Aquaculture in Ireland: Implications for meeting Water Framework Directive and Marine Strategy Framework Directive objectives and opportunities

A policy briefing by the Sustainable Water Network (SWAN)

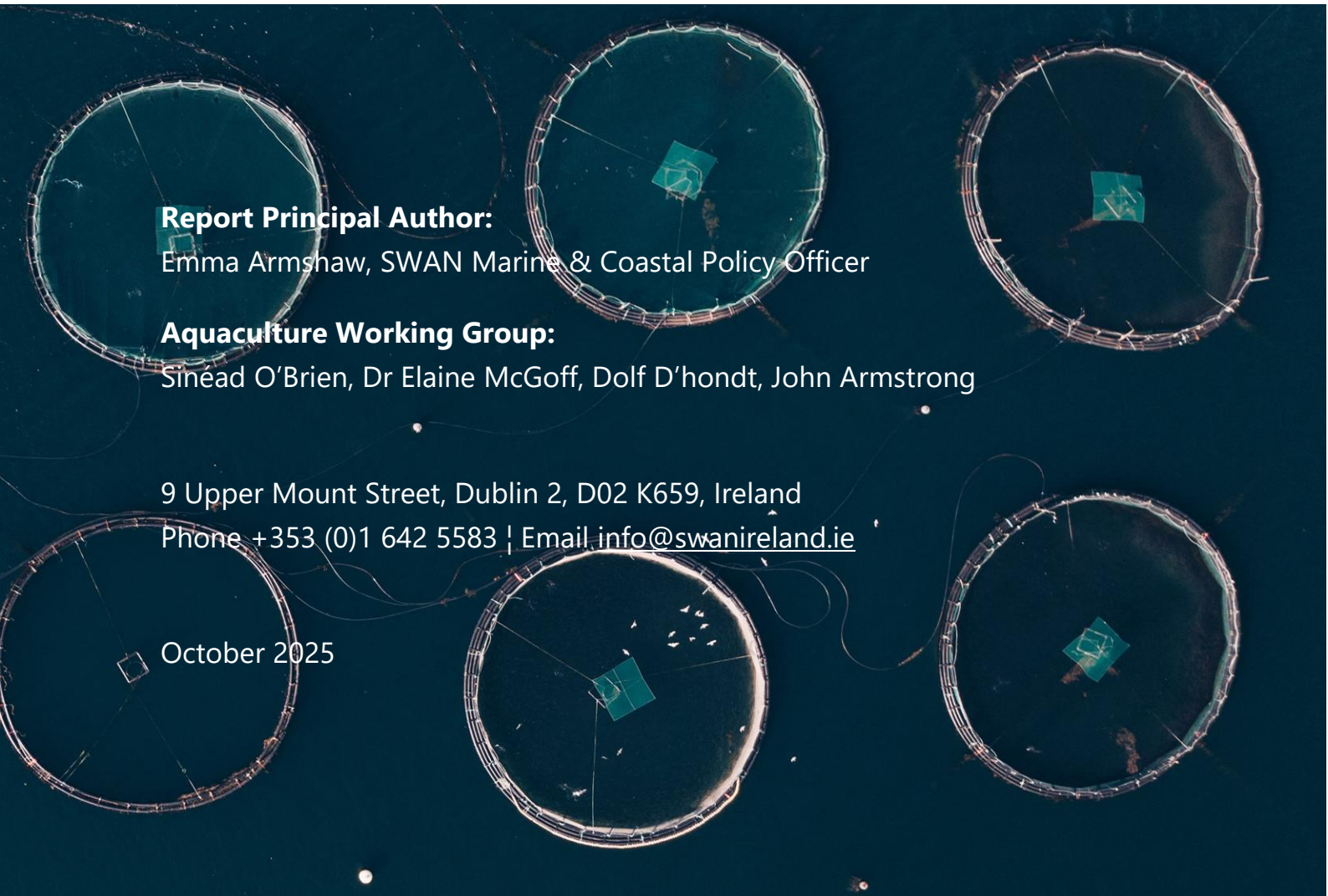

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Table of Contents

INTRODUCTION **1**

GLOBAL CONTEXT **2**

ENVIRONMENTAL IMPACTS **4**

IMPACTS ON WATER QUALITY 4

Eutrophication and harmful algal blooms *5*

Dredging *6*

ALIEN AND INVASIVE SPECIES 7

DISEASE 9

Oysters *9*

Salmon – sea lice and disease *10*

FEED FOR CARNIVOROUS FINFISH 12

Sprat *14*

ORGANIC SALMON 16

IMPACT ON WILD SPECIES 18

Salmon *18*

Shellfish *19*

Wading birds *20*

Maërl *20*

IRISH AQUACULTURE INDUSTRY **22**

EUROPEAN UNION **25**

COMMON FISHERIES POLICY 25

DIRECTIVES 26

Marine Strategy Framework Directive *27*

Water Framework Directive *30*

Water Action Plan 32

NATURE RESTORATION LAW 33

NATIONAL-LEVEL POLICIES & AGENCIES **34**

DEPARTMENT AND ACTS 34

AGENCIES 35

NATIONAL POLICIES 36

National Maritime Planning Framework *36*

National Strategic Plan for Sustainable Aquaculture *37*

15% damage threshold *40*

MARINE PROTECTED AREAS 42

RESPONSIBLE AQUACULTURE **47**

ALTERNATIVE AQUACULTURE APPROACHES 51

BIVALVES 52

CLOSED- AND LAND-BASED SYSTEMS 54
LOW TROPHIC AND INTEGRATED MULTI-TROPHIC 56
RECOMMENDATIONS 59
APPENDIX I: LEGAL ANALYSIS 62
INTRODUCTION 62
CURRENT EU AND IRISH LEGISLATION AND GUIDANCE GOVERNING AQUACULTURE 62
FISHERIES (AMENDMENT) ACT 1997 62
REGULATIONS 63
MAKING SUBMISSIONS 64
NOTIFYING PRESCRIBED AUTHORITIES 64
APPEALS 64
OLD ACTIVITIES 65
CRITERIA FOR GRANT OF LICENCE 65
JUDICIAL REVIEW 66
OTHER LEGISLATION 67
THE WATER FRAMEWORK DIRECTIVE, 2000/60, ... 67
THE MARINE STRATEGY FRAMEWORK DIRECTIVE, ... 70
THE MARINE SPATIAL PLANNING DIRECTIVE, ... 72
MARINE AREA PLANNING ACT 73
FORESHORE ACT 77
HABITATS DIRECTIVE (NATURA 2000, SAC SITES), ... 77
BIRDS DIRECTIVE 2009/147 (NATURA 2000, SPA SITES) 79
EIA DIRECTIVE 2011/92. 80
PRACTICAL STEPS IN MAKING A SUBMISSION OR APPEAL 81
RECOMMENDATIONS FOR AMENDING LEGISLATION 82
EFFECTIVENESS OF CURRENT REGIME 84
LIMITATION OF LIABILITY 85
LEGAL RECOMMENDATIONS 86
SWAN MEMBER ORGANISATIONS AND BOARD OF DIRECTORS 87
MARINE WORKING GROUP 87
BOARD OF DIRECTORS 87

INTRODUCTION

The Sustainable Water Network (SWAN) is an umbrella network of 25 of Ireland's leading environmental NGOs, national and regional, working together to protect and enhance Ireland's water environment. Through coordinating the work of the SWAN office with that of our members, SWAN seeks to influence water and water-related policy so as to secure maximum protection for Ireland's aquatic resources, through participation in the implementation of the Marine Strategy Framework Directive (MSFD), the Water Framework Directive (WFD) and other water-related policy and legislation. We are a founding partner of Fair Seas and a member of Seas at Risk, the Irish Sea Network and the Irish Ocean Literacy Network. SWAN's Marine Working Group members are listed at the end of this document.

The aquaculture industry in Ireland has grown significantly from its beginnings in the 1980s and the Government envisions a "sustainable, profitable, competitive, and market-focused aquaculture industry making the maximum long-term economic and social contribution to coastal communities and Ireland" (DAFM, 2022). The 2025 Programme for Government stated that the Government will "continue to support and promote improvements in fisheries and aquaculture."

Within this context, SWAN has developed the following policy briefing on aquaculture in Ireland, as it relates to the WFD and MSFD. This aims to provide a review of current aquaculture operations and impacts in Ireland in the context of the WFD and MSFD indicators and objectives and an overview of EU and Irish policy, legislation and guidance relevant to aquaculture and its strengths and weaknesses especially in relation to alignment with/achievement of WFD and MSFD requirements. Using this evidence base, we then propose recommendations on how to best plan and manage aquaculture which reduces detrimental environmental impact and brings it in line with WFD and MSFD objectives. SWAN's priorities are ensuring compliance with these directives, by achieving and maintaining Good Environmental Status in Ireland's waters. As such, our response will focus less on social and economic analysis of the uses of the marine environment.

GLOBAL CONTEXT

Seafood (a combination of wild fisheries, finfish mariculture and bivalve mariculture) currently comprises approximately 17% production of edible meat consumed globally and could increase by 36-74% of current yield (Costello *et al.*, 2020). However, global catches from wild fisheries have been plateauing since the 1980s, despite an increase in fishing effort, leading to supply shortfall. While it has been projected that the production of aquatic foods will increase by 32% between 2018 and 2030, "aquaculture's contribution to global aquatic food production is expected to increase from 46% in 2018 to 53% in 2030" (Henriksson *et al.*, 2021).

As defined by the United Nations' (UN) Food and Agriculture Organisation (FAO), aquaculture is: "The farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding and protection from predators. Farming also implies individual or corporate ownership of the stock being cultivated, the planning, development and operation of aquaculture systems, sites, facilities and practices, and the production and transport" (FAO).

Costello *et al.* predict that an increase in aquaculture production can meet these needs, whereas Sumaila *et al.* (2022) found that "without wild fish, the world will face a fish food shortage of about 71 million tonnes annually by 2030, and the aquaculture production growth rate would have to be 3 times current average projected production by the FAO, the World Bank and the OECD in 2030." They refer to the belief that the industry can continue its rate of growth and meet global seafood demands as "aquaculture over-optimism."

The FAO published its biennial "State of World Fisheries and Aquaculture" most recently in 2024, which is broadly supportive of sustainable aquaculture intensification and expansion. The FAO reports that global aquaculture production is at an all-time high (having increased by 6.6 percent since 2020, contributing over 57 percent of aquatic animal products used for direct human consumption) and in 2024, surpassed capture fisheries for the first time. China dominates global aquaculture production. Globally, Atlantic salmon is the top farmed marine species by value, with production more than doubling since 2000, aided by rapid increases in production in Norway.

The key facts on global aquaculture from the 2024 FAO report are presented below:

Table 1. Key messages from The State of World Fisheries and Aquaculture 2024 – Blue Transformation in action. Source: FAO, 2024.

FAO Key Message: Aquaculture is expected to play an increasingly important part in meeting the rising global demand for aquatic foods. Future expansion must prioritise sustainability and benefit regions and communities most in need
• In 2022, global aquaculture production reached 130.9 million tonnes (valued at USD 312.8 billion), 59 percent of total global fisheries and aquaculture production. This was comprised of 94.4 million tonnes of aquatic animals and 36.5 million tonnes of algae. • Inland aquaculture contributed 62.6 percent of farmed aquatic animals, with marine and coastal aquaculture comprising 37.4 percent of total production. • For the first time, aquaculture surpassed capture fisheries in aquatic animal production with 94.4 million tonnes, representing 51 percent of the world total and a record 57 percent of the production destined for human consumption. • By 2032, it is anticipated that aquaculture will account for 54 percent of the total production of aquatic animals and 60 percent of total aquatic food for human consumption, estimated at 184 million tonnes or 90 percent of total production. • Aquaculture remains dominated by a small number of countries, with China, Indonesia, India, Viet Nam, Bangladesh, Philippines, Republic of Korea, Norway, Egypt and Chile producing nearly 90%. • Out of some 730 farmed species items, 17 staple species represent about 60 percent of global aquaculture production, while other species are important at local level. • Targeted policies, technology transfer, capacity building and responsible investment are crucial to boost sustainable aquaculture where it is most needed, in particular in Africa.

The FAO's Blue Transformation Roadmap also includes "sustainable aquaculture growth to meet the increasing demand for aquatic foods" as one of its three global objectives. It advises:

"An ecosystem approach should be at the centre of future aquaculture intensification and expansion, to minimise environmental impacts and secure animal health and food safety, with an efficient, diverse and sustainable use of inputs and resources, in particular water, land and feed, while improving yields and supporting livelihoods, especially for the most vulnerable communities and populations."

ENVIRONMENTAL IMPACTS

With aquaculture continuing to expand globally, it is imperative this is not at the expense of water quality or biodiversity. However, serious environmental issues around the aquaculture industry persist, including pollution, disease, inconsistent regulation, sourcing feed for carnivorous finfish and impacts on wild populations. The industry requires robust management and tight regulation to avoid environmental degradation.

The farming of marine species brings with it direct biological, chemical and physical impacts on the environment, with environmental implications varying whether finfish, shellfish, or seaweed is farmed. Examples from studies in numerous aquaculture-producing nations, applicable to the Irish context, are provided throughout this briefing. Under analysis done as part of the Marine Strategy Framework Directive (MSFD), nutrient input, marine litter and the spread of invasive species have been identified as the three main damaging impacts of aquaculture on Ireland's marine environment *(see MSFD section below)*.

Effects of finfish aquaculture have much to do with whether farms are closed (on land, utilising water recirculation and filtration systems) or open systems (where fish are reared, fed and caught in ocean pens- the practice for the vast majority of Irish fish-farming). Open-net fish farming can impact the marine environment through the release of waste, uneaten food pellets, antibiotics and pesticides into the water, including challenges from disease and effects due to fish-meal requirements (Fernandes, McWhinnie & Tett, 2011; Buschmann & Muñoz, 2019). Organic waste (such as from uneaten food and faeces) can lead to pollution, changing the physico-chemical properties of the surrounding waters and benthic biodiversity under the cages or pens (González-Gaya *et al.*, 2022; Mayor & Solan, 2011). There is also a risk of introducing chemical and drug contaminants to the marine environment through the antibiotics used to protect fish against disease (Buschmann & Muñoz, 2019).

Shellfish farming can also impact marine ecosystems through dredging for spat (i.e., mussel seed), the introduction of non-native species and potential for disease crossover. According to the Marine Institute, "aquaculture farms around Ireland are subject to water pollution by diarrhetic shellfish poisoning toxins."

IMPACTS ON WATER QUALITY

Aquaculture can have a detrimental effect on surrounding water quality, with increased nutrients and decreasing dissolved oxygen (an issue, as many aquatic organisms cannot live in water with low oxygen levels) mainly due to nutrient input from an excess

of organic and inorganic material from aquaculture, including effluents and uneaten fish feed, as well as residuals of drugs to cure or prevent disease. Finfish aquaculture especially can affect the structure and functioning of benthic coastal ecosystems. Effects can include increased levels of nitrogen, phosphorus and carbon entering the marine environment and changes to turbidity (a result of nutrients and ammonia), lipids and dissolved oxygen fluxes (NOAA, 2024; Legrand *et al.*, 2024; Simões *et al.*, 2008; Tovar *et al.*, 2000).

Chemicals present in medicines, biocides, antifoulants and feed additives used in the aquaculture industry can pose a threat to the aquatic environment surrounding farms. This includes "direct toxic effects [on benthic micro and meiofauna, algae, plankton and other aquatic organisms] and more subtle effects including potential modification of bacterial communities [and the promotion of antibiotic-resistant organisms] as a result of discharge of antibiotics into the environment" (European Commission, 2016).

Eutrophication and harmful algal blooms

These excesses of nitrogen and phosphorus entering the marine environment due to the release of solid and dissolved nutrients from open-cage fish farms may lead to localised eutrophication occurring. A 2012 study in Norway found 70% of carbon, 62% of nitrogen and 70% of phosphorus from the total feed input were lost into the environment (Wang *et al.*, 2012). These nutrients can generate anoxic (oxygen-depleted) conditions and negatively impact benthic (seafloor) communities near salmon farms (Legrand et al., 2024). However, despite higher nutrient loads in the waters around fish farms, the effects of these on surrounding ecosystems remain largely unknown (Streicher et al., 2021). With such unknown variables, the precautionary principle must be applied. In Ireland, the Marine Institute releases weekly Harmful Algae Bloom bulletins to prevent toxin-related aquaculture farm closure.

While a direct link to aquaculture has been proposed, but not proven, fish farms can be devastatingly affected by harmful algal blooms (HABs) (Gianella, Burrows & Davidson, 2023; Lenzen, Li & Murray, 2021) and experience mass mortality due to events. HABs are caused by a combination of nutrient pollution and climate factors; while they are a natural phenomenon, it is thought there has been a rise in frequency, scope, and impact, which the International Conference on Harmful Algae attributes to factors including "*nutrients increments in the water column due to human activities, ballast waters, advancements in science and technology geared towards studying these events, and extreme oceanographic climate fluctuations, such as El Niño and La Niña, the Antarctic Oscillation, as well as the broader effects of climate change.*" However, a

statistical analysis of data from 1985-2013 from the Harmful Algae Event Database and Ocean Biodiversity Information System suggests instead that "*intensified monitoring efforts associated with increased aquaculture production are responsible for the perceived increase in harmful algae events and that there is no empirical support for broad statements regarding increasing global trends*" (Hallegraef *et al.*, 2021).

When aquaculture farms are located in hydrodynamically energetic locations, the risk of HABs to farmed fish are diminished, likely due to recurrent flushing allowing for efficient dilution of nutrients, as described in research from Scotland (Gianella, Burrows & Davidson, 2023). Issues such as organic enrichment of sediments beneath fish farms, decreased species richness and single-species dominance by opportunistic species have been reported in shallow water sites. However, where farms have been relocated from shallow waters and sheltered and enclosed bays to deeper, more exposed sites, the increased water depth and currents have allowed for greater dispersal of organic waste and reduced the impact on the faunal community (Kutti *et al.*, 2007).

Dredging

Benthic habitats can be impacted by shellfish aquaculture, with wild seed mussels for cultivation harvested by dredging the benthic environment. An appeal by An Taisce in 2019 "pursuant to Section 40 of the Fisheries (Amendment) Act 1997 Aquaculture Licences in Wexford Harbour" details many of these issues surrounding bottom culture of mussels, intertidal oyster culture and subtidal suspended mussel culture, in areas within and near Special Areas of Conservation:

"The practice of mussel seed fishing involves dredging (dragging a metal dredge across the seabed) small immature mussels (spat) from the seabed and transporting them to a calm water area... During harvesting the dredgers move slowly over the site with dredges (heavy metal devices) trailing about 30m behind scraping the sea floor which, when full, are winched in and the contents emptied into the hold... Seabed habitat change may be a consequence of dredging during maintenance and harvesting. The activities associated with this culture practice (dredging of the seabed) are considered disturbing which can lead to removal and/or destruction of infaunal species and changes to sediment composition. Additionally, the deposition of the dredged material to relay the mussel seed also causes disturbance in terms of smothering of the existing fauna; creation of sediment; potential increased risk and exposure of the receiving areas to Invasive Alien Species."

Dredging is among the most harmful fishing methods for benthic ecosystems (Kaiser *et al.*, 2006). The dredging activities for mussels in subtidal areas may change marine ecosystems in relation to benthic organisms (Dolmer *et al.*, 2001; Neckles *et al.*, 2005)

and substrate (Frandsen & Dolmer, 2002) and may induce cascade effects on higher trophic levels, including birds (Atkinson *et al.*, 2010). Production of blue mussels in bottom culture can change the structure of the ecosystem, thereby affecting several trophic levels (Dankers & Zuidema, 1995). Bottom culture may change the composition of the benthic community, with a decreased number of species and individuals (Beadman *et al.*, 2004; Smith & Shackley, 2004). Fishing with dredges can change the seabed topography and the seabed composition, and can resuspend bottom sediment, oxygen-consuming substances and nutrients. It has been shown that mussel dredging significantly increased the amount of suspended particulate matter for a few hours after dredging, and that the amount of oxygen decreased, whereas the amount of ammonia increased (Frandsen & Dolmer, 2002 and references therein). These studies have demonstrated that dredged seabed areas contain far fewer structural components such mussels, mussel shells, pebbles and boulders. Larval settlement and recruitment of many invertebrates are strongly influenced by substrate structures, and thus these are essential to the benthic community, as they provide refuges for prey and predators. The altered composition of the seabed induced by dredging thereby impoverishes the seabed, and interferes with recruitment, growth and survival of the associated benthic fauna.

Polychaetes associated with mussel beds had a reduced density after dredging, and gastropods and bivalves were also reduced in number after dredging (Frandsen & Dolmer, 2002). The same study showed that there is a rapid invasion of dredged areas by scavengers, which can change the trophic structure of the ecosystem. In fact, it has been found that sponges, echinoderms, anthozoans, molluscs, crustaceans and ascidians had a reduced density or were not observed at all four months after an area had been dredged (P. Dolmer, unpublished). It has been shown that the dredging activities for mussels in subtidal areas may change marine ecosystems in relation to benthic organisms and substrate and may induce cascade effects on higher trophic levels, including birds (Dolmer *et al.*, 2012).

In a 2007 study, Maguire *et al.* proposed alternatives to dredge fishing for mussel seed, which aimed "to introduce a science-based management system for the sustainable exploitation of seed mussels in the Irish Sea." These alternatives include producing mussel seed from hatcheries or nurseries, closing certain areas of seedbeds, long-term monitoring of seedbeds and further research on various factors affecting seedbeds.

ALIEN AND INVASIVE SPECIES

Ireland's National Biodiversity Action Centre warns that "invasive species pose a significant threat to our native wildlife and the functioning of our ecosystems." The EU

regulation of 2014 on the prevention and management of the introduction and spread of invasive alien species describes "invasive alien species [as] represent[ing] one of the main threats to biodiversity and related ecosystem services" and reports that "some 12,000 species in the environment of the Union and in other European countries are alien, of which roughly 10 to 15 % are estimated to be invasive."

Aquaculture can both facilitate the spread of alien species and be impacted by non-native marine species. The introduction of non-indigenous species is one of the main pressures of aquaculture identified as a risk for not meeting Good Environmental Status (GES) under Marine Strategy Framework Directive indicators (*see MSFD section below*).

The invasion of non-native species can be facilitated by translocation of aquaculture gear and stock; in Ireland, this is predominantly due to shellfish (Costello, 2021). In her 2021 PhD thesis, Costello describes some of the risks: "An example of parasite spillover is the parasitic copepod *Mytilicola orientalis* moving from its principal host, the invasive Pacific cupped oyster *Crassostrea gigas*, to blue mussels *Mytilus edulis*, common cockles *Cerastoderma edule* and Baltic tellins *Macoma balthica* in northern Europe. Both *M. orientalis* and *C. gigas* originate in Asia and this is also an example of how the invasive nature of an organism depends on its locality, as in some regions *C. gigas* are purposely introduced for aquaculture." Production of this Pacific oyster in Ireland has increased significantly in the 21st century, with the market switching to this introduced species due to a lack of supply of the native European flat oyster, *Ostrea edulis*. *O. edulis* beds were once prevalent around Irish coasts and at their peak, 34-38 million oysters were harvested in 1863 and 1864, though fisheries went into decline due to overfishing, with little production remaining by the early 20th century. The parasite *Bonamia ostrae* was first discovered in Ireland in 1987 and further decimated native oyster populations, causing over 90% mortality of the Cork Harbour population when first introduced (Lynch & Culloty, 2023). It was due to this collapse that the Pacific oyster *C. gigas* was introduced to Irish waters.

