The Minister for Agriculture, Food and the Marine
Aquaculture and Foreshore Management Division,
National Seafood Centre
Clogheen,
Clonakilty
Co. Cork. P85 TX47

04.04.2024

RINMORE

Re. Public Consultation – Aquaculture licence T06/202 Deenish, Co. Kerry

Dear Minister,

We refer to the general public submissions on our published application for the renewal and review of an aquaculture licence at Deenish, Co. Kerry.

We note the concerns expressed in the submissions and rather than address each submission from the public consultation process individually, we have summarised the key issues raised into an appropriate categorisation in order to deal with these as comprehensively as possible.

For simplicity of reference, we also append a summary of all correspondent issues noted and identify where these are addressed in the published Screening for Appropriate Assessment and Natura Impact Statement in addition to the Environmental Impact Assessment Report which accompanied the licence renewal application.

1. **Algal blooms:**

Phytoplankton bloom events occur from time to time in southwestern Irish bays and further afield. These result from the advection, into the bay, of off-shore phytoplankton populations fed from natural, nutrient upwelling events. As illustrated in the EIAR, current and foreseeable nutrient conditions around Deenish are neither at nor expected be at concentrations which would change the trophic state of the water body and promote localised algal blooms. Long term monitoring data of the existing farm at Deenish Island both by the developer and the EPA, illustrate that the nutrient status of these waters is well below the established Environmental Quality Standards (EQS) for marine waters.

2. **Benthic Impact**

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.

Mowi Ireland

Registered in Ireland as Comhlucht Iascaireachta Fanad Teoranta, VAT No: IE4530734O: Registration No. 66929
Directors: Catherine McManus, David Brennan, Pat Connors, Joseph Gibbons

OFFICE
Kindrum
Letterkenny Co. Donegal, Ireland F92 XD93

POSTAL
Rinmore, Ballylar P.O.
Letterkenny Co. Donegal, Ireland F92 T677

PHONE
+353 74 9192105

MAIL
Catherine.mcmanus@mowi.com

WEB
http://mowi.com

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 was 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%".

3. Cetaceans

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.

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.

4. Cleanerfish Management

The use of wild cleanerfish 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 cleanerfish. Wild fish are sustainably harvested by local fishermen when required. Further details on cleanerfish management can be found in the EIAR and NIS appendix 3.3.

5. Climate change & Energy use

Mowi has adopted a global approach to climate change which is aligned with climate science (our targets are approved by the Science Based Targets Initiative, SBTi) and the Paris Agreement to limit the increase in the global average temperature to 1.5°C above pre-industrial levels by the end of the century. Mowi has chosen to pursue the Representative Concentration Pathways (RCP) 2.6 pathways and the climate scenario that will limit the global average temperature to 1.5°C above pre-industrial levels.

Our energy consumption and GHG emissions data are reported internally and audited by an independent third-party annually. We disclose our GHG emissions strategy and performance in

association with the Carbon Disclosure Project (CDP). Mowi has maintained its CDP climate rating at A- reflecting our continuous work on performance and transparency on climate-related metrics.

We are working in collaboration with our peers in the seafood sector and other ocean economies (High Level Panel for a sustainable ocean economy) and the UN Global Compact to optimise the value of the ocean to produce more sustainable food as a strategy against climate change, while at the same time increasing our understanding of the potential impact of climate change on our business. Mowi also collaborates with science to further advance our focus on circularity and climate change.

We also engage with public policy officials to discuss the topic of climate resilience in the seafood sector. Through the Federation of European Aquaculture Producers and national industry associations we engage with governments, public policy officials, scientists and NGOs towards sustainable seafood production, healthy ocean, sustainable finance (including green bonds and sustainability-linked finance) and ESG disclosure regulation and standards (such as GRI, TCFD and TNFD).

GHG emissions from Irish salmon aquaculture is relatively low when compared to other protein sources such as poultry, beef, or lamb. 3.88 CO_2 eq./kg of organic farmed salmon compared to 11.75 kg CO_2 eq./kg of cattle. (BIM, 2023). https://bim.ie/wp-content/uploads/2023/02/BIM-Carbon-footprint-report-of-the-Irish-Seafood-Sector-1.pdf

Mowi is part of the advisory network of the High Level Panel for a sustainable ocean economy which comprises more than 135 private sector, non-governmental organisations, and intergovernmental organisations across 35 countries. As a member of the advisory network, we aim to share knowledge on existing initiatives and actions within ocean-farming that can contribute to the High Level Panel's aim of advancing a new relationship between humanity and the sea that protects the ocean and optimises its value to humankind. https://www.oceanpanel.org/. In addition, this network allows a discussion with public policy officials on topics such as climate change and ocean pollution.

The Blue Food Assessment, the High Level Panel for a Sustainable Ocean Economy, and FAO's Blue Transformation roadmap, continue to provide a credible and transparent assessment of the potential of aquaculture as a sustainable ocean economy. Blue foods have lower environmental footprints than land-based foods. Farmed salmon in particular has lower GHG emissions, water use and land use when compared with chicken. https://mowi.com/blog/blue-food-assessment-shows-benefits-of-salmon-farming/

In response to a comment regarding fish farms requiring significant energy for water circulation and temperature control, open net pen marine fish farming sites, like Deenish, are located in areas where the water flow is sufficient to assimilate uneaten fish feed and fish faeces without significant effect on the environment and where water temperatures are suitable for the fish being reared. Water circulation and water temperature control are not a requirement for rearing the fish at these sites, and hence they use much less energy than would be required for operating fully enclosed pens or terrestrial grower sites.

6. Stocking density

All Mowi Ireland farms including Deenish are managed under organic principles as dictated by the requirements of EU Organic regulations 854/2004, 889/2008, 710/2009 and 848/2018. The maximum allowable stocking density in net pens is 10kg/m^3, which is at least half that allowed in conventional salmon rearing systems.

7. Escapes

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 non-company 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.

8. 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 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.

9. Bay obstruction

The Deenish farm site is accessed primarily from Travara pier. Other piers that may be used include those located at Westcove, Derrynan, Ballycrovane and Castletownbere. As this is a licence renewal application, all aquaculture associated ship traffic makes up part of the existing shipping levels in the area. Shipping traffic associated with the Deenish site will not significantly change due to the renewal license and changing the site boundaries or operating conditions attached to the licence.

There is a minimum of 170m and 200m space between the respective northwest and southwest corners of the site pen grid and Deenish island for vessels to pass. The additional pens only make a difference to the northwest access by reducing the passage by 20m, therefore the sheltered area west of the site will not be obstructed.

It should be noted that the pens will be fitted with radar reflectors and navigational lights.

10. Feed ingredients & Feeding

The farm at Deenish is manged under organic farming principles which governs the choice of feed rations delivered to fish on site. All feed inputs are formulated to comply with EU Directives 834/2007/EC and 889/2008/EC as amended by 710/2009/EC and are certified to the organic standards set by a number of international organic certifiers e.g. Organic Food Federation (UK), Naturland (Germany) and Agriculture Biologique (France).

The feeds are composed mainly of fish meal and oil derived from the trimmings of fish caught for human consumption, organic vegetable oil, organic peans and beans, organic soya products, organic wheat, vitamins, and minerals in addition to naturally fermented sources of pigment are added to our organic salmon feeds.

In 2023, the forage fish dependency ratio (FFDR) for Mowi Ireland salmon was 0.34. Thus, for every one kg of fish produced by Mowi Ireland, 0.34kg of forage fish (meal) was fed. This ratio represents the quantity of wild-caught fish used to produce our organic feeds. It is calculated based on taking into account the eFCR (Feed Conversion Ratio), the inclusion level of forage fish-derived marine ingredients in the feed (notably any marine ingredients produced from by-products are not included) and the yield ratio of producing marine ingredients from forage fisheries.

All ingredients, marine as well as non-marine in origin, which are used in the production of our feeds, are fully traceable. 100% of our soy originates from deforestation-free areas, is non GM (not genetically modified) and is Organic certified.

For more information go to https://mowi.com/blog/mowi-annual-report-2023/

Automated delivery of feed from the barge to the pens is controlled by site staff who monitor fish behaviour via underwater cameras. The fish cannot be force fed, as some comments suggested, and delivering feed to the pens when the fish are not going to eat would be a waste of resources for the company, hence the controls put in place to mitigate excess waste feed entering the environment.

11. Fish Health & Welfare management

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.

12. Freshwater use

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.

13. Sea lice levels

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 are triggered 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.

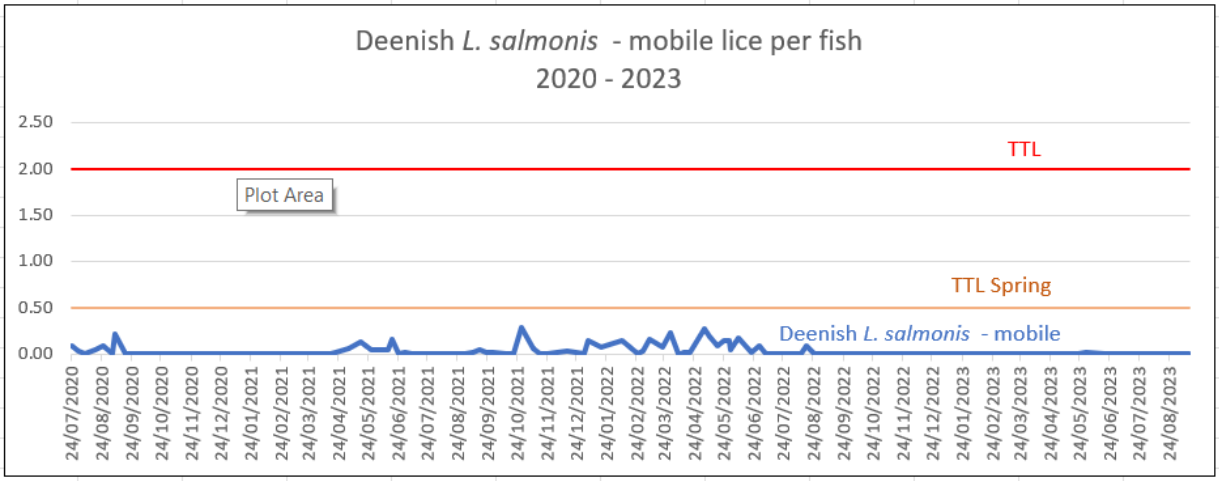


Figure 1: All mobile L. salmonis reported at Deenish 2020-2023 (blue). No data is available in Aquafarmer for mobile species prior to 2020. TTL Spring (orange) is the treatment trigger level set by the Marine Institute for the Spring period and TTL (red) is the treatment trigger level set for all other 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.

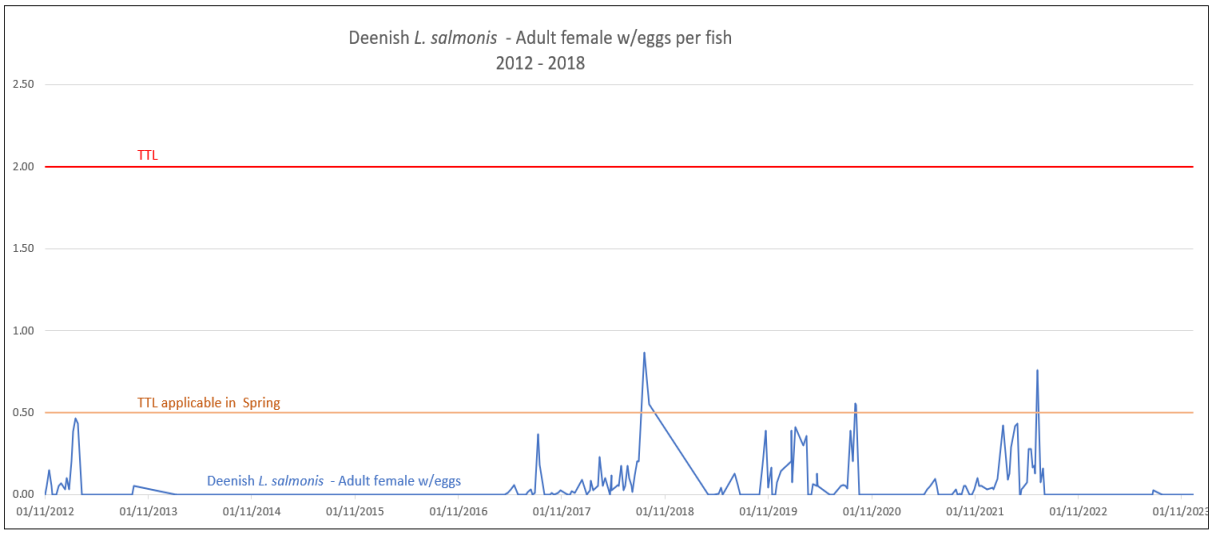


Figure 2: Adult ovigerous female L. salmonis reported at Deenish 2012-2023 (blue). TTL Spring (orange) is the treatment trigger level set by the Marine Institute for the Spring period and TTL (red) is the treatment trigger level set for all other times. Note that at no time were the TTL levels breached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

14. Impacts on Wild Salmonids

Introduction

Many of the submissions largely relate 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 3. No specimen sea trout taken on rod and line on the Cummeragh River system have been certified by the ISFC since 2017.

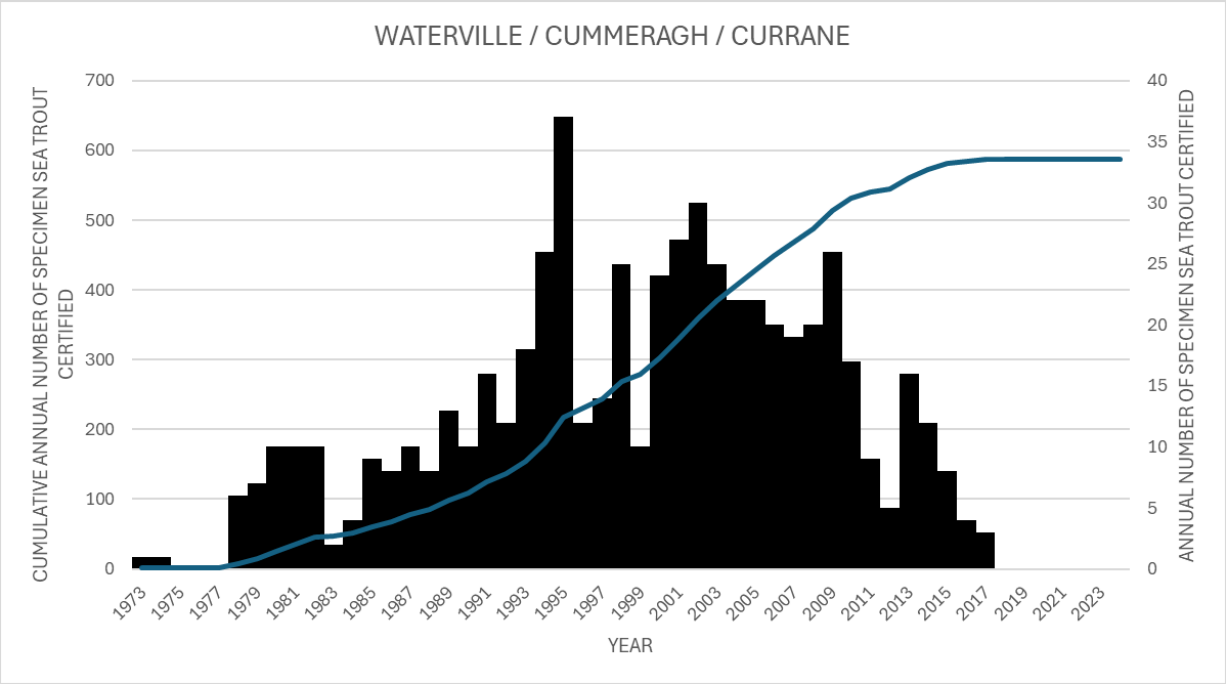


Figure 3 Number and cumulative annual number of specimen sea trout certified by the Irish Specimen Fish Committee for the years 1973-2017.

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 bye-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 fishing 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 Figure 4, namely, salmon and sea trout.

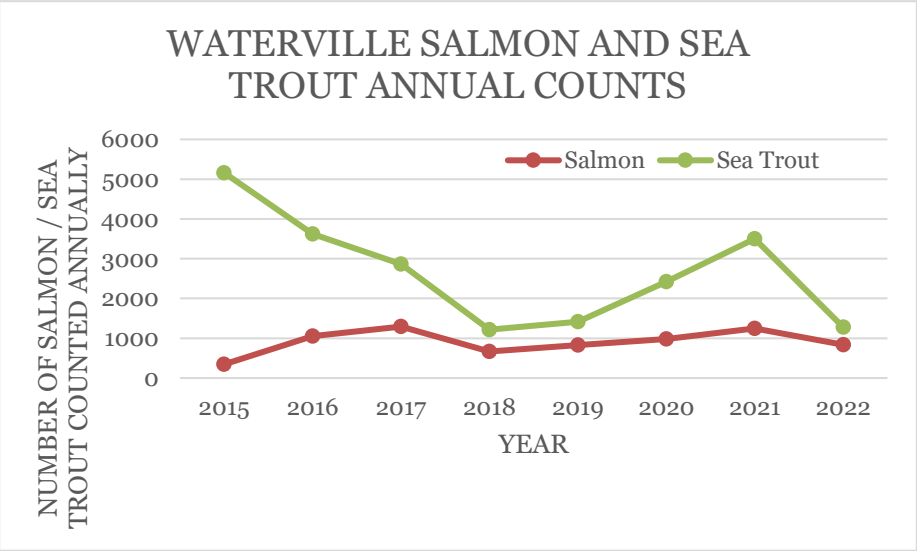


Figure 4 Annual salmon and sea trout counts at Waterville (2015-2022).

