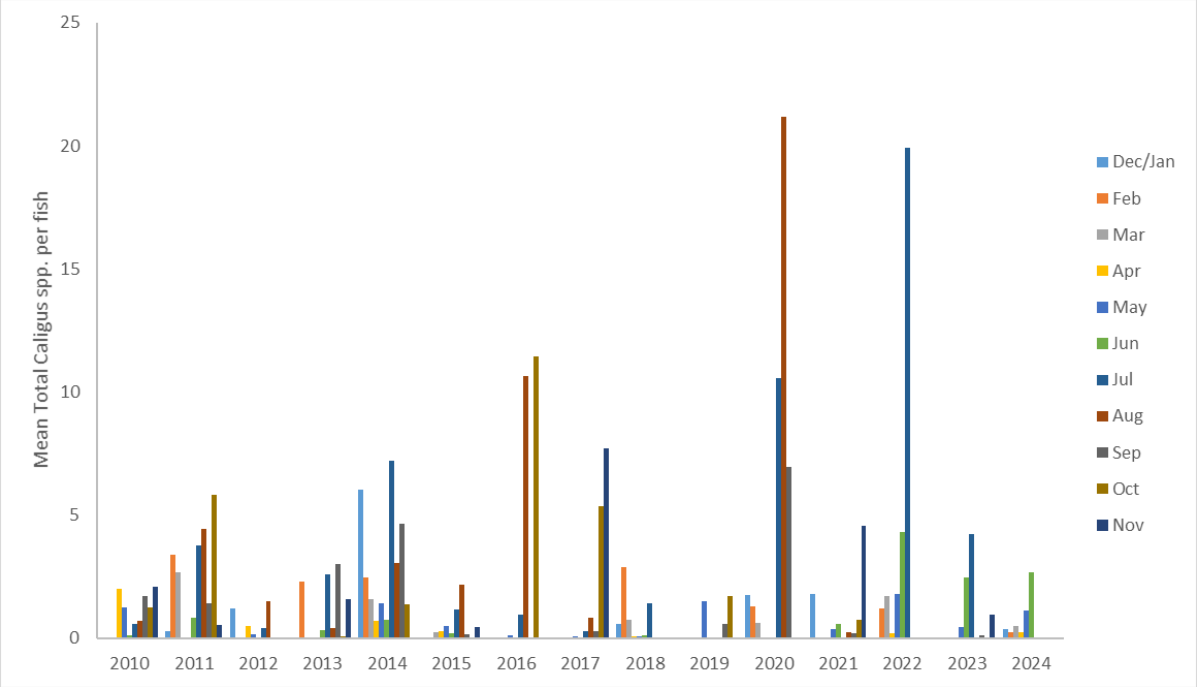
Comment on *Caligus*

The effectiveness of the management of salmon lice at the Deenish site is outlined in Section 5.2.4.3.1 above. *Caligus elongatus* is a generalist ectoparasite infesting a range marine fish species whereas *L. salmonis* is primarily an ectoparasite of salmonid species and all sea lice monitoring programmes in European Atlantic

[203] Vollset KW, Lennox RJ, Skoglund H, Karlsen Ø, Normann ES, Wiers T, Stöger E & Barlaup B. 2023. Direct evidence of increased natural mortality of a wild fish caused by parasite spillback from domestic conspecifics. Proceedings of the Royal Society B 290: 20221752.
[204] ICES. 2016. Report of the Workshop to address the NASCO request for advice on possible effects of salmonid aquaculture on wild Atlantic salmon populations in the North Atlantic (WKCULEF), 1-3 March 2016, Charlottenlund, Denmark. ICES CM 2016/ACOM:42. 44 pp.
[205] Kkrošek, M, Revie CW, Finstad B & Todd CW. 2014. Comment on Jackson *et al*. 'Impact of *Lepeophtheirus salmonis* infestations on migrating Atlantic salmon, *Salmo salar* L., smolts at eight locations in Ireland with an analysis of lice-induced marine mortality'. Journal of Fish Diseases 37: 415-417.
[206] Jackson D, Cotter D, Newell J, McEvoy S, O'Donohoe P, Kane F, McDermott T, Kelly S & Drumm A. 2013. Impact of *Lepeophtheirus salmonis* infestations on migrating Atlantic salmon, *Salmo salar* L., smolts at eight locations in Ireland with an analysis of lice-induced marine mortality'. Journal of Fish Diseases 36: 273-281.
[207] Jackson D, Cotter D, Newell J, O'Donohoe P, Kane F, McDermott T, Kelly S & Drumm A. 2014. Response to M Krkošek, C W Revie, B Finstad and C D Todd's comment on Jackson *et al*. 'Impact of *Lepeophtheirus salmonis* infestations on migrating Atlantic salmon, *Salmo salar* L., smolts at eight locations in Ireland with an analysis of lice-induced marine mortality'. Journal of Fish Diseases 37: 419-421.
[208] Jansen PA & Gjerde B 2021. Comment on "Salmon lice-induced mortality of Atlantic salmon post-smolt during migration in Norway" by Johnsen *et al*. (2021). ICES Journal of Marine Science 78: 3847-3851.
[209] Johnsen IA, Harvey A, Saevik PN, Sandvik AD, Ugedal O, Ådlandsvik B, Wennevik V, Glover KA & Karlsen Ø. 2021. Reply to jansen and Gjerde's (2021) critique of the salmon louse infection model reported in Johnsen *et al.* (2021). ICES Journal of Marine Science 78: 3852-3857.
[210] Jones SRM & Beamish RJ. 2012. Comment on "Evidence of farm-induced parasite infestations on wild juvenile salmon in multiple regions of coastal British Columbia, Canada". Canadian Journal of Fisheries and Aquatic Sciences 69: 201-203.
[211] Price MHH & Reynolds JD. 2012. Salmon farms as a source of sea lice on juvenile wild salmon; reply to the comment by Jones and Beamish. Canadian Journal of Fisheries and Aquatic Sciences 69: 204-207.

salmon farming countries are based on *L. salmonis*, which is considered the more serious parasite. Although there have been reports of significant infestations of *C. elongatus* on farms in Northern Norway in recent years, epizootics are extremely rare[212]. Most studies of the pathological effects of caligid infestations on farmed salmonids have been carried out on *L. salmonis*. This is due to the fact that intensities of *L. salmonis* tend to be higher and the effects on the host more severe than is the case with *Caligus* species. *L. salmonis* is a specialist parasite of salmonids whereas many *Caligus* species such as *C. elongatus*, are much less host specific and therefore more likely to move between farmed salmonids and wild hosts of other species.

Levels of *Caligus* are monitored as part of the National Sea Lice Monitoring Programme and reported for each site annually[213]. A plot of the total numbers of *Caligus* at the Deenish site since 2010 is shown below.



Levels of total mobile *Caligus* on the farmed Atlantic salmon are generally low, being < 5 total mobiles per fish and are believed to be due in part to the more offshore nature of the particular site. Occasional higher levels are observed which are transient in nature and are most likely due to the migratory nature of other marine fish species which may come into contact with the farm. The fact that these peaks do not persist indicates that on-farm treatments are effective, particularly freshwater bathing as it is known that *Caligus* species are intolerant to lower saline waters.

6.1.1.10 Deficiencies in assessments and determinations based on "best scientific knowledge"

Point raised

The Screening for AA and NIS report states that its purpose is to provide the competent authority with the necessary information required to conduct the AA and make determinations in view of best scientific knowledge. The assessment of the screening AA (Report supporting the Appropriate Assessment Screening of Intensive Aquaculture (T06/202) in Kenmare River SAC [Site Code: 002158] and Deenish Island and Scariff Island SPA [Site Code 004175), states that, "Assessments should be undertaken based on the best scientific evidence and methods". The NIS notes that it has examined and analysed, in light of the best scientific knowledge, how the proposed operations could impact on the Qualifying Features of SACs and SPAs and whether the predicted impacts would adversely affect the integrity of protected sites and states that, "there is no reasonable scientific doubt" in relation to its overall conclusion that there is likely to be no significant

[212] Hemmingsen, W., MacKenzie, K., Sagerup, K., Remen, M., Bloch-Hansen, K. & Imsland, A.K.D. 2020. Caligus elongatus and other sea lice of the genus Caligus as parasites of farmed salmonids: a review. Aquaculture 522: 735160.
[213] D'Arcy, J., Kelly, S., McDermott, T., Casserly, J., Power, A., Waters, C., O'Donohoe, P. & Ruane, N. 2024. National survey of sea lice (Lepeophtheirus salmonis Kroyer and Caligus elongatus Nordmann) on fish farms in Ireland – 2023. Irish Fisheries Bulletin 55, Marine Institute 37pp.

direct or indirect effects. The EIA concluded that the proposed operations together with the mitigation measures proposed, will not significantly affect the environment.