Another example of attempting to solve a problem with non-native species involves studies on seaweeds farmed as an additive to cattle feed to reduce methane, a powerful greenhouse gas. Studies were first conducted in Australia with a tropical species native to the southern hemisphere, *Asparagopsis taxiformis* (Camer-Pesci *et al.*, 2023). A later study in Ireland by Bantry Marine Research Station conducted research on methane reduction using *Asparagopsis armata*- a non-native species first recorded in Ireland in 1939 (MarLIN). Though it has become well-established around the Irish coast in less than 100 years, caution should be taken before further scaling up production without knowing how this alien species may affect ecosystems.

Invasive Species Ireland's 2009 draft Marine Aquaculture Code of Practice identified a number of invasive species at risk of spreading by the aquaculture sector: "*Didemnum* species (a species of invasive tunicate), wireweed (*Sargassum muticum*), clubbed tunicate (*Styela clava*), the vase tunicate (*Ciona intestinalis*), wakame (*Undaria pinnatifida*), slipper limpet (*Crepidula fornicata*), and the Asian rapa whelk (*Rapana venosa*)."

Though this report focuses on the effects of aquaculture on the marine, it is necessary to note how invasive species (and associated parasites) introduced through aquaculture may also impact freshwater species. In 2020, a "horizon scanning approach was used to identify the most likely invasive alien species (with the potential to impact biodiversity) to arrive on the island of Ireland within the next ten years" (Lucy *et al.*, 2020). The scan identified the North American signal crayfish (*Pacifastacus leniusculus*) as the number one species most likely to invade Ireland and cause the greatest impact. While it has not yet reached Ireland, it is "the most widespread alien crayfish in Europe, introduced for stocking and aquaculture purposes." Worryingly, it is also "a carrier of the crayfish plague (*Aphanomyces astaci* – strains B and C), which is lethal for the Irish population of white clawed crayfish (*Austropotamobius pallipes),* having a 100% mortality rate. Its feeding habits, burrowing activity, reproductive rate and aggressiveness has a highly destructive effect on invaded ecosystems, allowing it to outcompete native crayfish, reducing local biodiversity and stability of river banks."

DISEASE

A number of diseases and parasites can affect farmed finfish and shellfish. A risk-based health surveillance scheme is managed by the Marine Institute (MI). In addition to the animal welfare and economic impacts, these can have a significant impact on the natural environment.

Oysters

One of the MI's targeted surveillance programmes tests annually for *Bonamia ostreae*, a parasite that affects the native oyster *Ostrea edulis*, however, this species is not commonly farmed. The more commonly farmed species in Ireland is the Pacific or rock oyster *Crassostrea gigas*, which are not susceptible to the parasite.

A Northern Ireland Assembly research paper on opportunities and challenges for Lough Foyle noted that "pests, pathogens and invasive non-native species could be unintentionally introduced by unregulated aquaculture activities," finding that "*Marteilia* parasites have caused serious mortalities in other European shellfisheries

[and] the parasite *Bonamia ostreae* has devastated many European oyster beds" (Hughes, 2021).

Salmon – sea lice and disease

Sea lice are one of the main concerns for wild and farmed salmon. They are a parasite which causes physical injury to salmonids, leading to physiological problems and osmoregulatory disturbances and ultimately mortality (Gargan, Shephard & MacIntyre, 2017). Of the two species of lice common in Ireland, *Lepeophtheirus salmonis* is the more serious parasite (by prevalence and effects) for Atlantic salmon (Marine Institute).

Lice from farm origin are a main source of infection in wild salmon (Jansen *et al.*, 2012) and can cause a sizeable reduction in the runs of wild Atlantic salmon. Research published in May 2025 by Patrick Gargan (formerly of Inland Fisheries Ireland) reports that "between the early 1980s and 2023, numbers of wild Atlantic salmon fell by more than half prior to any fishing taking place, and the reported catch of wild Atlantic salmon in 2023 was the lowest in the time series since 1960," based on ICES reported status. Coastal salmon aquaculture is posing a regional threat to wild salmonid stocks, particularly through sea lice infestations from open net farms. The meta-analysis performed by the researchers showed "salmon lice from salmon aquaculture as a mechanistic threat to wild Atlantic salmon."

A 2017 study used 26 years of data to examine the effect of sea lice from salmon farming in Killary Harbour and the effect on the return of wild Atlantic salmon to the River Erriff (County Mayo) and found that returns of wild adult salmon could be reduced by over 50% in years following high lice levels in the nearby salmon farms (Shephard & Gargan, 2017). This is especially concerning as the River Erriff and Killary Harbour are part of a Special Area of Conservation (SAC) in which Atlantic salmon are one of the selected species (NPWS).

High concentrations of salmon in open-ocean pens or cages have been linked to increased levels of sea lice (Jansen *et al.*, 2012; Walraven, Fjørtoft & Stene, 2021), particularly where farms are located near shore and in high densities. High densities at aquaculture sites can increase the risk of disease outbreak, with sea lice then affecting wild salmon populations. Sea lice from salmon farms have also been found infecting wild sea trout, leading to mortality and premature return to fresh water (Gargan, Shephard & MacIntyre, 2017) (Figure 1).

Figure 1. Sea lice can spread from open net farms to wild species of fish, including trout. Photo by Conor Folan.

A National Sea Lice Monitoring Programme has been carried out in Ireland since 1991 by the Marine Institute (see 2025 report here), under the government's Monitoring Protocol No. 3 in 2000 and the publication of the Strategy for improved pest control in 2008. Salmon Watch Ireland provides an explanation of the protocol for sea lice monitoring (formally published in 2000 as the *Monitoring Protocol No.3 for Offshore Finfish Farms – Sea Lice Monitoring and Control* by the Department of Marine and Natural Resources) and why it is not adequately robust:

> "Sea lice inspections are carried out by the Marine Institute on 14 occasions annually [at all fish farm sites]. Two inspections are carried out per month for March, April and May and monthly inspections outside this period. Only one inspection is carried out during the December / January period due to weather constraints.
>
> The protocol [Monitoring Protocol No.3] lays down treatment trigger levels for sea lice within the period of March to May, which is referred to as the critical period. This period is consistent with wild salmon and sea trout outward migration. This "critical period" is reflected in lower trigger levels for mandatory treatment at 0.5 ovigerous (egg bearing) lice per farmed fish, but certain licences indicate a lower level of 0.3 ovigerous lice per fish. The trigger level is also initiated if mobile lice infestation is high even in the absence of ovigerous lice. The lice treatment levels can be relaxed during harvest or by agreement with DAFM. The treatment level is set at 2 ovigerous lice per fish outside the spring period.

While there are 14 physical inspections carried out each year by the Marine Institute regarding sea lice levels, no account has been taken of the effect of biomass or numbers of salmon on the individual farms and thus the treatment trigger levels are somewhat redundant. For example, a farm with 250,000 fish has the same ovigerous lice treatment level per fish as a farm with 500,000 fish.

The very nature of the inspection regime is not robust enough with a very small number of 60 farmed fish being inspected per farm from two net pens, one standard pen and one random choice. With large farms consisting of up to close on a million fish it is highly unlikely that a sample of such order would satisfy any statistical model.

The size of farms and changing environmental factors must be taken into account and effectively a larger farm has more capability in production and distribution of excessive lice larvae in the wider environment. As such, today we are looking at a situation which is quite different to the previous generation of salmon farms which operated in different environmental and oceanic conditions and with a smaller biomass generally."

A 2021 investigation by Noteworthy found that "despite improvements in sea lice control on farms, the Marine Institute has found 44 cases of elevated levels and issued 32 notices to farms to take urgent action to treat lice outbreaks since 2018, including repeat occurrences at several farms" (The Journal).

In addition to the effects on wild salmon, pancreas disease (Marine Institute, 2008) and gill disease (Downes, 2017) are two other significant problems for farmed salmon.

As well as the potential for diseases spreading from open-net cages to wild populations, another concern is the pesticides and antibiotics often used to treat diseases and parasites. The chemicals from these released into the water can impact other organisms and the ecosystem more widely (*see "Water Framework Directive" section below*). However, the 2024 Irish Fisheries Bulletin on sea lice reported that "official data on the methods used to control salmon lice are not collected in Ireland."

A combination of factors including warming seas, hypoxia (low oxygen levels), sea lice, water quality problems, disease and HABs, as well as production practices that affect fish health, have led to an increase in the frequency and scope of mass mortality events of salmon in major salmon producing nations, including Scotland and Norway, between 2012-22 (Singh, Sajid & Mather, 2024).

FEED FOR CARNIVOROUS FINFISH

The issue of feeding farmed fish is another major concern, with a global increase in the aquaculture of carnivorous finfish leading to rising demand for fishmeal. The "need for feed" thus means aquaculture perpetuates the issues of wild capture fisheries,

including bycatch, habitat destruction and overfishing. Salmon farming in particular often relies on low value, or "trash fish" (as described by the FAO), as feed.

A study on global aquaculture published in October 2024 (Roberts *et al.*) describes the issues around feed for farmed carnivorous finfish:

"The farming of many aquatic species relies on feed, which incurs social and environmental impacts. An issue that has raised much attention is the **reliance on capture fisheries for reduction into fish meal and oil**. 'Reduction fisheries'—industrial seine fleets targeting small pelagic fish such as anchoveta, whiting, and sardine—account for an **estimated average of one-sixth of the mass of the global marine catch and can comprise nearly one-third** in some years. **Approximately 70% of this biomass is processed into aquaculture feed**, with the remaining 30% being used for other animal feed, supplements, and cosmetics. Reduction fisheries have global ecological impacts, affecting the structure of exploited populations and reducing food availability for predators, such as fish, seabirds, and marine mammals. Reduction fishing also diverts millions of tons of food-grade fish (e.g., anchovies and sardines) and nutrients from countries with high rates of hunger to farmed aquatic animals (e.g., salmon and shrimp) intended for luxury markets" [SWAN's emphasis].

Roberts' study found the ratios of wild-caught fish inputs to farmed outputs far higher than previously reported, with the researchers stating, "**our assessment challenges the sustainability of fed aquaculture** and its role in food security" [SWAN's emphasis]. With the farming of carnivorous finfish relying heavily on wild-caught fish, the impact on marine ecosystems must be considered in determining the sustainability of aquaculture.

Ireland's National Strategic Plan for Sustainable Aquaculture (NSPSA) 2030 mentions that the increased need for marine components of salmon feed in conjunction with a drive for sustainability has led to considering alternative resources. The Plan states that "introduction of novel non-marine feed components can lead to specific problems although there is evidence for their potential to partly replace high quality fish meal in diets." However, what these components are is not detailed.

BIM's *Carbon Footprint report of the Irish Seafood Sector* (2023) reports that salmon feed alone accounts for 58% of greenhouse gas emissions of salmon aquaculture to farm gate. The same BIM report states that Irish salmon feed is composed mainly of fish meal trimmings (43.7%), fish oil (17.7%) and organic peas and beans (18.6%). Page 263 of the Organic Food & Farming Standards in Ireland sets out specific rules on feed: "Feed for carnivorous aquaculture animals shall be sourced with the following priorities: (a) organic feed of aquaculture origin; (b) fishmeal and fish oil from organic

aquaculture trimmings sourced from fish, crustaceans or molluscs; (c) fishmeal and fish oil and feed material of fish origin derived from trimmings of fish, crustaceans or molluscs already caught for human consumption in sustainable fisheries; (d) organic feed materials of plant origin and of animal origin; (e) fishmeal and fish oil and feed materials of fish origin derived from whole fish, crustaceans or molluscs caught in sustainable fisheries and not used for human consumption."

Sprat

However, details of the species component of the trimmings and oil, or whether they are sourced from currently unregulated fisheries such as sprat, are not easily available. The impacts of increased demand for fishmeal are being seen in Ireland. SWAN member organisation the Irish Whale and Dolphin Group (IWDG) has reported "sprat has grown as a target species [for fishers], especially off the south and southwest coast in recent years as due to demand for fish meal for the finfish aquaculture sector, and development of a processing plants for fishmeal and fish derived nutritional supplements. This fishery is unregulated despite the importance of these keystone species as a food source for resident and migratory cetaceans of international importance, including porpoise, dolphins, large whales and seabirds." This then has an effect on food webs, one of the MSFD descriptors.

SWAN made a Freedom of Information request to the Sea Fisheries Protection Authority for details on non-human consumption of sprat and received the following information in April 2025 on tonnage caught from 2019-2023 and percentage used as feed:

Table 2. Data on sprat landings and usage in Ireland 2019-2023, provided through Freedom of Information request.

Year	2019	2020	2021	2022	2023
Tonnage of sprat caught in Ireland	13,008	14,345	14,511	7,299	3,328
Product Destination Description					
Human Consumption	34%	49%	29%	38%	34%
Animal Feed	45%	46%	67%	47%	49%
Industrial Purposes	19%	6%	3%	14%	17%
Other	2%	0%	1%	0%	0%

It is evident that catches have dropped significantly in recent years, though almost half is still converted to feed. The International Council for the Exploration of the Sea (ICES) 2025 advice recommends "that when the precautionary approach is applied, catches [of sprat] should be no more than 1,792 tonnes in each of the years 2026 and 2027." Per the last ten years of records in the below table, annual catch has far exceeded ICES recommendations.

In July 2025, DAFM announced that "a limited total allowable catch of 2,000 tonnes of sprat will be permitted for vessels over 18 metres length overall inside the six nautical mile zone and inside baselines from 1 October 2025 to 30 September 2026 only. Over 18 metre vessels fishing for sprat during that period will require an authorisation to do so."

Table 3. ICES advice and records of catches (in tonnes) for sprat (*Sprattus sprattus*) in Celtic Seas and Oceanic Northeast Atlantic ecoregions

Year	ICES Advice	Catch corresponding to advice	Total allowable catch (Note: Was not set in Ireland prior to 2025)	Catches (in tonnes)
2015	20% reduction on catches (10-year average)	< 3,500	-	14,447
2016	Precautionary approach	< 3,500	-	9,857
2017	Precautionary approach	< 3,500	-	7,417
2018	Precautionary approach	< 2,800	-	4,779
2019	Precautionary approach	< 2,800	-	7,321
2020	Precautionary approach	< 2,800	-	16,896
2021	Precautionary approach	< 2,800	-	19,823
2022	Precautionary approach	< 2,240	-	10,009
2023	Precautionary approach	< 2,240	-	3,605
2024	Precautionary approach	< 2,240	-	17,151

Year	ICES Advice	Catch corresponding to advice	Total allowable catch (Note: Was not set in Ireland prior to 2025)	Catches (in tonnes)
2025	Precautionary approach	< 2,240	-	
2026	Precautionary approach	< 1,792		
2027	Precautionary approach	< 1,792		

ORGANIC SALMON

The Irish Food Board, Bord Bia, reports that Ireland is the only producer in the EU with 100% salmon produced to organic standards. However, chemical treatments and pesticides are used on Irish organic salmon farms, and issues of sea lice persist, as well as the influx of aforementioned excess nutrients entering the marine environment through faeces and uneaten feed.

Standards are set out in Section 4 of Organic Food and Farming Standards in Ireland – Edition 2.03 (2023), 'Standards for Aquaculture Production.' This states that organic aquaculture production "shall be based on the following principles: (a) the continuing health of the aquatic environment and the quality of surrounding aquatic and terrestrial ecosystems; (b) the feeding of aquatic organisms with feed from sustainably exploited fisheries."

For salmon, the environmental standards relate to:

REQUIREMENTS	KEY POINTS
Maximum stocking density	Space for wellbeing: 10 kg/m3 for salmon in net pens
Water of good quality	Adequate flow and exchange rate, sufficient oxygen levels and keeping a low level of metabolites
Containment systems at sea	To be located where water flow, depth and water-body exchange rates are adequate to minimize the impact on the seabed and the surrounding water body
Feed	The plant fraction of feed shall be organic and the feed fraction derived from aquatic animals shall originate from organic aquaculture or from fisheries that have been certified as sustainable under a scheme recognised by the Competent Authority

REQUIREMENTS	KEY POINTS
	[*As noted in "Sprat" section above, sprat is currently a non-quota, unregulated fishery used for salmon feed*].
Disease prevention	Uneaten fish-feed, faeces and dead animals shall be removed promptly to avoid any risk of significant environmental damage as regards water status quality, minimize disease risks
Disease treatment	Chemically synthesised allopathic veterinary medicinal products including antibiotics may be used, as well as substance which include trace elements, metals, natural immunostimulants or authorised probiotics
Parasite treatments	An allowed maximum of two courses of treatment per year or to one course of treatment per year where the production cycle is less than 18 months
Cleaning/disinfecting cages	Allowed substances: ozone, sodium hypochlorite, calcium hypochlorite, calcium hydroxide, calcium oxide, caustic soda, alcohol, potassium permanganate, mixtures of potassium peroxomonosulphate and sodium, chloride producing hypochlorous acid, limestone (calcium carbonate) for pH control, sodium chloride, hydrogen peroxide, sodium percarbonate, organic acids (acetic acid, lactic acid, citric acid), humic acid, peroxyacetic acids, peracetic and peroctanoic acids, iodophores (only in the presence of eggs)

EU regulations apply to products from all Member States. Though Scotland is no longer under EU law, a 2023 report by WildFish provided multiple examples of how Scottish salmon farms certified organic by three different certification schemes (the Aquaculture Stewardship Council, RSPCA Assured and Soil Association) have maintained their certification despite breaches of sea lice requirements, major escape incidents, regular use of toxic pesticides and chemicals (known to affect surrounding biodiversity) and continued reliance on unsustainable fisheries for feed. Despite the ongoing environmental damage documented in the report, Scottish salmon producers continue to use "organic" labelling.

Similarly, producers and promoters of Irish salmon paint a very positive picture of organic production, which is at odds with the extensive environmental issues reported above. A document from Bord Bia (Irish Food Board) profiling Irish smoked salmon producers speaks of farmed salmon "thriv[ing] in the wild pristine waters along Ireland's westerly coastline," despite the cages they are kept in. Campaigns such as Friends of the Irish Environment's "Boycott farmed salmon for Christmas" have challenged this messaging by highlighting the parasites and disease linked to overstocking. Irish organic salmon is referred to in the same Bord Bia document as

being "among the most environmentally friendly and healthiest salmon in the world"- claims which have been reputed by scientists, biodiversity experts and environmentalists, as reported in Noteworthy and in regular reports from SalmonWatch Ireland. Irish Food & Drink is vague in their statements that Irish salmon are provided "feed sourced from sustainable fisheries.... growing in an environment where maintaining a healthy and sustainable aquatic ecosystem is a top priority achieved through responsible farming practices." Given the antibiotics and pesticides used on farmed Irish salmon, feed sourced from sprat fisheries which are currently unregulated in Ireland, and the known stressors of lice and escapees affecting wild populations, the "organic" label given to 100% of farmed Irish salmon is not consistent with the reports and studies quoted in this briefing.

IMPACT ON WILD SPECIES

Aquaculture can impact wild marine species and habitats in a myriad of ways.

Salmon

Salmon farming in particular can lead to the spread of diseases, issues associated with escapees (including gene-mixing) and marine pollution, which affect wild salmons' ability to survive in the wild and reproduce.

In a 2024 debate by the Committee of Public Accounts, Dr Cathal Gallagher (Deputy Chief Executive Officer, Inland Fisheries Ireland) was called and examined. He told the committee that "**wild salmon numbers returning to Ireland have dropped from 1.7 million in 1975 to just over 170,000 in 2022**. This is a **catastrophic decline** in less than one generation" [SWAN's emphasis].

The ICES Working Group on Effectiveness of Recovery Actions for Atlantic Salmon identified 11 stressors affecting wild salmon: Pollution; Barriers; Water Regulation; Exploitation; Aquaculture; Habitat Degradation; Diseases / Parasites; Climate Change; Invasives; Stocking; and Predators. The North Atlantic Salmon Conservation Organisation (NASCO- an international organisation enabling seven Governments and the European Union to cooperate to conserve wild Atlantic salmon) uses this agreed list to conduct a stressor analysis in each EU jurisdiction. In the report from NASCO's June 2025 Annual Meeting, aquaculture is recorded as one of Ireland's four highest scoring stressors. This is primarily related to "the impacts associated with marine salmon aquaculture in open-net cages on wild Atlantic salmon populations, and in some instances, the effects of freshwater salmonid hatcheries on wild river populations. Main impacts on wild salmon include increased sea lice infestation pressure, escaped farmed salmon (both adults in the marine and juveniles in

freshwater) and other potential infections related to fish farms that could spread to wild stocks... Lack of implementation of effective mitigation measures, and absence of planned future mitigation measures, largely contributed to the high overall score in this category."

Another stark example comes from the "Status of wild Atlantic salmon in Norway 2024" report, which gives an alarming assessment: "*Atlantic salmon stocks in Norway are at a historically low level. The number of salmon returning from the ocean to Norway in 2023 was the second lowest ever. The two lowest returns occurred during the last three years, in 2021 and 2023... The biggest threats to Norwegian salmon are salmon farming and climate change. Salmon lice from farms, escaped farmed salmon and infections are the biggest threats from salmon farming*." Rather than promoting continued growth of the salmon industry, Ireland must learn from the risks seen in Norway, which is responsible for about half of the world's farmed salmon (Legrand *et al.*, 2024).

Since the 1980s, millions of farmed Atlantic salmon have escaped into the wild (Solberg *et al.*, 2016). These escapees can have serious impacts on wild populations, leading to gene mixing. A 37-year study of wild and open-net farmed Atlantic salmon found that salmon escapees can "substantially depress recruitment [breeding] and more specifically disrupt the capacity of natural populations to adapt to higher winter water temperatures associated with climate variability," leading to potential extinction of wild populations within 20 generations (McGinnity *et al.*, 2009). The escapees are liable to transfer disease and parasites (including sea lice and pancreas disease), interfere with wild salmon breeding, genetically alter native populations, and compete with wild populations for food (Jensen *et al.*, 2010).

In British Columbia, Canada, the Government recognised the threat that open-net salmon farming poses to wild salmon and the wider ecosystem and in June 2024, announced a transition away from this aquaculture practice, with a ban in place from June 2029. They are already banned in Denmark, Southern Argentina and some states in the northwest USA. However, the practice in Ireland is encouraged and subsidised.

Shellfish

Farmed bivalves can also affect native species. One of the main molluscs cultivated in Ireland is the Pacific oyster (*Crassostrea gigas*), introduced in the 1970s. Despite being non-native, they have been found to thrive in Irish waters. This leads to potential for displacing native species and disrupting ecosystems. In the cross-border Lough Foyle, unlicenced farming of this species has expanded rapidly, with over 60,000 trestles in 2018 (Hughes, 2021).