The above data is included in Table 2 below.

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

Table 2 Annual counts of salmon and sea trout at Waterville (2015-2022)

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 bye-law 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 Kery 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 sub catchment (Figure 5 below).

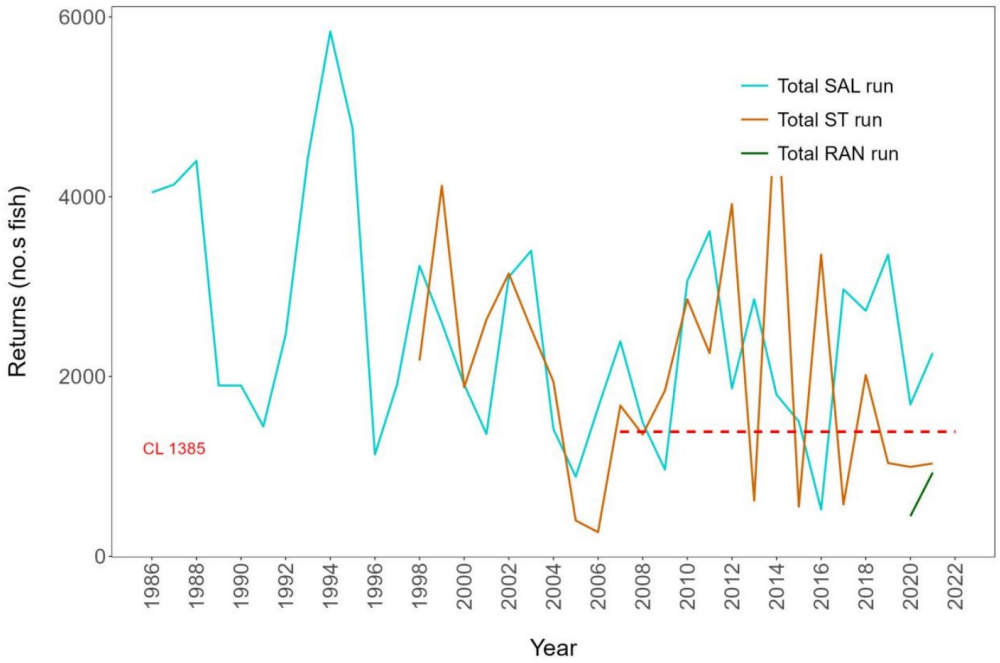


Figure 5 (Figure 8 of Kelly et al. 2024) Adult returns of wild salmon, sea trout and ranched salmon to River Erriff since 1986 (conservation limit for wild salmon of 1385 indicated)

In Figure 5 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 (Figure 6).

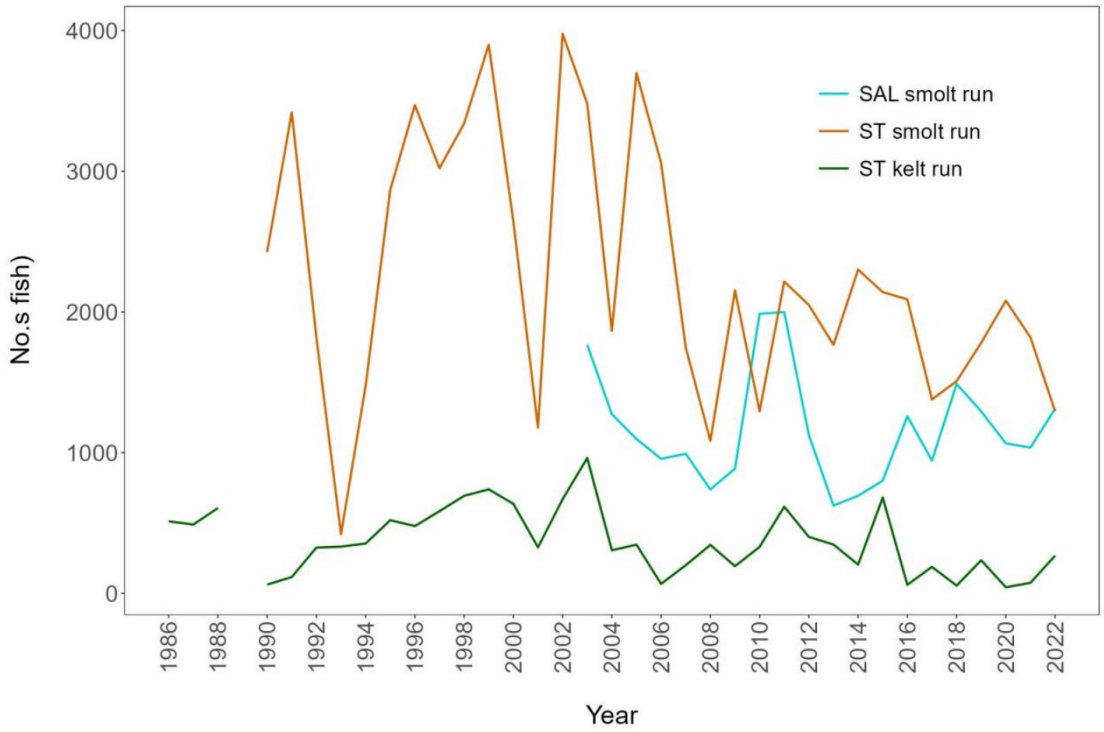


Figure 6 (Figure 10 of Kelly et al. 2024) Number of downstream migrating salmon and sea trout smolts and sea trout Kelts (and immature sea run fish) recorded at the Tawnyard trap since 1986.

This graph 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, were 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.

Salmon Migration

With regard to 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.

Litter

Mowi Ireland operates a comprehensive environmental management system which is certified to the ISO 14001 standard. Operational procedures are in place for the management of all waste streams arising from its farm operations including Deenish. The potential risk of materials or waste entering the marine environment is low. However, occasionally after severe storms, some materials may blow from land bases off-shore. In this event, every effort is made by local staff to retrieve any loose materials. In addition, Mowi Ireland organise annual shore and beach cleans to retrieve all waste material. It is our experience that the waste collected is derived from sources other than fish farms, including domestic sources.

Micro plastics and Copper

In a Mowi study, fillet, liver, gills, and the content in the gastrointestinal tract from farm-raised (Mowi North Atlantic salmon) and wild-caught salmon (caught on the Norwegian coast) were analysed. The company found that there were no microplastics in their salmon fillets. The study also showed that the levels of contaminants in wild salmon is higher compared to farmed salmon, which is to be expected and related to differences in diet. https://www.salmonbusiness.com/mowi-looks-for-microplastics-in-its-farmed-salmon

Organic farming regulations prohibits the use of copper antifoulants on net pens. The Deenish site has not had any net antifoulants for more than 14 years.

Otters

This is a widespread species that can live in close proximity to 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.

Pearl mussels

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 river bed. The juvenile mussels often stay buried in the river bed 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 withing 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, river bank 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.

Pollution

The Environmental Impact Assessment report deals comprehensively with impacts from farm discharges. Discharges from the farm in its current form do not have a significant effect (positive or negative) on water quality. Mowi Ireland has submitted annual environmental monitoring reports since 2008 to the Department of Agriculture food and Marine, for both the benthos and the waters around the farm. These reports illustrate 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.

Discharges predicted from the proposed operations will not give rise to negative effects on water and it is concluded that there will no significant effects.

Regulation of sector

Aquaculture in Ireland is licensed by The Minister for Agriculture, Food, and the Marine, (MAFM) under the Fisheries (Amendment) Act, 1997 and its associated Regulations which have been amended to give effect to various EU environment protection Directives.

All licenced sites are subject to annual audit by the licencing authority, in addition to sea lice and fish health inspections by the Marine Institute and food safety audits by the Sea Fisheries Protection Authority.

Mowi Ireland is also subject to audit under voluntary certification schemes as listed below.

- ISO 9001:2015
- ISO 14001:2015
- ISO 45001:2018
- The Irish Organic Association Organic Salmon Standard with reference to EU Organic regulations 889/2008, 710/2009 and 848/2018 for organic aquaculture production,
- Naturland Standard for Organic Processing,
- Bio-Suisse standard for Organic aquaculture & processing,
- Naturland Standard for Organic Smolt & Salmon Production,
- The Brand Reputation Compliance Global Standard for Food Safety
- Global Gap Integrated Farm Assurance Standard - Aquaculture base

A number of comments referred to the licence conditions relating to stocking, harvesting and biomass. This is the subject of an ongoing appeal being considered by the Aquaculture Licences Appeals Board. All relevant information can be publicly accessed via https://alab.ie/activeappeals/appealsyearsreceived/appealsreceivedin2019/ap12019/#d.en.189147

Social impact

The current aquaculture operations at Deenish Island directly employs, from the local population, 7 full-time employees, in addition to 4 cleaner fish/fish health coordinators, 6 operations staff, 2 mechanical staff and 2 administrative staff all shared between four different sites in Kenmare and Bantry Bays, equating to 10.5 full time employees onsite. Contracting staff are also hired consisting of 4 part time engineering staff, 1 part time electrician, 4 divers and 1 truck driver. Staff will increase by a further 6 people during harvesting (3 full time crew assisted by 3 harvest crew). The presence of coastal communities within this region and aquaculture employment in the area illustrate the importance of the maritime industry in the region. Fish farming offers a means of maintaining a similar type of lifestyle as traditional fishing and has brought much needed year-round income to this part of rural Ireland. The importance of the industry to the local economy was highlighted during the Covid pandemic when tourism was shut down.

Sustainability

Mowi Ireland is committed to the production of high quality organically certified Atlantic salmon products in harmony with the natural environment. We believe this to be an integral part of

responsible, efficient, sustainable aquaculture and profitable business management.

To this end Mowi Ireland is committed to producing salmon in harmony with its natural cycle and with respect for the natural resources on which we depend. Specifically, we will produce our salmon and products along the following principals.

- Respect for the needs of our animals and implement high welfare standards which is essential for fish health management
- Conservation of natural resources
- Promotion of renewable resources and minimization of the use of non-renewable resources in our production and processing systems
- The use of natural processes and substances and mechanical methods in preference to chemically synthetic substances with minimal use of chemically synthesised substances and synthetic processes
- Promote the reduction, reuse and recycling of wastes while avoiding pollution and waste
- No use of Genetically Modified Organisms (GMO's) in our products, feed, and processing aids, either directly or indirectly.

At the very least, all organically reared and processed salmon produced by Mowi Ireland will comply with the requirements of the following Organic aquaculture production regulations and standards.

- EU Organic regulations 854/2004, 889/2008, 710/2009 and 848/2018
- Bio-Suisse standard for Organic aquaculture & processing,
- Naturland Standard for Organic Smolt & Salmon Production

Third-party certification remains key to our sustainability strategy. 100% of harvested volumes in 2023 were sustainably certified by the Global Sustainable Seafood Initiative (GSSI)-recognised standard: GlobalG.A.P.

Tourism

Recreational and tourism activities in the area currently take place in harmony with the existing aquaculture operation. The renewal application varies from the existing licence in that it requests a change to the boundaries of the existing site and to the operating conditions attached to the licence. If approved, the site boundaries will increase from 14.48ha to 33.48ha and operations will change from 10 pens to 15 pens. The increased site area will not prohibit or impact upon any existing recreational activity in the bay as only an additional 0.63ha of equipment will be visible at the surface.

There is a minimum of 170m and 200m space between the respective northwest and southwest corners of the site pen grid and Deenish island for vessels to pass into the sheltered area west of the proposed site, ample room for local users. The additional pens only make a difference to the northwest access by reducing the passage by 20m. Average annual vessel density for pleasure craft is only 2.67 hours per square metre, and even lower for sailing craft at 0.05 hours per sq. km.

Treatments

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.

Visual impact

Unlike the siting of a new farm, Deenish fish rearing pens have been a normal part of the landscape in Kenmare Bay and the shore base a permanent and normal part of the shoreline since Mowi acquired the farm in 2008. Since first introduced into the bay in the 1980's, pen design and mooring arrangements have changed over the years and pens, top nets and ancillary equipment are now designed to have as minimal visual impact on the environment as possible.

In terms of cumulative visual impact for Ballinskelligs Bay as a whole, the current and proposed Deenish site will not have a significant effect as the current site is visually limited to vantage points along the tip of Lambs head, and even so, the site is only fully distinguishable on a very clear day.

Consequently, the cumulative visual impact of the development with other existing developments will be negligible.

APPENDIX 1

SEA LICE ON WILD SEA TROUT

There was no monitoring of sea lice on farmed salmon or wild sea trout in Ireland before the collapse of sea trout populations in some parts of the west of Ireland (mainly Connemara and Mayo) during 1989-1990. After the sea trout collapse, monitoring of sea lice on farmed salmon commenced and treatment protocols were put in place. Also, intensive monitoring of sea lice on wild sea trout commenced at various locations (coastal waters / estuaries / lower reaches of rivers using various netting methodologies and electrofishing.

In Ireland, the Irish government sponsored Sea Trout Working Group of the early 1990s recommended sampling wild sea trout at sea, in estuaries and on the lower reaches of rivers during the period 1 May – 15 June each year and to include only fish up to 26cm fork-length in analyses. It was felt that fish up to this length would include only smolt / post-smolt and that all fish sampled during the period 1 May – 15 June each year would have migrated to sea by the conclusion of that time period and either represent post-smolt at sea or post-smolt early returned to freshwater.

There are many challenges facing researchers attempting to count and interpret sea lice on sea trout post-smolt captured at sea or in an estuary or in the lower reaches of a river. For example, fish sampled in the lower reaches of a river may have lost some or all of their sea lice burden and / or the capture method *e.g.* netting, may have resulted in the loss of some or all of a fish's sea lice burden prior to examination.

Sea trout in many parts of Ireland, and particularly in the west of Ireland from whence most published accounts emanate, have complicated and sometimes subtle differences in life histories.

The following is a summary:

- Sea trout emanate from a brown trout population that is partially migratory *i.e.* not all brown trout in a population migrate to sea,
- Where large samples of rod caught sea trout have been examined internally, there is an even distribution of the sexes,
- High mortality (c. 70-90% - average of 80%) characterises the initial marine migration of sea trout post-smolt,
- Most sea trout post-smolt return to freshwater during their first post-migration summer and most are immature fish,
- Most sea trout mature for the first time after spending two summers at sea and one winter in freshwater and are annual spawners for the remainder of their lives,
- On their return from marine to freshwater habitat most sea trout do not feed and continue to decline in condition for the duration of their freshwater residency and
- Most sea trout in the west of Ireland (with the exception of the Currane system in Co. Kerry) are short lived with few fish surviving beyond three summers feeding at sea *i.e.* 2SW.

The design of investigations of sea lice on sea trout in marine / freshwater habitat is challenging and in the absence of individual tagging and / or tracking of individual fish it is not possible to determine duration of marine residency and / or timing of return to freshwater. Without going into too much detail, a visual analysis of fish scales might not enable a researcher to determine if marginal circuli were laid down in freshwater or in an estuary or in seawater post migration. A chemical analysis of scale margins may be required to determine this. Also, it is to be expected that sea trout post smolt will vary considerably in length on their return to freshwater and it is not

known if this is related to smolt length, length of marine residency or other factors *e.g.* sex and maturation.

With regard to the two pillars of the investigation of sea lice on sea trout in Ireland during the 1990s:

- Pillar 1 - only sea trout less than 26cm in fork-length included in analyses,
- Pillar 2 - only fish sampled during the period 1 May - 15 June included in analyses,

The first pillar is well chosen and almost certainly excludes all but sea trout smolt / post-smolt.

However, the second pillar has weaknesses. The sampling period was chosen because it was assumed that all smolt would have migrated to sea by 1 May and that any fish sampled by 15 June in the lower reaches of a river would be a pre-mature return which entered freshwater to lose its sea lice burden.

The timing of sea trout smolt migrating from Tawnyard Lough in the Erriff catchment, Co. Mayo in 1990 shows the mean fork-length (+/- 95% CI) on each day when more than 5 sea trout smolt were recorded (Figure 1) and the number of smolt counted downstream (Figure 2) each day (n=2342). The smolt migration period depicted extended from 27 April to 8 June and only a small percentage (c. 9%) had migrated before 1 May.