National and EU guidance documentation on the preparation of Screening AAs, NIS and EIAs highlight the importance of making assessments and determinations based on the best scientific knowledge, evidence and methods. However, this has clearly not been achieved in the preparation of the consultation documentation to support the conclusions made as set out in the above sections. This is particularly notable in relation to assessing the potential impacts of increased sea lice loads associated with the proposed operations and potential farm escapes and their consequent potential effects to proximal salmon, sea trout and pearl mussel populations as well as the potential socio-economic effects that may arise. Indeed, the EPA Guidelines on the information to be contained in environmental impact assessment reports (EIAR) are intended to inform the obligations on those who are preparing EIAs. The Guidelines are also intended to provide all parties in the EIA process with a standard to measure whether EIARs are fit for purpose. Moreover, the Guidelines highlight the importance of the methods used in the preparation of an EIAR to ensure that the information presented is adequate and relevant. They specifically note the following:

- The EIAR should consist of a systematic analysis and assessment of the potential effects of a proposed project on the receiving environment and the information presented should be relevant and complete and systematically presented and assessed.
- The assessment should be conducted with objectivity, and based on high quality scientific information using recognised methods that are presented in a fully transparent manner with clarity.
- Baseline information should be sourced from published references to ensure reliability and objectivity and should be sufficient to inform a reliable assessment of the implications for the environment.

Such guidance further highlights the inadequacies of the EIA and NIS, specifically concerning the omission of reference and consideration to a large body of more up to date published peer-reviewed literature from Ireland and internationally demonstrating the impacts of sea lice and escaped farmed salmon on wild salmonids.

In IFI's consideration, an objective assessment of this literature is likely to conclude that there is significant reasonable doubt evident in relation to the conclusions made in the application that no significant direct or indirect effects are likely.

Based on the above (**referring to various issues raised in the submission),* we submit that the analysis presented is not sufficient for meeting the needs of an Article 6(3) Appropriate Assessment, or an Article 4 WFD assessment.

Furthermore, it is our considered opinion that the licencing authority should be seeking external reviewers for the modelling data to ensure its scientific robustness.

We are of the view that the relevant authority does not have the data and analysis available to them to be able to conclude beyond reasonable doubt that there will be no impact on the SCIs and QIs of the various Natura 2000 sites under the ambit of Article6(3) of the Habitats Directive.

Ultimately, it is An Taisce's position that the Licence must in fact be refused, as Mowi Ireland have not submitted the relevant information to address the impacts of their aquaculture operations at Deenish Island which have been carried out in breach of the EIA and Habitats Directives.

Points addressed by the applicant

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MI - Further comments or requests

It is the Marine Institute's position that this Appropriate Assessment process has considered the best scientific knowledge, evidence and methods and provides a comprehensive ecological impact assessment of the project, in relation to direct and indirect impacts that the project might have on its own, or in combination with other plans and projects, on Natura 2000 sites in view of the sites' conservation objectives.

6.1.1.11 Sea lice impacts

Point raised

The potential impact of sea lice infestation for wild salmonids is discounted thus in the NIS:

"The continuous weekly monitoring as well as coordinated treatment of all licenced sites within the bay through the Single Bay Management (see Section 2.1.16 for further details) plan once trigger levels have been breached is imperative to minimise any potential risk on wild salmonids. Consequently, it can be concluded that the proposed operations at the site are unlikely to result in significant impact in sea lice infestations in wild salmon populations; consequently there will be no likely significant direct effects to the Qualifying Feature salmon and no likely significant indirect effects to the Qualifying Feature freshwater pearl mussel"

While the NIS provides a modelling exercise for lice, we would note that the operators of this plant are alleged to have previously stocked the farm at 122% of what they were licenced for, and, short of a change in approach in terms of monitoring and enforcement of the stocking density for this operator, then the licencing authority cannot be confident that the limit will be respected. That, in turn, raises reasonable scientific doubt as to the infection potential of the farm. We submit that this is a significant uncertainty, and given the alleged track record of the applicant, unless far stricter inspection and enforcement is guaranteed then the scientific doubt remains, in conflict with Article 6(3) of the Habitats Directive.

Additionally, anecdotal evidence from the very reputable Inland Fisheries Ireland indicates that there are serious concerns in regard to the impact of the salmon farm on wild trout and salmon. Inland Fisheries Ireland clearly outlined in their 2019 submission to ALAB2, in regard to the revocation of the Mowi licence, how with an increase in the number of salmon being reared at the Deenish salmon farm there was a corresponding dramatic decline in Sea Trout numbers, as a result of sea lice infestation from the Deenish Salmon Farm. They made their concerns regarding the salmon farm very clear, and clearly welcomed the revocation of the licence.

Furthermore, we note that Mowi seeks to rely on a study from 2013(Jackson et al., 2013), which downplays the overall impact of lice on wild salmon. However, there have been clear examples of lice infestation of wild salmonids as a result of farmed salmon, and the international literature is testament to that. Specifically, in the Irish context, a study by Shephard and Gargan (2020) shows that salmon returns on five rivers on the West coast between 1990 and 2019 dropped by between 19% and 46% in the years following high lice levels on nearby salmon farms. Similarly, a previous study by Shephard and Gargan (2017) demonstrated a 50% decrease in the salmon run largely attributable to lice infestation on farmed salmon. In a similar piece of work, highlighted by IFI, an extensive review by Thorstad et al (2015) assessed the impacts of the salmon louse on sea trout. They concluded that intensively farmed areas have negatively impacted wild sea trout populations by increasing marine mortality, changes in migratory behaviour, reduction of marine growth and reduced population sizes.

Given the anecdotal evidence of a collapse in the local salmonid population, which coincides with an increase in stocking density on the Deenish Island farm, combined with Irish studies demonstrating measurable impact as a result of salmon farms, and the large scale review of salmon farm impacts on sea trout, it becomes increasingly difficult to believe the conclusion in the NIS that there will be no likely significant direct effects as a result of sea lice emanating from the salmon farm.

The requirement for certainty when carrying out an Appropriate Assessment has been clearly fleshed out in case law. It is now very well established in law that approval can only be granted for plans and projects when it has been established beyond all reasonable scientific doubt that the subject proposal will not adversely impact any Natura 2000 sites. In CaseC-258/11, Sweetman & Others v An Bord Pleanála & Others, the CJEU held that:

"authorisation for a plan or project ....may therefore be given only on condition that the competent authorities ....are certain that the plan or project will not have lasting adverse effects on the integrity of the site. That is so where no reasonable scientific doubt remains as to the absence of such effects" [emphasis added].

In Kelly v An Bord Pleanála & Ors. [2013 No 802 J.R.], with reference to Commission v Spain c-404/09, the High Court held in para. 36 that the competent authority must carry out an AA for a plan or project in light of the best scientific knowledge in the field and that the final determination of the competent authority must include complete, precise and definitive findings. The case repeated the conclusion of the CJEU at para. 44 in Case C-258/11, namely that an AA:

"cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt."

This test has not only been established in Irish law but further developed in recent case law, with reference to the Kelly judgement, in Connelly v ABP [2018] IESC 31 (paras. 8.15 & 8.16) and Foley v EPA & Ors and Hayes v EPA & Ors [2022] IEHC 470 (para. 118).

We would observe in this case that the only evidence upholding the conclusion that there will be no significant impact on the QI of the nearby SACs as a result of sea lice relies entirely on modelling carried out by Mowi. There is extensive evidence highlighting that this is likely a flawed conclusion, and we submit that it is incumbent upon the licencing authority to seek external independent validation of any modelling work before relying on it. This is particularly pertinent given it appears to conflict with a large body of published literature on the impacts, and with very plausible anecdotal evidence provided by the IFI on this issue.

Points addressed by the applicant

Refer to comments elsewhere in this document on sea lice

MI - Further comments or requests

The supplied NIS documents provide an assessment based on the application in hand. These issues are addressed at various points within the NIS documents, including this document.

6.1.1.12 Sea lice levels

Points addressed by the applicant

Sea lice are a naturally occurring small ecto-parasitic copepod crustacean found on marine fish, including salmonids. Ovigerous female sea lice are those which produce the infective larvae and treatments are timed to remove adult females before they can release larvae. Setting the treatment trigger at 0.5 ovigerous *L. salmonis* per fish in spring ensures that treatments are carried out when a maximum of half of the fish examined have one ovigerous sea louse. This is a practical time to interrupt sea lice development. Later in the year, the development of new generations is not as synchronised and automatic intervention at a sea lice level of 0.5 ovigerous by way of treatment is not justified. A level of 2.0 ovigerous sea lice per fish has been shown to be a pragmatic level at which intervention by way of treatment is advisable.