As an example, an Appropriate Assessment Report of Shellfish Culture in Castlemaine Harbour SPA was conducted by the Marine Institute in 2019. At the time, shellfish culture in the Special Protection Area (SPA) consisted of "31 licenced sites for intensive oyster culture, one licenced site for extensive oyster culture, 16 licenced sites for mussel culture and one pending licence decision site for extensive mussel rope and bottom mussel culture, [as well as] 34 pending licence applications for extensive oyster culture, one pending licence application for extensive mussel culture and two pending licence variations (i.e. from mussel culture to intensive oyster culture)." In the report, the Marine Institute assessed the potential impact of these shellfish aquaculture activities and found that the impacts include "changes in invertebrate communities found in inter-tidal and sub-tidal habitats; habitat smothering; changes in turbidity/ sediments; changes in oxygen levels; introduction of non-native species; abrasion, physical disturbance and compaction; displacement or relocation of prey species; selective extraction of target species; and selective extraction of non-target species." Many of these impacts are at odds with reaching GES under the WFD and MSFD.

Wading birds

The aquaculture industry has potentially significant impacts for the reproductive fitness of wading birds in the estuaries and mudflats around the Irish coast, many of which are designated as SPAs for birds. According to the Marine Institute, these impacts can be due to "targeted removal of prey species such as bivalves; by causing mortality of other non-commercial invertebrate prey species that come into contact with aquaculture installations; by alteration of the habitat and the invertebrate communities it supports and by reducing access to food or time available to feed by disturbing flocks of feeding birds." Localised data is reported by SWAN member BirdWatch Ireland as part of the Irish Wetland Bird Survey (I-WeBS) including species trends by site for wintering waterbirds in many of the SPAs which are targeted for aquaculture.

The Castlemaine Harbour SPA 2019 assessment of shellfish culture above also notes that "the impacts of non-native bivalves on waterbirds is also largely unknown. Research on the effects of Pacific oyster in the Wadden Sea identified adverse effect only on wading birds that preferentially foraged on native blue mussel, i.e. oystercatcher, dunlin and knot (Waser *et al.*, 2016)" (Marine Institute, 2019).

Maërl

Maërl beds, which are unattached coralline algae that form important, yet sensitive, benthic habitats which support a number of species (MarLIN), are also vulnerable to the impacts of aquaculture, especially salmon farming. Studies in Norway (Legrand *et*

al., 2024), Scotland (Hall-Spencer *et al.*, 2006) and the Mediterranean (Aguado-Giménez & Ruiz-Fernández, 2012) have identified a number of negative effects on maërl beds near to salmon farms, such as a build-up of waste organic matter, reductions in live maërl cover (or the community even being buried), reductions in biodiversity and structural and functional changes to the maërl beds and associated faunal communities in response to effluents from salmon farms.

IRISH AQUACULTURE INDUSTRY

The aquaculture industry began in Ireland in the 1980s and has grown significantly since then, though still represents a smaller volume in the seafood sector than fisheries. The most recent report by the European Market Observatory for Fisheries and Aquaculture Products (EUMOFA) ranked Ireland sixth amongst the EU-27 in terms of aquaculture production, representing 4% of European production and 0.03% of world production. EUMOFA also reports that in 2021, only 1% of Irish aquaculture production occurred in freshwater. Otherwise, production in sea and brackish water occurs 49% off bottom (a form of shellfish aquaculture, which can include rope-grown mussels), 34% in cages (generally open-net pens for salmon in open water) and 16% on bottom (growing shellfish such as clams, mussels and oysters on the seabed, as well as seaweed farming). Ireland's aquaculture sites can be viewed on a map maintained by the Department for Agriculture, Food and the Marine (DAFM), including where sites intersect with Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

The "Annual Aquaculture Report: Findings of the National Seafood Survey 2024" by Bord Iascaigh Mhara (BIM) reported production in 2023 involved over 12,250 licenced hectares in 280 production units in Ireland. As of 2025, there are 296 aquaculture sites in Ireland producing approximately 40,000 tonnes of finfish and shellfish (BIM). The main species farmed are mussels (*Mytilus* species), Atlantic salmon (*Salmo salar*) and oysters (different species) (EU Aquaculture Assistance Mechanism). Other species farmed to a smaller degree include seabed cultured native oysters, King scallops, clams, lumpfish (bred to remove parasites for sea-site salmon farms), suspended culture seaweed and some land-based cultivation of finfish and shellfish.

The BIM survey reported an overall decrease in national aquaculture output of 20% in volume and 9% in sales value between 2022 and 2023 (mostly due to external market factors).

Table 4. Aquaculture output by category, 2022 to 2023. Source: BIM Aquaculture Report, 2024.

Aquaculture Category	2022	2023
All Finfish		
Sales volume (tonnes)	12,409	9,940
Sales value (millions €)	€107.3	€101
Atlantic Salmon		

Aquaculture Category	2022	2023
Sales volume (tonnes)	11,862	9,289
Sales value (millions €)	€101.6	€94.8
All Shellfish/Other		
Sales volume (tonnes)	32,124	25,797
Sales value (millions €)	€76.47	€67.4
Farmed Oysters		
Sales volume (tonnes)	11,038	9,663
Sales value (millions €)	€54.5	€50.8
Suspended Mussels		
Sales volume (tonnes)	13,240	11,058
Sales value (millions €)	€9.8	€8.9
Seabed Cultured Mussels		
Sales volume (tonnes)	6,864	3,626
Sales value (millions €)	€9	€4
Seaweed		
Sales volume (tonnes)	493	532
Sales value ('000s €)	€396	€650
National Totals (including the above, as well as smaller levels of production output of other bivalves, land-based hatchery production of juvenile salmon, and rainbow trout)		
National output (tonnes)	44,532	35,737
National sales value (millions €)	€184	€168.2

Despite a reduction in overall output and sales across the national aquaculture sector, the seaweed segment bucked the trend, with an 8% increase in output and 64% increase in sales value. Regarding the economic performance of farmed salmon, the report also states "For the third consecutive year, the segment faced unfavourable economic conditions due to falling production sales revenue and rising costs, particularly in inputs and operational expenses. Key economic indicators such as Gross Value Added and Earnings Before Interest and Tax remained negative in 2023, indicating **the segment has not been profitable since 2020**" [SWAN's emphasis].

While this briefing is focussed on the environment and the impact of aquaculture on nature and ecosystems, we recognise the role aquaculture plays in coastal communities. The Irish aquaculture industry directly employs around 1150 people in mainly rural locations, contributing to 8500 indirect jobs, and worth €182m to the Irish

economy (EU Aquaculture Assistance Mechanism; BIM). For comparison, the marine and coastal tourism sector alone reported a direct turnover of over €1.2 billion in 2022 with over 18,300 direct employees (Ireland's Ocean Economy 2023). Figure 2 shows the enormous contribution of all ocean industries (including seafood, shipping, technology and bioresources) to Ireland's economy.

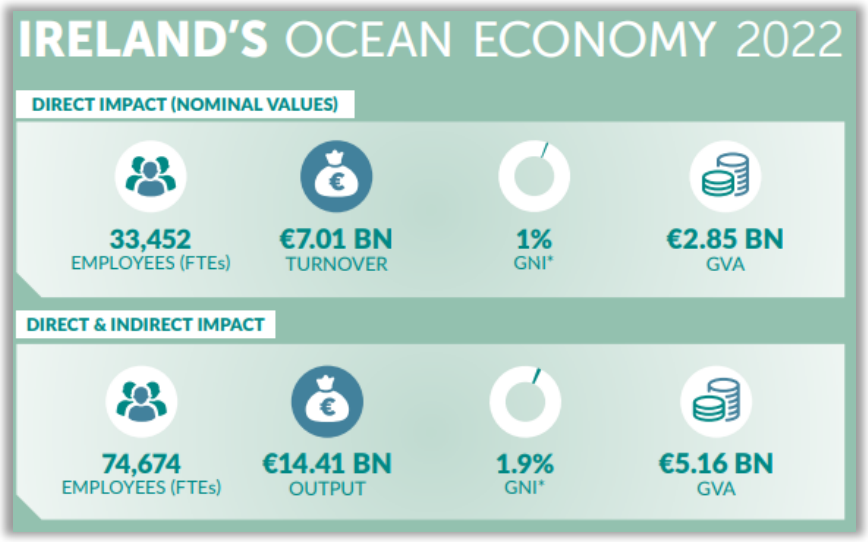


Figure 2. Image from "Ireland's Ocean Economy 2023."

Within the overall figure of €7.01 billion turnover from the ocean economy, aquaculture plays a relatively small part in the ocean economy, with a national sales value of €168.2 million in 2023.

Food Vision 2030 recognises that the Irish aquaculture industry "produce[s] products that are highly valued in the marketplace and provide high value, year-round, jobs along the coast." However, it is important that social and economic benefits are balanced with environmental considerations.

EUROPEAN UNION

Compared to the growth of the aquaculture industry globally, production has been relatively stagnant in the EU, with the European Commission engaging in strategies to grow the industry since the beginning of the twenty-first century (European Parliament).

The Aquaculture Advisory Council was established in 2016 to provide advice to the European Commission and Member States on all matters affecting EU aquaculture production with an objective to "ensure that aquaculture activities are developed in a sustainable way in the European Union by organising the dialogue among all interested stakeholders." As of 2024, there is one Irish member, the Aquaculture Section of the Irish Farmers' Association. Other than a small number of animal welfare organisations, the Council is dominated by producer organisations and lacking in conservation or nature-focused NGOs (see Members here).

The EU aquaculture sector also receives generous subsidies, with €1.17 billion invested 2000-2014, €1.2 billion allocated for 2014-2020 and a further €1 billion for 2021-27 (Guillen *et al.*, 2019). The European Maritime, Fisheries and Aquaculture Fund (EMFAF) 2021-2027 is the primary funding mechanism, with co-funding from Member States. However, the European Court of Auditors found results were not in line with the increase in funding and the industry has flatlined despite the billions in sector investment. Additionally, they noted a lack of monitoring and were "**unable to find a single set of indicators allowing them to assess the environmental sustainability of the sector**, despite this being one of the main objectives of EU policy" (ECA, 2023) [SWAN's emphasis].

In 2021, the European Commission published strategic guidelines for sustainable and competitive aquaculture in the EU for the 2021-2030 period. The guidelines recommend streamlining legislation and administrative guidance by "adopting a single piece of national legislation gathering all relevant aspects." This led to Multi-annual National Strategic Plans for Aquaculture (MNSPAs) adopted by EU Member States (*see "National Strategic Plan for Sustainable Aquaculture" section below*).

COMMON FISHERIES POLICY

The Commons Fisheries Policy (CFP) has been reformed several times (in 1992, 2002 and 2013) since it was separated from the Common Agricultural Policy in 1970. Its overall objective "is to ensure that fishing and aquaculture activities are environmentally sustainable in the long term are managed in a way consistent with achieving economic, social and employment benefits, and contribute to the availability

of food supplies." It also includes commitment to the precautionary approach and ecosystems-based approach to management, ensuring that "negative impacts of fishing activities on the marine ecosystem are minimised, and that aquaculture and fisheries activities avoid degrading the marine environment" (European Parliament). A new "fisheries and ocean package of measures" to improve the sector's sustainability and resilience was introduced by the European Commission in February 2023. While the package does not propose another reform, it recommends improvements, which include adopting a broader ecosystem approach. The 2023 CFP implementation report reiterated support and promotion of "aquaculture with a lower environmental footprint (such as low-trophic, multi-trophic or algae farming)" (EPRS, 2023).

DIRECTIVES

The Marine Strategy Framework Directive (MSFD) and Water Framework Directive (WFD) are pieces of EU legislation transposed into Irish law designed to protect, preserve and enhance marine and fresh waters by reaching Good Environmental Status and Good Ecological Status, respectively. While neither includes explicit obligations for aquaculture, the industry must comply with the legal requirements of the WFD and MSFD and ensure activities do not compromise the Directives' targets.

The European Commission published guidance documents on the application of the WFD and the MSFD in relation to aquaculture in 2016, advising taking precautionary actions and adopting regulatory, control and monitoring procedures to prevent, minimise or mitigate environmental impacts. The guidance offers regulatory and industry good practices and suggestions, organised by the environmental effects on benthic impacts and nutrients, disease and parasites, chemical discharges, escapees and alien species and physical impacts, disturbance and predator control. Some of these recommendations include setting caps on feed input and biomass, improving monitoring of nutrient loads, using modelling to locate farms, inter-departmental collaboration, developing integrated multi-trophic systems (*see "Responsible Aquaculture" section below*), locating open-net farms away from areas where interactions with migratory wild species may occur, implementing management plans to reduce negative interactions between wild and farmed species, using disease treatment strategies that do not result in additional chemical impacts on water bodies, and considering the cumulative aspects of aquaculture and other activities with a water body.

Such guidance is not legislative, and therefore not legally binding, but does seek to offer Member States guidance on implementing the WFD and MSFD in the context of developing sustainable aquaculture. As detailed in Table 5, the Directives' boundaries

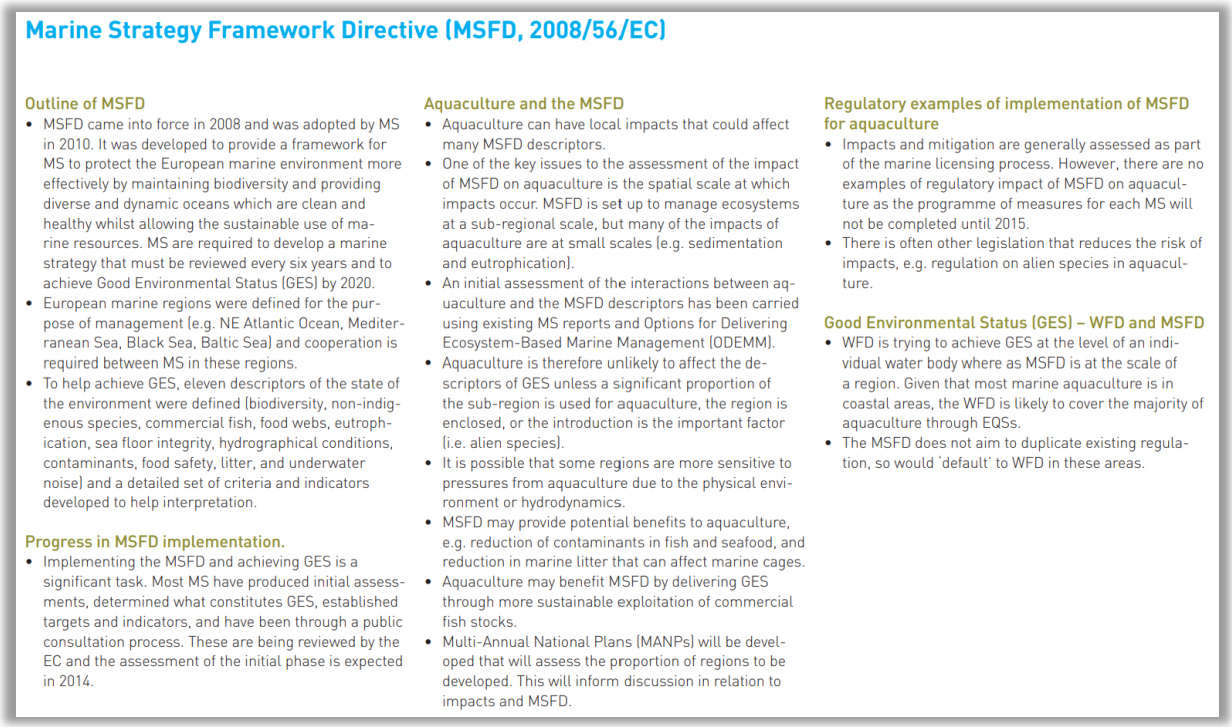
overlap in coastal waters and here, "the MSFD is intended only to apply to those aspects of good environmental status which are not covered by the WFD," which includes marine litter and aspects of biodiversity.

Table 5. WFD and MSFD overview. Source: "On the application of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) in relation to aquaculture" (European Commission, 2016).

Water Framework Directive	Marine Strategy Framework Directive
"The WFD aims to improve and protect the chemical and ecological status of surface waters and the chemical and quantitative status of groundwater bodies throughout a river basin catchment. This extends from rivers, lakes and ground-waters through to transitional (including estuaries) and coastal waters. For ecological status, coastal waters extend to one nautical mile out to sea. Chemical status, however, applies also to territorial waters extending out to 12 nautical miles. Article 4 of the WFD requires Member States to prevent deterioration of the ecological and chemical status of surface waters, and to restore polluted surface waters and the ecological conditions necessary to achieve good status in all surface waters by 2015. Article 4 also requires Member States to take all the necessary measures to progressively reduce pollution from priority substances and to cease or phase out the emissions, discharges and losses of priority hazardous substances."	"Its scope of application extends to coastal waters on aspects of environmental status which are not already addressed by the WFD or other Community legislation, as well as the full extent of Member States territorial waters over which they have or exercise jurisdictional rights (MSFD, Article 3.1)."

Marine Strategy Framework Directive

Pre-Brexit, the UK's Centre for Environment Fisheries & Aquaculture Science provided a helpful overview of the connections between aquaculture and the MSFD:



Marine Strategy Framework Directive (MSFD, 2008/56/EC)

Outline of MSFD

- MSFD came into force in 2008 and was adopted by MS in 2010. It was developed to provide a framework for MS to protect the European marine environment more effectively by maintaining biodiversity and providing diverse and dynamic oceans which are clean and healthy whilst allowing the sustainable use of marine resources. MS are required to develop a marine strategy that must be reviewed every six years and to achieve Good Environmental Status (GES) by 2020.
- European marine regions were defined for the purpose of management (e.g. NE Atlantic Ocean, Mediterranean Sea, Black Sea, Baltic Sea) and cooperation is required between MS in these regions.
- To help achieve GES, eleven descriptors of the state of the environment were defined (biodiversity, non-indigenous species, commercial fish, food webs, eutrophication, sea floor integrity, hydrographical conditions, contaminants, food safety, litter, and underwater noise) and a detailed set of criteria and indicators developed to help interpretation.

Progress in MSFD implementation.

- Implementing the MSFD and achieving GES is a significant task. Most MS have produced initial assessments, determined what constitutes GES, established targets and indicators, and have been through a public consultation process. These are being reviewed by the EC and the assessment of the initial phase is expected in 2014.

Aquaculture and the MSFD

- Aquaculture can have local impacts that could affect many MSFD descriptors.
- One of the key issues to the assessment of the impact of MSFD on aquaculture is the spatial scale at which impacts occur. MSFD is set up to manage ecosystems at a sub-regional scale, but many of the impacts of aquaculture are at small scales (e.g. sedimentation and eutrophication).
- An initial assessment of the interactions between aquaculture and the MSFD descriptors has been carried using existing MS reports and Options for Delivering Ecosystem-Based Marine Management (ODEMM).
- Aquaculture is therefore unlikely to affect the descriptors of GES unless a significant proportion of the sub-region is used for aquaculture, the region is enclosed, or the introduction is the important factor (i.e. alien species).
- It is possible that some regions are more sensitive to pressures from aquaculture due to the physical environment or hydrodynamics.
- MSFD may provide potential benefits to aquaculture, e.g. reduction of contaminants in fish and seafood, and reduction in marine litter that can affect marine cages.
- Aquaculture may benefit MSFD by delivering GES through more sustainable exploitation of commercial fish stocks.
- Multi-Annual National Plans (MANPs) will be developed that will assess the proportion of regions to be developed. This will inform discussion in relation to impacts and MSFD.

Regulatory examples of implementation of MSFD for aquaculture

- Impacts and mitigation are generally assessed as part of the marine licensing process. However, there are no examples of regulatory impact of MSFD on aquaculture as the programme of measures for each MS will not be completed until 2015.
- There is often other legislation that reduces the risk of impacts, e.g. regulation on alien species in aquaculture.

Good Environmental Status (GES) – WFD and MSFD

- WFD is trying to achieve GES at the level of an individual water body where as MSFD is at the scale of a region. Given that most marine aquaculture is in coastal areas, the WFD is likely to cover the majority of aquaculture through EQSs.
- The MSFD does not aim to duplicate existing regulation, so would 'default' to WFD in these areas.

Figure 3. Source: Centre for Environment Fisheries & Aquaculture Science.

Aquaculture can impact the marine environment in a number of ways which affect reaching GES targets, as detailed in the Commission's guidance (Table 6). For further details on the criteria and indicators used to assess descriptors, see DHLGH's most recently published report on Ireland's progress towards GES (DHLGH, 2024).

Table 6: Potential interactions between aquaculture, the environment, and MSFD descriptors based on Members States initial impact statements. Source: European Commission.

Descriptor	Degree of Interaction	Evidence & mitigation
1. Biodiversity	Small	If unmanaged, escapees, diseases and parasites may have localised effects on biodiversity. These should be addressed through the implementation of the EIA, SEA and Habitats Directives. Siting is a critical factor in reducing the potential impacts on biodiversity.
2. Non-indigenous species	Large	Aquaculture provides a potential route for introduction of NIS; introduction of alien species in aquaculture is regulated by Regulation 708/2007 requiring a specific authorisation for any introduction of alien species.
3. Commercial fish & shellfish	Small	If unmanaged escapees (gene flow), diseases and parasites may have localised effects on wild commercial fish and shellfish.

Descriptor	Degree of Interaction	Evidence & mitigation
4. Food-webs	Small	If unmanaged escapees (gene flow), diseases and parasites may have localised effects on food-webs. Siting is a critical factor in reducing the potential impacts on food-webs.
5. Eutrophication	Small	Some impact at local scale, but generally unlikely to occur at sufficient scale at present to have significant impact except in enclosed seas like the Baltic that already have significant nutrient inputs. In such cases, Member States may consider the application of nutrient-neutral schemes or other approaches that remove nutrients from the sea
6. Sea-floor integrity	Small	Some impact at local scale due to siltation or scour, but unlikely to occur at sufficient scale at present to have significant impact. This can be mitigated by moving cages, by fallowing areas or by relocation to more energetic sea areas (areas with a greater circulation.
7. Hydrographical conditions	Small	Some impact at local scale due to formation of small-scale features including eddies, but unlikely to occur at sufficient scale at present to have significant impact unless large scale facilities.
8. Contaminants	Small	Some impact at local scale due to contamination by hazardous substances and microbial pathogens, but unlikely to occur at sufficient scale at present to have significant impact. Mitigation comes from the regulatory limits set within food safety legislation. However, these regulatory limits, which are set to protect the health of consumers, are not specifically designed to protect the environment. Therefore, additional action may be necessary to ensure adequate environmental protection
9. Fish & seafood contaminants	Small	Impacts are assessed using regulatory limits set within food safety legislation.
10. Marine litter	Small	Aquaculture may be a source of marine litter alongside urban discharges and fisheries.
11. Underwater energy (e.g. noise)	Small	Some impact at local scale close to cages, but unlikely to occur at sufficient scale at present to have significant impact. Little information available on potential mitigation.