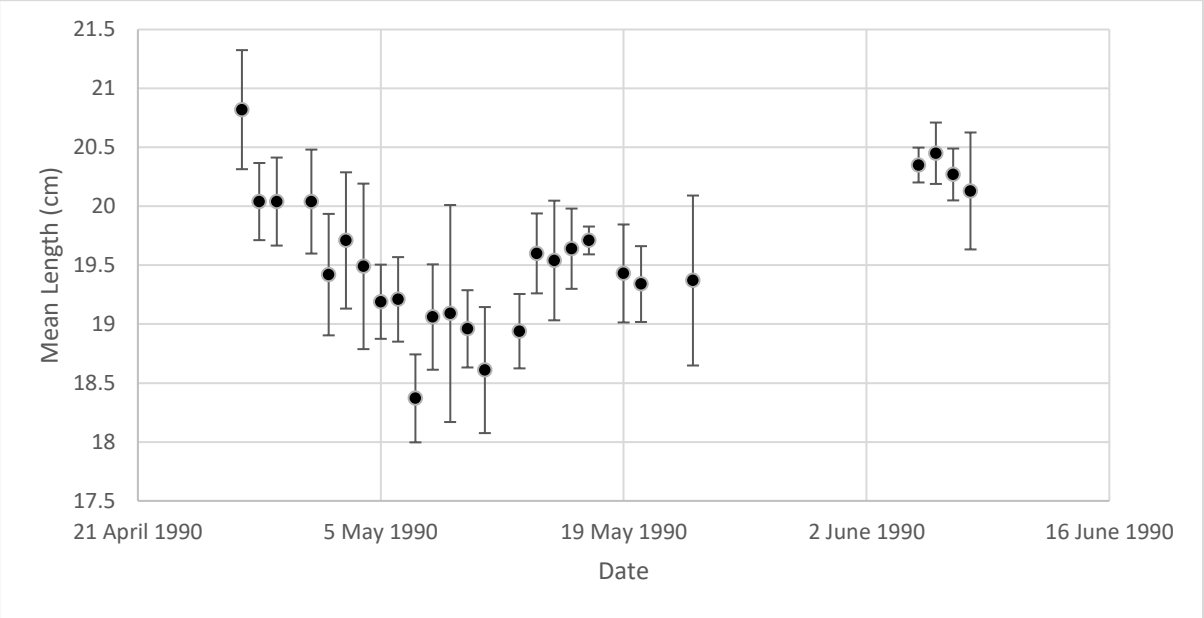


Figure 1. Daily Mean fork-length (+/- 95% CI) of sea trout smolt counted downstream at the Tawnyard Lough trap in 1990.

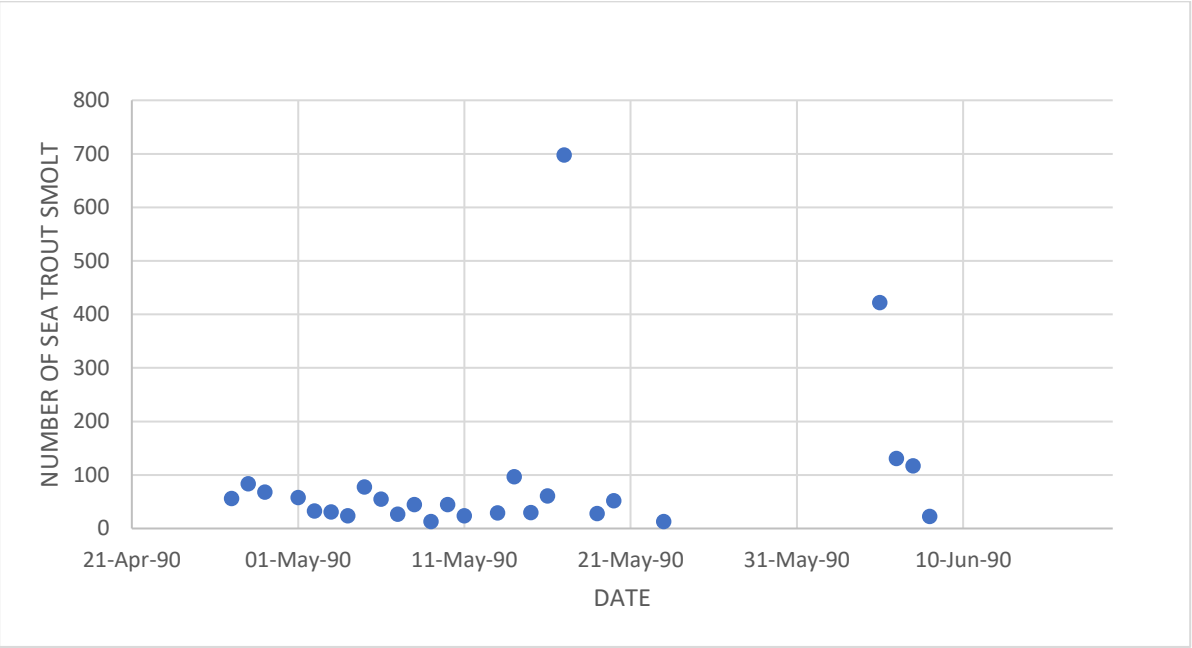


Figure 2. Number of sea trout smolt counted downstream each day at the Tawnyard Lough trap in 1990.

The sea trout rod catch records for the Erriff Fishery for the years 1925-1983 were examined by O'Farrell & Whelan (1984) and show that of 14,373 taken or rod and line, the following was the monthly distribution of catches over these 58 years (data extracted from Figure 9 of O'Farrell & Whelan,1984) using Image J software:

- April: 0.4%
- May: 0.8%
- June: 4.2%
- July: 31.0%
- August: 32.6%
- September: 27.6%
- October: 3.3%

Thus, during these years a total of 5.4% of the sea trout catch was made before July. The catch record does not provide information on the size of sea trout taken on rod and line but during the period 1983-1985, 0SW (finnock) sea trout accounted for 87.4,87.2 and 82.8%, respectively, of sea trout taken on rod and line on the River Erriff (O'Farrell & Whelan,1991). Accordingly, sea trout present in the lower reaches of the River Erriff in June are not necessarily early returning or prematurely returning fish as rod catches made on the River Erriff over several decades before the commencement of marine salmon farming conclusively show.

Marine mortality of sea trout

Little investigation was ever carried out in Ireland on the factors which resulted in the loss of 70-90% of sea trout smolt / post-smolt within a few months of their seaward migration.

However, post collapse in 1989-1990, sea lice emanating from marine salmon farms became the focus of research into the cause of the sea trout population collapse. Marine mortality of sea trout

smolt / post-smolt had risen from 70-90% prior to the commencement of marine salmon farming to >90% after the commencement of marine salmon farming.

The main findings of the research carried out over a period of several years post collapse was that there was a negative relationship between mean abundance of sea lice on sea trout and distance to the nearest marine salmon farm. With regard to settling on statistical descriptors for sea lice infestation of sea trout, it was recognised that the data showed that sea lice on sea trout followed a negative binomial distribution where most sea trout samples had few or no sea lice while a small percentage of fish had high lice burdens. In spite of this, the 'mean abundance' of sea lice on all sea trout examined for the presence of sea lice became the norm.

Interpreting the significance of sea lice burdens for the survival of individual fish (sea trout and Atlantic salmon) was only possible after the completion of experimental studies. The results of some of these studies were included in a review (Anon. 2021) who reported that:

- Under laboratory conditions, over 13 attached sea lice (at the pre-adult and adult mobile stages) per trout (19-70 g) caused physiological stress and was potentially lethal (Wells *et al.*,2006).
- Under laboratory conditions, mortality of individual salmon due to sea lice can occur at 0.2 mobile lice per g of host fish and becomes more likely as the level of infection increases (Fjelldal *et al.,* 2020).

Strom *et al.* (2022) referenced Taranger *et al.* (2015) who reported on the sea lice infestation levels assumed to impact anadromous salmonids (0.1 lice g^{-1} fish) and cause severe health effects (0.3 lice g^{-1} fish).

Other studies have reported on the benefits of sea lice therapeutant treatment of reared Atlantic salmon smolt (Torrissen *et al.,* 2013) and wild sea trout smolt (Skaala *et al.,* 2013) prior to their release into marine environments. Torrissen *et al.* (2013) estimated early seawater mortality and performance by treating smolts with anti-lice drugs prior to their release and comparing their recapture rates as adults with untreated control groups. The efficacy of the drugs is limited to weeks or in some cases months after smolt release and it is assumed that differences in ocean survival are caused by infestation of control fish with salmon lice during the early stage of smolt migration. Estimates from Ireland and Norway indicate an odds ratio of 1.1:1-1.2:1 for sea lice treated Atlantic salmon smolt to survive sea migration compared to untreated salmon smolts. One study in Norway (Skaala *et al.*,2013) treated wild sea trout smolt with Substance EX (to prevent sea lice infestation) in 2004 and 2005 (n=704) and compared return rates to a trap with non-treated controls (n=1306) and found that the return rate for the treated fish was 3.4% (n=24) compared to 1.8% (n=23) for the non-treated controls. While the return rates of treated fish were higher than non-treated controls, Skaala *et al.* (2013) make no comment on the overall high mortality of both groups (96.6% for treated fish and 98.2% for non-treated controls).

In Ireland, sea trout smolt aged 2 and 3 years predominate and in 1992 and 1993, smolt of known age migrated from the School House Lakes, Casla River catchment, Connemara, Ireland (O'Farrell *et al.* 1993) with the following fork-length(cm) and weight(g) characteristics:

Age	Mean fork-length (cm)	95% CI	Mean weight (g)	95% CI
2	18.4	0.31	55.9	2.9
3	20.4	0.37	83.4	9.8

A sea lice infestation of 13 pre-adult / adults equates to 0.23 lice per gram for the average 2-year-old smolt and to 0.15 lice per gram for the average 3-year-old smolt.

At an infestation level of 0.2 mobile lice per gram of host, the infestation level would be 11.2 lice per 2-year-old smolt and 16.7 lice per 3-year-old smolt.

Of course, while the above infestation levels have been shown in laboratory studies to cause mortality in salmon and sea trout smolt / post-smolt, the literature also focuses on different levels of infestation which are capable of causing stress and distress to host fish.

In Ireland, studies relating to sea trout and sea lice issues frequently cite similar studies carried out in Scotland and in Norway. However, studies of the environmental and wild salmonid impact of salmon farming in Ireland rarely refer to the nature of the industry in all three countries. While farmed salmon production in Ireland has generally fluctuated between 10,000t and 20,000t during the past three decades, production in Scotland is now approximately one order of magnitude higher than in Ireland while production in Norway is now approximately two orders of magnitude greater than in Ireland. Thorstad *et al.* (2015) presented graphical descriptions of the prevalence (percentage of fish infested with sea lice) and mean abundance (mean number of sea lice per sea trout examined) in published accounts from Ireland, Scotland, and Norway. In their graphs prevalence of sea lice (Y) was on an arithmetic scale while mean abundance of sea lice on sea trout (X) was transformed to natural logarithm. For the purpose of this interpretation, the graphs included in Thorstad *et al.* (2015) have been scanned and the data points extracted using Image J software and the natural logarithm data transformed to arithmetic.

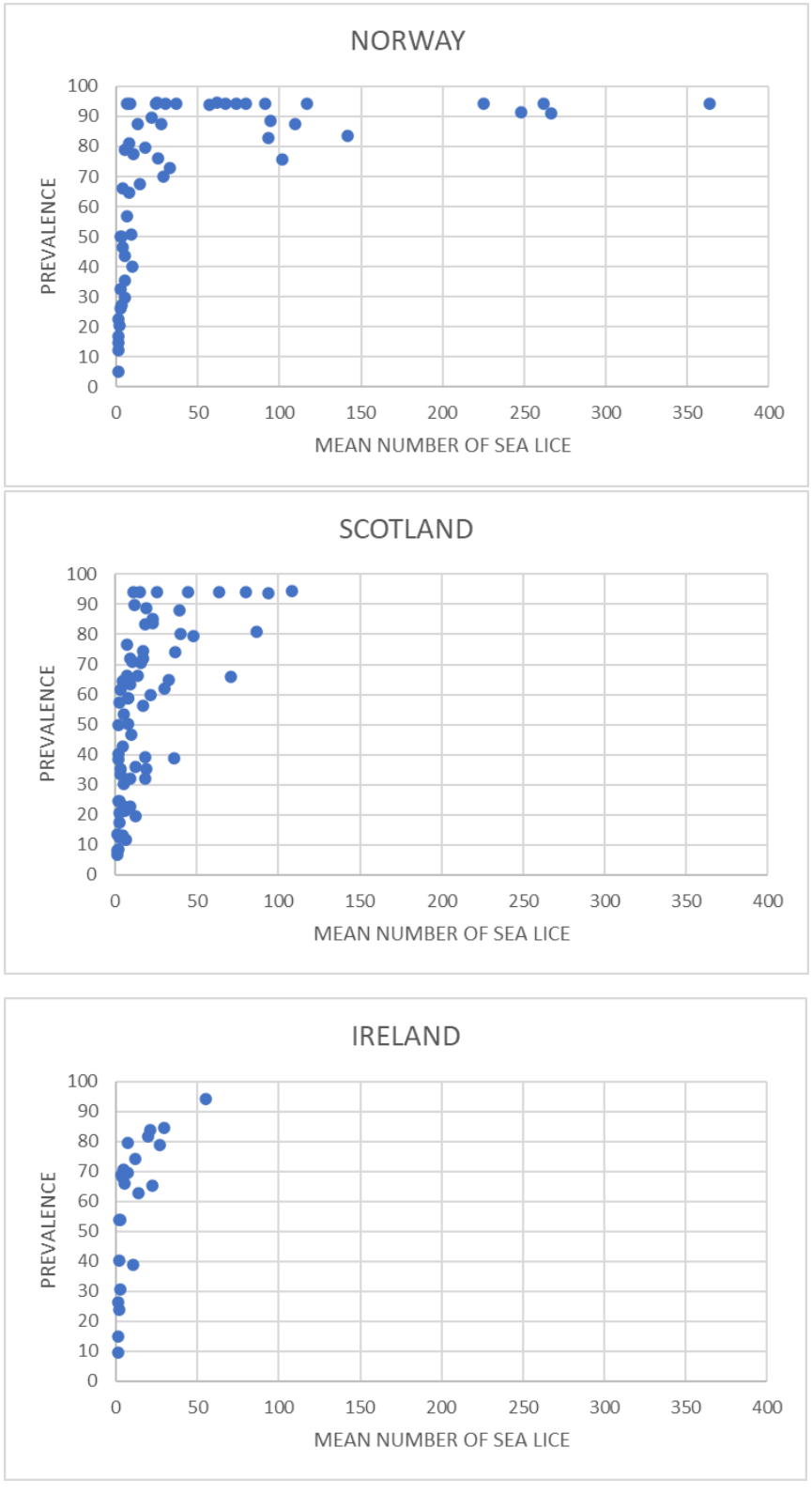
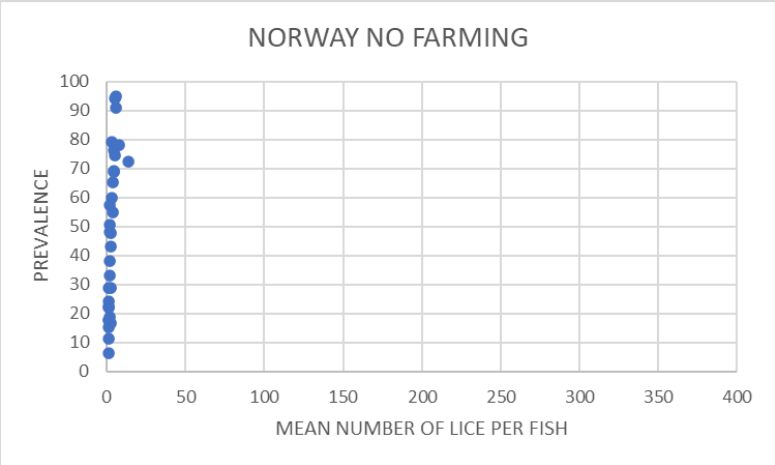


***Figure 3**. Relationship between sea lice prevalence and mean abundance per sea trout examined in areas with net-pen salmon farming in Norway, Scotland, and Ireland.*

The first series of graphs (Figure 3 above) which uses the data from Thorstad *et al.* (2015) shows the percentage prevalence (0-100 Y axis) and mean abundance of sea lice per fish (0-400 on the X axis) relating to areas with net-pen salmon farming in these three countries. Clearly, the patterns of sea lice infestation are very different for the three countries and, accordingly, the results of scientific studies carried out in these three countries might be expected to reflect different outcomes with respect to sea lice infestation on wild salmonids.