Sea lice level of 2.0 ovigerous (0.5 ovigerous in Spring period) are used as Treatment Trigger Levels (TTL) to inform management to take action to reduce sea lice levels, as outlined in the Monitoring Protocol No.3 for Offshore Finfish Farms – Sea Lice Monitoring and Control, Department of Marine and Natural Resources (2000).

Monitoring Protocol No.3 for Offshore Finfish Farms – Sea Lice Monitoring and Control by the Department of Marine and Natural Resources. Treatment triggers during the spring period are set close to zero in the range of from 0.3 to 0.5 egg bearing females per fish and are also informed by the numbers of mobile lice on the fish. Where numbers of mobile lice are high, treatments aretriggered even in the absence of egg bearing females. Outside of the critical spring period, a level of 2.0 egg bearing lice acts as a trigger for treatments.

Mowi Ireland has developed a non-medicinal strategy to control sea lice using cleaner fish. This is the preferred strategy for managing sea lice infestations. Results to date illustrate that cleaner fish will maintain ovigerous lice levels on salmon in pens at or below 0.1 lice per fish. It also has the beneficial effect of radically reducing the use of chemical treatments and, therefore, treatment dispersal. Cleaner fish are species which display a natural behaviour of removing parasites and dead skin from other fish species in the wild. Mowi Ireland sources hatchery reared lumpfish from two hatcheries in Ireland and Wales in addition to hatchery reared wrasse supplemented with locally caught wrasse.

National Survey Of Sea Lice (Lepeophtheirus salmonis Krøyer and Caligus elongatus Nordmann) on Fish Farms in Ireland 2010 to 2022 – In the Southwest (all farms) there were no recorded instances of *L. salmonis* infestation levels greater than the treatment trigger level as shown in Figure 1 and Figure 2

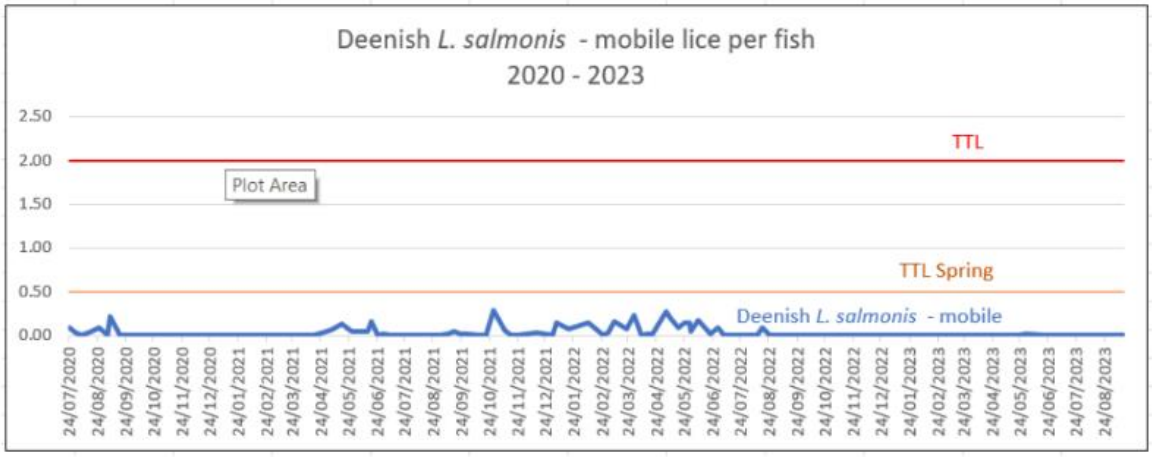

Figure 1: All mobile L. salmonis reported at Deenish 2020-2023 (blue). No data is available in Aquafarmer for mobile species prior to 2020. TTL Spring (orange) is the treatment trigger level set by the Marine Institute for the Spring period and TTL (red) is the treatment trigger level set for all other times. Note that in the sea lice monitoring protocol TTL thresholds apply to Adult ovigerous female L. salmonis, but at no time were the TTL levels breached even for all mobile sea lice and for most of this period the levels were significantly lower than the trigger levels.

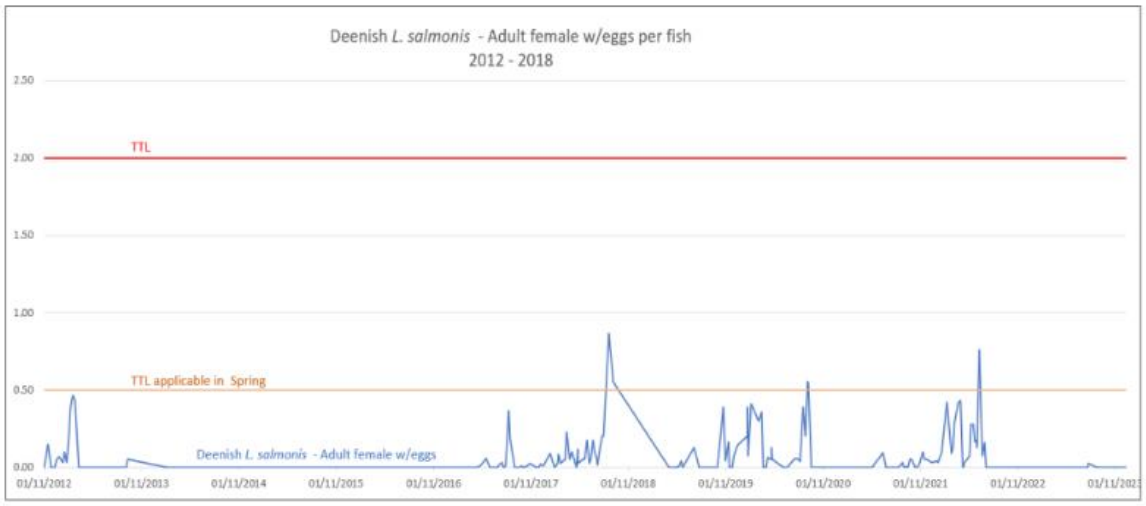

Figure 2: Adult ovigerous female L. salmonis reported at Deenish 2012-2023 (blue). TTL Spring (orange) is the treatment trigger level set by the Marine Institute for the Spring period and TTL (red) is the treatment trigger level set for all other times. Note that at no time were the TTL levels breached and for most of this period the levels were significantly lower than the trigger levels.

MI - Further comments or requests

This is covered in various Sections above.

6.1.1.13 Impact on salmon, sea trout and pearl mussel stocks

Point raised

No explicit methodological consideration is presented in the NIS or EIA to the potential loss or detrimental population effects on individual wild salmon and sea trout stocks located in the wider vicinity of the proposed salmon farm associated with its operations (likely zone of influence), particularly in relation to the potential effects of increased sea lice loads. Therefore, in regard to the preparation of the Screening AA and NIS, due consideration was not given to EC (2021) Commission notice. Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC. For the Screening AA, this includes the following:

- Description of likely effects on the Natura 2000 sites in view of the specific conservation objectives set out for the designating features, including:
    - disturbance to species, reduction in species populations and density;

    - changes in ecological functions and/or features that are essential for the ecological requirements of habitats and species;
    - interference with the key relationships that define the structure and function of the site.
- Criteria for assessing significance, indicators of significance, in view of the site-specific conservation objectives e.g.:
    - risk of species populations' displacement, level of disturbance, reduction of species home range, feeding area, refuge areas, alteration of favourable condition for breeding;
    - importance of the habitats and species affected, e.g. representativeness, local variety;
    - importance of the site (e.g. limit of distribution area for certain habitats and species, stepping stone, important for ecological connectivity);
    - disruption or alteration of ecological functions;
- For the NIS this includes the following:
    - conservation condition of the species in the site
    - species vulnerability to potential impacts

It is particularly important to consider these in relation to vulnerable and potentially vulnerable stocks in Kenmare Bay and Ballinskelligs Bay including those salmon stocks marginally above or below their conservation limit (CL) or those stocks above CL showing declining trends in their attainment of CL (TEGOS annual reports). The CL is essentially the minimum number of adult salmon a river should have returning to ensure its stock is in a healthy state. In addition, some of the smaller rivers in the vicinity of the proposed operation, although not officially designated as salmon rivers are also known to record small stocks of salmon. In addition, sea trout stocks in Kenmare Bay and Ballinskelligs Bay may be particularly vulnerable to any additional pressures that may result from the proposed operation. Information on these are presented in the following sections but should have been considered in the consultation documents.