In Ireland, the Marine Strategy Framework Directive Marine Strategy Part 1: Assessment (Article 8), Determination of Good Environmental Status (Article 9) and

Environmental Targets (Article 10) was published in July 2024. This identified three main damaging pressures that aquaculture places on Ireland's marine environment:

- input of nutrients organic material causing eutrophication (D5 Eutrophication[1])
- input of litter (D10 Marine Litter[2])
- input or spread of non-indigenous species (D2 Non-Indigenous Species[3])

In addition to these main pressures, the latest report also notes shellfish aquaculture as one of the main three activities causing loss to the seabed in the Irish marine environment, leading to damage of sea-floor integrity (Descriptor 6), with finfish aquaculture named as another activity putting pressure on the marine environment. Descriptor 7, Hydrographical Conditions, also includes shellfish aquaculture as one of the main activities causing changes, though mainly at a local scale. Additionally, while Descriptor 3 (Populations of commercial fish and shellfish) relates to wild fisheries, their management is also closely linked to the aquaculture sector, particularly in relation to species used as feed (*see "Environmental Impacts" section above*).

Water Framework Directive

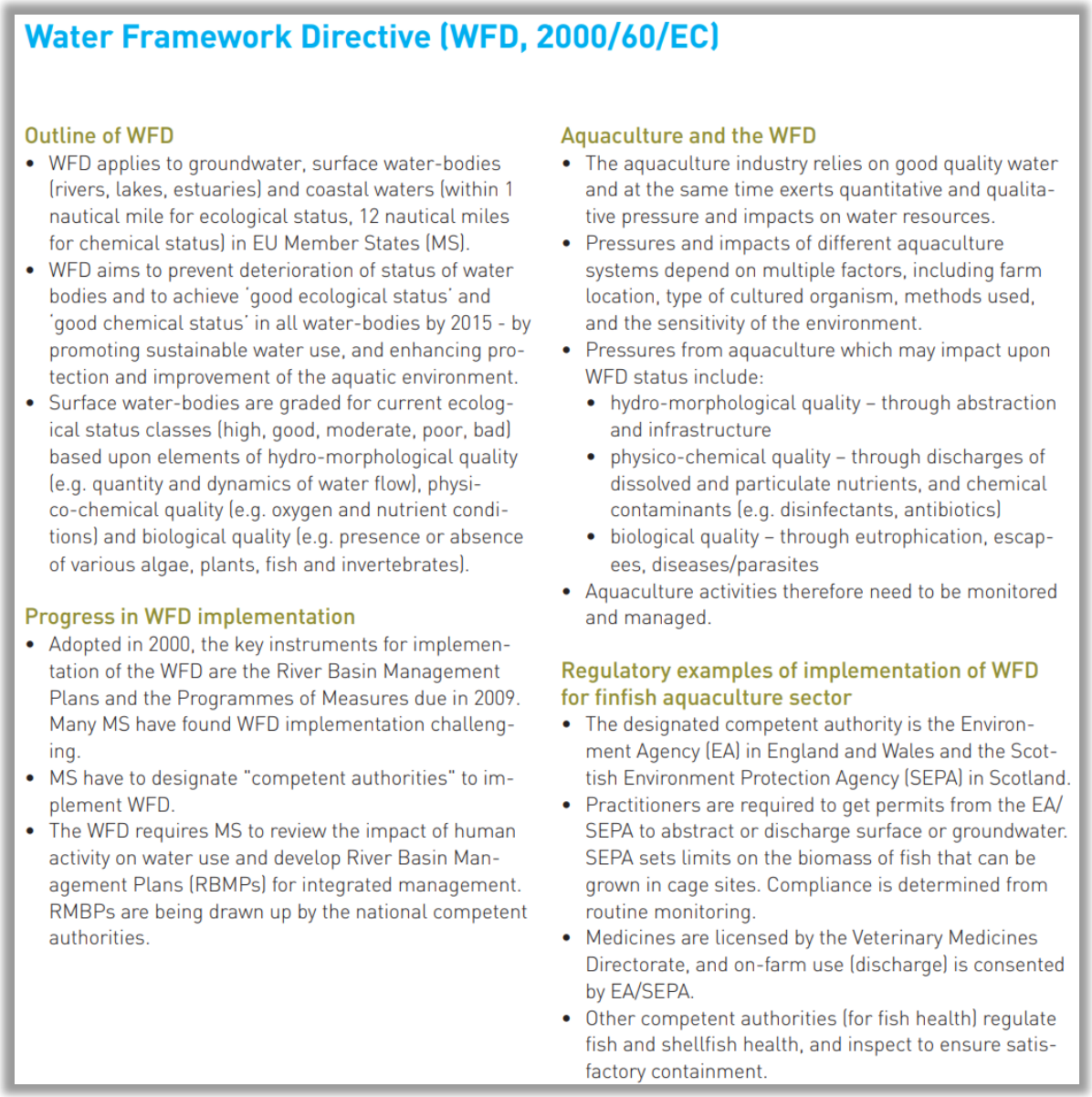
The European Commission's 2016 guidance document succinctly describes the connection between the WFD and aquaculture: "On the one hand, **aquaculture activities can potentially exert pressures and impacts upon aquatic ecosystems**, for example through increased nutrient load, from concentrations of faecal matter and uneaten feed, from dispersal of cleaning agents and medicines. On the other hand, **aquaculture can itself be subject to pressures and impacts from other activities** taking place in the aquatic ecosystem, for example pollution incidents, wastewater treatment facilities upstream, and hydropeaking/flow variations due to flow regulation in the river e.g. from dams" [SWAN's emphasis].

As in Figure 3, the UK similarly laid out the connections between the WFD and aquaculture:

[1] Defined in the MSFD as "Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters" (Europa)

[2] Defined in the MSFD as "Properties and quantities of marine litter do not cause harm to the coastal and marine environment" (Europa)

[3] Defined in the MSFD as "Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems" (Europa)



Water Framework Directive (WFD, 2000/60/EC)

Outline of WFD

- WFD applies to groundwater, surface water-bodies (rivers, lakes, estuaries) and coastal waters (within 1 nautical mile for ecological status, 12 nautical miles for chemical status) in EU Member States (MS).
- WFD aims to prevent deterioration of status of water bodies and to achieve 'good ecological status' and 'good chemical status' in all water-bodies by 2015 - by promoting sustainable water use, and enhancing protection and improvement of the aquatic environment.
- Surface water-bodies are graded for current ecological status classes (high, good, moderate, poor, bad) based upon elements of hydro-morphological quality (e.g. quantity and dynamics of water flow), physico-chemical quality (e.g. oxygen and nutrient conditions) and biological quality (e.g. presence or absence of various algae, plants, fish and invertebrates).

Progress in WFD implementation

- Adopted in 2000, the key instruments for implementation of the WFD are the River Basin Management Plans and the Programmes of Measures due in 2009. Many MS have found WFD implementation challenging.
- MS have to designate "competent authorities" to implement WFD.
- The WFD requires MS to review the impact of human activity on water use and develop River Basin Management Plans (RBMPs) for integrated management. RMBPs are being drawn up by the national competent authorities.

Aquaculture and the WFD

- The aquaculture industry relies on good quality water and at the same time exerts quantitative and qualitative pressure and impacts on water resources.
- Pressures and impacts of different aquaculture systems depend on multiple factors, including farm location, type of cultured organism, methods used, and the sensitivity of the environment.
- Pressures from aquaculture which may impact upon WFD status include:
  - hydro-morphological quality – through abstraction and infrastructure
  - physico-chemical quality – through discharges of dissolved and particulate nutrients, and chemical contaminants (e.g. disinfectants, antibiotics)
  - biological quality – through eutrophication, escapees, diseases/parasites
- Aquaculture activities therefore need to be monitored and managed.

Regulatory examples of implementation of WFD for finfish aquaculture sector

- The designated competent authority is the Environment Agency (EA) in England and Wales and the Scottish Environment Protection Agency (SEPA) in Scotland.
- Practitioners are required to get permits from the EA/SEPA to abstract or discharge surface or groundwater. SEPA sets limits on the biomass of fish that can be grown in cage sites. Compliance is determined from routine monitoring.
- Medicines are licensed by the Veterinary Medicines Directorate, and on-farm use (discharge) is consented by EA/SEPA.
- Other competent authorities (for fish health) regulate fish and shellfish health, and inspect to ensure satisfactory containment.

Figure 4. Source: Centre for Environment Fisheries & Aquaculture Science.

Under the requirements of the WFD, Members States must collect data on anthropogenic pressures on surface waters in each River Basin District, including point source pollution, which aquaculture activities can contribute to. The Commission's guidance recommends monitoring as a precursor to effective management.

Article 11 of the WFD requires the establishment of a "programme of measures... in order to achieve the objectives established under Article 4"; in particular, the requirement to prevent deterioration of the ecological and chemical status of surface waters and to restore polluted waters. The WFD Reporting Guidance 2022 lists aquaculture as both a point source and a diffuse source pressure (*see "Water Action Plan" section below*). The WFD requires that for discharges liable to cause pollution, prior authorisation, or registration based on general binding rules, laying down

emission controls for the pollutants concerned, must be put in place (see the FAO and Appendix I for more detail on aquaculture licensing in Ireland.)

Water Action Plan

While the previous "River Basin Management Plan (RBMP) for Ireland 2018-2021" had only one mention of aquaculture in 186 pages (in a table regarding abstractions), the third and most recent RMBP ("Water Action Plan 2024," published in September 2024) identifies finfish aquaculture as "a significant water management issue in terms of its potential impacts on water quality" and includes five action points relating to aquaculture:

1	*Review of consents causing impacts*: DAFM will conduct a periodic review, and where necessary, update of controls contained in aquaculture consents.
2	*Enhanced integration of WFD into Aquaculture Consents:* DAFM to enhance links between the aquaculture authorisation and the objectives of the Water Framework Directive.
3	*Online Aquaculture licensing:* To encourage the active involvement of all interested parties DAFM is to launch an online mapping viewer of licenced aquaculture sites in Ireland including access to licence and licence application information
4	*Enhanced Protection for Designated Shellfish Production Areas:* DHLGH will examine the need for amendments to legislation and whether a new management framework for shellfish waters in Ireland is needed.
5	Complete the National Strategic Plan for Sustainable Aquaculture, including water quality measures.

We note in the "National Strategic Plan for Sustainable Aquaculture" (NSPSA) section below, the Plan also commits to "further strengthening the links between the aquaculture sector and the objectives of the Water Framework Directive and the Marine Strategy Framework Directive will be supported."

While a welcome step in the right direction, this does not fulfil SWAN's recommendation from our 2022 RBMP submission: *"Review of all aquaculture licences for compliance with the WFD and include a WFD-specific assessment in all new licence applications to ensure that the proposed/existing farms do not compromise the meeting of WFD objectives for the relevant waterbody, taking into account cumulative impacts. To support this, establish an independent monitoring programme…"*

Sectors including agriculture and forestry are required by the Water Action Plan 2024 to publish a Sectoral Action Work Plan, setting out "how the sector will address all water bodies at risk from that pressure with a plan to develop evidence-based targeted restoration measures" with the objective of " ensur[ing] the sector will no longer be a significant pressure on water status. The aquaculture sector has not been required to

produce such a plan, despite finfish aquaculture in particular being recognised in the plan as a significant pressure on water.

NATURE RESTORATION LAW

The Nature Restoration Law (NRL) goes beyond the scope of the MSFD by targeting specific habitats for restoration, with its targets contributing to MSFD GES objectives "by reducing negative impacts of fishing activities on marine ecosystems, restoring fish spawning and nursery areas, restoring seagrass meadows, and more. The NRL targets reinforce the MSFD framework and put a stronger focus on the maintenance of ecological functions" (Institute for European Environmental Policy). It commits to "restoring marine habitats such as seagrass beds or sediment bottoms that deliver significant benefits, including for climate change mitigation, and restoring the habitats of iconic marine species such as dolphins and porpoises, sharks and seabirds" (European Commission) with restoration measures in place in at least 20% of sea areas by 2030.

NATIONAL-LEVEL POLICIES & AGENCIES

A comprehensive legal analysis of aquaculture controls in Ireland conducted by a barrister can be found in Appendix I. This includes an assessment of the current legislative, policy and planning regime for controlling impacts from aquaculture on the aquatic environment and meeting WFD and MSFD targets, including strengths and weaknesses, and an assessment of its implementation and enforcement.

DEPARTMENT AND ACTS

Irish aquaculture licensing is administered through the Aquaculture and Foreshore Management Division of the Department of Agriculture, Food and the Marine (DAFM). This Division "ensures the efficient and effective management of Aquaculture licensing and Foreshore licensing in respect of Aquaculture and Sea Fishery related activities."

In their "Best Practice Guidance & Information for Aquaculture licensing, Legislative responsibilities & Environmental objectives" the Irish Farmers' Association (IFA) explains that for finfish, shellfish and seaweed aquaculture both an aquaculture and a foreshore licence are required, which are processed by DAFM and determined by the Minister. If the proposed site is within a Special Area of Conservation, an Appropriate Assessment is also required under the EU Habitats Directive. The Minister may also require an Environmental Impact Statement.

The industry is regulated through the Fisheries (Amendment) Act 1997, the Fisheries and Foreshore (Amendment) Act 1998, the Fisheries (Amendment) Act 2001, the Sea Fisheries and Maritime Jurisdiction Act 2006, the Aquaculture (Licence Application) Regulations 1998 as amended and the Foreshore Act 1933 as amended.

Of particular concern to SWAN is Section 19A(4) of the Fisheries (Amendment) Act, which states: "A licensee who has applied for the renewal or further renewal of an aquaculture licence shall, notwithstanding the expiration of the period for which the licence was granted or renewed but subject otherwise to the terms and conditions of the licence, be entitled to continue the aquaculture or operations in relation to aquaculture authorised by the licence pending the decision on the said application." One such example of the use of this section is a salmon farm run by Norwegian-owned seafood producer Mowi at Deenish Island, Co. Kerry (ALAB). Though Mowi's licence to farm salmon at this location was revoked in April 2019 due to overstocking (harvesting 121% of what was permitted [The Journal]), it continued to operate during the six years the case was before the Aquaculture Licence Appeal Board (ALAB) (SalmonWatch). In September 2025, ALAB announced its decision that the 2019 decision by then-DAFM

Minister to revoke Mowi's licence at the Deenish Island site would be overturned, and the operator may continue operations.

AGENCIES

Various national industry associations and networks associated with the Irish aquaculture industry include the Irish Farmers' Association (IFA), Irish Salmon Growers Association (ISGA) and Irish Shellfish Association (ISA). An Bord Iascaigh Mhara (BIM) acts as the seafood development agency, providing training opportunities, advisory services and funding schemes for the industry.

The Marine Institute (MI) provides scientific and technical advice to DAFM on licensing procedures, as well as numerous other services relating to the aquaculture industry, "to ensure the aquaculture industry operates to international best practice standards and in accordance with national and European legislation." These are further detailed on the MI website, and include:

- Inspection of sea lice levels (as reported annually- *see "Sea Lice" section above*)
- Co-ordinated local aquaculture management systems (CLAMS) to highlight issues in bays and coordinate the industry and relevant bodies to deal with them; these are individual management plans for each area (further information at BIM, though there is no central resource to access each bay or harbour's plans)
- Phytoplankton monitoring, with reports on the Government's open data portal.
- Benthic monitoring: "Aquaculture operators are obliged to monitoring the benthic environment with a view to assessing the impacts. The Marine Institute reviews these reports to ensure that they comply with standard outlined in the Monitoring Protocols."
    - The aquaculture operators submit their monitoring reports to DAFM, which then shares them with the Marine Institute to assess. The reports are not published but can be requested from DAFM. The Marine Institute has 25 years of these records, from which they are in the process of developing a database on benthic data.
- Acting as the National Reference Laboratory for marine biotoxins and for finfish, mollusc and crustacean diseases
- Acting as the Competent Authority for the implementation of aquatic animal health legislation
- Monitoring shellfish for biotoxins and monitoring the bacteriological and viral contamination of bivalves.

- Monitoring farmed fish for veterinary drug residues
- Providing scientific and technical advice to DAFM as part of the aquaculture licensing process
- Participating in the Appropriate Assessment of the impacts of aquaculture activities on Natura 2000 sites
- Monitoring contaminants and residues in seafood

NATIONAL POLICIES

National Maritime Planning Framework

Ireland's National Maritime Planning Framework (NMPF) presents Sectoral Marine Planning Policies for each individual marine sector or activity, including aquaculture. The stated objectives for the sector are:

- To support a diverse, compliant, growing aquaculture sector that operates in a modern licensing and enforcement system to produce high quality food, protects and enhances the social and economic fabric of rural coastal and island communities, and conserves biodiversity around our coasts in line with ecological sustainability.
- To manage an aquaculture licensing system based on best practice that promotes the efficient use of space and resources, protects water quality and supports the future potential of aquaculture.
- To further enhance the aquaculture licensing system so that it is characterised by the highest levels of legislative, administrative and scientific expertise and promotes the fullest possible trust in the regulatory system by aquaculture operators, environmental Non-Government Organisations (NGOs) and the general public.
- To develop enforcement strategies that deliver the best possible outcomes by achieving full compliance while keeping costs and administrative burdens to a minimum.
- To develop responsive regulation principles designed to enable a differential response to diverse operator behaviours in a proportionate manner.
- To ensure that the aquaculture licensing system has regard not only for the commercial value of the food provided under licence but, crucially, the social dividend for coastal communities arising from aquaculture activity as well as any social cost in relation to limiting other current or potential uses of the coastal environment.

In addition to the aquaculture sectoral objectives, three marine planning policies relating to aquaculture are also included in the NMPF, as listed in Table 7. However, these are not legally binding, with the NMPF stating "It will be for decision-makers and those making proposals to ensure proportionate, proposal specific application of relevant plan policies to ensure compliance."

Table 7. Aquaculture policies. Source: Project Ireland 2040 National Marine Planning Framework.

Policy 1	Policy 2	Policy 3
Proposals for sustainable development of aquaculture that: • demonstrate use of innovative approaches, and / or • contribute to diversification of species being grown in a given locality, particularly proposals applying a multi-trophic approach, and / or • enhances resilience to the effects of climate change should be supported.	Non-aquaculture proposals in aquaculture production areas must demonstrate consideration of, and compatibility with, aquaculture production. Where compatibility is not possible, proposals must demonstrate that they will, in order of preference: a) avoid; b) minimise; c) mitigate significant adverse impacts on aquaculture. d) If it is not possible to mitigate significant adverse impacts upon aquaculture, proposals should set out the reasons for proceeding.	Land-based coastal infrastructure that is critical to and supports development of aquaculture should be supported, in accordance with any legal requirements and provided environmental safeguards contained within authorisation processes are fully met

National Strategic Plan for Sustainable Aquaculture

In 2013, the European Commission published strategic guidelines for aquaculture in the EU, which was later updated in 2021. Based on those new guidelines, Member States were "invited to review their Multi-annual National Strategic Plans (MNSPs) for aquaculture." In response to this, Ireland's National Strategic Plan for Sustainable Aquaculture Development 2030 (NSPSA) was published by Minister McConalogue in October 2023, with the intention of "set[ting] the path for the Irish Aquaculture sector

so that it is resilient, competitive and is a global standard in sustainability and quality... [and] has the ability to build and maintain its competitive edge into the future." The plan's focus is heavily weighted to industry, prioritising profit and economic/market focus over the environment- as evident in the Plan's objectives, below. It notes the importance of protecting water quality, but as "a primary consideration for aquaculture operators for reasons of animal health and welfare, food safety and market access," rather than acknowledging the detrimental effects some aquaculture practices can have on water quality, such as the potential for pollution from finfish farms. Proposals to address water quality are mentioned in the below Environmental Performance actions under the Green Transition bullet point below, but they are not specific measures. The Plan also states that "Irish aquaculture is already based upon the use of low trophic species such as shellfish and marine algae that provide a number of ecosystem services"; however, finfish totalled 28% of the national output by tonnes and 60% of the national sales value of all Irish aquaculture products in 2023 (BIM, 2024)- a not insignificant part of the current industry.

There are four high-level objectives within the NSPSA:

- "Building the Resilience and Competitiveness of Irish Aquaculture"
    - The actions under this objective include access to space and water, regulatory and administrative framework, animal and public health, climate change adaptation and mitigation, producers and market organisations, control of aquaculture products, and diversification and adding value.
- "Participating in the Green Transition" (with sub-headings under this objective for environmental performance and animal welfare)
    - Key to water quality are these Environmental Performance (EP) Actions, quoted below:
        - EP1: "Further **develop our understanding of aquaculture-derived ecosystem services** and interactions with the natural capital upon which it relies. Further develop our understanding of aquaculture-derived ecosystem services by **applying current academic knowledge to Irish shellfish aquaculture** (producing ecosystem service metrics and value metrics specific to Irish Shellfish Aquaculture) and by **engaging in industry-academic studies to reduce knowledge gaps** (for example, determine biodiversity enhancement around Irish shellfish and shellfish aquaculture structures, determine the level of coastal defence afforded by shellfish and structures)" [SWAN's emphasis in the quoted text].
            - SWAN notes that these actions relate only to shellfish, not the interactions of finfish aquaculture.

- EP2: "Develop locally based non-specialist environmental monitoring around aquaculture sites. Development of operator and other local stakeholder reporting of environmental conditions, changes for example, via a smartphone application."
  - SWAN notes this as a potential for the inclusion of citizen science.
- EP7: "Further strengthening the links between the aquaculture sector and the objectives of the Water Framework Directive and the Marine Strategy Framework Directive will be supported. This will be achieved by active engagement with appropriate working groups and forums, from local to national level. The sector can also provide data to local authorities and LAWPRO who are tasked with conducting assessments of water bodies with unknown pressures to identify the significant pressures in these areas with a high level of confidence."
  - As described in the "Water Action Plan" section above, there is also commitment in the newest RBMP for "enhanced integration of WFD into Aquaculture Consents.".
  - Further detail on how LAWPRO is, or will be engaged, is not evident in the Plan.

- "Ensuring social acceptance and consumer information"
  - The actions under this objective include communicating on EU aquaculture, integration of aquaculture in the local economy and data and monitoring.
- "Increasing Knowledge and Innovation"
  - The actions under this objective relate to human capacity-building and training.

Each of these objectives and sub-headings come with key actions, such as an improved online aquaculture licensing system, increasing knowledge and innovation for the sector, human capacity building and a skills gap analysis to enable career path development among the targets of the plan over the next seven years.