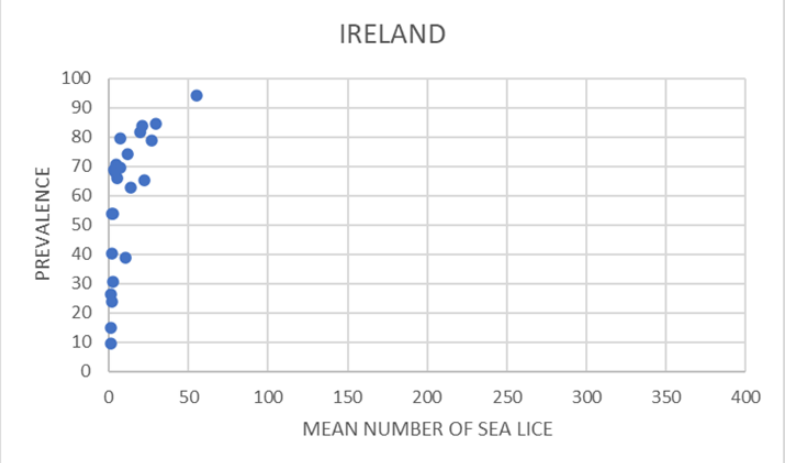
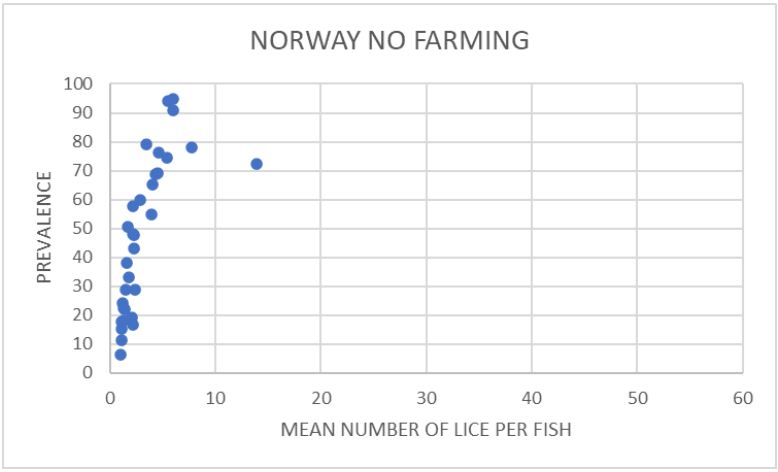
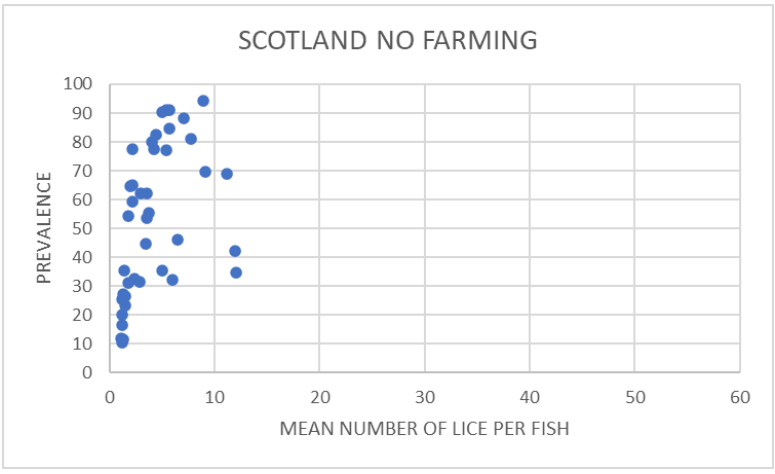


***Figure 4**. Relationship between sea lice prevalence and mean abundance per sea trout examined in areas without net-pen salmon farming in Norway, Scotland and with net-pen salmon farming in Ireland.*

Thorstad *et al.* (2015) also presented graphs for Norway and Scotland using data on sea lice prevalence and mean abundance of sea lice per sea trout sampled in areas without net-pen salmon farming. No such data were available for Ireland. These graphs have been plotted (Figure 4 above) using the same axes used in the graphs relating to areas with net-pen salmon farming in Norway, Scotland, and Ireland.

Because so much of the data in the above graphs are confined to the left-hand side of the graphs, these graphs have been redrawn with the X axis having a maximum value of 60 (Figure 5 below).





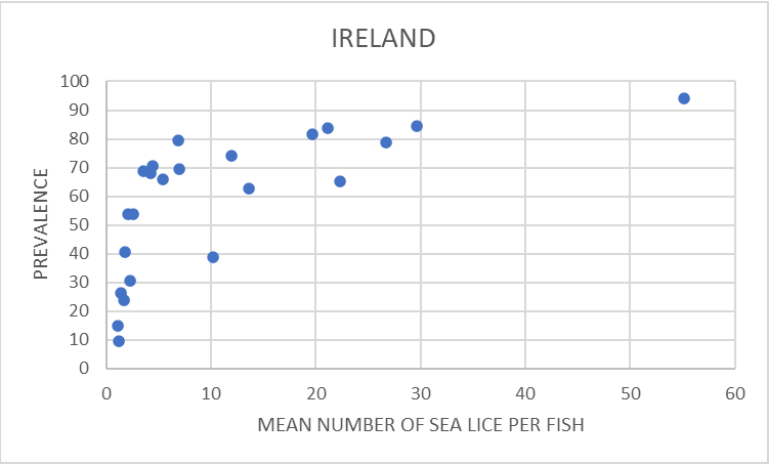


***Figure 5**. Prevalence and mean abundance of sea lice per sea trout examined in areas of Norway and Scotland without net-pen salmon farming and in Ireland in areas with net-pen salmon farming.*

A total of six out of twenty-three data points for Ireland for areas with net-pen salmon farming can be considered to exceed the range of values for mean number of lice per sea trout recorded in Norway and Scotland without net-pen salmon farming. Thus, apart from approximately a handful of situations, sea lice prevalence and mean abundance per sea trout examined in Ireland was in keeping with levels recorded in Norway and Scotland in areas without net-pen salmon farming.

REFERENCES

Anon. (2021). Impacts of lice from fish farms on wild Scottish sea trout and salmon: summary of science. Marine Scotland Directorate.

Fjelldal,P.G., Hansen,T.J. and Karlsen,Ø. (2020). Effects of laboratory salmon louse infection on osmoregulation, growth, and survival in Atlantic salmon. Conservation Physiology 8, 1-10.

O'Farrell,M.M. and Whelan,K.F. (1984). River Erriff Research Programme Report 1.
Central Fisheries Board, Dublin.

O'Farrell, M.M. and Whelan, K.F. (1991). Management of migratory trout (*Salmo trutta*) in the Erriff and other catchments in Western Ireland. *In*: Steer,M.W. (ed.) 'Irish Rivers: Biology and Management', pp 99-112, Royal Irish Academy, Dublin.

O'Farrell,M.M., Whelan,K.F., Poole,R., Gargan,P., Peirce,R.P., Moore,T. and Lubberhuizen, J. (1993). Western Ireland migratory trout (*Salmo trutta*): smolt production, characteristics, and timing of migration. ICES Anadromous and catadromous Fish Committee CM 1993 / M:52

Skaala,O., Kalas,S. and Borgstrom,R. (2013). Evidence of salmon lice-induced mortality of anadromous brown trout (Salmo trutta) in the Hardangerfjord, Norway.
Marine Biology Research, 2014 Vol. 10, No. 3, 279-288.

Strøm,J.F., Bjørn.P.A., Bygdnes,E.E., Kristiansen,L., Skjold,B. and Bøhn,T. (2022).
Behavioural responses of wild anadromous Arctic char experimentally infested in situ with salmon lice. ICES Journal of Marine Science, 2022, 0, 1–11

Taranger, G. L., Karlsen, Ø., Bannister, R. J., Glover, K. A., Husa, V., Karlsbakk, E., Kvamme, B. Ø. *et al.* (2015). Risk assessment of the environmental impact of Norwegian Atlantic salmon farming. ICES Journal of Marine Science, 72: 997–1021.

Thorstad, E.B., Todd, C.D., Uglem, I., Bjorn, P.A., Gargan, P.G., Vollset, K.W., Halttunen, E., Kalas, S., Berg, M. and Finstad, B. (2015). Effects of salmon lice *Lepeophtheirus salmonis* on wild sea trout *Salmo trutta*- a literature review. Aquaculture Environment Interactions 7, 91-113.

Torrissen, O., Jones, S., Asche, F., Gutormsen, A., Skilbrei, O., Nilsen, F., Horsberg, T.E. and Jackson D. (2013). Salmon lice – impact on wild salmonids and salmon aquaculture. Journal of Fish Diseases 36, 171-194.

Wells, A., Grierson, C.E., MacKenzie, M., Russon, I.J., Reinardy, H., Middlemiss, C., Bjorn, P.A., Finstad, B., Bonga, S.E.W., Todd, C.D. and Hazon, N. (2006). Physiological effects of simultaneous, abrupt seawater entry and sea lice (*Lepeophtheirus salmonis*) infestation of wild, sea-run sea trout (*Salmo trutta*) smolts. Canadian Journal of Fisheries and Aquatic Science. 63 2809-2821.

With regards

Catherine McManus

Catherine McManus

OPERATIONS DIRECTOR IRELAND

Deenish Public Consultation Responses - March 2024

OBJECTION COMMENTS (redacted)	Subject	NIS Section	EIAR section
There has been issues in recent years with algal blooms in the area of the site which most likely is related to nitrates emananting from the salmon farm.	Algal blooms		
Biodiversity loss on seabed	Benthic impact	3.3.2	App. 6
Destroys all life beneath the farm	Benthic impact	3.3.2	App. 6
Malfunctioning feed pipe throwing out feed for hours	Benthic impact	3.3.2	App. 6
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.(source Irish Times 26/01/2023)	Benthic impact	3.3.2	App. 6
Barren and toxic seabed due to faeces, food, and sea lice chemicals dropping to the seabed.	Benthic impact	3.3.2	App. 6
Images beneath farm in EIA show sludge which may turn the seabed anoxix and toxic-not in line with Nature Restoratin Law.	Benthic impact	3.3.2	App. 6
Anecdotal accounts of divers observing the mountains of excrement under the salmon cages.	Benthic impact	3.3.2	App. 6
Deenish failed its last benthic test.	Benthic impact	3.3.2	App. 6
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	App. 6
Having dived on the reefs adjacent to the fish farms I have seen toxic bottom sludges spread into the adjoining areas.	Benthic impact	3.3.2	App. 6
Waters around Deenish identified as a high biodiversity "Area of Interest" by June 2022 Fair Seas publication	Biodiversity	Ref NIS	
Disturbance to cetaceans due to noise/anchor chains/traffic. Report of MOWI over using them in Scotland.	Cetations	2.2.6	6.3.1/6.3.2
Impact of removing wild cleaner fish and what happens post captivity	Cleanerfish management	App. 3.3	App. 3.3
Wild cleanerfish being taken from bays without any proper asessment of impact	Cleanerfish management	App. 3.3	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	App. 3.3	App. 3.3
Warming sea temperatures raises questions about the viability of the operation	Climate change		
Salmon farming should be moved to closed containers onshore	Closed containment		
Cramped pens	Density		6.5.6
Salmon farms contain hundreds of thousands of fish in foul cages.	Density	Appendices	2.8
High-density conditions in fish farms can facilitate the spread of diseases among the fish, requiring the use of antibiotics and other chemicals.	Density	2.8	2.8
Running fish farms may require significant energy inputs for water circulation, temperature control, and other operational needs.	Energy use		
Escape/interbreeding risk	Escapes	3.5.6	6.5.6
Genetics damaged by escapees (in general - not Deenish)	Escapes	3.5.6	6.5.6
High risk of escape	Escapes	3.5.6	6.5.6
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	6.5.6
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	2.1.15.6/3.5.6	2.14.6
No fallow period with Deenish and Inishfarnard being open 12 months a year	Fallowing	2.1.9	2.8

Deenish Public Consultation Responses - March 2024

Accessibility to a safe harbour will be cut off by the new layout of pens obstructing Deenish Island Bay. With the obstruction to the bay and increased fish loads this may alter the natural habitat of this bay in an SAC. With the obstruction to the bay local recreational boat users and sea fishers will not be able to access the sheltered waters of Deenish Bay.	Farm layout		11.2/11.4
Extraction of wild fish/sprat for fish meal	Feed ingredients	2.1.10	2.9
Farm fish being fed by industrial herring fishing, being mashed into meal at Killybegs, put on trucks and driven to Deenish?	Feed ingredients	2.1.10	2.9
Uncontrolled taking of fodder fish around Ireland to provide fish meal	Feed ingredients	2.1.10	2.9
Salmon feed putting pressure on wild stocks - is suply chain taken into account in the Ministers' decision?	Feed ingredients	2.1.10	2.9
The inshore waters of Cork and Kerry have been devastated by Pair Trawling targeting sprat as feedstock for the fishmeal plant in Killybegs, Donegal. It is reasonable to assume that Mowi's proposal to quadruple production will require four times as much fish feed.	Feed ingredients	2.1.10	2.9
It takes 5kg of wild fish to produce 1.1kg to 1.5kg of high protein fish pellet, which in turn produces 1kg of finished farmed salmon. One of the fish used as fin fish food is sprat. Sprat fishing is at present completely unregulated, using a 16 millimeter net to catch everything in almost every bay and inlet in Ireland.	Feed ingredients	2.1.10	2.9
Flesh dyed to make the salmon pink	Feed ingredients	2.1.10	2.9
Protein harvested from sea off Africa that is no longer available to feed the people in that region.	Feed ingredients	2.1.10	2.9
Soya grown on reclaimed land to make fish food.	Feed ingredients	2.1.10	2.9
Feed being eaten by wild fish destroying natural instinct to look for food	Feed ingredients	2.1.10	2.9
Farms introduce a non natural food source in the wild due to overspill.	Feed ingredients	2.1.10	2.9
Automated intensive force feed farming system.	Feeding	2.1.10	2.9
High concentration of force fed salmon surrounded by clouds of sea lice	Feeding & lice	2.1.10/3.5.3	2.9/2.12.2
AGD potentially being passed to wild salmonids	Fish health & Welfare	2.1.13/3.5.4	2.12
Mortalities increasing with increase in sea level temperature	Fish health & Welfare	2.12.1	2.12
Annual mortality rates are in excess of 40%	Fish health & Welfare	2.12.1	2.12
It is dishonest that the mortality figures for salmon farms in Ireland do not include fish that have died from non notifiable diseases such as Salmonid Rickettsial Septicaemia (SRS).	Fish health & Welfare	2.12.1	2.12
Animal welfare history of Mowi is sub-par (sea lice, open wounds, disease)	Fish health & Welfare	3.5.3	2.12
Salmon farming is cruel, unethical and barbaric	Fish health & Welfare	2.12.1	2.12
Fresh water extraction degrades the environment and residents drinking water	Freshwater use		
Locations for water abstraction associated with this licence application have been omitted	Freshwater use		
The fresh water used to treat the salmon gets dumped at sea in enormous volumes, no effects have ever been monitored.	Freshwater use		
Open pen salmon farming is no longer allowed in Norway	General		
Impacts on wild salmon and sea trout	Impact on salmonids	2.3/3.5	6.5
Natura Impact Statement submitted is inadequate in that it relies on a narrow field of scientific data, such as Jackson et al	Inadequate EIAR		
When the licence was revoked by the Department of Agriculture, the operators sought to frustrate this decision by way of the courts. They continually sought adjournments and would not proceed to a full hearing for more than two years.	Legal		
What is the legal basis of this renewal application of the licence, given that it is revoked and under appeal?	Legal		
Licence was revoked and should remain revoked.	Legal		
Operating since 2019 despite a court order to close it	Legal		
Contrary to national and EU legislation on the protection of ecosystems, environment, water quality and habitats	Legal		

Deenish Public Consultation Responses - March 2024

Debris from fish farm are periodically found on local beaches - pens broken up in storms? This will become more frequent with climate change.	Litter	App. 2.4	App. 2.4
I am a very frequent visitor to the Derrynane area and have spent many hours in the winter months picking up litter from its beautiful beaches and much of what I find, particularly on the beach near Derrynane pier, is netting and other debris from the fish farm	Litter	App. 2.4	App. 2.4
Debris from the fish farm are periodically found on our local beaches and the last such incident at Derrynane, two years ago took us 6 days to clear, when a very large buoy, broke apart and sent hundreds of thousands of polystyrene beads into the water and across rocks and rock pools at Lambs head.	Litter	App. 2.4	App. 2.4
The micro plastics associated with the feeding routine are producing sick fish that are not fit for eating. The pollution from the feed itself and the copper materials will last for decades if not over a hundred years.	Micro plastics, Cu	2.1.10	2.9
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 & Pearl mussels	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.	Pearl mussels	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.	Pearl mussels	3.5.1	
I will not allow my child to swim on certain day.....see the slice of faeces and food waste coming out of the cages, rife with parasites and disease	Pollution	2.1.11.4/2.1.12	8.2
Seen deterioration in Ballinakill Bay where the seashore is barren and salt water fish are all but gone	Pollution	2.1.11.4	8.2
Effluent discharge (Ecoli)	Pollution	2.1.11.4	8.2
Increased bacteria in fish farms	Pollution	2.1.11.4	8.2
No negative impact cannot be the case - plume of excreted material seen emanating from the pens as seen from Scariff Island in summer	Pollution	2.1.11.4	8.2
Feed and excrement cannot be contained in the open nets	Pollution	2.1.11.4	8.2
In constant breach of quotas and other regulations	Regulation		
Degree of self-regulation in the sector	Regulation		
Mowi has left a trail of destruction in many parts of the world	Reputation		
Recently found by the E.U. to be in breach of anti-trust rules and accused of price fixing	Reputation		
Lack of trust in Mowi - overstocking and harvesting more than licenced. Fine for false marketing in U.S. in 2021. Fines for excapes.	Reputation		
Ineffective use of wrasse to reduce sea lice	Sea lice	3.5.3	2.12.2
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	2.12.2
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	2.12.2