There are 14 designated salmon rivers in the Kenmare Bay and Ballinskelligs Bay area in the vicinity of the proposed operation namely: Emlaghmore, Inny, Currane / Waterville (all flow into Ballinskelligs Bay); Owenragh, Sneem, Blackwater Kerry, Finnihy, Roughty, Sheen, Cloonee, Owenshagh, Croanshagh, Lough Fada system, and Kealincha (flow into Kenmare Bay). In addition, these rivers along with the Tahilla and Coomnahorna have sea trout stocks.

In the Killarney National Park, Macgillycuddy's Reeks and Caragh River catchment SAC and River Blackwater (Kerry) SAC the conservation objectives for salmon are to maintain its favourable status and restore its favourable status, respectively. There are also three catchments where pearl mussel is a qualifying interest, namely, the Currane, Kerry Blackwater, and Ownagappul (Lough Fada system) in the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Blackwater River (Kerry) SAC and Glanmore Bog SAC, respectively.

Freshwater pearl mussel is an endangered species listed under Annex II and V of the EU Habitats Directive and protected under the Convention on the Conservation of European Wildlife and Natural Habitats. It is legally protected in Ireland under Schedule 1 of the Wildlife Act, 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477, 2011) (as amended). As such, any plans developments or activities that may cause undesirable impacts on populations must be fully evaluated.

The location of the salmon farm with a maximum allowable biomass of 2,200 tonnes has the potential to affect wild salmon, an obligate host for pearl mussel larvae, and thereby indirectly effect freshwater pearl mussel. Given the nature of salmon farming there is potential that operations may directly impact wild salmon populations by increasing lice infection rates in wild salmon or through interbreeding which may result in indirect impacts to freshwater pearl mussel. Any increases in marine mortality of salmon and sea trout due to lice infestation from the proposed salmon farm could have significant effects on salmonid population status in these rivers and consequently to freshwater pearl mussel conservation objectives. The conservation objectives for the pearl mussel in the relevant SACs is restore the favourable conservation condition. In addition, under the attribute "host fish" the conservation target is to "maintain sufficient juvenile salmonids to host glochidial larvae" and states that, "No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time."

IFI consider that all of these fish and mussel populations have the potential to be significant negatively impacted from the operations of the farm as a consequence of increased sea lice loads which may result in both lethal and sub-lethal effects on the salmonid stocks and ultimately result in reduced population sizes. This is not sufficiently considered in the NIS or EIA.

The Screening for AA and NIS Volume 1 – main report incorrectly states that the Blackwater (Kerry) has "approximately 1,500 salmon and grilse entering the river annually". Since 2012 the annual run of adult

salmon has been an average of 421 ranging from a low of 143 to a maximum of 675 in this time period. This data is published annually in the Appendices of the Standing Scientific Committee on Salmon and Technical Expert Group on Salmon reports. Indeed, the River Blackwater (Kerry), which also has a significant pearl mussel population reliant on salmonids to successfully reproduce, is now only marginally above its conservation limit and was below it in the period 2014 to 2023. The most vulnerable salmon stocks in the likely zone of influence are the Emlaghmore, Owenragh, Finnihy, Owenshagh, Lough Fada system and Kealincha, all of which have been closed to angling for many years as their stocks are considered to be in a precarious state based on juvenile electrofishing data and / or insufficient data to assess stock status. IFI are not aware of any contact from those responsible for preparing the Screening AA, NIS or EIA to solicit such information from us to better inform their assessments and resultant conclusions. Other rivers in the Kenmare Bay area, although above CL, notably the Roughty and Sheen have shown declining trends stocks in recent years (TEGOS annual reports). In addition, the Inney stock has fluctuated around its CL in recent years EGOS annual reports). Despite the well-documented declines in our national stock over the last few decades (ICES WGNAS 2023), any further such anthropogenic pressures that may be exerted on such stocks is very concerning and may further inhibit their potential rehabilitation, maintenance or improvement in stock status.

In addition to the above, in the Screening for AA and NIS Volume 1 – main report Table 2.13: SACs designated for Annex II migratory fish species, it should be noted that there are the following omissions as regards SACs where salmon is designated as a qualifying interest, namely:

- River Moy SAC
- The Twelve Bens/Garraun Complex SAC
- River Boyne and River Blackwater SAC
- West of Ardara/Maas Road SAC
- Unshin River SAC

The Lough Currane fishery, situated close to the village of Waterville, is regarded as the premier sea trout fishery in Ireland and is known for its large multi-sea-winter and repeat spawning sea trout. In excess of two thousand sea trout were recorded on the fishery up until 2015 and numbers have declined dramatically since then. There is concern that sea lice emanating from the Deenish Island salmon farm have impacted on out migrating sea trout smolts and kelts and may be responsible for the apparent dramatic decline in sea trout numbers on the fishery. Over the 2006-2013 period, the Deenish Island site had either been fallow or only contained salmon smolts in spring. With the presence of larger grower salmon at the site in recent years, IFI has been concerned regarding the apparent large-scale decline in sea trout runs at the Currane fishery. In this regard, IFI sought submissions on a proposed bye-law to impose catch & release only angling for sea trout in the Currane fishery in 2018. The purpose of the bye-law was to seek to reasonably limit the pressure on sea trout stocks in the area of Ballinskelligs Bay and the river systems which discharge into the bay. IFI counter data and catch records indicate that there has been a collapse in sea trout stocks in the general Waterville area. The introduction of a bye-law to prohibit the retention and possession of any sea trout was intended to decrease the pressure on the sea trout stock. The bye-law was Introduced in 2018. In conjunction with is bye-law, IFI initiated a research programme for the Lough Currane/Waterville fishery to investigate the apparent decline in sea trout stocks. The study involves salmonid census data, fish monitoring in freshwater and salmonid monitoring in inshore marine waters. Each element aims to contribute to the determination of status of different life stages of sea trout and salmon to ascertain if the perceived decline in sea trout stocks in Currane is unique to sea trout and if salmon are also impacted. Against this background, IFI have serious concerns regarding the potential impact of rearing large numbers of farmed salmon at the Deenish site, located 10.8 km from the mouth of the Waterville river on the future viability of Ireland's premier sea trout fishery. The Currane fishery is also an important salmon fishery with a run of both one-seawinter and multi-sea-winter salmon, a qualifying interest in the Killarney National Park, Macgillycuddy`s Reeks and Caragh River Catchment SAC.

In this context, it is also notable that specific conditions related to sea trout were contained in the original licence granted for the operation of the Deenish and neighbouring Inishfanard salmon farms, namely:

- "This licence will remain subject to ongoing review in light of continued monitoring of, and research into, the two marine sites and neighbouring sea trout fisheries which may be undertaken by the Salmon Research Agency and/or the Fisheries Research Centre."
- "In the event of proven contra-indications for sea trout stocks causatively linked to the fish farming operations permitted under this licence, the Minister may exercise his discretion to take any necessary protective measures ranging from reduction in permitted production levels to revocation of the licence and harvesting of all stock".

IFI are not aware of any such monitoring of, and research undertaken by these bodies or their successors to explore this.

In Section 6.5.1.2. Salmonids of the EIA, in reference to the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, it is stated that, “Drift net fishing for salmon was banned at the end of the 2006 season. Draft net fishing has not been licenced since 2014”. The latter is incorrect. The Castlemaine mixed-stock commercial draft-net fishery does exploit salmon stocks from the Caragh, Laune and Maine rivers, two of which are within the bounds of the SAC. Furthermore, in the same section, it is stated that, “These rivers and lakes fall under the Waterville rivers and lakes system which is managed by the Inland Fisheries Ireland. This system is utilised for salmon fishing each year with its open season being from 17th January to 30th .” This is incorrect. The system typically closes to salmon fishing on the 30th September and not 30th January.

In the consultation documentation, Amoebic Gill Disease (AGD) is noted as a parasite that may impact farmed salmon and associated pest control measures are outlined to address any outbreaks on the proposed farm. Schall et al. (2022), note that this emerging disease could represent an additional threat to the long-term viability of wild salmon stocks. In their study, the impact of natural exposure to AGD on wild, hybrid and farmed post-smolt Atlantic salmon reared in a sea farm was assessed and it was found that wild fish showed substantially higher mortality levels (64%) than farmed fish (25%). However, no consideration is given to or assessment is made in the NIS or EIA for the potential of an AGD outbreak in the proposed farm operation to cross-infect wild salmon stocks the vicinity of the farm and the resulting consequences that may result for any impacted wild stocks. Further to this, it is unclear where the freshwater for any treatment of AGD would be sourced and this has raised environmental concerns of using lake abstraction in at least one other salmon farming operation in Ireland (IEHC 2021). If this is planned to be taken from a natural source it should be documented in the consultation documentation and any associated effects on the natural source evaluated in accordance with relevant directives and regulations and NIS/ EIA impact guidance.