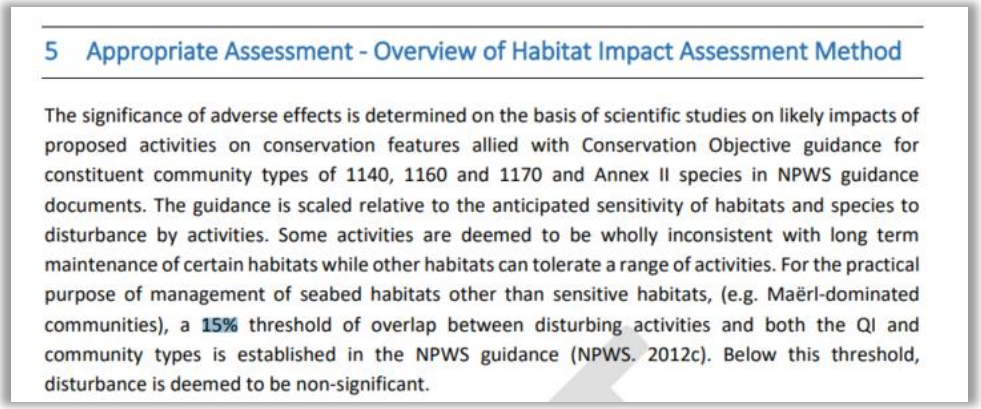
The lessons learned from the 2014-2020 NSPSA which they propose implementing include "more regular and systematic monitoring" and "better engagement of stakeholders." While SWAN welcomes these improvements, monitoring must include the localised effects of aquaculture on water quality (including monitoring conducted by citizen science), with readily accessible results reported on small grid areas, rather than only the wide Marine Reporting Units used in the MSFD, and engagement with environmental NGOs. The plan aims for sustainable aquaculture to play an important role in delivering public goods, including "nutritious and healthy seafood with a limited

environmental footprint,... reducing pollution... [and] preserving ecosystems and biodiversity." These goals must take priority over economic expansion.

The NSPSA 2030 also claims that "any of the headline issues/impacts linked directly to aquaculture, such as interactions with protected bird species and habitats, salmon escapes and sea lice, are well researched and included within current licence conditions to minimise, mitigate, or fully eliminate risks and impacts." Given the evidence presented in this policy briefing, SWAN disagrees with DAFM's assessment that these risks are adequately mitigated or eliminated.

15% damage threshold

A policy adopted by the National Parks and Wildlife Service (NPWS) allows for activities inside protected areas (other than vulnerable keystone communities) to disturb up to 15% of an entire habitat area. Appropriate Assessments (AA) and risk assessments set this as a permissible damage threshold. In a 2011 document on marine objectives for the Slaney River Valley SAC the NPWS stated: "*Significant anthropogenic disturbance may occur with such intensity and/or frequency as to effectively represent a continuous or ongoing source of disturbance over time and space (e.g., effluent discharge within a given area). Drawing from the principle outlined in the European Commission's Article 17 reporting framework that disturbance of greater than 25% of the area of an Annex I habitat represents unfavourable conservation status, this Department takes the view that licensing of activities likely to cause continuous disturbance of each community type should not exceed an approximate area of 15%.*" It is subsequently referred to in similar terms in several SPA and SAC assessments (Doyle), such as the example from September 2023 shown in Figure 5:



5 Appropriate Assessment - Overview of Habitat Impact Assessment Method

The significance of adverse effects is determined on the basis of scientific studies on likely impacts of proposed activities on conservation features allied with Conservation Objective guidance for constituent community types of 1140, 1160 and 1170 and Annex II species in NPWS guidance documents. The guidance is scaled relative to the anticipated sensitivity of habitats and species to disturbance by activities. Some activities are deemed to be wholly inconsistent with long term maintenance of certain habitats while other habitats can tolerate a range of activities. For the practical purpose of management of seabed habitats other than sensitive habitats, (e.g. Maërl-dominated communities), a **15%** threshold of overlap between disturbing activities and both the QI and community types is established in the NPWS guidance (NPWS. 2012c). Below this threshold, disturbance is deemed to be non-significant.

Figure 5. Example of use of 15% disturbance threshold. Source: "Natura Impact Statement of Extensive Aquaculture operations in Valentia Harbour/Portmagee Channel SAC, Co. Kerry" (Marine Institute)

The Irish Wildlife Trust (IWT) has described this policy as "highly damaging to marine habitats and not compatible with the protection of habitats and species afforded under the Habitats Directive." This policy is not in line with the Habitats Directive requirements to "take appropriate steps to avoid, in the Special Areas of Conservation, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated" (Habitats Directive Article 6 (2)). The IWT also found that "scallop aquaculture which uses dredging to relay scallop seed on the seabed is also not considered disturbing to sedimentary habitats in the AA if less than 15% of the total habitat are affected" (IWT). In a 2020 report on Marine Protected Areas, the IWT provided the below example of the deterioration of ecosystems in Roaringwater Bay.

Case Study: Roaringwater Bay Islands and SAC

Background

Roaringwater Bay and Islands SAC is protected for the qualifying interests: Large shallow inlets and bays, reefs, sea caves, Harbour Porpoise, and Grey Seal. The marine community types in those habitats include Zostera; Maërl; Muddy sand with bivalves and polychaetes community complex; Mixed sediment community complex and Shallow sand/mud community complex; Laminaria-dominated communities and several other types of reef.

Licensed aquaculture in the bay at the time of the [Appropriate Assessment] (AA) include rope mussel culture and intertidal oyster culture. Fisheries in the bay include shrimp, crab and lobster potting, tangle netting, scallop dredging, pelagic jigging, pelagic trawling, whitefish gill netting and demersal trawling.

The AA of fisheries and aquaculture in Roaringwater Bay recognised the sensitivity of Zostera, Maërl and Laminaria-dominated communities to structural damage from fishing gear and the impacts of aquaculture on these communities. Unfortunately, the impact on community types was once again only considered further if there was a significant spatial overlap of over 15%. In the case of rope mussel culture on Zostera and Maërl habitat, there is no spatial overlap and therefore these were excluded from further risk analysis.

Based on this AA, a mitigation plan was developed which closed four small areas in the bay to scallop dredging only.

Issues

In a recent report the conservation status of the bay had declined to unfavourable-bad. As a reason, the following is given:

"In Roaringwater Bay SAC, significant negative impacts were recorded in the Maërl community as a result of pseudo-faeces deposition and/or extensive algal cover on the Maërl beds; these beds included the rare Lithothamnion dentatum Maërl species. This impact was caused by the presence of mussel longlines directly over the beds. A proliferation of opportunistic ascidian species Ascidiella aspersa was also recorded during

sampling by diving; it formed an extensive community on the seabed adjacent to mussel lines" (Scally, Pfeiffer & Hewitt, 2020).

The AA cites the NPWS' conservation objectives for Roaringwater Bay and Islands SAC, but adapts them slightly to add that persistent disturbance of some habitats should be less than 15% of the total habitat area in order to be significant, as per the conservation objectives supporting document for marine habitats.

Rope mussels are the largest aquaculture activity in the bay by spatial coverage, with nearly 290 ha currently licensed and an additional licence application of 22 ha pending (at the time of the AA in 2013). The combined spatial footprint of licensed aquaculture in the bay is over 400 ha.

The AA discounts any significant adverse effects of rope mussel aquaculture on the habitat shallow sand mud community, including cumulative effects with other activities, due to the fact that less than 15% of the habitat overlap with human activities. The shallow sand mud community includes vulnerable Zostera and Maërl beds.

Since the time of the AA, an aquaculture mitigation plan was drawn up which now recognises the need for a 30 m buffer zone between Zostera and Maërl and the mussel longlines. This may have been put in place after it became apparent that the mussel longlines do impact on seagrass and Maërl beds. Depending on the hydrographic conditions of the site, a 30 m buffer may not be sufficient to stop the spread of pseudo-faeces from the mussel longlines to the seagrass and Maërl. Furthermore, increased presence of algae and opportunistic species on the seabed will also harm the sedimentary communities below the longlines. Any smothering of infauna can reduce oxygen concentrations in and on the seabed. It is doubtful that these mitigation measures will be sufficient. Furthermore, scallop dredging takes place outside of the closed zones on sedimentary habitat and very close to reef habitat which can have significant effects on these areas.

From this case study of Roaringwater Bay, it is clear that the arbitrary 15% damage threshold does not provide adequate protection to the vulnerable habitats and species that SACs are designated to protect.

MARINE PROTECTED AREAS

As of October 2025, Ireland has not yet published Marine Protected Area (MPA) legislation, despite a commitment to designate 30% of the marine area by 2030. Currently, just over 9% of Ireland's seas are designated as MPAs, in the form of Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). These Natura 2000 sites, designated for the protection of species and habitats in the EU Habitats and Birds Directives, are Ireland's only MPAs currently. Guidelines on the integration of aquaculture in Natura2000 areas were originally published by the European Commission in 2012.

The International Union for the Conservation of Nature (IUCN) has defined six categories of MPAs:

Table 8. Categories of Marine Protected Areas. Source: IUCN, 2017.

Protected Area Category and International Name	Management Objectives
Ia – Strict Nature Reserve	Managed mainly for science
Ib – Wilderness Area	Managed mainly to protect wilderness qualities
II – National Park	Managed mainly for ecosystem protection and recreation
III – Natural Monument	Managed mainly for conservation of specific natural/cultural features
IV – Habitat/ Species Management Area	Managed mainly for conservation through management intervention
V – Protected Landscape/Seascape	Managed mainly for landscape/seascape conservation and recreation
VI – Managed Resource Protected Area	Managed mainly the sustainable use of natural ecosystem

Within these categories, the IUCN recommends only two (Categories V and VI) may allow aquaculture activities. They also recommend the development of matrices to identify synergies between MPAs and aquaculture. The below figure provides examples from the IUCN of activities that may be appropriate for categories of MPAs.

Matrix of activities that may be appropriate for each IUCN management category.

Activities	Ia	Ib	II	III	IV	V	VI
Aquaculture	N	N	N	N	*	Y	Y
Works (e.g. harbours, ports, dredging)	N	N	N	N	*	Y	Y
Untreated waste discharge	N	N	N	N	N	Y	Y
Mining (seafloor as well as sub-seafloor)	N	N	N	N	N	Y*	Y*
Habitation	N	N*	N*	N*	N*	Y	N*

Key:

N = No
N* = Generally no, unless special circumstances apply
Y = Yes
Y* = Yes because no alternative exists, but special approval is essential
* = Variable; depends on whether this activity can be managed in such a way that it is compatible with the MPA's objectives

Illustrative example of a matrix Aquaculture systems and MPAs categories.
Any actual version would need to be developed through extensive discussion and dialogue,
and so accordingly the below table should not be taken to reflect a formal view of IUCN or its Commissions.

Categories	Ia	Ib	II	III	IV	V	VI
High density fish cage culture	N	N	N	N	*	*	*
High density on-land close system fish culture	N	N	N	N	*	*	Y
Medium density on-land circulating system fish pond culture	N	N	N	N	*	Y	Y
High density shell fish culture (table, long-lines)	N	N	N	N	*	*	Y
Low density pond /lagoon fish culture	N	N	N	N	*	Y	Y
High density seaweed culture	N	N	N	N	*	*	Y
Low density shellfish culture	N	N	N	N	*	Y	Y
Medium density invertebrate (e.g. sea cucumber) culture	N	N	N	N	*	Y	Y
Integrated Multi-trophic culture	N	N	N	N	*	Y	Y
Restoration purpose aquaculture *	*	*	*	*	*	Y	Y

Figure 6. Matrix of aquaculture activities that may be appropriate for each IUCN management category, and example.

However, without Irish legislation defining protected area categories or MPAs (other than SACs and SPAs designated for specific features under the EU Birds and Habitats Directives), our existing "protected areas" run the risk of being little more than "paper parks" which do not offer true protection for vulnerable ecosystems. Each site must have a detailed management plan which centres inclusive local stakeholder engagement, as recommended by Fair Seas. Without these management plans, aquaculture will continue in SPAs and SACs, with the allowed 15% damage threshold. Ireland currently has only one area that could be considered under "Category Ia Strict Nature Reserve." Lough Hyne is a designated Nature Reserve under the Wildlife Act,

yet even here, fishing and potting continue. Per the below map, created by SWAN with data from Ireland's Marine Atlas, many aquaculture licences have been granted in, or in close proximity to, Natura 2000 sites. Locations of licensed aquaculture sites and protected sites can also be viewed on DAFM's Marine Aquaculture Viewer.

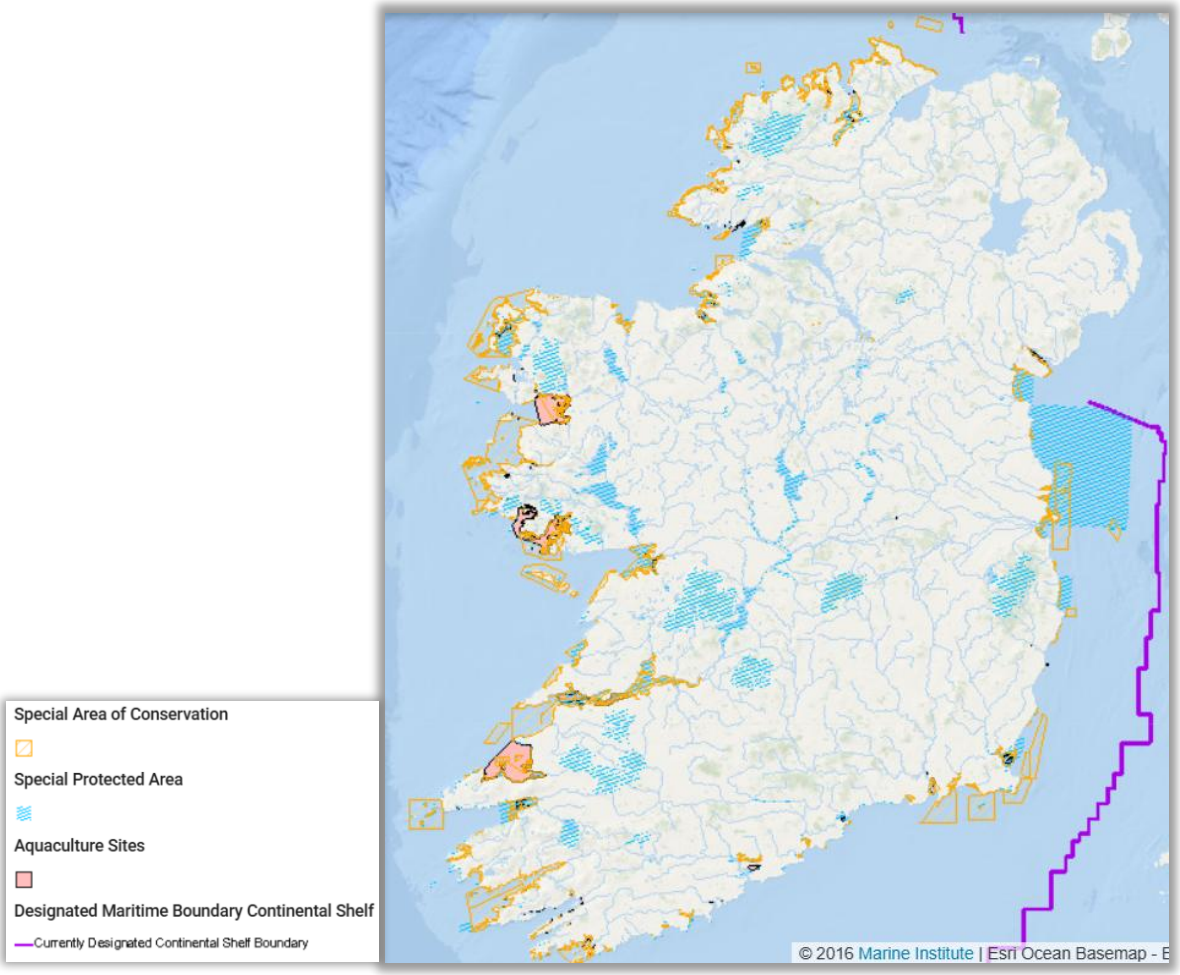


Figure 7. Map showing Natura 2000 sites and aquaculture sites within the Republic of Ireland (Ireland's Marine Atlas, 2025).

In a section on 'Aquaculture in sensitive areas' in DAFM's National Strategic Plan for Sustainable Aquaculture 2030, there is an acknowledgement that "there is an **increasing overlap between marine aquaculture production areas and the protected nature sites of the Natura 2000 network**... The network is particularly relevant to shellfish farming but there is also overlap with finfish farming sites... If improperly sited or managed, **Aquaculture can impact the marine environment through disturbance to and displacement of fish, shellfish, birds and other wildlife populations**. **Water pollution, escaped farmed salmon and spreading of disease to native populations** [are] considered a **pressure for a number of protected habitats**. There is an important role that both regulators and the industry

alike can play in reducing and minimising the environmental impact of aquaculture" [SWAN's emphasis].

The National Marine Planning Framework sets out the current situation regarding aquaculture and Nature 2000 sites: "Proposed aquaculture activities are screened for appropriate assessment pursuant to the Habitats Directive, and if necessary, an appropriate assessment is conducted. The potential impacts of aquaculture on designated maritime Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are assessed. Aquaculture projects in Natura 2000 sites are, if approved, licensed along with specific management actions and mitigation measures as appropriate so that the integrity of the relevant SACs and SPAs is maintained. Access, supporting infrastructure and site selection are important considerations in identifying impacts on protected marine sites, including SACs and SPAs."

The Marine Institute conducts Appropriate Assessment reports for aquaculture activities in SPAs (some of which were funded by the European Maritime and Fisheries Fund from 2017-2020); the results of these bay-wide assessments are published by county on DAFM's website.

Many forms of aquaculture can negatively impact the surrounding ecosystems, including the features which SACs and SPAs are designated to protect. However, some forms of restorative aquaculture may provide ecosystem benefits and could be beneficial to the goals and management of MPAs. For instance, an increase in native oyster beds in Strangford Lough in Northern Ireland are providing ecosystem and ecological benefits. As filter feeders, oysters can filter up to 140 litres of seawater per day. Their reefs can act as carbon sinks and as nurseries for other fish species (Smyth, 2022). As all commercially fished Irish oyster beds in Ireland are within SACs and "oysters are potentially keystone habitat (reef) forming species or important characterising species in these areas and the maintenance of favourable conservation status of oyster habitat is a requirement under conservation objectives now being defined for these habitats" (Tully & Clarke, 2012), aquaculture focussed on native oysters within SACs could be beneficial to water quality.

RESPONSIBLE AQUACULTURE

While this document has so far primarily concerned itself with conventional aquaculture systems, it is important to note that examples do exist of forms of aquaculture which have a less detrimental effect on the environment, such as restorative aquaculture. The aquaculture industry must not be further developed nor aquaculture licences granted unless it can be demonstrated that the farming practices will not compromise the objectives of the WFD and MSFD, or impact the features protected within Natura 2000 sites. SWAN supports an ecosystems-based approach that takes the precautionary principle where there are knowledge gaps.

Ireland needs robust management and tight regulation to manage all aquaculture in a coordinated, transparent way, taking into account the cumulative impacts of various forms of finfish and shellfish farming on the environment and water quality. The industry must not be seen as having potential for exponential growth, particularly for the farming of carnivorous species, while still relying on wild-caught species for feed.

While many forms of aquaculture can be detrimental to the environment, the positives and benefits should also be recognised, with responsible aquaculture's potential for sustainable food provisioning. Farmed fish have been found to have 87% smaller carbon footprints than beef, use 49% less land than poultry and significantly less freshwater than pigs (Henriksson *et al.*, 2021), resulting in significantly less greenhouse gas emissions than terrestrial livestock (Lenzen, Li & Murray, 2021).

However, a comparison of greenhouse gas emissions alone does not factor in other issues of environmental sustainability, such as the detrimental effects some forms of aquaculture can have on water quality and the ecosystem effects of sourcing feed for carnivorous finfish and seed for shellfish culture. Compared to wild-caught fisheries, aquaculture generally reduces the possibility of bycatch and the problem of discards (risks of pelagic and bottom trawling), as well as avoiding the disturbance to the benthic environment by some types of fishing gear. However, the farming of carnivorous finfish still relies on wild-caught fish for feed, so it is important to note that these issues of bycatch and benthic disturbance still exist to provide feed for salmon aquaculture.

At a global level, the FAO has recommendations of initiatives and technologies that aim to achieve healthier, more efficient and safer aquaculture production. Their "Guidelines for Sustainable Aquaculture" were published in March 2025 to offer a "comprehensive framework for the management and development of sustainable aquaculture," as seen in Figure 8:

Figure 8. Summary of Guidelines for Sustainable Aquaculture.

In Ireland, DAFM's "Food Vision 2030" presents the building of sustainable aquaculture enterprises as a key objective for Irish food security. Goal 6 (Embed the Agri-Food Sector in the Circular, Regenerative Bioeconomy) recognises that "the oceans and seas offer huge potential for cascading use of biomarine resources in the bioeconomy," which includes seaweed farming and circular aquaculture. Under Goal 5 (Enhance the Environmental Sustainability of the Seafood Sector), several actions relate to aquaculture, including achievement of GES:

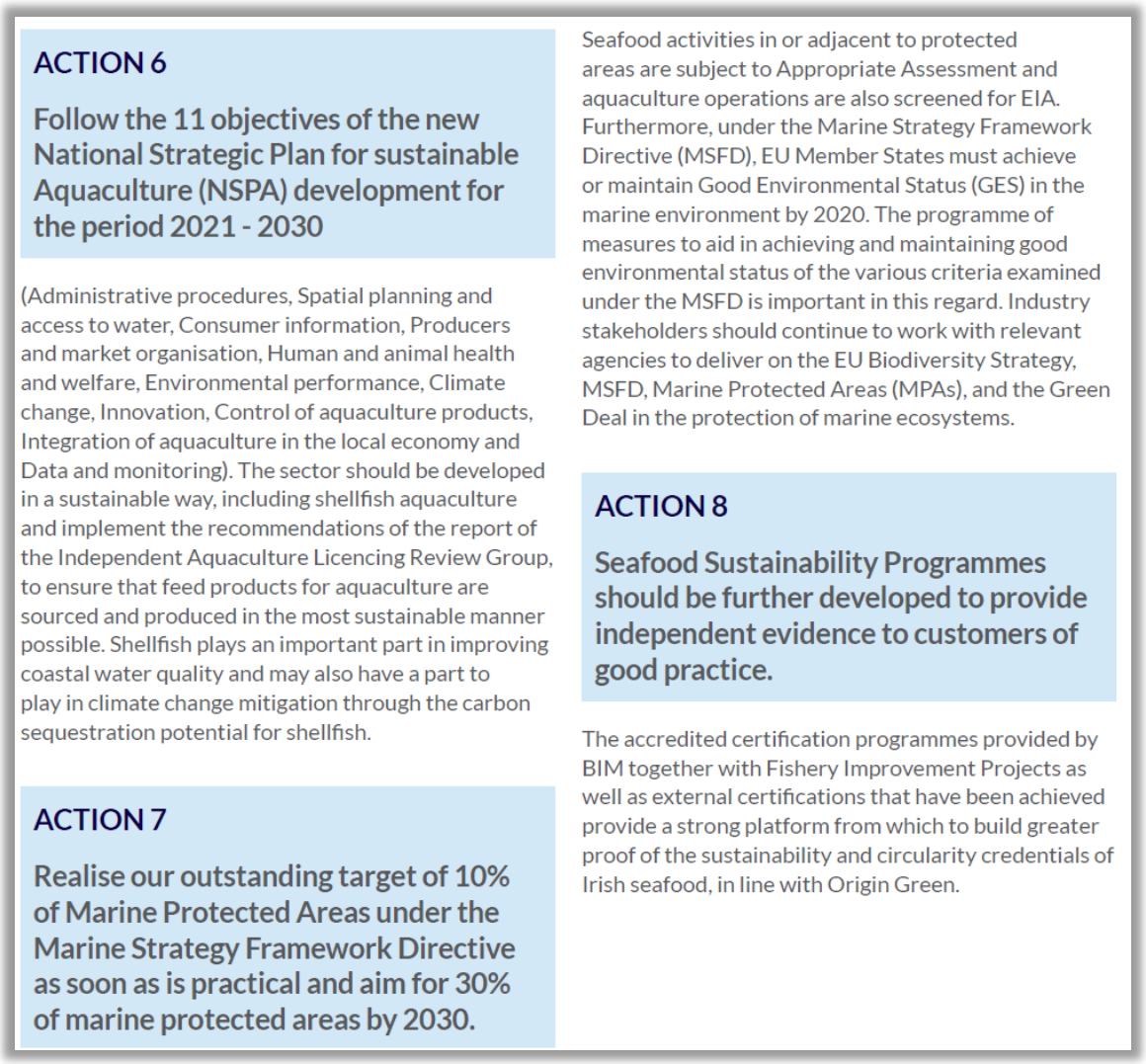


Figure 9. Aquaculture actions from Food Vision 2030.