Deenish Public Consultation Responses - March 2024

Swimmer claims to have been "covered by sea lice all over my body whilst swimming in the area a few years ago. I believe the fish farm was the only obvious reason for this infestation..."	Sea lice	3.5.3	6.5.3
Number of lice not reflective of number of fish in pen	Sea lice	3.5.3	6.5.3
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	2.12.2
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	2.12.2
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	2.12.2
Frequent and uncontrolled levels of sea lice during wild smolt migrations	Sea lice	3.5.3	2.12.2
Impacts of sea lice eggs/larvae being carried in currents not taken into consideration	Sea lice	3.5.3	2.12.2
Sea trout not taken into account in NIS	Sea trout		
Cleaner fish coordinators assumed to be wrasse fishermen - questioning their inclusion in employment tally	Social impact	2.1.13	5.1
Small number employed at the farm but large number of jobs lost due to low wild fish stocks (in tourism)	Social impact	5	5.1
Farms are nearly totally automated and require minimal labour to run them	Social impact	5	5.1
33 staff cut in 2023 due to difficulties after warmer temperatures - no mention of the extent of casulaties - contradictory to renew licence	Social impact	5	5.1
Zero benefits for the Kerry area	Social impact		5.1
In some cases, fish farming can lead to social conflicts over land use, water rights, or traditional fishing territories.	Social impact		5.1
EIA does not acknowledge the negative effect on local population (tourism/anglers)	Social impact		5.1
Mowi contributes little to the local economy and pollutes the waters for profit	Social impact		5.1
Going over licenced harvest limit	Stocking limits		
Overstocking in the past exceeding the licence limit	Stocking limits		
The location is directly outside Derrynane Harbour. A very popular area for swimming and watersports.	Tourisim		11.2
Decimation of angling tourism	Tourisim		11.4
Detrimental economic impacts to sports tourism - job losses in retail, hotels, cafes, fishing guides and gillies	Tourisim		11.4
Antibiotic overuse	Treatments	3.5.5/ App 3.1	2.12.1
Treatments with antibiotics and poisons	Treatments	2.1.13	6.5.5
The use of Nuvan and other pesticides at the fish farm sites create's living clouds of sea lice	Treatments	2.1.13	6.5.5
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	6.5.5
Current research has, in addition, raised concerns regarding the dangers to human health from exposure to the large volumes of chemicals used by open-net farms in their efforts to control sea lice numbers and disease, and from the consumption of potentially contaminated farmed salmon produced under the present open-net system. It has been suggested that the chemicals used for lice and disease control in salmon, whilst in the nets, do not affect the fish. However evidence shows that a large proportion of harvested fish have suffered injury whilst in the nets, creating pathways for chemical compounds to ingress the bodies of the fish.	Treatments	2.1.13	6.5.5
Need for many chemicals to keep the fish alive	Treatments	2.1.13.2.1	6.5.5
Chemical treatment on an overwhelming scale	Treatments	2.1.13.2.1	6.5.5

Deenish Public Consultation Responses - March 2024

High level of pesticide use	Treatments	2.1.13.2.1	6.5.5
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	6.5.5
A sign on the road close to the Scarriff Inn mentions the Best View in Ireland Here, but when onelooks down to the water the salmon farm is in full view !	Visual impact		13.2
Visual impact effect from Comakista on the Wild Atlantic Way where there are viewing binoculars	Visual impact		13.2
Derrynane, Deenish, Scarriff and Atlantic ocean viewpoints - tourists are upset to know that we have such an unsustainable industry in our pristine corner of Ireland.	Visual impact, sustainability, tourisim		13.2
MOWI in their native country Norway, would not be allowed produce farmed salmon for human consumption, in the way they do in Ireland. The Norwegian health authorities have established and enforce, extremely rigorous controls to ensure maximum fish welfare, minimum use of chemicals, and maximum food safety and fish quality standards. Regular sea-floor inspections are carried out to also ensure minimum disturbance of the sub-surface environment.	Welfare, food safety, quality standards	2.1.13	2.12
Arguments for and against but there is a need to adopt the Precautionary Priciple to protect wild fish	Wild fish	3	6.5
Small wild fish entering the pens and being eaten	Wild fish	3	6.5
Impacts on Lough Currane and Waterville fishery	Wild fish		
Sea trout are listed in Ireland's biodiversity plan and the commitments in the national strategic plan for sustainable aquaculture development must include maintaining biodiversity with regard to sea trout populations.	Wild salmonids	3.5	
No mention of sea trout in fisheries section of EIAR.	Wild salmonids		
Excellent wild catch in the Currane system after Deenish had been closed for a few years (2006-2010?).			
Unsustainable			

The Minister for Agriculture, Food and the Marine
Aquaculture and Foreshore Management Division,
National Seafood Centre
Clogheen,
Clonakilty
Co. Cork. P85 TX47

04.04.2024

RINMORE

Re. Statutory Consultation – Aquaculture licence T06/202 Deenish, Co. Kerry

Dear Minister,

We refer to the Statutory submissions on our published application for the renewal and review of an aquaculture licence at Deenish, Co. Kerry.

We note the observations in the eight statutory consultee submissions and comment on the key issues raised as follows.

Marine Survey Office

If granted, the new licence boundaries of Deenish site will be notified to the British Admiralty Hydrographic Office. In addition, an application for Statutory Sanction marks will be furnished to the Commissioners of Irish Lights.

Irish Water

We note the information supplied by Irish Water on the existing primary effluent discharges within 10km and 16km of the Deenish site.

Commissioners of Irish Lights

If the licence is renewed, all structures will be clearly marked as required by Regulations and Licensing Permit conditions and to the approval of the Marine Survey Office.

The previous operator of the Deenish sea farm, Silverking Seafoods, made an application in 2000 to Irish Lights (CIL) for Statutory Sanction for the establishment of Aids to Navigation relating to the Deenish site. In any event, if this licence is renewed, Mowi will apply to CIL to secure Statutory Sanction from the Commissioners of Irish Lights for the aids to navigation for marking the structures as required by the Marine Survey Office.

Mowi Ireland

Registered in Ireland as Comhlucht Iascaireachta Fanad Teoranta, VAT No: IE4530734O: Registration No. 66929
Directors: Catherine McManus, David Brennan, Pat Connors, Joseph Gibbons

OFFICE
Kindrum
Letterkenny Co. Donegal, Ireland F92 XD93

POSTAL
Rinmore, Ballylar P.O.
Letterkenny Co. Donegal, Ireland F92 T677

PHONE
+353 74 9192105

MAIL
Catherine.mcmanus@mowi.com

WEB
http://mowi.com

Department of Housing, Local Government and Heritage (DHLGH)

1. Biosecurity threat from brown rat and American mink

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 Trava 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.

2. Impact of lighting

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.

3. Benthic Impact

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 many 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 biomass and the farm operations as proposed which together with the application of a fallow period at the end of each cycle, will not significantly affect benthic ecology.

Results of seabed surveys at numerous sites around the Irish coast and specifically at Deenish Island clearly indicate that this is not the case with at least 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 conditions). 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.

4. Seals

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.

5. Fallowing

It is a requirement of all finfish farm licences that sites are fallowed between production cycles. 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.

6. 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/fish-health-authorisation/irish-aquaculture-production-businesses.

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. https://eur-lex.europa.eu/legal-content/AUTO/?uri=CELEX:32020R0691&qid=1658927862300&rid=1

Inland Fisheries Ireland

1. Proposed Production Cycle & Fallow period

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 1km 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/4m³ 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.

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 https://www.gov.ie/en/publication/fcd20-aquaculture-foreshore-management/#marine-finfish-protocols

2. Deficiencies in sea lice model & impact on migration routes

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; Byrne et al., 2018; Costelloe et al.,1995; Costelloe et al., 1996a; Costelloe et al., 1998a; Costelloe et al., 1998b; Crosbie et a., 2019; Morton et al., 2011; Nelson et al.,2017.

2.1 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:

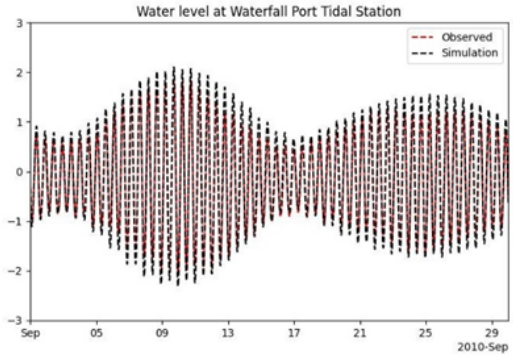
- Electricite de France (France) ;
- SOGREAH (France) ;
- HR Wallingford (UK) ;
- Centre d'tudes Techniques Maritimes et Fluviales (France) ;
- Bundesanstalt fur Wasserbau (Germany).
- Daresbury Laboratory (UK).

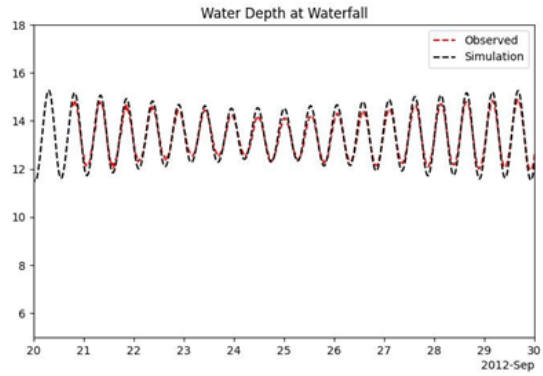
Since its inception TELEMAC has been used extensively around the world to model hydrographic processes in shelf, coastal and estuarine environments and has become one of the major standards of computational modelling of free surface flow in its field.

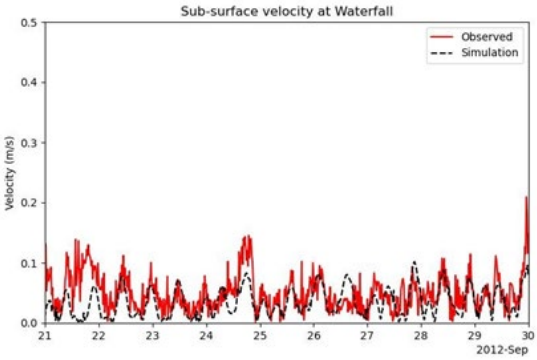
TELEMAC is built on sophisticated algorithms that use a finite-element approach to perform numerical simulation on an unstructured triangular mesh (Hervouet, 2007). This allows complex coastlines and estuaries to be represented more accurately than using regular grids.

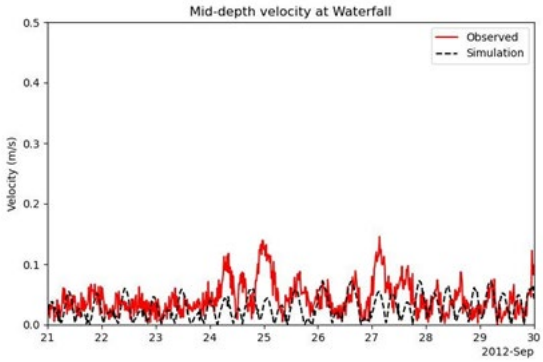
The outputs from the model have also been extensively validated against in situ data and peer review. For example, TELEMAC, is used extensively in the UK National Network of Regional Coastal Monitoring Programmes and models produced are routinely validated against the network of tidal gauges and wave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

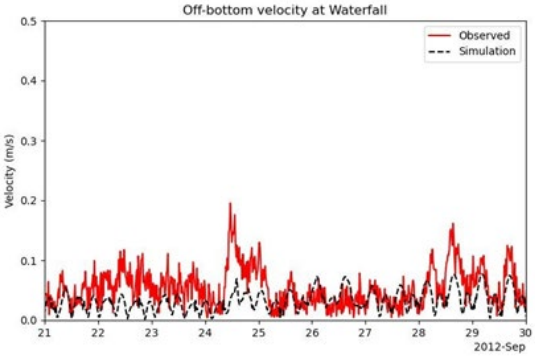
The TELEMAC model has also been used extensively in Ireland to model water quality, water currents, tidal heights and sediment transport in a variety of environments including lagoons, estuaries, coastal waters, harbours and ports. These individual studies often include comparisons to measured, in situ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

2.2 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 m³ - < 0.4 m³ 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 m³ for nauplii and 0 – 0.21 m³ 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 and
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.

2.3 Wind forcing

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/m3) 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.

2.4 Particle Tracking

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.

2.5 Migration Routes

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).

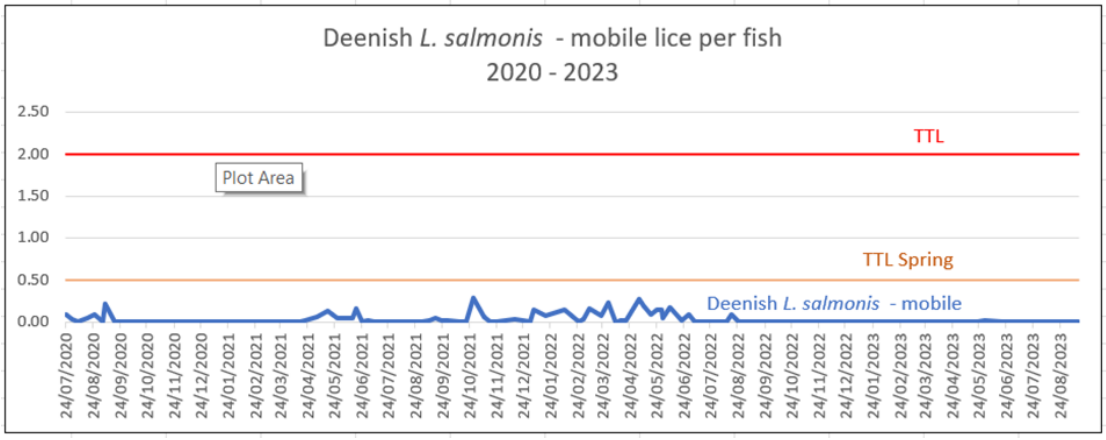
3. *Deficiencies in sea lice monitoring*

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.

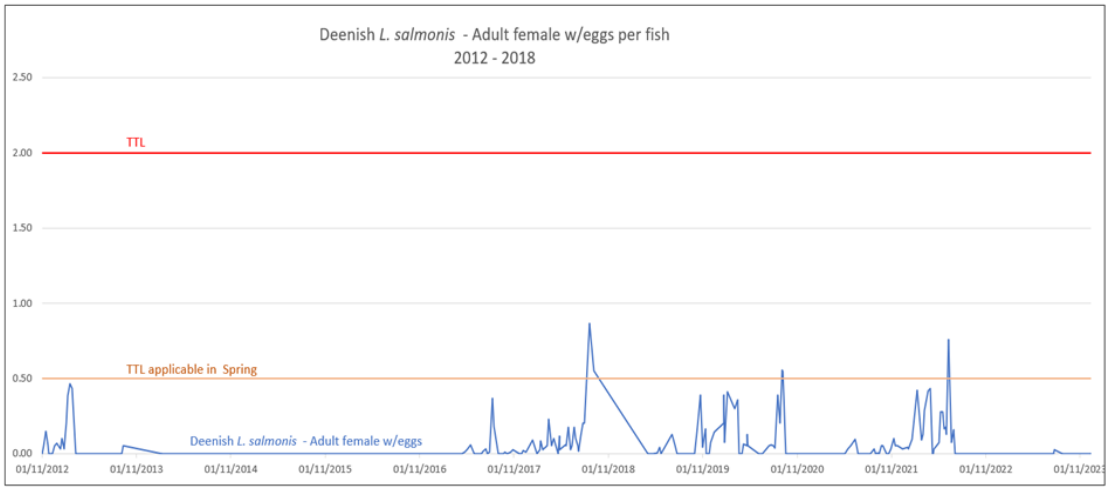
4. *Sea lice management*

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).



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.



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.

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.

5. Impact of sealice on wild salmonids.

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.

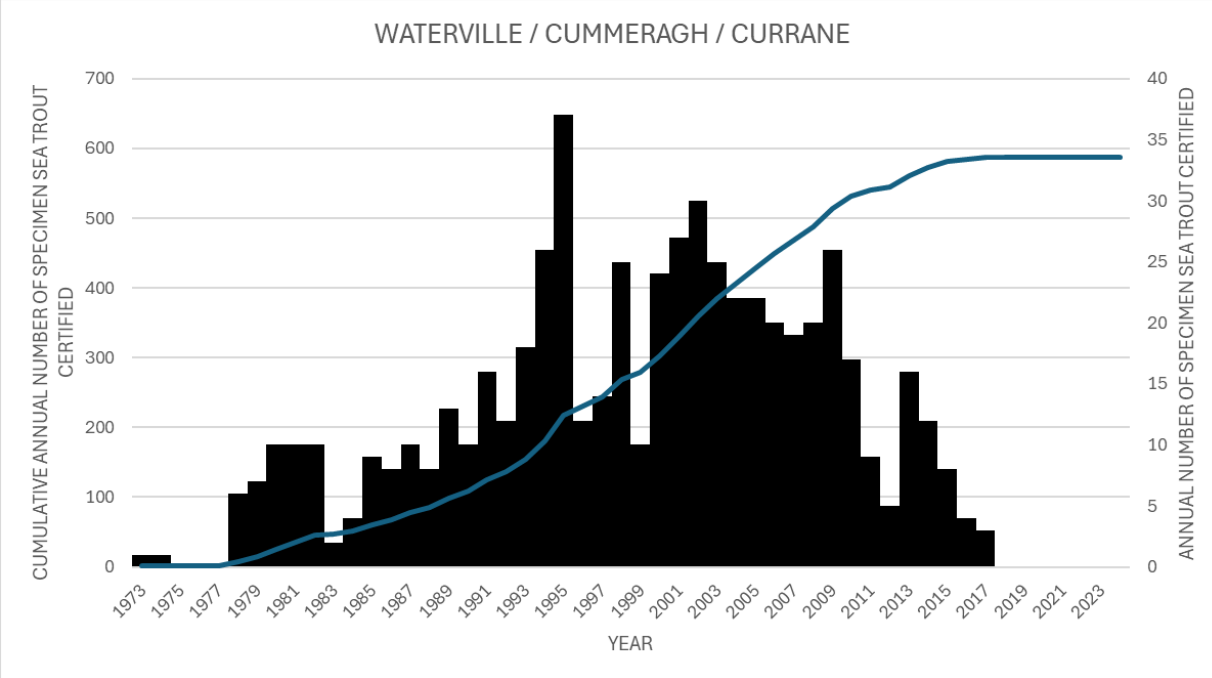


Figure 1 Number and cumulative annual number of specimen sea trout certified by the Irish Specimen Fish Committee for the years 1973-2017.