Points addressed by the applicant

The freshwater pearl mussel (*Margaritifera margaritifera*) is a large filter feeding mollusc found in unpolluted freshwater rivers.

The freshwater pearl mussel has a very unusual life cycle involving a larval stage (glochidia) which must attach to the gills of a host salmonid fish and stay encysted for approximately 9 months before dropping off and settling back on to the riverbed. The juvenile mussels often stay buried in the riverbed for a period of 5 years until they are large enough to withstand the currents of the river.

The populations of European pearl mussel have been in decline over the past century with populations declining by as much as 90%. In Ireland, 27 freshwater pearl mussel populations are protected within 27 Special Areas of Conservation with eight of these populations representing 80% of the total population of Irish freshwater pearl mussels.

Threats to freshwater pearl mussels in Ireland include nutrient enrichment, acute pollution incidents, riverbank erosion, forestry, land change, bog and arterial drainage and loss of salmonid stocks (Moorkens, 1999).

The main reason for the observed decline appears to be the low level of survival of juvenile mussels which are extremely sensitive to slight changes in environmental conditions. For survival, juvenile mussels require clean, well oxygenated water with little silt, sediment or algal growth.

According to the NPWS ‘the decline of the freshwater pearl mussel has resulted from failure to recruit young mussels to populations. The cause of these recruitment failures is damage to the species’ habitat, specifically through hydrological, sedimentation, other morphological and enrichment impacts’.

In Ireland, the dramatic decline in the number of highest quality river sites in recent years is likely to have been a major factor in the decline in freshwater pearl mussel populations. Just over 30 of these highest quality river sites remain having numbered in their hundreds in the 1980s and 1990s (EPA, 2021).

While the absence of a host salmonid species may also be a factor it does not appear to be as important as the environmental conditions of the river in which the juveniles are found. In an extensive study of 20 freshwater pearl mussel populations across Europe the link between juvenile mussels and the lack of a suitable host species was only rarely observed (Geist et al., 2006). Indeed, recruitment of juvenile mussels was higher in rivers with lower numbers and biomass of host salmonid species compared to rivers with higher numbers and biomass of host species where mussel recruitment was lower or absent. The explanation being that the higher densities of host fish in the non-recruiting streams was due to nutrient enrichment which was resulting in an adverse impact on pearl mussel recruitment.

It follows therefore that the priority for supporting the recovery of freshwater pearl mussel populations will be efforts to address water quality and hydromorphological impacts on rivers with resident populations.

MI - Further comments or requests

Freshwater pearl mussels are covered in Section 5.2.5 above. The preferred host for freshwater pearl mussel in this region is Atlantic salmon. Atlantic salmon are covered in Section 5.2.4 above. Within the sub-basin catchment management plans, it has been stated that host presence is sufficient for the Caragh, Currane and Gearhameen catchments [SAC 000365] , the Kerry Blackwater [SAC 002173] and the Ownagappul river [SAC 001879]. The likelihood of impact occurring to the QI Freshwater Pearl Mussel is very remote; it is concluded that there will be no likely significant effects to the Freshwater Pearl Mussel.

Concerning AGD, in their response to the public consultation, the applicant has stated that they:

- apply good husbandry and management practices under the supervision of a dedicated fish health team, which includes a veterinary practitioner;
- periodically bathe fish in freshwater to repair gill damage caused for marine amoeba, phytoplankton, zooplankton and jellyfish.

In addition, they have confirmed that the water required for such bath treatments will be generated by reverse osmosis filtration of seawater, which will be carried out on the applicant's own vessel MV Aqua Transporter.

The husbandry and management practices referred to above are reviewed during annual inspections carried out by Veterinary Inspectors in compliance with Regulation (EU) 2016 (Animal Health Law) and Regulation (EU) 2017/625 (Official Controls Regulation). Whilst the objective of such practices and treatments is to protect the health and welfare status of the aquaculture animals in the establishment, strong veterinary supervision and appropriate treatments, will also serve to mitigate any potential impact on wild stocks.

6.1.1.14 15% Threshold and Benthic Communities

Point raised

The NIS outlined risks to QI sedimentary habitats in the Kenmare River SAC as a result of benthic enrichment beneath the salmon farm:

"The potential source of impact to benthic habitats from operations at the Deenish site is predominately organic enrichment due to settleable solids discharged from the fish sites which comprised fish faeces and feed waste. Solid wastes arising from the culture of fish can impact the seabed and associated benthic communities. Potential likely significant effects of the proposed project to the following marine Annex I benthic habitats of Kenmare River SAC could not be excluded at the Screening for AA stage (see Section 2.4 for summary):

• Large shallow inlets and bays [1160]

• Reef [1170]"

However, any impacts were discounted with a reliance on a 15% disturbance threshold:

"For the practical purpose of management of habitats, a 15% threshold of overlap between a disturbing activity and a habitat is given in the NPWS guidance. Below this threshold, which was used by Marine Institute in the AA of aquaculture activity in Kenmare River SAC (Marine Institute, 2017, 2019) (see Appendix 1), disturbance is deemed to be non-significant. In all cases the percentage of the community overlapped by the proposed licenced area and/ or the sedimentation footprint was below the 15% threshold for a disturbing activity identified in NPWS guidance (NPWS 2013)."

The source of this 15% threshold is unknown. The Commission framework on which it is allegedly based has not been included in the application documents, and it has not been possible to examine it. More fundamentally, it is not referred to in Article 17 of the Habitats Directive. It is also not referred to in Article 6(3) of the Habitats Directive which sets out the obligation for Appropriate Assessment. And it is not anywhere referred to in the case law of the EU Court of Justice. On the contrary, several judgements of the Court of Justice clearly set out very specific requirements in relation to site specific considerations and the thresholds of scientific certainty required for each of the different tests required to be addressed under Article 6(3), as clarified by the CJEU. The court's interpretation of the case specific context for how effects need to be assessed relies largely on specific ecological considerations at issue for the habitat or species, and the nature of impacts.

For example, in Case C258/11 Sweetman, the loss of approximately 1% of the protected habitat was considered to be an adverse effect on the integrity of the site. Furthermore, in assessing the potential effects of a plan or project, their significance must be established in light, inter alia, of the characteristics and specific environmental conditions of the site concerned by that plan or project as clarified by the CJEU in case c-127/02 Waddenzee. Consequently, both the project and site characteristics are required to be considered which is quite opposite to the very generic approach proposed with this 15% rule by the NPWS.

As such we submit that this is an unlawful approach to risk assessment under the Habitats Directive, and percentage overlap should not be relied upon when drawing conclusions for Appropriate Assessment.

Additionally, the applicant proposes mitigation measures to protect the Annex I benthic habitats for which the SAC is designated. The NIS then concludes:

"It can be concluded that the operations at the proposed site, together with the mitigation measures proposed (i.e. implementation of a fallow period), will not significantly affect benthic ecology. Any disturbance experienced will be temporary with the species characterising the community types recovering to pre-disturbed state following cessation of activity."

However, the fallow period is either for one month, or three, both are proposed at different points in the NIS, with no clarity provided for which is accurate.

Section 3.3.4 outlines that:

"Organic enrichment due to settleable solids discharged from the fish site is the main source of potential impact to marine benthic habitats. Potential effects of settleable solids will be mitigated through the implementation of fallow periods between production cycles at the site. Following each production cycle, the proposed Deenish site will lie fallow for 3 months." [our emphasis]

But section 3.8 outlines that:

"Organic enrichment due to settleable solids discharged from the fish site is the main source of potential impact to Habitats Directive Annex I Habitats. Potential effects of settleable solids on Habitats Directive Annex I Habitats will be mitigated through the implementation of fallow periods between production cycles at the site. Following each production cycle, the proposed Deenish site will lie fallow for a minimum of one month." [our emphasis]

The applicant then asserts that the disturbance will be temporary:

"Any disturbance experienced will be temporary with the species characterising the community types recovering to pre-disturbed state following cessation of activity."

However, our information shows that this site was first licenced in 1995, and has been in operation ever since. It is difficult to conclude that this is a temporary disturbance given that it's now almost 30 years later. Furthermore, having one/three month fallow periods does not provide optimum conditions for these sedimentary habitats for the other nine/eleven months of the year during which the farm is active.