DAFM's National Strategic Plan for Sustainable Aquaculture (NSPSA) 2030 similarly focuses on the sector as a major contributor to food security. In the "National-Level Policies" section of this briefing, the proposed "Environmental Performance" action points were considered. However, the Plan does recognise that "low-impact aquaculture (such as low-trophic, multi-trophic and organic aquaculture), and environmental services from aquaculture can, if further developed, greatly contribute to the European Green Deal, to the Farm-to-Fork Strategy and to a sustainable blue economy."

In any plan, priority must be given to reaching GES under MSFD descriptors and WFD objectives, ensuring water quality and protection of biodiversity. The NSPSA recognises that, "given the poor ecological status of many transitional water areas, further work needs to be undertaken to **support aquaculture to contribute to their restoration and recovery**. This work can be done both through **refinement of the**

aquaculture licensing and permitting processes at site level or more likely through **bay-level assessments** of environmental carrying capacity to see **how both individual and cumulative aquaculture operations might impact on MSFD or WFD GES goals**" [SWAN's emphasis].

The Marine Institute's draft "Ocean Knowledge 2030: Ireland's Strategy for Marine Research, Innovation and Knowledge, 2025-2030" identified several research, knowledge and innovation priority areas for aquaculture in Ireland, including "continued development and application of new tools and technologies (Aquatech and Biorefinery) in support of sustainable seafood production and processing, including land-based recirculating aquaculture systems (RAS), novel feed solutions, digital tools, Artificial Intelligence, marine engineering, fish health and genetics" and "further development of low-impact, non-fed aquaculture, in particular seaweed and molluscs; integrated multi-trophic aquaculture; and opportunities for co-location of aquaculture with other developing offshore activities (e.g. offshore wind developments)."

In all future planning, SWAN calls for taking the precautionary principle- "where, if it is possible that a given policy or action might cause harm to the public or the environment and if there is still no scientific agreement on the issue, the policy or action in question should not be carried out."

Fernandes, McWhinnie and Tett identified key areas where aquaculture can improve sustainability, including "*genetic interactions of farmed and wild populations (including reduction of escapes), management of disease, especially of disease transfer between farmed and wild populations, improved husbandry practice to minimize the effects of culture (e.g., organic matter, nutrients, and chemicals), reduction of dependency on wild taxa for seed collection and for feedstuffs, and control of introduction of alien species. It is important that the relevance of current management and regulatory procedures is assessed and any amendments implemented. The development of new feeds, new vaccines and treatments, offshore aquaculture, and integrated multi-trophic aquaculture are all promising areas of development where currently much progress is being made*" (2011).

SWAN is a member of Seas at Risk (SAR), an association of environmental NGOs from across Europe. SAR recognises the potential of low impact, responsible aquaculture to aid in the recovery of wild fish stocks and help meet global protein demands. We back our SAR partners in calling a more environmentally responsible approach to aquaculture, which uses sustainably-sourced feed and the use of practices with a lower environmental impact, including integrated multi-trophic aquaculture (IMTA). Potential for innovations in IMTA (such as new species and products) and the circular

economy were also recognised as opportunities for the Irish aquaculture sector by the European Commission. A 2017 study also demonstrated the Irish public's interest in salmon perceived to be produced in a more environmentally friendly way (van Osch *et al.*, 2017).

ALTERNATIVE AQUACULTURE APPROACHES

This report has primarily focussed on commercial aquaculture, which Mizuta *et al.* (2022) defines as "the cultivation of an aquatic organism for enhanced production and improvement of stocks." However, alternative forms of aquaculture may also allow for "conservation purposes including species recovery, habitat restoration and offsetting the impacts of wild capture on vulnerable harvested species" (Mizuta), coming under approaches the researchers defines as:

- "'**conservation aquaculture**': The use of human cultivation of an aquatic organism for the planned management and protection of a natural resource, connected to biodiversity, environmental protection and conservation hatchery, able to target at-risk species and related resource management;
- '**restorative aquaculture**': commercial or subsistence aquaculture that supports initiatives to provide/or directly provides ecological benefits to the environment leading to improved environmental sustainability and ecosystem services, in addition to the supply of seafood or other commercial products and opportunities for livelihood, connected to ecosystem services, biogenic habitats, and production improvement, requiring the use of low trophic species; and
- '**regenerative aquaculture**': commercial or subsistence aquaculture performed with focus on social, economic and ecological responsibility and stability, with minimal external input and impact to the environment, connected to policy, social wellbeing, environmentally friendly, holistic production and thinking and polyculture, requiring low external input during cultivation and a high focus on social responsibility results."

In May 2024, the Mediterranean region's first restorative aquaculture centre was announced, aiming to "enable innovation and capacity building in the region on the farming of species such as macroalgae, sea urchins, bivalves and holothurians [sea cucumbers], as well as on integrated multi-trophic aquaculture systems and adaptation to climate change." The FAO has stated that restorative aquaculture can "positively affect ecosystems services, offering ecological benefits, creating opportunities for local communities and addressing climate change through adaptation and mitigation strategies. A diverse range of activities fall under its umbrella, including the production of algae, sea urchin farming and roe enhancement, bivalve farming, integrated

multitrophic aquaculture systems and restocking." SWAN supports research and development of restorative aquaculture practices in Ireland.

BIVALVES

Restorative aquaculture which cultivates shellfish for human consumption can also offer "valuable ecosystem services, such as water filtration, nutrient cycling, carbon sequestration, protection from waves and storms, species habitat provision, biogenic habitat creation and cultural services such as tourism. Spillover of larvae from aquaculture sites may support restoration of wild stocks" (Stechele, 2023). The NSPSA 2030 also includes as an action point "Encourage opportunities for low trophic aquaculture species that can contribute to a low carbon economy" in recognition of the ecosystem services they can play, such as carbon sequestration.

Mussels and oysters are already farmed around Ireland. As bivalve shellfish culture does not require additional food or medicine, it avoids many of the detrimental environmental impacts of finfish aquaculture (Smaal, Craeymeersch & van Stralen, 2021). The Food Smart Dublin project of Trinity College reports that Irish blue mussels farmed by suspended rope culture and bottom culture "have little environmental impact" with minimal habitat concerns. However, the sourcing of spat for cultivation must avoid seabed dredging and associated habitat destruction. We support the continuation of research on the sustainability of this industry. A current project through University College Cork is "Bridging Research and Practice to Improve the Future Sustainability and Growth of the Irish Bivalve Industry (BIVALVE)." The project recognises the role bivalve aquaculture can play in removing nitrogen and carbon from the marine environment, as well as stabilising sediments and enhancing biodiversity. BIVALVE seeks to "quantify and evaluate the ecosystem services (nutrient recycling, biodiversity, and cultural importance) bivalve stocks contribute to healthy coastal ecosystems and their input to help fight climate change." Findings will support the sustainable growth of this sector but will also highlight this industry's contribution to maintaining healthy seas, fighting climate change and its importance to Ireland's cultural heritage.

The restoration of native oyster beds can also play a part in restorative aquaculture. Ireland's once dense native oyster beds (estimated at 5,895 oysters per square yard within their reefs [Lunz, 1960]) were harvested in an apparently sustainable manner from ancient times till the 1700s, peaking in the 19th century, when they began declining due to overfishing (Tully & Clarke, 2012). As described in the "Alien & Invasive Species" section above, *Ostrea edulis* declined further in the 1970s when the parasite *Bonamia ostreae* reached Irish waters. Given that the native oyster beds

peaked centuries ago, before robust scientific recording, "the structure and function of offshore oyster beds in the Irish Sea and similar beds in the southern North Sea and English Channel, all of which are now extinct, is not well documented. However, given the production of oysters from these offshore beds, in the 19th century, it is likely that oysters formed continuous cover over extensive area of seabed." With the modern pressures of fishing, the *Bonamia* parasite, and competition from the Pacific oyster, native oyster beds do not have the conditions to form biogenic oyster reefs, and it is estimated that they have been unable to do so for at least 200 years (Tully & Clarke, 2012). Native Oyster Reef Restoration Ireland (NORRI) aims to "work with nature to help establish conditions conducive to life and help restore native oyster reef habitats, while improving water quality [and] marine biodiversity." NORRI explains the importance of oyster beds to water quality and marine ecosystems:

"As ecosystem engineers, oyster reefs help facilitate ecosystem-wide biodiversity; enhance benthic and pelagic coupling by harbouring of juvenile and smaller fish species; they create natural coastal buffer zones absorbing wave energy and protecting from erosion. Oysters provide excellent water filtration removing nitrogen bound in phytoplankton and organic particulates, as well as promoting bio-deposition, bioremediation, while their shells have pH buffering capacity. An adult oyster can filter between 100 and 240 l of water per day and have been observed to remove as much as 0.52 g of [nitrogen] and 0.16 g [phosphorus] at harvest. Similarly, oyster filtration can help reduce the turbidity and improve photosynthesis in deeper waters, promoting the growth of submerged aquatic vegetation (SAV). This very important symbiotic relationship between oyster habitats and SAV like kelp and eel grass beds, have been supporting synergistic ecosystem benefits such as sediment stabilization, habitat creation, coastal protection and improved water quality. In addition, towards the coastal land side oysters prefer the vicinities of salt marshes. Together these three keystone coastal systems act in unison creating some of the most biologically productive areas promoting the overall ecosystem health and function in coastal systems and estuaries."

As demonstrated in the 2023 PhD thesis "*Towards Restorative Aquaculture of Flat Oysters (Ostrea Edulis) in Northern Europe: A Modelling Approach*" (Stechele), the farming of native oysters can support these important ecological benefits. The authors reported that native oyster restoration efforts in the North Sea and English Channel have been hampered by low larval concentrations and ensuing recruitment, but that "**flat oyster aquaculture might speed up restoration and recovery** by systematically providing larvae, [though requires] correctly taking into account hydrodynamic conditions... It is generally acknowledged that larval production from

restored sites will add to the larval pool and will therefore support colonisation of free substrates in suitable locations that are protected from bottom disturbances," such as trawling. They identify several factors of native oyster aquaculture necessary for habitat restoration, including water depth (between 10 and 30 metres), exposure, temperature and salinity. By focusing on larval dispersal as a central objective of restoration, historical oyster beds part of connectivity networks can benefit. The authors recommend "establish[ing] and manag[ing] networks of flat oyster connectivity that span across and extend beyond existing restoration sites to promote offshore connectivity more effectively. These networks should be managed at both national and regional levels (basin based). The restoration endeavours should not be confined to merely scaling up current efforts but should also concentrate on supplementing the network with additional support sites such as broodstock locations, artificial reefs, and oyster-related nature-inclusive-designs."

CLOSED- AND LAND-BASED SYSTEMS

Land-based recirculating aquaculture systems (RAS) are a method of closed, onshore fish farming in which water is treated and partially re-used, which can reduce water usage and improve waste management, reducing the cross-contamination of pollution to natural waterways. A 2008 study from the Technical University of Denmark, quoted in the NSPSA 2030, found RAS production of trout "has the potential to reduce emission of nitrogen, phosphorus, and organic material by 35%, 60% and 90%, respectively, per kilogram of produced fish." The systems also eliminate the possibility of farmed escapees to the wild and reduce the possibility of sea lice entering the marine environment.

Another example of a closed-containment system, currently being trialled in Norway, is the 'Watermoon,' "an enclosed cylindrical tank that is submerged 72m into the water and holds 200,000 fish in a closed-loop system. Seawater circulates through the tank, but fish faeces and waste are filtered and taken away to generate biogas. Because the farmed salmon are kept inside the tank, the sea lice are kept out and the fish cannot escape into the wild" (Irish Times, 2025). While this eliminates many of the water quality concerns around salmon farming, their need for a fish-based diet remains.

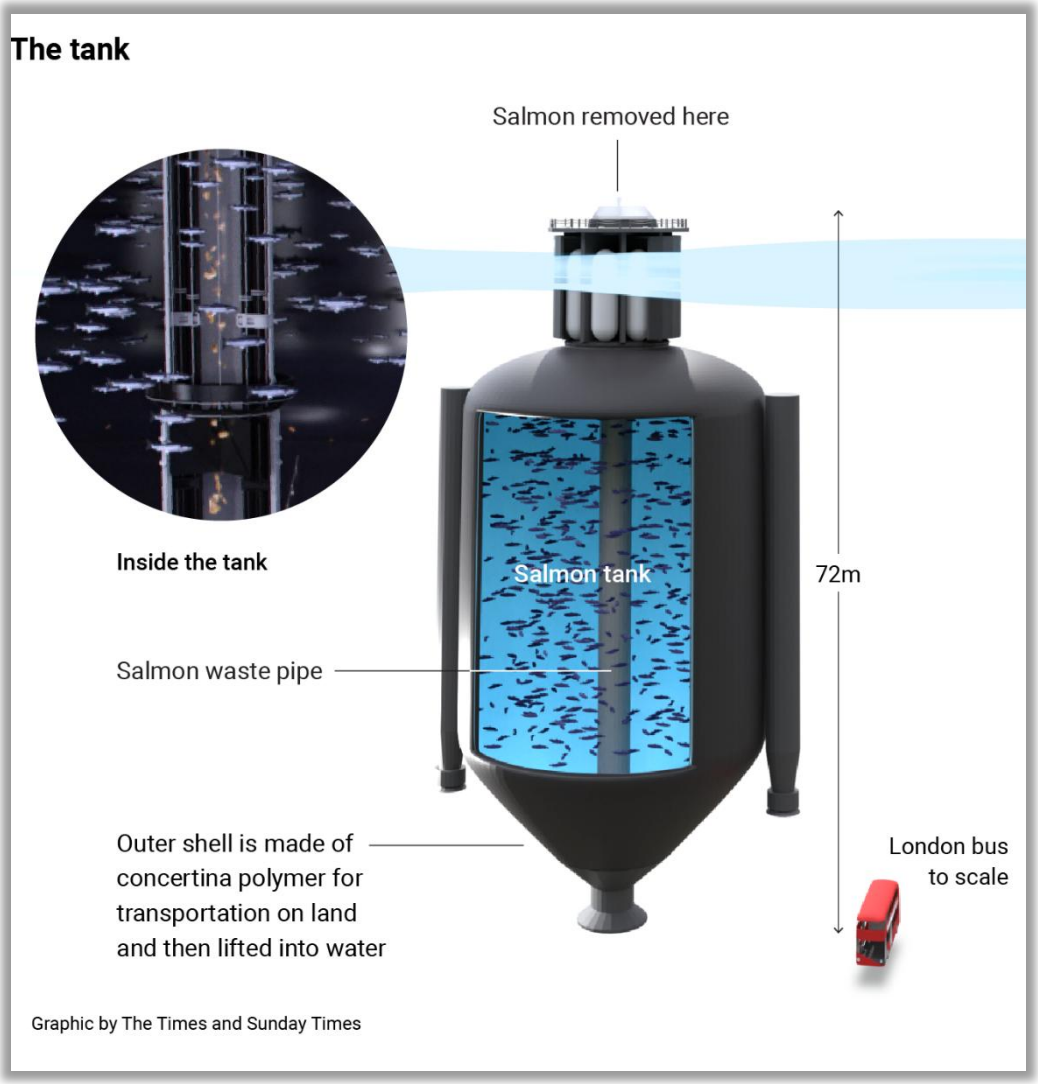


Figure 10. Graphic of the Watermoon closed circulation system. Source: The Times, 2024.

Martins *et al.* (2010) suggests that RASs have been developed as a more environmentally friendly aquaculture production system in response to increasing environmental regulations, including EU directives, finding the practice can "contribute to the environmental sustainability of the European aquaculture sector." The study reports the benefits of RAS include "reduced water consumption, improved opportunities for waste management and nutrient recycling and for a better hygiene and disease management and biological pollution control (no escapees)."

These closed systems are not commonly used in Ireland (where in 2024, only 1120 tonnes of the 35,737 tonnes (3%) of total aquaculture output were land-based). However, in 2019, Dr Ciaran Byrne, Inland Fisheries Ireland's Chief Executive, acknowledged the evidence is "pointing towards" moving fish farms onshore, in response to news that Denmark had taken a decision to ban new coastal salmon farms, or the expansion of existing ones. However in a 2009 study (Assessing alternative

aquaculture technologies: life cycle assessment of salmonid culture systems in Canada), Ayer & Tyedmers found "that while the use of these closed-containment systems may reduce the local ecological impacts typically associated with net-pen salmon farming, the increase in material and energy demands associated with their use may result in significantly increased contributions to several environmental impacts of global concern, including global warming, non-renewable resource depletion, and acidification."

The NSPSA recognises "that further investigations into the role of land-based RAS in future Irish aquaculture will be required" while also noting that "the viability of large-scale RAS development in Ireland may be limited by both the distance to major overseas markets and a potential conflict with the country's hard-fought reputation for high quality, low density organic salmon production."

As all salmon farmed in Ireland are certified organic under EU regulations, there may be resistance from industry to RAS, if it involves losing this valued certification. The Organic Food and Farming Standards in Ireland – Edition 2.03 (2023) states *"Closed recirculation aquaculture animal production facilities shall be prohibited, with the exception of hatcheries and nurseries or for the production of species used for organic feed organisms."*

Per a 2022 report on "Organic Aquaculture in the EU" by the European Market Observatory for Fisheries and Aquaculture Products (EUMOFA), "closed RAS is only allowed in the EU organic regulation for hatcheries and nurseries or facilities for the production of species used for organic feed organisms. RASs have several environmental advantages, but require significant input of external energy, high stocking densities (for economic reasons), advanced wastewater treatment devices, use of UV radiation and use of pure oxygen. All the above, together with the disconnection of the aquaculture production from the external natural aquatic environment, makes the closed RAS not in line with the principles of organic production. Thus, stakeholders who invest in this method for on-growing purposes cannot be labelled as organic. In addition, the Federation of European Aquaculture Producers (FEAP) highlighted in a letter to the European Commission (October 2021) that the definition of RAS is unclear in the EU organic Regulation, which limits possible investments."

LOW TROPHIC AND INTEGRATED MULTI-TROPHIC

Low-trophic aquaculture (LTA) is a form of aquaculture which does not farm carnivorous fish, rather producing seaweeds and bivalves. In a 2025 paper

"Recommendations for mainstreaming Low Trophic Aquaculture in countries around the Atlantic basin" Tett *et al.* describe: "seaweeds are primary producers, requiring only sunlight and mineral nutrients, and mussels (and other filter-feeding bivalve shellfish) feed mainly on natural phytoplankton... Arguably, **LTA has a higher efficiency of natural resource use and lower environmental impact**, compared with [High Trophic Aquaculture- fish farming]. Low trophic species can also be grown in systems that integrate species of different trophic levels, where some species use the inorganic or organic nutrients produced by other species, in what is known as Integrated Multi-Trophic Aquaculture (IMTA)... **Expansion of LTA seems desirable on grounds of reducing emissions of green-house gases and nutrients per kilogram of food** (and other products)... Despite recognition as a key pathway to the provision of sustainable food from the oceans, many forms of LTA around the Atlantic basin remain in the niche stage of socio-technical evolution" [SWAN's emphasis].

Projects in the North Sea and Baltic Sea (including ULTFARMS and Olamur) have shown how LTA is also compatible with offshore wind farms to optimise marine space (Figure 11).

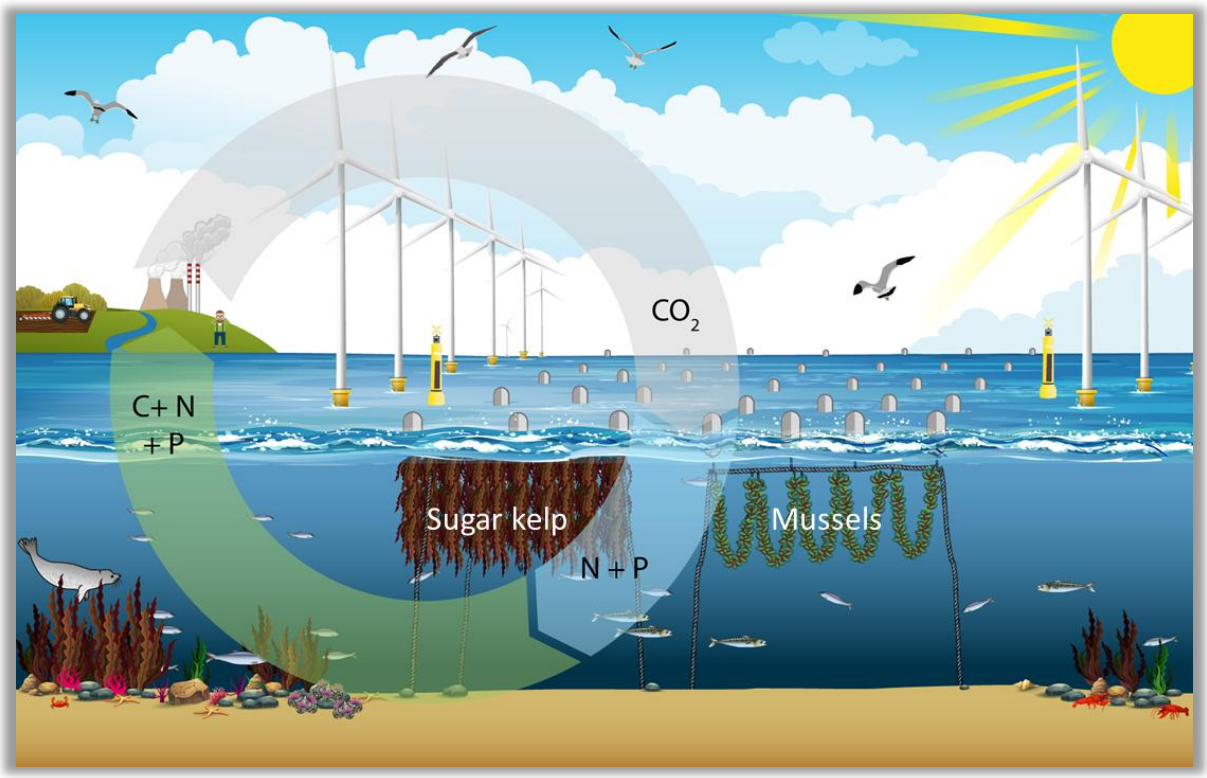


Figure 11. Marine multi-use and low-trophic aquaculture example. Source: Olamur.