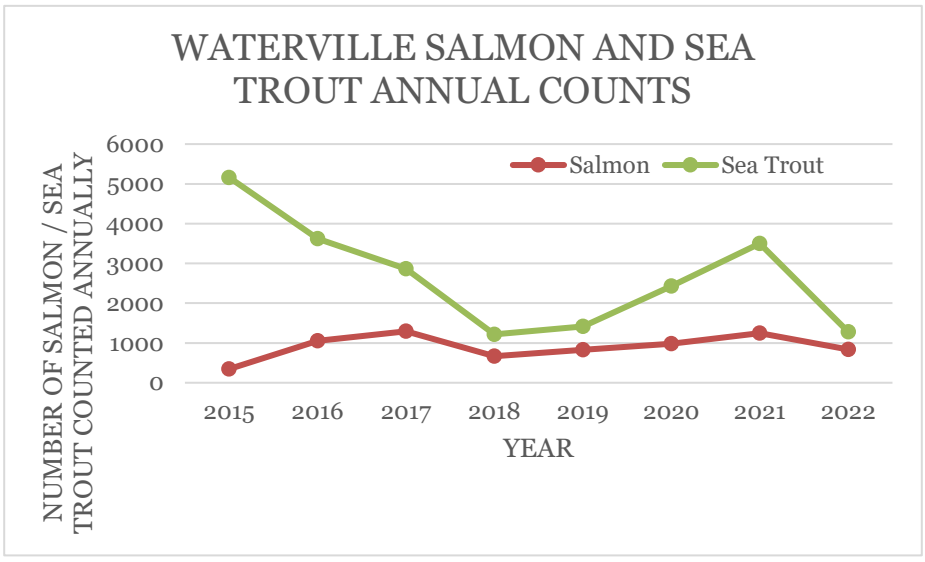
It was believed at the time that the 1989-1990 sea trout collapse in the west of Ireland extended to the south-west of Ireland also. On page 20 of Anon. (1995) it is stated: 'In 1993, conflicting sets of rod catch information were examined and it was reported (Anon 1993) that the stock (in Lough Currane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

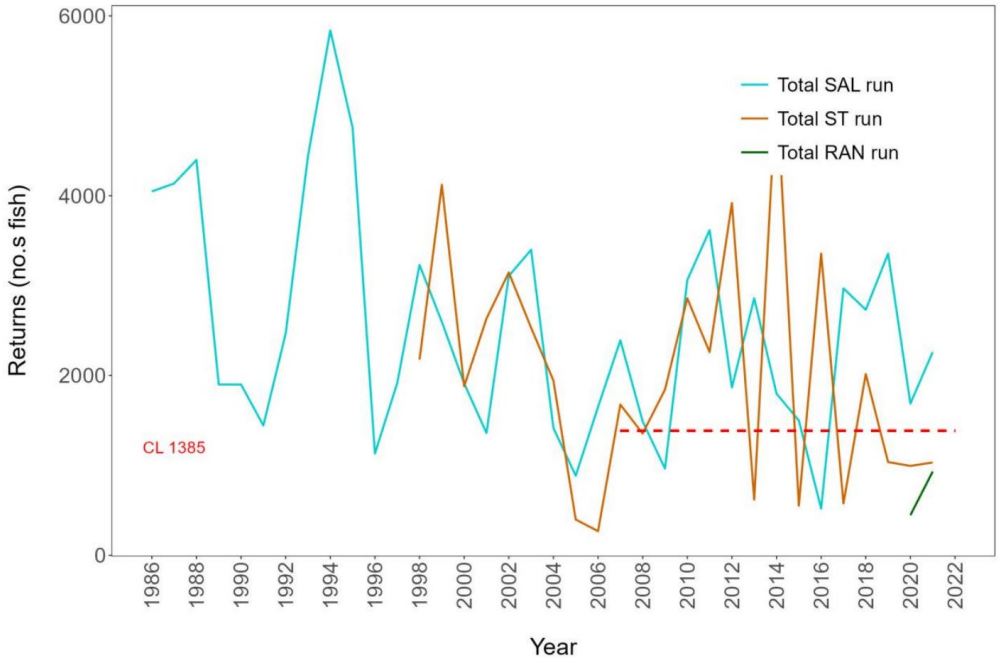
Regulation of sea trout angling

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.

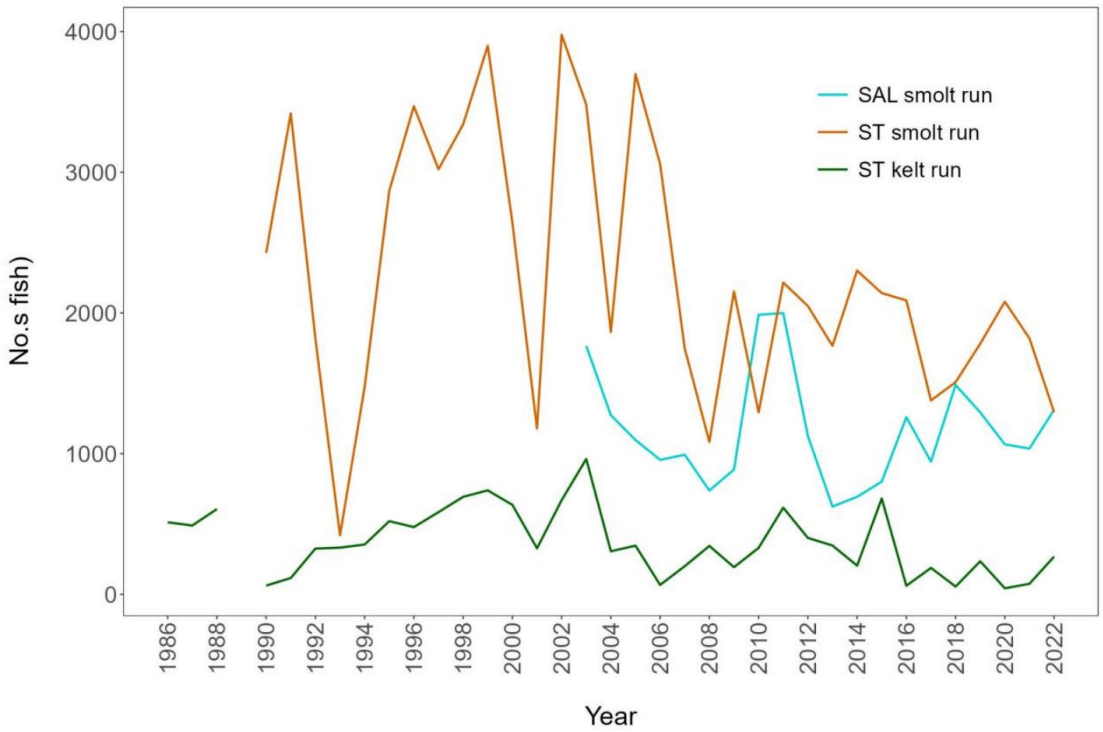
While some information on sea trout counts on fisheries in available on IFI's consolidated fish counter annual reports, the only long term data series available in the public domain is that for the Erriff River (Kelly *et al*. 2004) which details sea trout counts (upstream) for the Erriff River and also 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.

6. *Impact on salmon, sea trout and pearl mussel stocks*

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.

7. *Threat of fish escapes*

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 non-company 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.

8. Impacts on population & human health

Recreational and tourism activities in the area currently take place in harmony with the existing aquaculture operation. The renewal application varies from the existing licence in that it requests a change to the boundaries of the existing site and to the operating conditions attached to the licence. If approved, the site boundaries will increase from 14.48ha to 33.48ha and operations will change from 10 pens to 15 pens. The increased site area will not prohibit or impact upon any existing recreational activity in the bay as only an additional 0.63ha of equipment will be visible at the surface. Average annual vessel density for pleasure craft is only 2.67 hours per square metre, and even lower for sailing craft at 0.05 hours per sq. km.

9. Long term sustainability of Atlantic salmon aquaculture on the context of climate change

The applicant has operated several farm sites along the coast of Ireland since 1979, with differing temperature profiles and has experience of elevated summer temperature over that period of operation. Given the substantial investment required to operate any farm the applicant would not risk any investment if it were deemed unsustainable. It should be noted 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.

10. Deficiencies in the context of Ireland's biodiversity commitments and other plans & projects

Ireland's 4th National Biodiversity Action Plan (NBAP) sets the national biodiversity agenda for the period 2023-2030. The Plan contains five Objectives, each addressing a different theme that will contribute to the realisation of the vision for biodiversity. Outcome 2D of the plan (Biodiversity and ecosystem services in the marine and freshwater environment are conserved and restored) sets out a number of actions in order to achieve targets under this heading. MOWI Ireland are fully aware of the commitments that are included in the plan and the 196 actions listed in the plan and are fully committed to supporting those actions that will help improve biodiversity and reduce biodiversity loss.

The Government is developing legislation on Marine Protected Areas (MPAs) and will rapidly progress its implementation to help meet the target of 30% protection in the marine environment by 2030. If the network of MPA's are to achieve their objectives of restoring

biodiversity then it is essential that all stakeholders, including MOWI, actively engage in the process. It has been proven in Scotland that MOWI farms can and do operate within and near MPAs without harming the seabed environment and priority marine features, as shown by regular and thorough seabed survey compliance sampling and pre-operational computer modelling.

An Taisce

1. Environmental impacts of Deenish sea farm

Refer to comment on benthic impact for DHLGH on page 2.

2. Sea lice impacts

Refer to comments elsewhere in this document on sea lice.

3. Water Framework Directive and Water Quality

The EU Water Framework Directive (Directive 2000/60/EC) establishes a framework for the protection of inland surface waters, transitional waters, coastal waters, and groundwater. It aims to prevent and reduce pollution, promote sustainable water use, protect and improve the aquatic environment and mitigate the effects of floods and droughts.

In Ireland, the WFD is transposed by the following national regulations:

- European Communities (Water Policy) Regulations (2003 and 2014) and.
- European Union Environmental Objectives (Surface Waters) Regulations (2009, 2012, 2015 and 2019)

Under the WFD, a water body is the basic management unit used to assess if the environmental objectives for that water body have been met.

The key environmental objectives of the WFD are set out in Article 4 of the Directive. It requires member states to use their River Basin Management Plans (RBMPs) and Programme of Measures (PoMs) to protect and, where necessary, restore water bodies to reach good status, and to prevent deterioration. Good status means both good chemical and good ecological status.

The Deenish Island Salmon Farm is in the Southwestern Atlantic Seaboard (HA 23) coastal water body which extends from Outer Dingle Bay in the north to Dunmanus Bay in the south and covers an area of 1,540 square kilometres. This water body is characterised as being exposed, mesotidal and saline in character (euhaline).

The most recent assessment from the Environmental Protection Agency for the period 2016-2021 shows that this water body is in high ecological status which is the highest ecological status a water body can be in under the WFD assessment system (EPA, 2022). This indicates that this water body is showing no or only minor evidence of human disturbance in the context of the EU Water Framework Directive.

This assessment is based on monitoring results undertaken by the Marine Institute (Data - Catchments.ie - Catchments.ie) which show that the concentration of dissolved inorganic nitrogen (DIN) is below the environmental quality standard established in national regulations implementing the Directive, namely the European Union Environmental Objectives (Surface Waters) Regulations

(2009, 2012, 2015 and 2019).

Furthermore, concentrations of dissolved inorganic phosphorus (DIP) in this water body are also well below the environmental quality standard established for this parameter in the Surface Water Regulations although it should be noted that this standard only applies to transitional waters and not coastal waters.

However, both the concentration of DIN and DIP observed in this water body are at satisfactory concentrations being below the area specific OSPAR assessment thresholds established by Ireland under its obligations as a contracting party to the OSPAR Convention. Indeed, this water body has been classified as a non-problem area about eutrophication under the OSPAR Common Procedure (Integrated Assessment, 2017) for assessing nutrient enrichment which means there is no evidence that anthropogenic enrichment has disturbed or may in the future disturb the marine ecosystem in which this water body is found.

This is consistent with the results obtained from the 3-dimensional hydrodynamic water quality monitoring which show that DIN concentrations outside the licensed area easily meets the environmental quality standard for DIN and is less than 0.005 mg/l of N within a relatively short distance of the boundary of the farm. Similarly, DIP concentrations (<0.005 mg/l of P), outside the proposed licensed area are also well below the EQS set for transitional waters under the WFD but also well below the OSPAR area-specific assessment threshold (0.025 mg/l of P) for this parameter.

The modelling outputs are also consistent with the empirical observations on the almost negligible impact of salmon farming on water quality in an exposed Irish coastal embayment, similar in setting to the Deenish Island salmon farm.

O'Donohoe et al. (2000) in a review of a water quality dataset collected over 15 years from 11 sites in Kilkieran Bay where intensive salmon farming has been ongoing since 1984, these authors could not identify any measurable impacts on water quality over that period. In the discussion section of their report, they state "Given that the seasonal cycle of nutrients at each sampling station was typical of north temperate coastal waters and that no significant trends in the temporal levels of nutrients were observed, it can be concluded that there is no indication that fish farming in Kilkieran Bay has caused any detectable change in the levels of inorganic nutrients" and that "comparison of pre-salmon farming data and post-salmon farming data from one site indicates that the levels are similar in concentration." The report notes that other studies in Norway, the USA and Scotland all report similar undetectable increases in dissolved nitrate from marine salmon farms (see Ervik et al., 1985, Weston 1986, and Gowen and Bradbury, 1987).

It can be concluded that Deenish Island salmon farm is having a negligible impact on water quality.

4. Water Framework Directive Assessment

Under the requirements of the Water Framework Directive the national competent authority is required to undertake an assessment to determine if a project is likely to result in deterioration of the status of the body of water concerned or to jeopardise the attainment of good surface water status, unless the view is taken that that project is covered by a derogation under Article 4(7) of the Directive.

In the first instance, the responsibility for undertaking such an assessment lies with the relevant national competent authority, and not MOWI Ireland.

5. Bird impacts

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 withing 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.

6. 15% Threshold and Benthic Communities

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%".

7. Otters

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.

8. Escapees

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 non-company 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.

References:

Adams, T., Marshall, S., Brown, S., and Black, K. 2021. Validating a biophysical parasite model with fish farm pen and plankton trawl data. Aquaculture Environment Interactions. 13, 425 – 437.

Anon. 1994. The sea trout working group 1993 report to the Minister for the Marine. Marine Institute, Fisheries Research Centre, Abbotstown, Co. Dublin

Anon. 1995. The sea trout working group 1994 report to the Minister for the Marine. Marine Institute, Fisheries Research Centre, Abbotstown, Co. Dublin

Anon. 1996. The sea trout working group 1995 report to the Minister for the Marine. Marine Institute, Fisheries Research Centre, Abbotstown, Co. Dublin

Anon. 2021. IFI Consolidated Fish Counter Summary Report 2021 Inland Fisheries Ireland, Dublin

Anon. 2023. Newport Research Facility ANNUAL REPORT NO. 67 Report for the year ended 31st December 2022 Marine Institute, Ireland

Anon. 2023. Report of the Technical Expert Group on Salmon to the North-South Standing Scientific Committee for Inland Fisheries : Appendix IV River / stock specific information used in the salmon catch advice process for 2023 advice.

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.

Bord Iascaigh Mhara 2007. Understanding Irish Shellfish Culture Environments (UISCE). BIM Newsletter, 60.

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.

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.

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

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.

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.

EPA, 2021. Water Quality in 2020: An Indicators Report. Environmental Protection Agency, Ireland.

EPA, 2023. Bathing Water Quality in Ireland. A report for the year 2022. Environmental Protection Agency, Ireland.

EPA, 2022. Water Quality in Ireland 2016-2021. Environmental Protection Agency, Ireland.

Ervik, A., Johannessen, P. and Arve, J. (1985). Environmental effects of marine Norwegian fish farms. ICES, C.M., 1985/f:37/Session W.

Fahy,E. 1980. Sea trout from the Currane fishery in 1973 and 1974. Irish Fisheries Investigations Series A (Freshwater) No. 19

Fahy,E. and Rudd,R. 1988. The Currane, Co. Kerry, Sea Trout Fishery, 1980-1986 Irish Fisheries Investigations Series A (Freshwater) No. 31

Galland, J. C., Goutal, N. & Hervouet, J. M. (1991) TELEMAC: A new numerical model for solving shallow water equations. Adv. Water Resour. 14(3), 38–148

Geist, J., Porkka, M., & Kuehn, R. (2006). The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams. Aquatic Conservation-marine and Freshwater Ecosystems, 16, 251-266.

Gowen, R. and Bradbury, N. (1987). The ecological impact of salmonid farming in coastal waters; a review. Oceanography and Marine Biology Review, 25, 563-575.