Again, we submit that the potential pressure on sedimentary habitats has not been adequately identified in the NIS, the reliance on a 15% threshold is not lawful, and the proposed mitigation measures conflict with each other in terms of time limits. At best they allow an opportunity for sedimentary habitats to begin recovering for a quarter of the year, before being damaged again for the remainder of the year. This harmful annual pattern is destined to continue indefinitely.

We submit that the efficacy of this proposed mitigation measure is insufficiently evidenced in the NIS, and as such is non-compliant with Article 6(3) of the Habitats Directive

Points addressed by the applicant

The reference to the 15% threshold and overlay with disturbing activities is taken from NPWS guidance and is used extensively by the competent authority to assess screening for appropriate assessment. The Kenmare River SAC – Conservation objectives supporting document – Marine habitats and species (NPWS, 2013) outlines the Department's view that "licensing of activities likely to cause continuous disturbance of each community type should not exceed an approximate area of 15%".

MI - Further comments or requests

The 15% threshold is clearly identified in NPWS guidance document[214] and is derived from the broader EU Guidance on concepts and definitions under Article 17 of the Habitats Directive[215]. While it is beyond the scope of the MI to comment on legal standing of the guidance documents, the Marine Institute is satisfied that sufficient scientific rigour attaches to the assessment of likely impacts of the activities and the sensitivity of receiving environment as it relates to habitat structure and function. These facts allied with the guidance provided allow for definitive findings.

Following is a summary of the MI interpretation of the threshold and its application to AA. In the first instance it is important to note that EU guidance acknowledges that development in Natura 2000 sites is not excluded. More specifically, the European Commission has published guidance documents on aquaculture activities in Natura 2000 sites[216], within which is stated:

> *"There is no automatic exclusion of any economic activities in and around Natura 2000. Instead, human activities need to comply with the provisions outlined in Article 6 of the Habitats Directive to ensure that these activities are in line with the conservation objectives of Natura 2000 sites."*

To this end, and in order to facilitate decisions in relation to aquaculture licencing applications, assessments under Article 6(3) are carried out. The assessments for intensive aquaculture operations[217] are undertaken on an individual application basis, however, the assessment will consider all other activities (including aquaculture) that are likely to interact with habitats and species for which sites are designated and specifically in relation to the conservation objectives and targets for these features set out by the NPWS.

Any and all activities may have some level of interaction with conservation features in a site. The significance of these interactions and the need for management intervention and mitigation therefore, needs to be identified on a case-by-case basis. In the absence of a scientific framework or guidance on what constitutes significance, in the practical sense as it applies to management of a site, pragmatic reference points are needed.

In order to identify situations that would trigger management intervention resulting from the findings of Article 6.3 assessments, the NPWS identified a level of 15% spatial overlap of likely disturbing activities on marine communities as a threshold for management intervention. This threshold is applied at both Annex I habitat level and also at the finer spatial scale of the Marine Community Types (MCT) within these large-scale physiographic habitats. This guidance was prepared in the absence of specific guidance from the EU and has been applied since the initiation of AA reporting for aquaculture licencing in 2011. The 15% threshold is considered a guide to trigger management actions when all likely disturbing activities may spatially overlap these aforementioned habitats (QIs) and MCT.

Habitat disturbance, as distinct from habitat loss, in this instance, is defined as that which leads to a change in the characterising species of the habitat or marine community type, i.e., on the structure and function of the habitat(s) in question. In the case of finfish culture, the changes are most likely as a result of organic enrichment from faeces, waste food, or chemotherapeutants. Such disturbance may be temporary or permanent, in the sense that change in characterising species may recover to a pre-disturbed state or may persist, and localised, in that the impact will likely be confined to a zone directly under the fish pens or close to that footprint. The degree of change is likely a function of the sensitivity of the receiving environment to the pressure, which in turn may be influenced by hydrodynamic conditions in addition to the density of the organisms in culture at the site. The rationale adopted to apply this threshold is that, while there may be persistent disturbance as a result of an activity (e.g. organic loading) which may result in a response/change

[214] NPWS (2015) Slyne Head Peninsula SAC (site code: 2074) Conservation objectives supporting document - Marine Habitats. Version 1 January 2015- link

[215] DG Environment. 2023. Reporting under Article 17 of the Habitats Directive: Guidelines on concepts and definitions – Article 17 of Directive 92/43/EEC, Reporting period 2019-2024. Brussels. Pp 104 Link

[216] EU (2018). Guidance on Aquaculture and Natura 2000 Sustainable aquaculture activities in the context of the Natura 2000 Network. PDF ISBN 978-92-79-99668-9

[217] 'Intensive fish farming' means aquaculture activities where the biomass produced is beyond that which could be naturally supported without the provision of additional feed' as defined in S.I. No. 240 of 2018.

to the structure of the marine community type, it is expected, however, that (some level of) function will be retained. Function is considered the process whereby the animals living on and in the seafloor, by virtue of their activities, influence benthic dynamics (reflective of) related to system health (Bolam et al 2002; Solam et al 2004). Such activities or traits are considered in relation to, among others, the organisms feeding type (e.g., scavenger, filter, deposit feeders), mobility, body size, and ability to bioturbate (i.e. introduce oxygen into the sediment). All such traits can result in the removal or conversion of organic matter to biomass (i.e. secondary production) or oxygenation of sediments. However, by virtue of the fact that the composite species may change, the result is considered a disturbance. The confidence around the measure of spatial overlap is considered high because much published literature and monitoring outputs identifies that the effect of shellfish and finfish culture is, for the most part, confined to the footprint of the activity in question (cage or longline). In addition, data on habitat and species resilience are derived from primary literature, review documents and sensitivity assessment frameworks specific to marine systems (e.g. MarLIN, MarESA)

The application of the 15% threshold to the AA process for aquaculture licencing is guided by a number of principles:

- All new applications are subject to full assessment which considers the pressures cumulatively with licenced aquaculture practices.
- This is not a 15% for aquaculture activities alone - all other likely disturbing activities (e.g. fishing, dredging) acting on habitats are considered in-combination with aquaculture activities.
- The process is applied only to Annex 1 - habitats and within these habitats, the marine community types – which represent finer resolution marine communities delineated within these broad qualifying interests. The thresholds do not apply to other conservation features, e.g. Annex 2 species and birds, which are considered separately in the reports.
- For highly sensitive marine communities such as eel grass, maërl and biogenic reefs no spatial overlap is tolerated and buffer zones are advised and factored in, if necessary, to ensure complete separation of effects.
- Likely disturbance effect resulting from aquaculture practices are derived primarily from peer reviewed literature and established risk frameworks (e.g., MarLIN and MarESA) and are specifically identified, in many instances, from empirical studies examining the effects.
- The process is considered precautionary in its application as the entire licence area is considered when in reality, any effects are likely to be more restricted and confined, for example, to the footprint of the structures.
- In the majority of sites/reports this threshold is never closely approached – those that do approach or exceed the value will result in the consideration of mitigation measures or licence refusal.
- Other pressures such as risk of establishment or introduction of alien species are also considered on a case-by-case basis.

Finally, it is important to clarify that 'loss of habitat' identified in the submission from An Taisce is not considered in this instance, only disturbance as defined above. The proposed activity in Kenmare River SAC will not result in the loss of any of Annex 1 qualifying interests (1160 and 1170 habitats).

Net-pen aquaculture can alter the benthic ecosystem but that effect is spatially limited[218]. When the cage footprint is small compared with the total area of the habitat, the sediment fauna will recover eventually[219].

The footprint of sinking particles on the seabed depends on currents and water depth at a farm. The models provide a prediction of how the waste will be distributed as it reaches the sea-bed at this site. The primary impact is directly beneath the pens. The model does indicate some migration of settable solids outside the proposed site, but this is low level and would not be significant in the context of the greater environment.

Current licensing regulates benthic effects in terms of an allowable zone of effect (AZE) - where some degradation of seabed conditions is permitted. The impact criteria are laid out in Monitoring Protocol No.1

[218] Findlay, R.H., Watling, L. & Mayer, L.M. Environmental impact of salmon net-pen culture on marine benthic communities in Maine: A case study. Estuaries 18, 145–179 (1995).
[219] Review of the Environmental Impacts of Salmon Farming in Scotland 02468_0001, Issue 01, 24\01\2018

for Offshore Finfish Farms Benthic Monitoring and the size of the zone is determined on an individual site basis. [While not detailed in the current version of the Protocol document, this AZE can extend to 100m from the fish pens, and impacts should be reducing with distance from the pen and not detectable beyond the AZE]. While an effect is allowable, it is expected that even at the cage-edge, and under, some kinds of invertebrates are to be found. As the impacts are localised, disturbance experienced will be temporary with the species characterising the community types recovering to pre-disturbed state following cessation of activities. Spatial overlap with any community type at this site is <1%.