Integrated multi-trophic aquaculture (IMTA) is another similar ecosystem management approach and form of regenerative aquaculture which can alleviate some disadvantages of aquaculture. It is a balanced system that provides by-products of one

cultured species to another to increase efficiency of production by reducing costs and yields- i.e., using the waste products of one species as nutrients for another. Intensive culture of fish or shrimp is practiced as integrated with seaweed or mollusc culture. Waste and feed from fed high trophic level species, such as salmon, is used by extractive low-trophic species, which may include suspension feeders (such as mussels and oysters), deposit-feeders (like sea cucumbers and sea urchins) or other invertebrates and macroalgae (including kelps) (Sickander & Filgueira, 2022; Buck *et al.*, 2018).

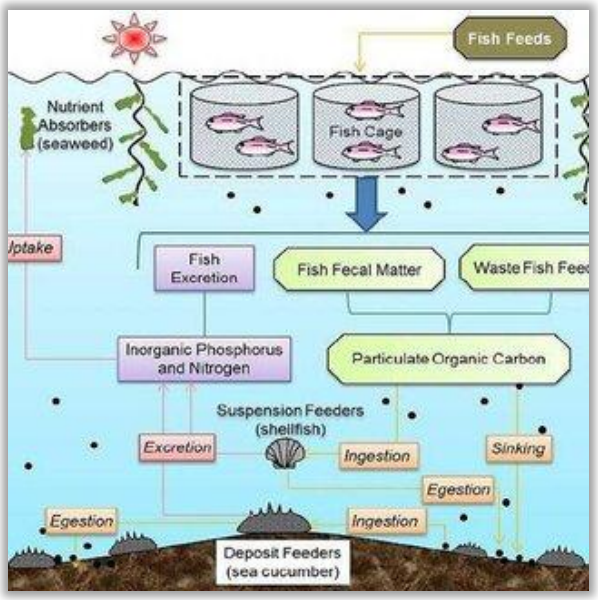


Figure 12. Visual of IMTA. Source: Kamleshbhai *et al.*, 2023.

The effects of inorganic and organic waste are one of the main environmental issues of carnivorous finfish farms. Despite the benefits of waste re-use in IMTA, the practice is not widely used as a mitigation measure in Atlantic salmon farms. One challenge relates to scaling up the culture of extractive species (shellfish and macroalgae) to provide meaningful mitigation. Capital and maintenance costs are sometimes prohibitive and there is a lack of government support and implementation. With IMTA not yet commonly implemented at a commercial scale, there is a barrier of industry adoption (Sickander & Filgueira, 2022).

In a presentation to SWAN and Coastwatch in 2013, Dr Karen Mooney of Queen's University stated, "*development of integrated multi-trophic aquaculture systems involving algae may generate significant benefits in terms of disease or lice infestation control for aquaculture involving other species.*" Twelve years later, SWAN reiterates a call for Ireland to be a leader in Europe in developing and supporting this more sustainable form of aquaculture.

RECOMMENDATIONS

This report sets out an overview of the impacts of aquaculture on the marine environment and the significant gaps in controlling these impacts, especially in the context of meeting legal obligations under the WFD and MSFD. As Ireland's River Basin Management Plan (Water Action Plan 2024) recognises "*Finfish aquaculture is a significant water management issue in terms of its potential impacts on water quality. The* ***potential impacts from finfish farming can include impacts on water quality, biodiversity, the condition of the local habitats, risks from the use of pesticides and threats from the introduction of non-native species****, if not managed effectively.*"

Based on this review of literature, we put forward the following recommendations for improved monitoring and regulation to control environmental impacts of the industry, for research on development of less impactful and more regenerative and restorative forms of aquaculture and modernised, streamlined licensing.

It is important to note that it is SWAN's position, based on the documented impacts on marine ecosystems and biodiversity by commercial aquaculture, that open-net salmon farming cannot be conducted sustainably and should be phased out. We present the accompanying recommendations below for implementation during a transition period before cessation, and for application to other aquaculture types.

1. BAN OPEN-NET SALMON FARMING
SWAN calls on the Irish Government to follow the example of British Columbia (Canada) and other salmon-farming regions and ban open-net salmon farming within a transition period, for the protection of wild species and benefit of the marine environment. No renewals or new licences will be permitted within that period.

2. REMOVE FARMED CARNIVOROUS FINFISH FROM DEFINITIONS OF SUSTAINABLE
SWAN joins over 160 think tanks, scientists and NGOs from six continents, including our coalition partners at Seas At Risk, in calling on the United Nations Food & Agriculture Organisation to remove Carnivorous Fish Farms from their definition of 'Sustainable Aquaculture' in light of overwhelming evidence of harm to the environment, society and the economy. We call on the Irish Government to also remove the farming of carnivorous finfish from definitions of sustainable aquaculture, shifting production to non-fed and low-trophic aquaculture.

3. MONITOR SALMON FEED

Where salmon farming is in operation, SWAN calls for monitoring of feed and transparent, publicly-available information about feed contents. Feed must not include contents from unregulated or non-quota fisheries, such as sprat.

4. REVIEW NATIONAL STRATEGIC PLAN FOR SUSTAINABLE AQUACULTURE

SWAN calls for an urgent review of the NSPSA with full public participation, in particular in light of invasive alien species regulations and the Nature Restoration Law. This must include:

- Increased monitoring to include water quality (including that conducted by citizen science) and engagement with environmental NGOs
- Investment in research on less impactful forms of aquaculture, such as land-based recirculating aquaculture systems, integrated multi-trophic aquaculture and restorative forms of aquaculture
- Ban on dredging for mussel spat

5. END EU SUBSIDIES TO AQUACULTURE & CREATE STRATEGIC GUIDELINES FOR THE SECTOR

We join our Seas at Risk partners in calling for the end of environmentally harmful subsidies to the aquaculture industry and call on the European Commission to adopt a clear set of indicators which allow auditors to assess the environmental sustainability of the aquaculture sector.

6. MEET REQUIREMENTS OF NATURE RESTORATION LAW

The Irish Government must prioritise meeting the NRL requirements and assess the impacts of aquaculture against this.

7. INCLUDE MONITORING OF AQUACULTURE IN MARINE STRATEGY FRAMEWORK DIRECTIVE REPORTS

SWAN calls for future MSFD reports in Ireland to specifically monitor and measure the impact of aquaculture on descriptors including hydrographical conditions, marine litter, eutrophication, seafloor integrity and non-native species. There must be consequences for non-compliance.

8. REVIEW AND REFORM LICENSING AND WATER FRAMEWORK DIRECTIVE-SPECIFIC ASSESSMENTS

We call for significant reform of the aquaculture licensing and regulatory regime, particularly regarding monitoring and enforcement, akin to the Office of Environmental Enforcement in the EPA.

Licences for all existing and potential future aquaculture must be fully and independently reviewed for compliance with the WFD and MSFD, with WFD-specific assessments, to ensure that the proposed/existing farms do not compromise the water quality of the waterbody in which they are located (per the objectives of the Directives), taking into account cumulative impacts. It is critical that forthcoming Sectoral Action Work Plans as part of the River Basin Management Plan include SWAN's recommendations on aquaculture, ensuring that the industry does not counter the objectives of the WFD and MSFD.

9. END USE OF 15% DISTURBANCE THRESHOLD

We call on all government bodies to end use of the 15% disturbance threshold inside protected areas when conducting Appropriate Assessments.

10. ESTABLISH A TRANSPARENT AND INDEPENDENT ENFORCEMENT SYSTEM

SWAN calls for the establishment and operation of a transparent and effective independent enforcement system for ensuring consequences of non-compliance with regulations for the aquaculture industry (such as fines, revoking of licences, or ceasing of operations for repeated infractions).

APPENDIX I: Legal Analysis

Submission Relating to Aquaculture Licensing, setting out the licensing system and related legislation, identifying relevant issues, and advising on potential remedies.

Alan Doyle BL

Introduction

1. This legal submission is provided to the Sustainable Water Network (SWAN) to provide the following:
   - An overview of current relevant EU and Irish legislation and guidance governing aquaculture with a focus on the relevant provisions in the WFD and MSFD
   - A critical analysis of the legislative provisions governing aquaculture, primarily in the context of the meeting of WFD and MSFD requirements, but also, secondly, N2000.
   - Identification of relevant legislative and planning instruments and respective competent authorities and responsible government departments.
   - Identification of overlaps, interactions and gaps between these.
   - An assessment of the effectiveness of the current legislative, policy and planning regime for controlling impacts from aquaculture on the aquatic environment and meeting WFD and MSFD targets, including strengths and weaknesses, and an assessment of its implementation and enforcement.
   - Recommendations on addressing the gaps / weaknesses identified above.
2. This is a large area to cover, and this submission provides a brief analysis only. It is not to be relied upon as a substitute for legal advice in respect of any individual case. Any or all views offered below are contingent and may not apply to any particular factual situation.

Current EU and Irish Legislation and Guidance Governing Aquaculture

Fisheries (Amendment) Act 1997

3. Aquaculture is regulated by the Fisheries (Amendment) Act 1997. No person is entitled to carry out aquaculture without a licence (S6).
4. The Minister for Agriculture, Food and the Marine is the licensing authority. Application for a licence is made to the Minister, who can grant or refuse a licence. The Minister's decision can be appealed to the Aquaculture Licence Appeals Board.

It is not unknown for the processing of an application and appeal to take over 10 years before a decision is taken.

5. Aquaculture is defined in S2 of the 1997 Act as, "the culture or farming of any species of fish, aquatic invertebrate animal of whatever habitat or aquatic plant, or any aquatic form of food suitable for the nutrition of fish." Thus, fish, shellfish and seaweed farming all require a licence.

Regulations

6. The 1997 Act must be read together with its implementing Regulations, adopted by the Minister. (Regulations are delegated legislation, adopted by a Minister, to give effect to an Act. They are identified by a reference number and year.) There are many Regulations adopted pursuant to the 1997 Act, including:
    - 6.1. The Aquaculture Licence (Application) Regulations 1998, SI No. 236 of 1998;
    - 6.2. The Aquaculture (Licence Application) (Amendment) Regulations 2001, SI No. 145 of 2001;
    - 6.3. The Aquaculture (Licence Application) (Amendment) Regulations 2006, SI No. 197 of 2006;
    - 6.4. The Aquaculture (Licence Application) (Amendment) Regulations 2010, SI No. 280 of 2001;
    - 6.5. The Aquaculture (Licence Application) (Amendment) (No. 2) Regulations 2010, SI No. 369 of 2010;
    - 6.6. The Aquaculture (Licence Application) (Amendment) Regulations 2001, SI No. 145 of 2001;
    - 6.7. The Aquaculture (Licence Application) (Amendment) Regulations 2012, SI No. 301 of 2012;
    - 6.8. The European Union (Environmental Impact Assessment) (Aquaculture) Regulations 2012, SI No. 410 of 2012;
    - 6.9. The Aquaculture Appeals (Environmental Impact Assessment) Regulations 2012, SI No. 468 of 2012
    - 6.10. The Aquaculture (Licence Application) (Amendment) Regulations 2016, SI No. 464 of 2016;
    - 6.11. The Aquaculture (Licence Application) (Amendment) Regulations 2018, SI No. 240 of 2018;
    - 6.12. The Aquaculture Appeals (Environmental Impact Assessment) (Amendment) Regulations 2019, SI No. 276 of 2019;

6.13. The European Union (Aquaculture Appeals) (Environmental Impact Assessment) Regulations 2019, SI No. 341 of 2019.

Making Submissions

7. There is a public right to make submissions on the licence application, but the public notification requirements are very limited (R8 of the 1998 Licensing Regulations). They require a newspaper notice of the application, but it is often published in a local paper with very limited circulation in the area. The application file has to be available for inspection, and the Minister normally directs the applicant to make it available in the local garda station, but this may sometimes be 50km away, and the local gardai are likely to be unfamiliar with the process. Sometimes the garda station is only open for a few hours a week, and it is unlikely to be a conducive place for inspecting a file, and is unlikely to have photocopying facilities. The application file may also be required to be made available at the applicant's head office, but this may be at the far end of the country. Some application documents may be available on the Department of Agriculture website. At the moment, this is accessed at the site www.gov.ie, navigating to the Department of Agriculture, then navigating to the link called "Department of Agriculture Food and the Marine Divisions", then to "seafood", and then to licences. A direct link to aquaculture licences provides an unsorted list of applications.
8. A submission has to be made within 4 weeks, 8 if the application is subject to an EIA. If an EIA is required, notice of the application has to be on the national EIA portal.

Notifying Prescribed Authorities

9. Certain public authorities have to be notified of licence applications. Failure to notify them is likely to lead to the application being deemed invalid and having to start again.
10. Where an EIA is required, failure to notify an authority "likely to be concerned" is a breach of EU law.

Appeals

11. Anybody can appeal a decision of the Minister. An appeal has to be accompanied by the relevant fee. It has to be lodged with ALAB within 4 weeks of the Minister's decision. It has to contain all the grounds of appeal. It has to state the name and address of the appellant. It has to set out what the appellant's interest is in the matter. If these requirements are not all complied with, the appeal is invalid. There

is no right to enlarge on grounds of appeal later, unless invited to do so by ALAB. But anybody can make a submission on somebody else's appeal (within 4 weeks).

12. A typical "interest" might be as a resident of an area close to where the proposed activity would take place, or as an environmental non-governmental organisation with an interest in aquaculture. A member of the "public concerned" has a right of public participation under the EIA Directive or the Aarhus Convention where an EIA is carried out.
13. Fees for making appeals are set out in the Aquaculture Licensing Appeals (Fees) Regulations 2021 (SI No. 771 of 2021), and may be updated from time to time.

Old Activities

14. Sometimes people are entitled to continue doing something if they were doing it lawfully before the Act was introduced. For instance, a house that had planning permission before the first Planning Acct came into force, in 1964, does not need permission. Sometimes there is a specific provision to make old activities licensable under a new Act, such as in the EPA Act or Waste Management Act. There is no provision specifically addressing existing, ongoing activities, that commenced before the passing of the 1997 Act. It is submitted, however, that the correct interpretation of the legislation is that pre-existing activities need a licence under the Act.
15. Pre-existing activities do exist and may have been authorised by private contract from a landowner who owned fishing rights, perhaps by a royal charter, or perhaps by an oyster bed licence or an oyster fishery order adopted under the Fisheries (Consolidation) Act 1959 and its predecessors. These situations will be rare, and specific legal advice should be sought. Some activities may have a foreshore licence but no aquaculture or fishery authorisation.

Criteria for Grant of Licence

16. In deciding a licence application or appeal, the Minister and ALAB have to consider a list of criteria laid down in S61, including:
    16.1. the suitability of the place or waters at or in which the aquaculture is or is proposed to be carried on for the activity in question,
    16.2. other beneficial uses, existing or potential, of the place or waters concerned,
    16.3. the particular statutory status, if any, (including the provisions of any development plan, within the meaning of the Local Government (Planning and Development) Act, 1963 as amended) of the place or waters,

16.4. the likely effects of the proposed aquaculture, revocation or amendment on the economy of the area in which the aquaculture is or is proposed to be carried on,

16.5. the likely ecological effects of the aquaculture or proposed aquaculture on wild fisheries, natural habitats and flora and fauna,

16.6. the effect or likely effect on the environment generally, in the vicinity of the place or water on or in which that aquaculture is or is proposed to be carried on, on the foreshore, or at any other place,

16.7. whether there is, or would be, a discharge of trade or sewage effluent within the meaning of, and requiring a licence under section 4 of the Local Government (Water Pollution) Act, 1977, and

16.8. the effect or likely effect on the man-made environment of heritage value in the vicinity of the place or waters.

17. The suitability of the waters requires a determination of the present condition of the waters, including: their water quality / status (which refers to their chemical and quantitative status); who else is using them (or wants to use them); and what pressure such use is placing on them. Consideration of the likely ecological effects and the effect on the environment will make all environmental questions and all other environmental legislation and planning permissions relevant. Compliance with the Water Framework Directive and all other water pollution legislation is relevant, and should be factored into the licence determination.

18. An ALAB decision is required to state the main reasons and considerations on which it is based. (S40(7).)

Judicial Review

19. A person who is dissatisfied with a licence decision can challenge it in the High Court by way of Judicial Review. (S73.) The person must either have a "sufficient interest" or be an environmental NGO. A person who appealed, or made a submission on the appeal, will normally have a sufficient interest. A person who did not will have to point to some other interest.

20. The main potential grounds for judicial review are:

20.1. Error of law (if ALAB misinterpreted the applicable legal provisions);

20.2. Failure to consider relevant material, or consideration of irrelevant material;

20.3. Failure to give a party an opportunity to be heard;

20.4. Bias;

20.5. Failure to give adequate reasons;

20.6. Invalidity of a law by reference to the Constitution or to EU law;
20.7. Unreasonableness.

21. In relation to unreasonableness, it is important to understand how limited it is as a cause of action. Judicial review is a review of the decision-making process. It is not a review of whether the decision is right or wrong. ALAB is entitled to be wrong on the facts, provided it does not make any of the errors listed above, unless there was no information before it on foot of which it could have come to the decision it did, and then – but only then – its decision is said to be unreasonable. Showing that there was no information sets a very high bar for judicial review. If they succeed at all, most judicial reviews do so on other grounds.
22. Adequacy of reasons is different from reasonableness. ALAB is entitled to rely on its decision, its technical reports, and all of the file, provided it identifies where the reasons are to be found. Sometimes, however, there are no reasons on a particular, important issue. This is a contentious area at present. Sometimes a claim is dismissed on the basis that there is no need to give micro-specific reasons on every point; at other times it succeeds on the basis that the Board has to engage with the submissions made to it, and that this is an important element of faith in the process.
23. There is in fact very little litigation about aquaculture licences, but many of the judgments from planning law are relevant because the features of the licensing system resemble the planning system.

Other Legislation

24. The criteria in S61 for what ALAB and the Minister have to consider when deciding whether to grant a licence mean that in practice they are required to ensure compliance with a range of other legislation. Relevant provisions of EU law include:
    24.1. The Water Framework Directive, 2000/60,
    24.2. The Marine Strategy Framework Directive,
    24.3. The Marine Spatial Planning Directive,
    24.4. The Habitats Directive (Natura 2000, SAC sites),
    24.5. The Birds Directive 2009/147 (Natura 2000, SPA sites),
    24.6. The EIA Directive 2011/92.
25. Each of these Directives contains provisions against which an application needs to be measured.

The Water Framework Directive, 2000/60,

26. The Water Framework Directive is the keystone protection of all waters in EU law. It applies to lakes, rivers, groundwater, coastal waters and offshore waters – so in

effect all waters. Waterbodies have to be given a status, described generally as high, good, moderate or poor. The EPA is responsible for assigning a status to all waterbodies. Small lakes (<0.5km^2) do not have to be designated. (***C-301/22, Sweetman.***)

27. The most important substantive provision of the Directive is A4, which establishes that water status must not be allowed to deteriorate, and that water bodies must achieve at least good status. (***C-461/13 Weser***.) This applies to all water bodies except heavily modified ones, such as canals or canalised rivers.
28. Water bodies should be divided into river basins and there should be a river basin management plan (RBMP) that sets out a "programme of measures" for achieving that status. Coastal waters are assigned to their nearest RBMP (A3). An RBMP is required under A12 and must address a list of issues set out in Annex VII. A new RBMP was finally adopted in 2024, two years after the deadline for adoption. When making a submission, the objectives of the RBMP should be consulted, first to see if the RBMP complies with Annex VII, then to see if the proposal complies with the RBMP. Submissions should be made in relation to any issues identified under both headings: national authorities are required to take account of, and remedy, the consequences of any breach of European law, so an error in the plan must be fixed in respect of the individual application. This can be quite complex legally.
29. If the RBMP is incapable of meeting the objectives of good status, or incapable of preventing deterioration, the submission should point this out, and additional measures should be called for to ensure that the non-deterioration and good status obligations are met.
30. An issue with maintaining water status is whether an activity becomes unacceptable if it lowers the water status in its immediate vicinity, but leaves the overall status of the water body unaffected, or whether it must lower the status of the water body as a whole before it becomes contrary to the Directive. For instance, where fish are raised in cages, there may be a local deterioration of water quality, but the rest of the water body may be minimally affected. A similar issue arises as to whether a temporary reduction in quality for a part of the year is acceptable if the water body will in overall terms meet the requirements. Neither point has yet been determined by the European Court. Arguably temporary or local deterioration are not permitted, and any such deterioration should be addressed in submissions.
31. Water status is affected by the presence of pollutants in, or discharge of pollutants to, the water. Pollutants are defined to include a list of main pollutants in Annex VII.

32. Much of the heavy work of the Framework Directive is done in its Annexes. A4 of the Directive requires water status to be determined in accordance with Annex 5. For coastal waters (where most aquaculture activities are carried on) Annex 5 sets out the biological quality elements (for phytoplankton, macroalgae, angiosperms, and benthic invertebrate fauna), hydromorphological elements (tide, depth, bottom conditions), and the physico-chemical elements (general conditions and pollutants). Under the Irish implementing law, the EPA is required to come up with a programme for designating waters and for monitoring them. The obligation to devise designation and monitoring systems is in R9 and R10 of the ***European Communities (Water Policy) Regulations 2003***, SI No. 722 of 2003.
33. The EPA made this designation, and presumably established a methodology in accordance with the Directive, but neither the methodology nor the designation appears to be in a formal published document. Anyone wishing to make a submission or appeal should seek a copy of the relevant documents from the EPA, and examine it to see if the designation methodology, or the actual designation, or the monitoring, may be inadequate to comply with the requirements of the Framework Directive, and may be capable of being challenged. If the documents are received too late to make this submission, there may be grounds to challenge the documents and the procedure later (or there may not, if a Court holds that the person seeking to rely on them was aware of the need to obtain them and did not do so.) Ideally, any eNGO interested in making submissions in the future, should seek this documentation immediately, and not wait for a specific application where they are required. Individuals with a local interest are unlikely to seek documents in advance, and may be prejudiced if the methodology is not immediately available.
34. A10 of the Framework Directive requires the State to establish emission controls based on best available techniques, and emission limits, as set out in the Industrial Emissions Directive (2010/75), Urban Waste-water Treatment Directive, 91/271, Nitrates Directive, 91/676, and daughter Directives of the Framework Directive, as well as "any other relevant Community legislation."
35. The State has to establish a programme of measures to achieve the objectives of A4 (non-deterioration, and good status for all water bodies). It has to take account of a characterisation of the water body done under A5. This characterisation should be found in the RBMP, and the RBMP should therefore be examined to see if it meets the requirements of the Directive. There is a fair chance that the RBMP will not meet those requirements, and this may provide a basis for challenge.
36. The programme of measures needs to include basic measures to achieve compliance with A4, A7, A9 and A10, measures to promote efficient and sustainable

water use, controls on abstraction and impoundment of fresh surface water, controls on recharge or augmentation of groundwater bodies, controls on point source discharges of pollutants (which must be reviewed and updated periodically), prior authorisation or registration of diffuse sources of pollution, and prohibition of direct discharges of pollutants to groundwater.