Hamre, L. A., Eichner, C., Caipang, C. M. A., Dalvin, S. T., Bron, J. E., Nilsen, F., Boxshall, G. & Skern Mauritzen, R. (2013). The Salmon Louse *Lepeophtheirus salmonis (Copepoda: Caligidae*) life cycle has only two chalimus stages. PLoS ONE, 8(9): e73539.

Hervouet, Jean-Michel. Hydrodynamics of Free Surface Flows Modelling with the Finite Element Method. Wiley, 2007.

Keegan, B. and Mercer, J. 1986. An oceanographical survey of Killary Harbour on the west coast of Ireland. Proceedings of the Royal Irish Academy, 86B: 1 – 70.

Kelly, S., Wightman, G., Gargan, P., Kelly F.L., Roche, W. & Millane, M. 2024. National Salmonid Index Catchment Erriff, Annual Report 2022. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24. 58 pp.

Lougee, L., Bollens, S. and Avent, S. 2002. The effects of haloclines on the vertical distribution and migration of zooplankton. J. Exp. Mar. Biol. Ecol., 278: 111 – 134.

Mc Dermott, T., D'Arcy, J.,Kelly, S, Downes., J,Griffin, B., Kerr, R.,O'Keeffe, D.,O'Ceallachain, M., Lenighan, L.,Scholz, F. and , Ruane, N. 2021. Novel use of nanofiltered hyposaline water to control sea lice (*Lepeophtheirus salmonis* and *Caligus elongatus*) and amoebic gill disease, on a commercial Atlantic salmon (*Salmo salar*) farm. Aquaculture reports, 20.

Moorkens, E.A. Conservation management of the freshwater pearl mussel : *Margaritifera margaritifera.* Part 1, Biology of the species and its present situation in Ireland. National Parks and Wildlife Service.

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.

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.

NPWS, 2013. Conservation objectives supporting document -Marine habitats and species, Version 1: 16.

O'Donohoe, G., Hensey, M. and O'Connor, B. (2000). An Assessment of Water Quality Data in Kilkieran Bay, Co. Galway. Marine Institute and Health Series, No. 1.

Roden, C., Rodhouse, P., Hensey, M., McMahon, T., Ryan, T. and Mercer, J. 1987. Hydrography and the distribution of phytoplankton in Killary Harbour: a fjord in western Ireland. Journal of the Marine Biological Association, U.K. 67: 359 – 371.

Rodhouse, P., Roden, C., Hensey, M. and Ryan, T. 1984. Resource allocation in *Mytilus edulis* on the shore and in suspended culture. Marine Biology, 84: 27-34.

Rodhouse, P., Roden, C., Hensey, M. and Ryan, T. 1985. Production of mussels, *Mytilus edulis* in suspended culture and estimates of carbon and nitrogen flow in Killary Harbour. Journal of the Marine Biological Association, U.K. 65: 55 – 68.

Rodhouse, P. and Roden, C. 1987. Carbon budget for a coastal inlet in relation to intensive cultivation of suspension feeding bivalve molluscs. Marine Ecology Progress Series, 3: 225 – 236.

Shepard, S. and Gargan, P. 2017. Quantifying the contribution of sea lice from aquaculture to declining annual returns in a wild Atlantic salmon population. Aquaculture Environment Interactions, 9: 181 – 192.

Weston, D.P. (1990). Quantitative examination of microbenthic community changes along an organic enrichment gradient. Marine Ecology Progress Series, 61, 233-244.

APPENDIX 1

SEA LICE ON WILD SEA TROUT

There was no monitoring of sea lice on farmed salmon or wild sea trout in Ireland before the collapse of sea trout populations in some parts of the west of Ireland (mainly Connemara and Mayo) during 1989-1990. After the sea trout collapse, monitoring of sea lice on farmed salmon commenced and treatment protocols were put in place. Also, intensive monitoring of sea lice on wild sea trout commenced at various locations (coastal waters / estuaries / lower reaches of rivers using various netting methodologies and electrofishing.

In Ireland, the Irish government sponsored Sea Trout Working Group of the early 1990s recommended sampling wild sea trout at sea, in estuaries and on the lower reaches of rivers during the period 1 May – 15 June each year and to include only fish up to 26cm fork-length in analyses. It was felt that fish up to this length would include only smolt / post-smolt and that all fish sampled during the period 1 May – 15 June each year would have migrated to sea by the conclusion of that time period and either represent post-smolt at sea or post-smolt early returned to freshwater.

There are many challenges facing researchers attempting to count and interpret sea lice on sea trout post-smolt captured at sea or in an estuary or in the lower reaches of a river. For example, fish sampled in the lower reaches of a river may have lost some or all of their sea lice burden and / or the capture method *e.g.* netting, may have resulted in the loss of some or all of a fish's sea lice burden prior to examination.

Sea trout in many parts of Ireland, and particularly in the west of Ireland from whence most published accounts emanate, have complicated and sometimes subtle differences in life histories.

The following is a summary:

- Sea trout emanate from a brown trout population that is partially migratory *i.e.* not all brown trout in a population migrate to sea,
- Where large samples of rod caught sea trout have been examined internally, there is an even distribution of the sexes,
- High mortality (c. 70-90% - average of 80%) characterises the initial marine migration of sea trout post-smolt,
- Most sea trout post-smolt return to freshwater during their first post-migration summer and most are immature fish,
- Most sea trout mature for the first time after spending two summers at sea and one winter in freshwater and are annual spawners for the remainder of their lives,
- On their return from marine to freshwater habitat most sea trout do not feed and continue to decline in condition for the duration of their freshwater residency and
- Most sea trout in the west of Ireland (with the exception of the Currane system in Co. Kerry) are short lived with few fish surviving beyond three summers feeding at sea *i.e.* 2SW.

The design of investigations of sea lice on sea trout in marine / freshwater habitat is challenging and in the absence of individual tagging and / or tracking of individual fish it is not possible to determine duration of marine residency and / or timing of return to freshwater. Without going into too much detail, a visual analysis of fish scales might not enable a researcher to determine if marginal circuli were laid down in freshwater or in an estuary or in seawater post migration. A chemical analysis of scale margins may be required to determine this. Also, it is to be expected that sea trout post smolt will vary considerably in length on their return to freshwater and it is not known if this is related to smolt length, length of marine residency or other factors *e.g.* sex and maturation.

With regard to the two pillars of the investigation of sea lice on sea trout in Ireland during the 1990s:

- Pillar 1 - only sea trout less than 26cm in fork-length included in analyses,
- Pillar 2 - only fish sampled during the period 1 May - 15 June included in analyses,

The first pillar is well chosen and almost certainly excludes all but sea trout smolt / post-smolt.

However, the second pillar has weaknesses. The sampling period was chosen because it was assumed that all smolt would have migrated to sea by 1 May and that any fish sampled by 15 June in the lower reaches of a river would be a pre-mature return which entered freshwater to lose its sea lice burden.

The timing of sea trout smolt migrating from Tawnyard Lough in the Erriff catchment, Co. Mayo in 1990 shows the mean fork-length (+/- 95% CI) on each day when more than 5 sea trout smolt were recorded (Figure 1) and the number of smolt counted downstream (Figure 2) each day (n=2342). The smolt migration period depicted extended from 27 April to 8 June and only a small percentage (c. 9%) had migrated before 1 May.

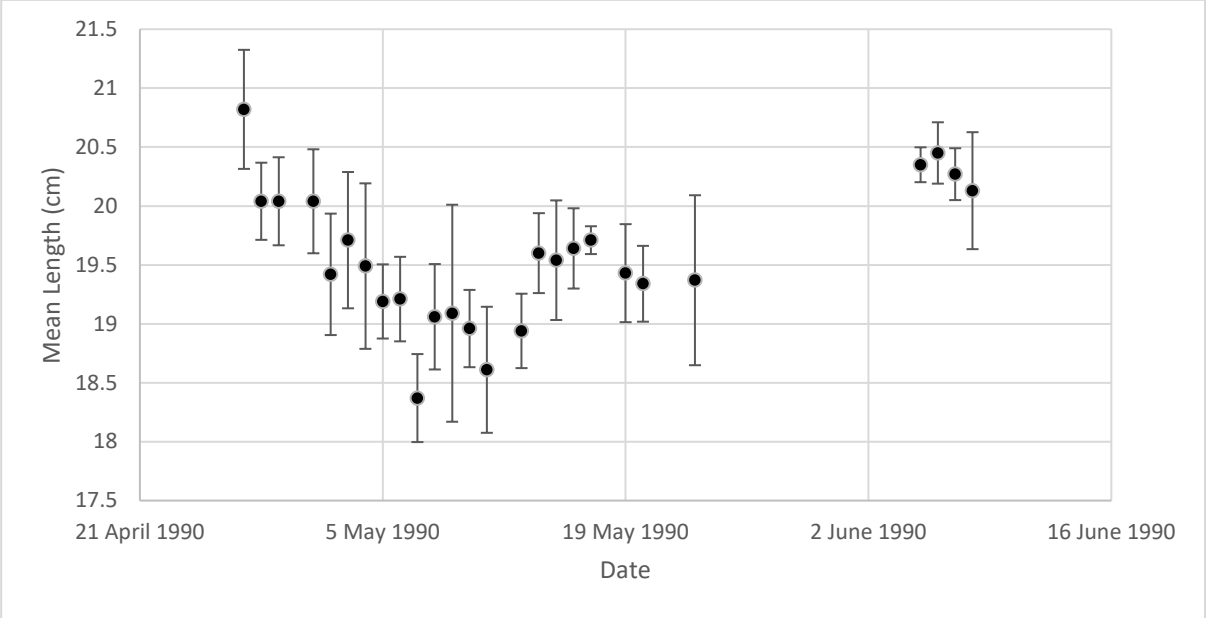


Figure 1. Daily Mean fork-length (+/- 95% CI) of sea trout smolt counted downstream at the Tawnyard Lough trap in 1990.

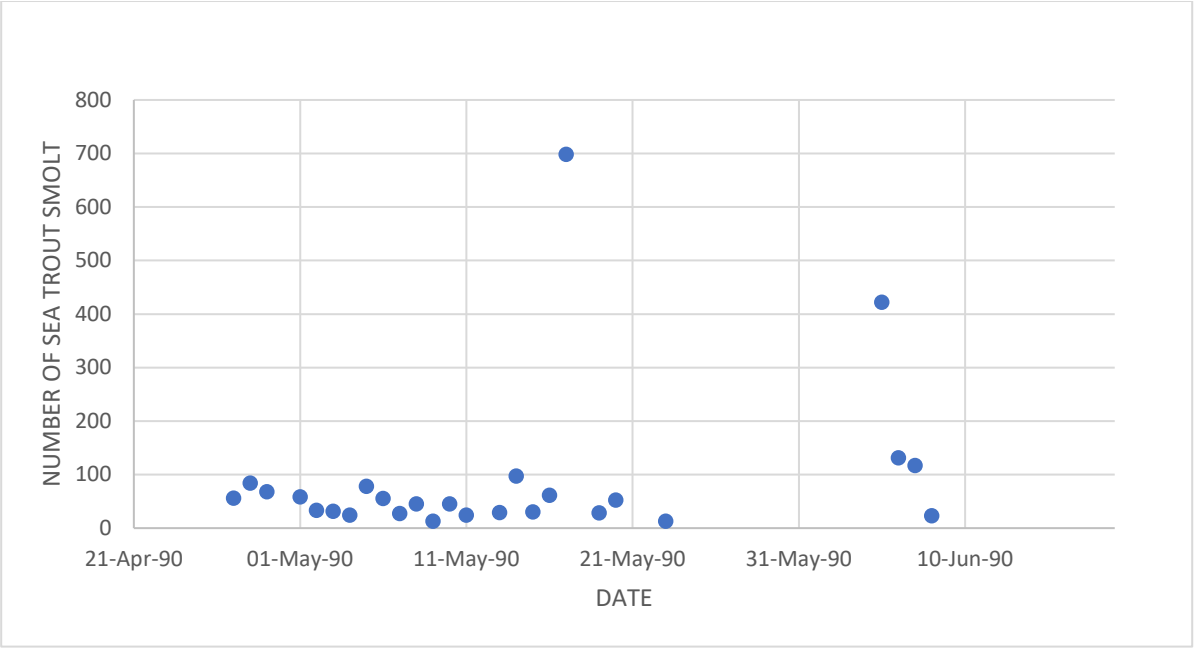


Figure 2. Number of sea trout smolt counted downstream each day at the Tawnyard Lough trap in 1990.

The sea trout rod catch records for the Erriff Fishery for the years 1925-1983 were examined by O'Farrell & Whelan (1984) and show that of 14,373 taken or rod and line, the following was the monthly distribution of catches over these 58 years (data extracted from Figure 9 of O'Farrell & Whelan,1984) using Image J software:

- April: 0.4%
- May: 0.8%
- June: 4.2%
- July: 31.0%
- August: 32.6%
- September: 27.6%
- October: 3.3%

Thus, during these years a total of 5.4% of the sea trout catch was made before July. The catch record does not provide information on the size of sea trout taken on rod and line but during the period 1983-1985, 0SW (finnock) sea trout accounted for 87.4,87.2 and 82.8%, respectively, of sea trout taken on rod and line on the River Erriff (O'Farrell & Whelan,1991). Accordingly, sea trout present in the lower reaches of the River Erriff in June are not necessarily early returning or prematurely returning fish as rod catches made on the River Erriff over several decades before the commencement of marine salmon farming conclusively show.

Marine mortality of sea trout

Little investigation was ever carried out in Ireland on the factors which resulted in the loss of 70-90% of sea trout smolt / post-smolt within a few months of their seaward migration.

However, post collapse in 1989-1990, sea lice emanating from marine salmon farms became the focus of research into the cause of the sea trout population collapse. Marine mortality of sea trout

smolt / post-smolt had risen from 70-90% prior to the commencement of marine salmon farming to >90% after the commencement of marine salmon farming.

The main findings of the research carried out over a period of several years post collapse was that there was a negative relationship between mean abundance of sea lice on sea trout and distance to the nearest marine salmon farm. With regard to settling on statistical descriptors for sea lice infestation of sea trout, it was recognised that the data showed that sea lice on sea trout followed a negative binomial distribution where most sea trout samples had few or no sea lice while a small percentage of fish had high lice burdens. In spite of this, the 'mean abundance' of sea lice on all sea trout examined for the presence of sea lice became the norm.

Interpreting the significance of sea lice burdens for the survival of individual fish (sea trout and Atlantic salmon) was only possible after the completion of experimental studies. The results of some of these studies were included in a review (Anon. 2021) who reported that:

- Under laboratory conditions, over 13 attached sea lice (at the pre-adult and adult mobile stages) per trout (19-70 g) caused physiological stress and was potentially lethal (Wells *et al.*,2006).
- Under laboratory conditions, mortality of individual salmon due to sea lice can occur at 0.2 mobile lice per g of host fish and becomes more likely as the level of infection increases (Fjelldal *et al.,* 2020).

Strom *et al.* (2022) referenced Taranger *et al.* (2015) who reported on the sea lice infestation levels assumed to impact anadromous salmonids (0.1 lice g^{-1} fish) and cause severe health effects (0.3 lice g^{-1} fish).

Other studies have reported on the benefits of sea lice therapeutant treatment of reared Atlantic salmon smolt (Torrissen *et al.,* 2013) and wild sea trout smolt (Skaala *et al.,* 2013) prior to their release into marine environments. Torrissen *et al.* (2013) estimated early seawater mortality and performance by treating smolts with anti-lice drugs prior to their release and comparing their recapture rates as adults with untreated control groups. The efficacy of the drugs is limited to weeks or in some cases months after smolt release and it is assumed that differences in ocean survival are caused by infestation of control fish with salmon lice during the early stage of smolt migration. Estimates from Ireland and Norway indicate an odds ratio of 1.1:1-1.2:1 for sea lice treated Atlantic salmon smolt to survive sea migration compared to untreated salmon smolts. One study in Norway (Skaala *et al.*,2013) treated wild sea trout smolt with Substance EX (to prevent sea lice infestation) in 2004 and 2005 (n=704) and compared return rates to a trap with non-treated controls (n=1306) and found that the return rate for the treated fish was 3.4% (n=24) compared to 1.8% (n=23) for the non-treated controls. While the return rates of treated fish were higher than non-treated controls, Skaala *et al.* (2013) make no comment on the overall high mortality of both groups (96.6% for treated fish and 98.2% for non-treated controls).