6.1.1.15 Biosecurity threat from brown rat and American mink

Point raised

...the assessment reports do not satisfactorily consider the potential impact of the proposed development and associated activities on the listed birds with regard to:

- the biosecurity threat to the SPA of potentially introducing predatory mammals such as Brown Rat and American Mink onto the islands of the SPA. If such species became established, they would likely significantly and negatively impact on the breeding birds' survival and productivity rates;

Points addressed by the applicant

Mowi Ireland does not operate any facility on Deenish Island. Feed is delivered in fully sealed one tonne tote bags via truck to our feed warehouse at Travara pier. From there, feed lots are loaded on to our marine vessel for transfer to the floating feed barge at site. The feed is then deposited into enclosed feed silos, below deck. All Mowi Ireland land-based facilities including feed storage, have fully serviced pest management plans in place, which are subject to audit under the various voluntary quality and food safety standards we adhere to. Thus, the threat of ingress from pests such as rodents and mink are minimised.

Marine Vessels and Invasive species

Wellboats and Specialist Transporters of fish are required to obtain Fish Health Approval (FHA) from the Marine Institute before operating in Ireland in accordance with Article 4(e) of Regulation (EU) 2020/691. Vessels owned or operated by Mowi Ireland, including the MV Aqua Transporter, are registered with the Marine Institute. Refer to the list of approved vessels here (https://www.fishhealth.ie/fhu/). Operators of these vessels are required to submit a documented biosecurity plan which must apply measures in accordance with EU rules for transporters of aquatic animals, specifically COMMISSION DELEGATED REGULATION (EU) 2020/691of 30 January 2020, supplementing Regulation (EU) 2016/429 of the European Parliament and of Council as regards rules for aquaculture establishments and transporters of aquatic animals.

MI - Further comments or requests

The registration and approval procedure as well as the biosecurity measures concerning certain marine vessels, which are referred to by the applicant, relate only to the requirements of Regulation (EU) 2016/429 and Commission Delegated Regulation (EU) 2020/691, concerning the prevention of the spread of diseases of aquatic animals. It should be noted that whilst these requirements are not designed to prevent the introduction/ manage the spread of predatory mammals such as Brown Rat and American Mink, the measures outlined by the applicant, concerning secure feed holdings and pest control, along with the fact that the farm does not operate on the Island as such, minimise the risk of the proposal being responsible for potential introductions of predatory mammals such as Brown Rat and American Mink onto the islands of the SPA.

6.1.1.16 Impact of lighting

Point raised

...the assessment reports do not satisfactorily consider the potential impact of the proposed development and associated activities on the listed birds with regard to:

- depending upon the intensity, layout and other characteristics, the lighting of the development has the potential to negatively interfere with the behaviour the Manx Shearwater and Storm Petrel fledglings which depart their natal sites under cover of darkness. Such young birds may get attracted

to the lighting of this development thus increasing their chances of depredation by gulls and other predators.

Points addressed by the applicant

Lighting is only deployed on site during low light conditions in winter to allow for safe staff access and egress with no lighting before 08.00hrs and after 17.00hrs daily other than the aids to navigation on site.

MI - Further comments or requests

Both Manx Shearwater and Storm Petrel migrate in early Autumn, when hours of daylight overlap with the working day. The minor requirement for lighting at the site, confined to working hours and at times of other operational activities, means the potential of lighting attracting young birds to the proposed project are minimal. There is not likely to be any negative interference.

6.1.1.17 Seals

Point raised

In relation to marine Annex II marine mammal species, the Department has undertaken regular monitoring across all SACs. Where population or count figures are provided in the assessment in order to describe a species' status or other parameters it would be helpful if the most recent information was used and a clear source citation provided. The Department has undertaken annual standardised moult season monitoring of the harbour seal population within Kenmare River SAC since 2009 and there are also substantial local records preceding the current monitoring programme. In addition, aerial surveys of the area were carried out in 2011/2012 and repeated again 2017/2018 (see http://www.npws.ie/marine/marinereports). There are still important data gaps remaining for the site. This is particularly the case regarding:

(a) harbour seal site use throughout the annual cycle and

(b) the spatial and numerical extent of harbour seal breeding (May–July) and post-moult (Oct-Apr) activity.

Points addressed by the applicant

The potential impact of the Deenish Island salmon farm on the harbour seal (*Phoca vitulina*) was considered in the screening for AA exercise and brought forward into the second stage of the Appropriate Assessment. Due to the widespread foraging nature of this species (up to 220 km) four separate SACs were considered in the assessment, including Kenmare River SAC.

Impact mechanisms considered in the NIS included disturbance due to noise, disturbance at seal haul out locations and entanglement. The nearest seal haul out location is located approximately 12 km to the northeast at Cove Harbour. Given this distance it is unlikely that operations at the salmon farm site will result in disturbance effects. Overall, the NIS concluded that the potential impacts identified would have no likely significant effect on the seal population in the Kenmare SAC or indeed in the other SAC's assessed. It should be noted that the purpose of an NIS is to provide the relevant information to the national competent authority who are ultimately responsible for undertaking Appropriate Assessments to determine the potential impact of projects on protected species and habitats.

MI - Further comments or requests

NPWS reports[220],[221] indicate that Kenmare Bay (inner) is an important site for Harbour seal, as are the Blasket Islands. Deenish Island show no records of Harbour seal activity, and being more off-shore this island is less likely to be used by Harbour seals.

The Harbour seal is addressed in detail in Section 5.2.3 of this document.

6.1.1.18 Otters

Point raised

[220] Lyons D. O. (2004) Summary of National Parks & Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003. Irish Wildlife Manuals, No. 13. National Parks & Wildlife Service, Department of Environment, Heritage and Local Government. Dublin, Ireland

[221] NPWS. 2011. HARBOUR SEAL PILOT MONITORING PROJECT, 2010 . Unpublished.

Otters are known to occur in the Kenmare River SAC, in which the salmon farm site falls. The AA screening outlines that:

"While otter is more an aquatic rather than a truly marine mammal, they are widely distributed in the SAC (Saunders, 2017) and so may occur within the proposed project area; consequently, potential effects to the otter cannot be excluded at the screening stage. Otter is brought forward to the Stage II AA NIS"

The NIS outlines that Otters forage and feed within 80m to 100m of the coastline and can travel distances up to 500m across estuaries or between islands, but discounts them interacting with the farm site thus:

"Although the proposed aquaculture renewal site is located within the Kenmare River SAC, the distance from the coastline of Deenish Island where otters can forage, is too significant for them to be found at the site.The likelihood of an impact occurring on otters is remote, the consequence of an impact if realised is negligible; it is concluded that there will be no likely significant effects to otter."

However, from the documentation on the NPWS site for the SAC, this does not seem to be entirely accurate. The following is a map of an Otter commuting buffer zone in the area, and clearly incorporates the entire boundary of Deenish Island, including the location of the fish farm.

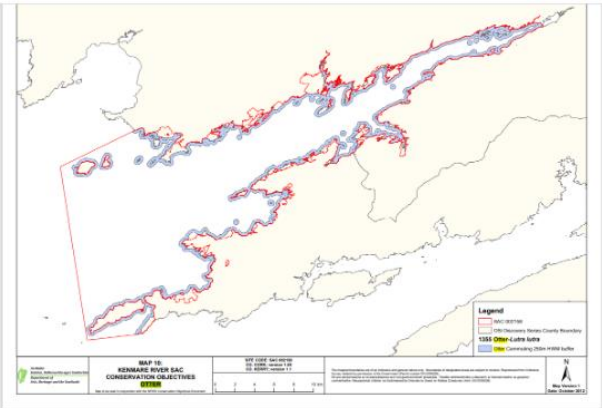

Figure 1: Map from NPWS Conservation Objectives for Kenmare River SAC[7]

As such, we would argue that the conclusion that there will be no impact is not scientifically robust. The CJEU at para. 44 in Case C-258/11 clearly states that an AA:

"cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt."

We would highlight that we do not believe the information provided in the NIS in regard to otters is accurate, given it appears to conflict with the information provided by the NPWS on the SAC. Further information should be sought from the licencing authority on otter movements in the vicinity of the salmon farm.

Points addressed by the applicant

This is a widespread species that can live near humans. Observations at the mouth of the River Corrib over a 5 year period showed that they are present both in early morning and late evening but were also seen in day light hours feeding in the Claddagh Basin where pedestrians and cars were passing by. No impact on the population of otter in Kenmare River is predicted due to activities on the farm and Deenish Island

MI - Further comments or requests

This issue is addressed in Section 5.2.2.