In Ireland, sea trout smolt aged 2 and 3 years predominate and in 1992 and 1993, smolt of known age migrated from the School House Lakes, Casla River catchment, Connemara, Ireland (O'Farrell *et al.* 1993) with the following fork-length(cm) and weight(g) characteristics:

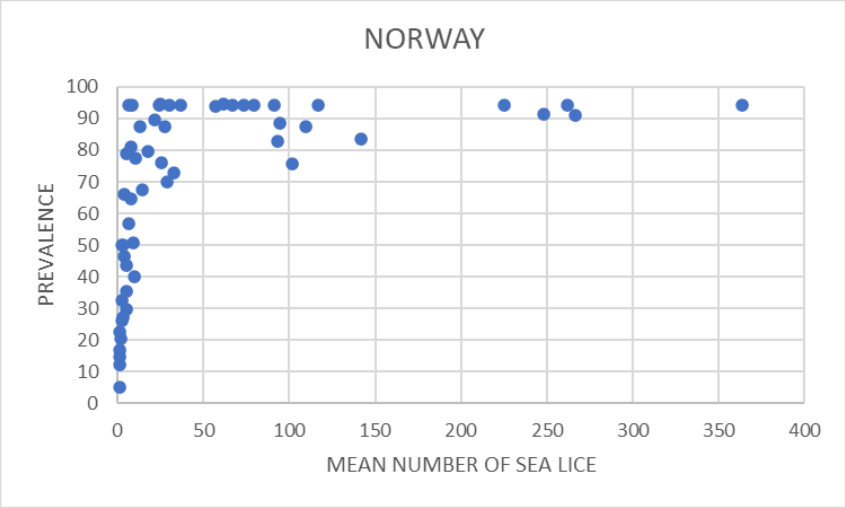
Age	Mean fork-length (cm)	95% CI	Mean weight (g)	95% CI
2	18.4	0.31	55.9	2.9
3	20.4	0.37	83.4	9.8

A sea lice infestation of 13 pre-adult / adults equates to 0.23 lice per gram for the average 2-year-old smolt and to 0.15 lice per gram for the average 3-year-old smolt.

At an infestation level of 0.2 mobile lice per gram of host, the infestation level would be 11.2 lice per 2-year-old smolt and 16.7 lice per 3-year-old smolt.

Of course, while the above infestation levels have been shown in laboratory studies to cause mortality in salmon and sea trout smolt / post-smolt, the literature also focuses on different levels of infestation which are capable of causing stress and distress to host fish.

In Ireland, studies relating to sea trout and sea lice issues frequently cite similar studies carried out in Scotland and in Norway. However, studies of the environmental and wild salmonid impact of salmon farming in Ireland rarely refer to the nature of the industry in all three countries. While farmed salmon production in Ireland has generally fluctuated between 10,000t and 20,000t during the past three decades, production in Scotland is now approximately one order of magnitude higher than in Ireland while production in Norway is now approximately two orders of magnitude greater than in Ireland. Thorstad *et al.* (2015) presented graphical descriptions of the prevalence (percentage of fish infested with sea lice) and mean abundance (mean number of sea lice per sea trout examined) in published accounts from Ireland, Scotland and Norway. In their graphs prevalence of sea lice (Y) was on an arithmetic scale while mean abundance of sea lice on sea trout (X) was transformed to natural logarithm. For the purpose of this interpretation, the graphs included in Thorstad *et al.* (2015) have been scanned and the data points extracted using Image J software and the natural logarithm data transformed to arithmetic.



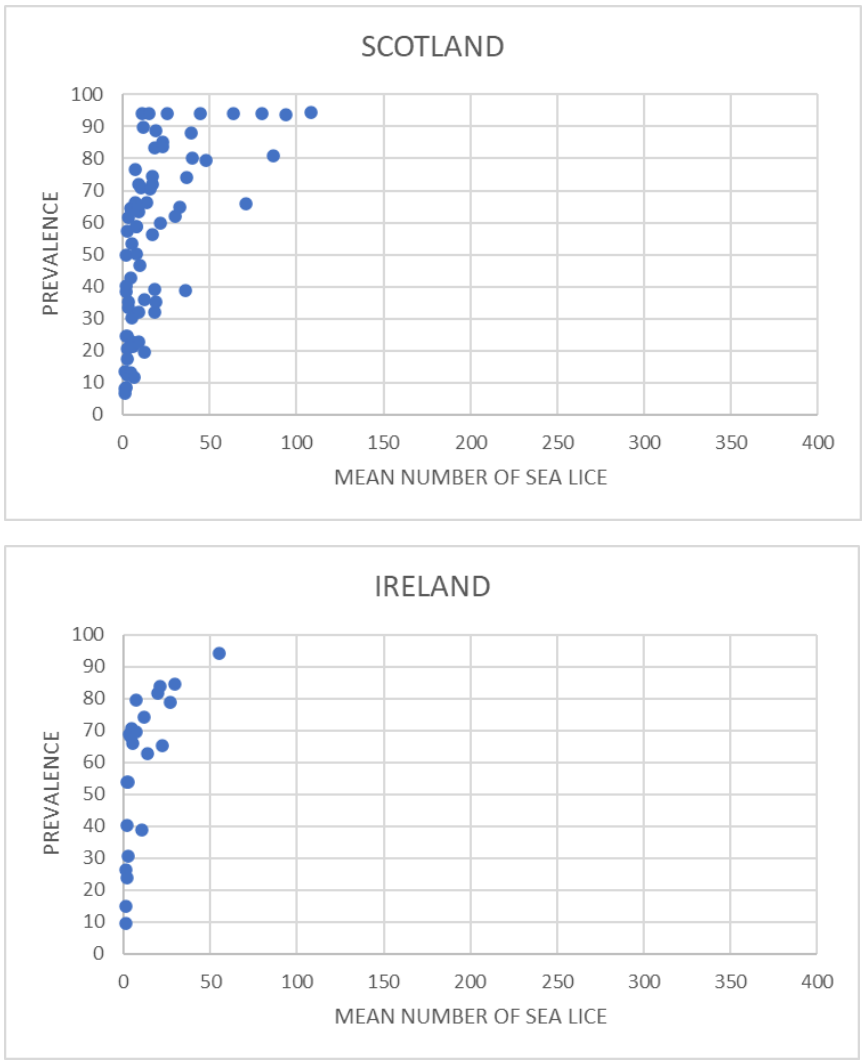


***Figure 3**. Relationship between sea lice prevalence and mean abundance per sea trout examined in areas with net-pen salmon farming in Norway, Scotland and Ireland.*

The first series of graphs (Figure 3 above) which uses the data from Thorstad *et al.* (2015) shows the percentage prevalence (0-100 Y axis) and mean abundance of sea lice per fish (0-400 on the X axis) relating to areas with net-pen salmon farming in these three countries. Clearly, the patterns of sea lice infestation are very different for the three countries and, accordingly, the results of scientific studies carried out in these three countries might be expected to reflect different outcomes with respect to sea lice infestation on wild salmonids.

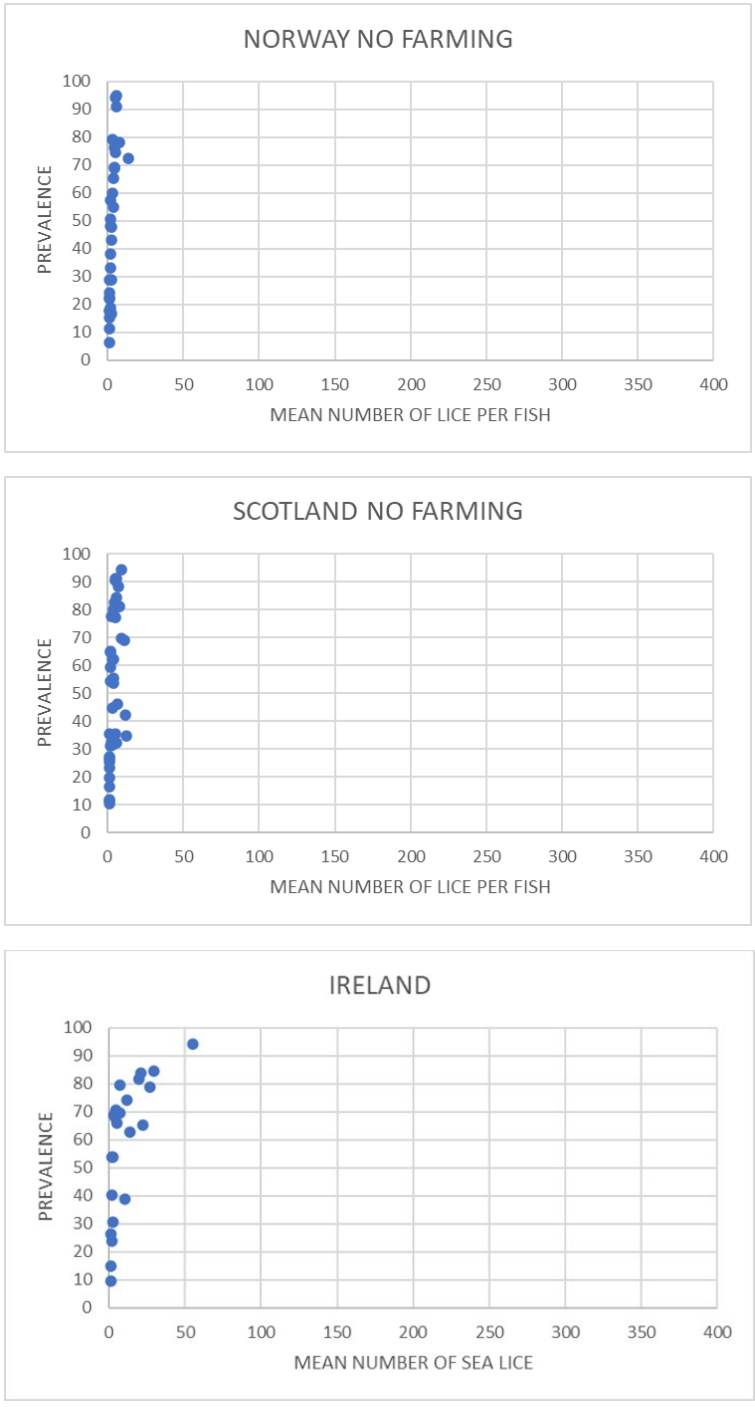


***Figure 4**. Relationship between sea lice prevalence and mean abundance per sea trout examined in areas without net-pen salmon farming in Norway, Scotland and with net-pen salmon farming in Ireland.*

Thorstad *et al.* (2015) also presented graphs for Norway and Scotland using data on sea lice prevalence and mean abundance of sea lice per sea trout sampled in areas without net-pen salmon farming. No such data were available for Ireland. These graphs have been plotted (Figure 4 above) using the same axes used in the graphs relating to areas with net-pen salmon farming in Norway, Scotland and Ireland.

Because so much of the data in the above graphs are confined to the left-hand side of the graphs, these graphs have been redrawn with the X axis having a maximum value of 60 (Figure 5 below).

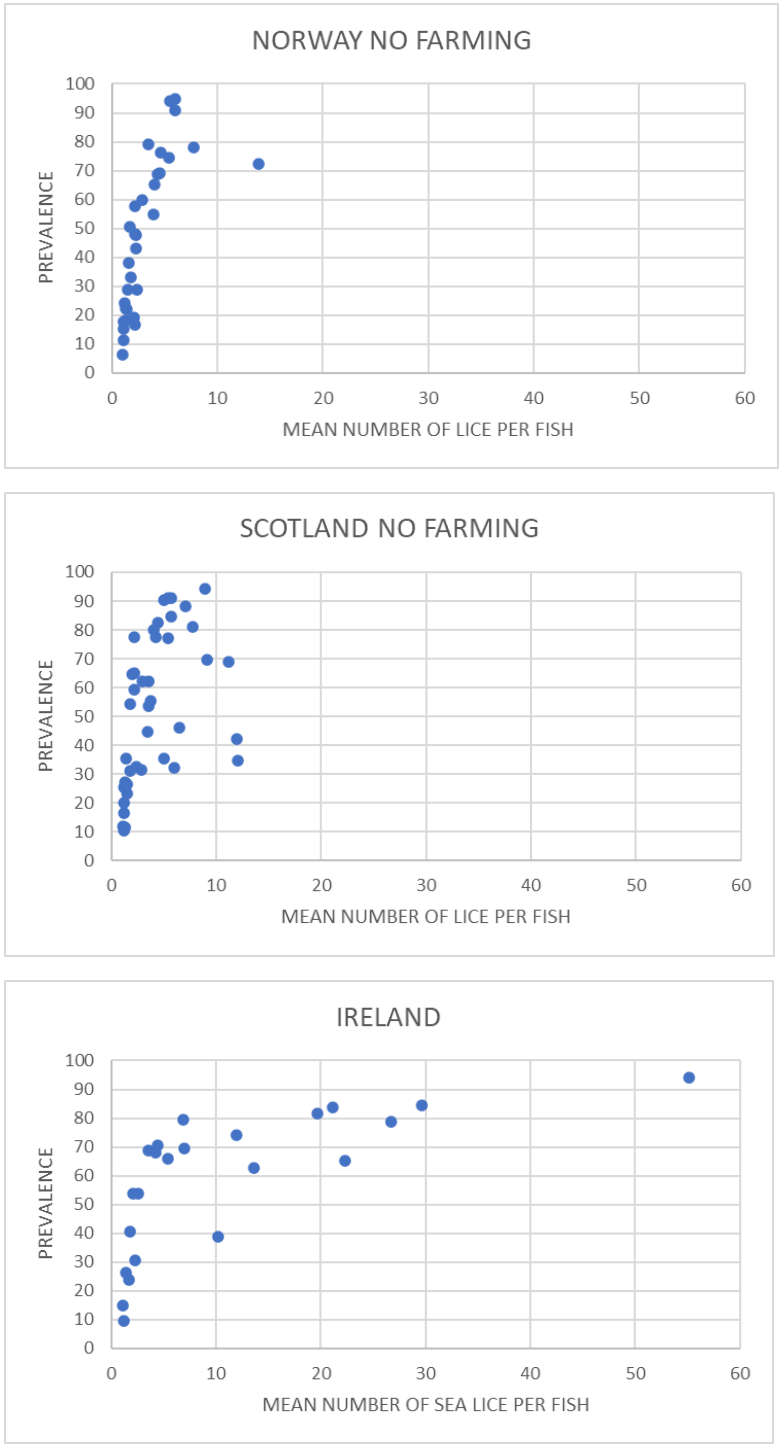


***Figure 5**. Prevalence and mean abundance of sea lice per sea trout examined in areas of Norway and Scotland without net-pen salmon farming and in Ireland in areas with net-pen salmon farming.*

A total of six out of twenty-three data points for Ireland for areas with net-pen salmon farming can be considered to exceed the range of values for mean number of lice per sea trout recorded in Norway and Scotland without net-pen salmon farming. Thus, apart from approximately a handful of situations, sea lice prevalence and mean abundance per sea trout examined in Ireland was in keeping with levels recorded in Norway and Scotland in areas without net-pen salmon farming.

REFERENCES

Anon. (2021). Impacts of lice from fish farms on wild Scottish sea trout and salmon: summary of science. Marine Scotland Directorate.

Fjelldal,P.G., Hansen,T.J. and Karlsen,Ø. (2020). Effects of laboratory salmon louse infection on osmoregulation, growth and survival in Atlantic salmon. Conservation Physiology 8, 1-10.

O'Farrell,M.M. and Whelan,K.F. (1984). River Erriff Research Programme Report 1.
Central Fisheries Board, Dublin.

O'Farrell, M.M. and Whelan, K.F. (1991). Management of migratory trout (*Salmo trutta*) in the Erriff and other catchments in Western Ireland. *In*: Steer,M.W. (ed.) 'Irish Rivers: Biology and Management', pp 99-112, Royal Irish Academy, Dublin.

O'Farrell,M.M., Whelan,K.F., Poole,R., Gargan,P., Peirce,R.P., Moore,T. and Lubberhuizen, J. (1993). Western Ireland migratory trout (*Salmo trutta*): smolt production, characteristics and timing of migration. ICES Anadromous and catadromous Fish Committee CM 1993 / M:52

Skaala,O., Kalas,S. and Borgstrom,R. (2013). Evidence of salmon lice-induced mortality of anadromous brown trout (Salmo trutta) in the Hardangerfjord, Norway.
Marine Biology Research, 2014 Vol. 10, No. 3, 279-288.

Strøm,J.F., Bjørn.P.A., Bygdnes,E.E., Kristiansen,L., Skjold,B. and Bøhn,T. (2022).
Behavioural responses of wild anadromous Arctic char experimentally infested in situ with salmon lice.
ICES Journal of Marine Science, 2022, 0, 1–11

Taranger, G. L., Karlsen, Ø., Bannister, R. J., Glover, K. A., Husa, V., Karlsbakk, E., Kvamme, B. Ø. *et al.* (2015). Risk assessment of the environmental impact of Norwegian Atlantic salmon farming.
ICES Journal of Marine Science, 72: 997–1021.

Thorstad, E.B., Todd, C.D., Uglem, I., Bjorn, P.A., Gargan, P.G., Vollset, K.W., Halttunen, E., Kalas, S., Berg, M. and Finstad, B. (2015). Effects of salmon lice *Lepeophtheirus salmonis* on wild sea trout *Salmo trutta*- a literature review. Aquaculture Environment Interactions 7, 91-113.

Torrissen, O., Jones, S., Asche, F., Gutormsen, A., Skilbrei, O., Nilsen, F., Horsberg, T.E. and Jackson D. (2013). Salmon lice – impact on wild salmonids and salmon aquaculture. Journal of Fish Diseases 36, 171-194.

Wells, A., Grierson, C.E., MacKenzie, M., Russon, I.J., Reinardy, H., Middlemiss, C., Bjorn, P.A., Finstad, B., Bonga, S.E.W., Todd, C.D. and Hazon, N. (2006). Physiological effects of simultaneous, abrupt seawater entry and sea lice (*Lepeophtheirus salmonis*) infestation of wild, sea-run sea trout (*Salmo trutta*) smolts. Canadian Journal of Fisheries and Aquatic Science. 63 2809-2821.

With regards

Catherine McManus

OPERATIONS DIRECTOR IRELAND