6.1.1.19 Bird impacts

Point raised

The location of this salmon farm is within the Deenish Island and Scariff Island SPA (Code 004175). Deenish Island and Scariff Island SPA is a site of high ornithological importance on account of the internationally important population of Storm Petrel and nationally important populations of Manx Shearwater, Fulmar, Lesser Black-backed Gull and Arctic Tern. It is also worth highlighting that the aforementioned Storm Petrel and Arctic Tern species, as well as Chough, are listed on Annex I of the E.U. Birds Directive According to the NPWS, these islands support important populations of breeding seabirds. The Seabird 2000 survey recorded

1,960 pairs of Manx Shearwater on Scariff Island and 351 pairs on Deenish Island in 2000, giving a total of 2,311 pairs which is equivalent to c. 5% of the national total. On Deenish Island, birds breed in burrows on steep grassy slopes with rock outcrops in a limited area on the south-east side of the island. Deenish Island is also a traditional site for nesting terns, with 54 pairs of Arctic Tern present in 1995 -a population of national importance. Other seabirds which were recorded breeding in 2000 include Shag (5 pairs), Herring Gull (28+ pairs), Great Black-backed Gull (7 pairs) and Black Guillemot (several pairs).

Potential impacts on birds are outlined in the NIS:

"The greatest potential impact from human activity will be associated with boat movements around the site. The sensitivity of various high conservation value species to such impacts will vary"

The NIS then proceeds to enumerate the risk to birds using a metric based on various aspects of the bird's sensitivity to disturbance, endangered status and habitat flexibility, and concludes that:

"The likelihood of impacts occurring is remote; it is concluded that there will be no likely significant effects."

We are of the view that the chosen metric is unfit for purpose, and results in an overly positive assessment of the potential impacts on the protected species of this SPA. The NIS seeks to rely on a composite metric, which includes measures of species habitat suitability and species habitat flexibility. We would highlight that this is irrelevant in this context. Habitat flexibility estimates if a species is very flexible in habitat use, or if it is reliant on one particular habitat type; and habitat suitability assesses how likely a species is to use a particular habitat.

The Deenish Island and Scariff Island SPA's high ornithological importance is demonstrated by its support of important populations of breeding seabirds. The Seabird 2000 survey recorded 1,960 pairs of Manx Shearwater on Scariff Island and 351 pairs on Deenish Island in 2000, giving a total of 2,311 pairs which is equivalent to c. 5% of the national total. As such, the impact on nesting species is the issue here, not their ability to nest or forage elsewhere. The SPA was designated because it is suitable for the species, and they naturally occur there. As such, assessing if they could utilise other habitats, or whether the existing habitat is suitable for them is moot. This is an area protected for the sole reason that it provides them with the habitat which they favour.

The impact of boat disturbances to these nesting bird species is entirely absent from the NIS, despite this being clearly identified in the NIS as having the greatest potential to impact on bird species. The energetic cost to the birds, and potential risks to their breeding success as a result of the flushing of birds due to boat traffic has not been assessed at all within the NIS.

As such, the information which is necessary for the decision maker to reach a conclusion beyond all reasonable scientific doubt is absent. Habitat flexibility is irrelevant given that Deenish Island is designated for the protection of breeding birds, no activity which requires the species to be flexible in their nesting choice should be licenced within the SPA. Likewise, the habitat suitability exercise is irrelevant as these species occur naturally on Deenish Island and are protected in that location. It is not up for debate whether the habitat is suitable for them or not. As such, the assessment of impact significance is not fit for purpose in this case, and we submit that it cannot be relied upon by the decision maker. Until such a time as the impact of daily boat disturbances can be enumerated and discounted for each of the SCI species within the Deenish Island and Scariff Island SPA, any decision made cannot be considered to have reached the acceptable threshold for the decision maker to be able to conclude beyond reasonable scientific doubt, and as such will be non-compliant with Article 6(3) of the Habitats Directive.

Points addressed by the applicant

The Species of Conservation Interest for this SPA include Manx Shearwater, Storm Petrel, Fulmar, Lesser Black-backed Gull and Tern spp. These species only occur at the SPA during the breeding period (ca. late March – mid-August) and for the other seven months of the year, they migrate either offshore to over-winter in the open ocean or in Iberia and both North and southern Africa. During that period, they cannot therefore be affected by the fish farm.

Manx Shearwater, Storm Petrel and Fulmar feed in offshore locations during day light hours (or for far longer periods of time), leaving their mates and return to the nest at night. They therefore will not be impacted by activities on the fish farm. Manx Shearwater nest in holes in the ground while Storm Petrel nests are cryptically hidden in holes in walls or under vegetation and therefore the bird that remains at the nest while its mate has gone foraging, will not be affected by activities at the fish farm. Fulmar nest on shelves of steep cliff faces ca. 10m above the levels of the highest wave action. Observations of a colony on Friar Island, Co. Galway since 2000 has shown that the sitting birds will not leave the nest even if the boat approaches the bottom of the

cliff face to within 5m (B. O'Connor, pers. obs.). As the farm is ca. 200m distant from Deenish, the sitting birds will not be impacted by activities at the farm.

As for the many gull species, Lesser Black-backed gulls are gregarious and are not sensitive to humans or human activities. They nest on a variety of habitat types e.g., islands, islands on lakes, coastal cliffs and even on tops of buildings. As the farm is ca. 200m distant from Deenish, the birds will not be impact by activities at the farm and may even forage at the farm.

Arctic Terns breed in colonies both on the coast and on lake shores. Like gulls, they are gregarious and are not affected by human activities. They will therefore not be impacted by activities on the farm

MI - Further comments or requests

This issue is addressed further in Section 5.2.6 above.

6.1.1.20 Freshwater use

Points addressed by the applicant

Periodically, Mowi Ireland bathe fish stocks in freshwater to repair gill damage caused by marine amoeba, phytoplankton, zooplankton, and jellyfish. To provide sufficient quantities of low salinity water for these baths, Mowi employs reverse osmosis filtration of seawater on its live fish wellboat carrier, MV Aqua Transporter.

MI - Further comments or requests

There will not be a requirement for water extraction from a freshwater source, therefore there will not be an impact on any Natura site or their QIs.

7 Conclusions

This Appropriate Assessment report has been prepared as it was not possible at the Screening for AA stage to rule out, as a matter of scientific certainty, that the proposed operation at the T06-202 site will not have a likely significant effect on Qualifying Interests in SAC and SPAs within the zone of influence of the proposed project. The Appropriate Assessment has examined and analysed how the proposed operation could impact on the Qualifying Features of the Natura 2000 sites, within the zone of influence of the project, and whether the predicted impacts would adversely affect the integrity of protected sites, in light of the best scientific knowledge available.

All statutory and public submissions received as part of the process have been fully considered and issues raised by the consultation process, and the technical responses, have supported this appropriate assessment, both informing and allowing for the provision of greater certainty to the conclusions reached.

To ensure the risk of introduction of non-native species is eliminated, the following mitigation measures should be implemented:

- the equipment and infrastructure used at the site should be site-specific and not transferred from other locations - or must be washed with detergent and disinfected before transfer to storage or any other site.
- Well-boats, and other boats, which come to the site from other locations should be required to follow disinfection procedures.
- Well-boat/live fish carrier should clean and disinfect their vessels between sites.

The operation should comply with all legislation and regulation to ensure the management and control of diseases, and should ensure good standards of animal health and welfare.

Mitigation measures have been identified which ensure that any impacts on the Conservation Objectives of Qualifying Features for which SACs and SPAs are designated will be avoided such that there will be no risk of adverse effects to the protected sites. These are to:

- adhere to *Monitoring Protocol No. 3 for Offshore Finfish Farms – Sea Lice Monitoring and Control* and the *Protocol for Fallowing at Offshore Finfish Farms* as mandatory requirements.
- adhere to the *Strategy for improved pest control on Irish salmon farms* as a mandatory requirement.
- comply with the *Protocol for Structural Design of Marine Finfish Farms* as a mandatory requirement.
- prohibit the use of acoustic deterrent devices (ADDs) at the site.
- Any cetacean mortalities should be quantified and reported to inform risk.

In light of the information presented, and the mitigation measures prescribed, it can be concluded that the proposed operations will not pose a risk of adversely affecting (either directly or indirectly)

the integrity of the Natura 2000 sites, either alone or in combination with other plans and projects, and that there is no reasonable scientific doubt in relation to this conclusion.