37. The European Communities (Water Policy) Regulations 2003, SI No. 722 of 2003, and the European Communities Environmental Objectives (Surface Waters) Regulations 2009, SI No. 9 of 2009, give effect to the Framework Directive. R5 of the 2009 Regulations requires public authorities to exercise their powers in accordance with the Directive. The public authorities in question are listed in Schedule 2 of the Regulations and include the Minister for Agriculture but not ALAB. Arguably the fact that ALAB is to determine the appeal as if the application had been made to it in the first instance extends the Minister's duty of compliance to ALAB. R3 of the 2003 Regulations applies to all public authorities, and also requires them to act "in a manner which is consistent with the provisions of the Directive and which achieves or promotes compliance with the requirements of the Directive" and to "take such actions as may be appropriate in the context of its functions to secure compliance with the Directive and with the provisions of any river basin management plan made, and any programme of measures established, in accordance with these Regulations". There is no reason why the 2003 Regulations should not apply to the Minister and ALAB. The difficulty with general provisions of this nature, though, is that public authorities tend not to be aware of them, and then, when challenged, to argue that they are, for whatever reason, not affected by the obligation. It would be more satisfactory if there was a specific obligation imposed on the Minister and ALAB to give effect to the provisions of the Framework Directive when deciding licence applications or appeals.
38. Water status and impact on waters are issues which the Minister and ALAB have to take into account under S61 of the 1997 Act.

The Marine Strategy Framework Directive,

39. The Marine Strategy Framework Directive, 2008/56, (MSF) applies to all marine waters. These include coastal waters (insofar as not already regulated by the Framework Directive). Its requirements are therefore cumulative with the Framework Directive.
40. The Directive is a framework Directive (which means it sets a general framework but contemplates that further Directives may be adopted to give detailed effect to specific areas). A1 requires States to achieve or maintain good environmental status

in the marine environment by 2020. It requires the adoption and implementation of strategies to protect and preserve the marine environment, prevent deterioration or, where practicable, restore adversely affected marine ecosystems. It requires measures to prevent and reduce inputs in the marine environment, with a view to phasing out pollution, and to ensuring there are no significant impacts on or risks to marine biodiversity, marine ecosystems, human health or legitimate uses of the sea. It requires marine strategies, applying an ecosystem-based approach to management of human activities, keeping the collective pressure of activities within levels compatible with good environmental status. It requires coherence between, and integration of environmental concerns into, policies and legislative measures impacting the marine environment.

41. The requirement for marine strategies is elaborated on in A5. Each country has to have a marine strategy that contains a plan of action, and the necessary elements of that plan are set out in A5(2). They include: an initial assessment of the current status of marine waters, a determination as to what constitutes good status, the establishment of a series of targets and associated indicators, and the establishment and implementation of a monitoring programme. The programme then requires a programme of measures to achieve or maintain good environmental status.

42. A9 requires adoption of a set of characteristics to determine if water has good status. An "indicative list" of elements is at Annex III. These elements are reasonably specific, and the national characteristics can be considered to see if they meet these requirements. In the Irish implementation of the Directive, the ***European Communities (Marine Strategy Framework) Regulations 2011***, SI No. 249 of 2011, the Minister for Local Government etc requires himself to carry out the initial assessment required, and to determine what criteria constitute good environmental status. This requirement led to a report in 2013 by the Marine Institute entitled "***Ireland's Marine Strategy Framework Directive Article 19 Report, Initial Assessment, GES and Targets and Indicator***s" (so called because it was drawn up to report to the European Commission under A19 of the Directive). The report concluded that the overall quality of the marine environment was good, but that there were knowledge gaps in the assessment.

43. The Directive requires a plan of action to be adopted, and this is now found in the ***National Marine Planning Framework*** (NMPF), adopted in 2021. A person making a submission or appeal should examine whether the proposal complies with the terms of the plan, and whether the plan complies with the requirements of the Directive. If the plan is not adequate, the Minister or ALAB have duties under

EU law to remedy the deficiency insofar as it affects the proposed activity. A8 requires an assessment of the marine environment, and the plan should be measured against this assessment. (The plan itself would be subject to the Strategic Environmental Assessment Directive, 2001/42.)

44. A10 requires the setting of environmental targets, and A11 requires the establishment of monitoring programmes. A13 requires a programme of measures which need to be taken to ensure good environmental status. These should also be located in the NMPF. Any submission or appeal should consider whether the proposed activity complies with the NMPF, but also whether the NMPF complies with the Directive (and indirectly whether the proposed activity does so). If there is an incompatibility, or if the issue is not considered, or if representations are made and not addressed, the ultimate decision may be vulnerable to challenge in judicial review.
45. The Directive is implemented together with the Marine Spatial Planning Directive through the Planning and Development Act 2000 and the Marine Area Planning Act 2021. Aquaculture is exempted development under S4(4A) of the Planning Act, and S281 provides that permission is not required for exempted development in the marine area. The MSF Directive therefore falls to be implemented through the aquaculture licensing process.

The Marine Spatial Planning Directive,

46. The purpose of the Marine Spatial Planning Directive, 2014/89, (MSP) is to promote sustainable development in the marine area, and the growth of maritime economies" (A1).
47. Objectives are set out in more detail in A5. The planning process has to consider economic, social and environmental aspects, support sustainable development and growth in the maritime sector, apply an ecosystem based approach, and promote coexistence of relevant activities and uses. The plan has to address energy, transport, fisheries and aquaculture, the preservation, protection and improvement of the environment, and climate change. Other objectives can be included, for example sustainable tourism and sustainable extraction of raw materials. The State is free to decide what weight to give to different interests.
48. The relationship between the MSF and MSP Directives is that the first sets out the strategy, the overarching goals, while the second sets out the measures required to give effect to the strategy.
49. Minimum requirements for the plan (A6) are to take account of land-sea interactions, economic and social matters, and safety. There has to be coherence

between the maritime spatial planning process and other processes impacting on the marine environment. There are procedural requirements for public participation, and these include use of best available data and inter-State cooperation.

50. This is a spatial planning process, which means it is about what activities should be located where. A8 provides that the spatial plan must, "identify the spatial and temporal distribution of relevant existing and future activities."

51. The State is required to monitor progress and report to the European Commission, and the Commission in turn is required to report to the European Parliament.

Marine Area Planning Act

52. The principal implementation for the MSF and MSP Directives is the Marine Area Planning Act 2021 (MAPA). MAPA replaces the previous legislation and provides a procedure by which the Minister for Housing is required to draw up a Maritime Spatial Plan. Until he does so, the existing plan, which is called the National Marine Planning Framework (NMPF), remains in place. In effect, this plan is intended to give effect to both Directives.

53. S17(2) says the objective of a maritime spatial plan is:

    53.1. to analyse and organise maritime usages in the maritime area for the purpose of achieving ecological, economic and social priorities,

    53.2. to establish a national strategy for the Government in relation to the strategic planning and sustainable maritime usages in the maritime area,

    53.3. to apply an ecosystem based approach for the purpose of supporting proper planning and sustainable maritime usages in the maritime area, and

    53.4. to promote the coexistence of different types of maritime usages in the maritime area.

54. To figure out whether this has been done, it is necessary to analyse the NMPF. Taking the "ecosystem based approach" as a key requirement, the NMPF says its environmental objective is to achieve:

Comprehensive, integrated management of human activities-based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health, diversity and productivity of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and the maintenance of ecosystem integrity.

This objective is derived from the description of the ecosystem approach set out by OSPAR. It will be achieved through specific environmental policies that are aligned to Ireland's achievement and maintenance of Good Environmental Status (GES).

55. The OSPAR Convention's document, Statement on the Ecosystem Approach to the Management of Human Activities "TOWARDS AN ECOSYSTEM APPROACH TO THE MANAGEMENT OF HUMAN ACTIVITIES", known as the Bremen Statement, provides a definition of what is meant by the ecosystem approach. It says:
    - "4. All the components of an ecosystem, including the human component, function together and interact to form an integrated network. Ensuring the integrity of the ecosystems, thereby restoring when practicable and/or maintaining their characteristic structure and functioning, productivity and biological diversity, requires a long-term integrated management of human activities, explicitly:
        - managing human activities in order to respect the capacity of ecosystems to fulfil human needs sustainably;
        - recognising the values of ecosystems, both in their continuing unimpaired functioning and specifically in meeting those human needs;
        - preserving or increasing their capacity to produce the desired benefits in the future.
    - 5. The ecosystem approach can therefore be defined as "the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity". The application of the precautionary principle is equally a central part of the ecosystem approach1."
56. The key phrase here appears to be, "continuing unimpaired functioning". The reference to the precautionary principle means that action should be taken to avoid not just impairment, but actions that create a risk of impairment. The approach should be a long term one, and should preserve or increase ecosystem capacity to fulfil human needs. This is a situation where European Court caselaw on the meaning of a precautionary approach should be relevant, and applying this across from the Habitats Directive, it is submitted that a risk of impairment exists where there is a risk of such impairment which cannot be ruled out beyond reasonable scientific doubt on the basis of objective evidence. Preserving ecosystem capacity on a precautionary basis is a key concept of the MSF Directive.

57. The key difficulty with the NMPF is that it gives no indication of what is appropriate in what places. Anything can be authorised anywhere, so long as it either avoids, minimises or mitigates significant adverse effects. This conceptual vagueness can be seen at work in the biodiversity policies in the plan. Biodiversity Policy 1 (p32) is that:

Proposals incorporating features that enhance or facilitate species adaptation or migration, or natural native habitat connectivity will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this NMPF. Proposals that may have significant adverse impacts on species adaptation or migration, or on natural native habitat connectivity must demonstrate that they will, in order of preference and in accordance with legal requirements:

- avoid,
- minimise, or
- mitigate

significant adverse impacts on species adaptation or migration, or on natural native habitat connectivity.

58. In other words, anything can be allowed, even if it will have significant effects so long as these effects are minimised or mitigated. It is submitted that this is not in accordance with the requirement of "unimpaired functioning" on a precautionary basis.

59. The NMPF sets out policies for aquaculture. The opening sentence of Chapter 9 aims to "support a diverse, compliant, growing" aquaculture sector. The "growing" element is clearly a point of concern since growth tends to give rise to impairment. The NMPF also "identifie[s] the elimination of the licensing backlog as the overriding priority in the reform of the licensing system." Interaction between aquaculture and other activities (relating to wild salmon and migratory fish, inshore fisheries, recreation, tourism, eutrophication and climate change) is noted as a concern. The NMPF notes that there are environmental capacity issues:

The carrying capacity of bays in relation to commercially farmed species places limits on aquaculture in terms of adequate site selection and areas having sufficient nutrients to support the cultivation of shellfish, seaweed, et cetera. Carrying Capacity studies can determine in a technical and scientific manner whether existing and proposed aquaculture activity is likely to have a detrimental effect on overall farmed fish growth due, for example, to a reduction in water flow or a reduction in plankton for the fish.

60. The NMPF proposes to address these problems through the licensing system, EIA, appropriate assessment, an ecosystem based approach, taking account of impacts on good environmental status descriptors in the MSF Directive, consideration of wider biodiversity interests (defined as heritage, seascapes, visual – though it is unclear how these relate to biodiversity), and use of best industry practices.
61. This is as close as the NMPF gets to identifying limits on what can be authorised.
62. It is submitted that there is a binding legal rule here which must be respected. The European Community is a party to the OSPAR Convention under Decision 98/249/EC, and this means that EU law has to be interpreted in accordance with that Convention. (See by analogy, ***Case C-240/09 Lesoochranarske***, which holds that this is so for the Aarhus Convention.) The precautionary principle is a fundamental part of EU Environmental law under A191 of the Treaty on Functioning of the EU. It has been addressed in the Habitats Directive and the EIA Directive, using the concept of reasonable scientific doubt. In ***Case C-127/02 Waddenzee*** the European Court held that a project must be refused permission unless it is established beyond reasonable scientific doubt that it will not do so. By analogy, when the MSF Directive requires the adoption of an "ecosystem based" approach, that is a system based on the principles that there must be "continuing unimpaired functioning" of ecosystems on a precautionary basis, and this creates a legal requirement for the proponent of a development to prove beyond reasonable scientific doubt that it will not impair the performance of ecosystems. A person wishing to challenge a proposal will then need to put scientific evidence before the tribunal that shows there is a real risk that the functioning of an ecosystem will be impaired.
63. MAPA attempts to insulate the NMPF from legal challenge to its validity. S33A (inserted by the 2022 Planning Act) provides that the validity of the plan can only be questioned by way of application for judicial review brought within 8 weeks of the date on which the plan was adopted. Given that the plan has already been adopted for more than that time, the current plan cannot be challenged. However, S17 requires the Minister to review the plan every 6 years and then to decide whether to replace it. If he decides not to replace it, he shall publish a notice to that effect "as soon as is practicable after making that decision." There is, on the face of it, no obligation to make the decision. Therefore the Minister could in theory begin a review and it could sit, undecided, for as long as the Minister liked. Or he could leave the existing plan in place so that it could not be reviewed.
64. Either approach would, however, appear to infringe the MSF Directive. The Directive requires updating of the plan every 6 years, and this process *does* have to be

finished. It creates an obligation to do what is required to complete the review and amend the plan if necessary. Thus, if something in the plan is identified that is illegal, or that otherwise needs review, the Minister can – it is submitted – be called on to begin the review process (if he has not), and to take a final decision on the matter (which will then be open to challenge). If the Minister will not begin or finish a review, an action of "mandamus" should be available to force him to comply with his obligations under EU law.

Foreshore Act

65. An aquaculture activity is exempted development and therefore, apparently, does not require a Marine Area Consent (MAC) under MAPA. S75 of MAPA says a MAC is required "*where development permission is required for a proposed maritime usage in a part of the maritime area*" and development permission is defined in S2 as any permission required under the Planning Act. Since no permission is required, it seems that no MAC is required. But a foreshore licence is still required under the Foreshore Act 1933.
66. MAPA changes the Foreshore Act and gives responsibility for granting foreshore licences to the Marine Area Regulatory Authority, MARA. S175 of MAPA inserts a new S1E into the 1933 Act to achieve this. It provides that the Minister shall not exercise certain functions, including the power to grant foreshore leases and licences, once MARA comes into being, and that any reference to the Minister in the Act is to be read as a reference to MARA. That appears to make MARA the consent authority.
67. Hence, a person seeking an aquaculture licence continues to need a foreshore licence as well, and the manner in which the licence is granted remains the same.

Habitats Directive (Natura 2000, SAC sites),

68. The Habitats Directive creates a network of protected special areas of conservation (SACs) around the country. Where development is proposed that would be "likely to have a significant effect" on an SAC, it must be subject to an appropriate assessment (AA). AA must be carried out unless "significant effects" can be ruled out on the basis of objective evidence. After an AA is carried out, permission must be refused if the proposed project will adversely affect the integrity of the SAC. Having regard to the precautionary principle, an adverse effect on integrity arises if such an effect cannot be ruled out beyond reasonable scientific doubt. (***Case C-127/02, Waddenzee***.) An AA must contain complete, precise and definitive findings capable of removing all reasonable scientific doubt as to the absence of

effects. (***Case C-258/11, Sweetman***.) A project may be authorised notwithstanding a finding that it will have adverse effect on the integrity of an SAC, if it is required by "Imperative Reasons of Overriding Public Importance", but such situations do not often arise in practice.

69. The State argues that loss of up to 15% of the surface area of an SAC does not have an adverse effect on the integrity of the site. This supposed rule originated with an early European Commission reporting document which said that, if more than 15% was lost, the effect *should* be considered to be significant. This has been reversed to form the basis for an argument that a loss of less than 15% is not significant. It is submitted that there is no basis for this conclusion in the Commission's document. The idea that there might be an acceptable threshold of loss originated before ***Case C-258/11 Sweetman*** where the European Court held that permanent loss of 2% of a protected area of limestone pavement was considered to be an adverse effect. Factual situations differ. The pavement in Sweetman was a priority habitat, and once lost could never be replaced, but there is simply no basis for any suggestion that there is a threshold below which habitat loss is deemed acceptable, much less one set as high as 15%.

70. A similar argument is made that bird populations naturally rise and fall, and that a loss of 25% is not a cause for concern. This may be the case in fact for a short term trend, but it appears incompatible with the basis of the legislation which requires that populations of protected species should be at "favourable conservation status", which means that their numbers should be stable or increasing. Falling numbers should always be a cause for concern unless it is established beyond reasonable scientific doubt that the trend is only a short term one.

71. The Habitats Directive is very powerful, but any person seeking to engage it properly should put a strong scientific argument to the decision maker and engage a relevant scientific expert to support any resulting court challenge.

72. Projects that were carried out without AA where it should have been required must, in principle, be examined to see if they are causing deterioration of an SAC. If they are, those effects must be remedied, and it may be necessary for the activity to be terminated if the effects cannot be eliminated. (***Cases C-399/14 Grune Liga Sachsen, C278/21 Aqua Pri***.) In practice, cases seeking to raise this obligation before the Irish courts have tended not to succeed (eg ***Krikke***, [2022] IESC 41, ***Carrownagowan***, [2024] IEHC 300).

73. An issue which can arise under the Habitats Directive is how to secure enforcement. There is no private enforcement mechanism in the Habitats Regulations, SI No. 477 of 2011, and all the enforcement powers rest with the Minister. The choice,

therefore, is between seeking to compel the Minister to exercise his powers, by way of mandamus, or to insist that one has a write to seek injunctive relief directly against a polluter, pursuant to a combination of the Judicature Acts, which provide a general basis for injunctive relief in Irish law, and the Aarhus Convention, or perhaps A47 of the Charter on Fundamental Rights of the EU, both of which give a right to an effective remedy subject to certain restrictions. Use of the Judicature Acts has not been tested in this context. A47 of the Charter arguably provides a stand alone right of action.

Birds Directive 2009/147 (Natura 2000, SPA sites)

74. The Birds Directive creates a network of special protection areas (SPAs) for birds, and these are now protected under the Habitats Directive and the same rules apply to them as to SACs: projects must be refused permission if they will have an adverse effect on the integrity of the site.

75. In addition to the protection of SPAs, the Birds Directive provides some additional protection for species located outside SPA boundaries. A3 requires the State to, "take the requisite measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of birds referred to in Article 1," and this "shall include primarily the following measures", namely the protection of SPAs, the "re-establishment of destroyed biotopes" and "creation of biotopes."

76. Outside SPA sites, A4(4) requires the State to "strive to avoid pollution or deterioration of habitats". This arguably creates an obligation to take steps, for instance, to prevent development of areas that are used by bird species subject to an exception for unavoidable loss: if a competent authority granting authorisation for a project (such as a licence or planning permission or maritime area consent) does not make a determination either that there will be no pollution or deterioration of habitats, or that pollution or deterioration cannot be avoided, it is arguably failing to exercise its powers in accordance with the Birds Directive. However, this Article has not yet been deployed in this way, and one would expect pushback against this interpretation from the consent authority.

77. A5 of the Birds Directive requires the State to, "establish a general system of protection for all species of" wild birds, prohibiting
    77.1. deliberate killing or capture,
    77.2. deliberate destruction of, or damage to, nests and eggs,
    77.3. taking of eggs in the wild,
    77.4. deliberate disturbance of birds (particularly during the period of breeding and rearing, but not limited to that period) insofar as the

disturbance would be significant having regard to the objectives of the Directive, and

77.5. keeping birds of species whose hunting or capture is prohibited.

78. R53 of the European Communities (Birds and Natural Habitats) Regulations 2011 appears to be considered to implement this provision, but it is questionable whether it does so adequately, because it only applies to hunting, capture or killing. It does not apply to deliberate destruction of or damage to nests, etc, and it does not appear to set up a "general system of protection". Accordingly, there may be a question mark over whether A5 has been adequately implemented in Ireland.

EIA Directive 2011/92.

79. The EIA Directive is procedural in scope: it creates a procedure for carrying out assessment of proposed projects, but does not say what the outcome of the assessment must be. A project may be authorised, even if its environmental impacts will be horrendous, so long as they are identified in the assessment. The Directive applies to projects of particular categories of activity listed in 2 annexes. Where one of these projects is likely to have significant effects on the environment, it must be subject to EIA. The categories of project include "intensive aquaculture". This leads to the bizarre argument that cultivation of shellfish is not covered because it is "extensive" rather than "intensive." This argument appears to be that, because the shellfish will not be contained within a pen or building, their farming is not intensive and therefore cannot require EIA. This distinction seems highly questionable: the European Court has considered whether the rearing of sheep on hillsides may amount to intensive agriculture (Case C-392/96 Commission v Ireland), and though it did not hold that it was, because it decided the case on other grounds, it also seemed to have no objection to the concept that this was extensive agriculture. Shellfish farming is certainly a project, following ***Case C-127/02 Waddenzee*** and it is submitted that the concentration of a large number of shellfish in a smaller area than they would naturally be found in is sufficient to make the project one for "intensive" cultivation.

80. The original importance of the EIA Directive is that it provides a right of public participation, requires the application to be assessed in a particular way, and also requires consideration of all other relevant Directives, including the various Directives cited above. (However, Irish law has to date been reasonably good at providing a right to make submissions and appeals. If those rights were to be truncated, however, they might still exist and be invocable under the EIA Directive.) The right of public participation originates in the Aarhus Convention and has since

2009 been held to apply to all EU Directives, but where an EIA is required, it is the vehicle for carrying out an assessment (***Case C-240/09 Lesoochranarske***).

Practical Steps in Making a Submission or Appeal

81. Most applications are supported by scientific reports. These are usually carefully crafted to say as much as can be said in support of the application without actually saying something incorrect, and one suspects that economy with the truth is an important aspect of the drafting. However, this cannot be identified without engaging a corresponding expert to review the documentation and identify any suspect claims. In principle it is the decision maker who should engage the expertise, but most Irish authorities are understaffed and the practice tends to be for the application to be reviewed by somebody with a general qualification in environmental or planning matters, rather than by a range of experts with the expertise to analyse developer submissions critically. Deployment of inadequate expertise represents a non-compliance with the EIA Directive, but is difficult to prove.
82. When seeking to argue that an application should not be granted because it does not meet a particular legal or factual standard, first identify the standard. Where is it set out? Give the document, paragraph and page number. Why is this standard binding? Is it a piece of legislation that makes compliance with it imperative? Does it represent best practice? Why? Quote the relevant phrase from the legislation or the relevant technical documents. Then identify the key phrase in the standard that is not met, and explain why it is not met. For instance, if opposing a proposal on the basis that it would damage an ecosystem, set out the following:
    82.1. that the MSF Directive requires application of an ecosystem based approach;
    82.2. that S17 of MAPA requires that the NMPF must set an ecosystem based approach;
    82.3. that approval of any project must be in accordance with that ecosystem based approach;
    82.4. that an ecosystem based approach is defined in the OSPAR Bremen Statement as one that requires continuing unimpaired functioning of ecosystems through application of the precautionary principle in order to preserve or increase ecosystem capacity to fulfil human needs;
    82.5. that the EU is a party to the OSPAR Convention by virtue of Decision 98/249/EC;

82.6. that the Convention is an integral part of the Union's legal order, and EU law has to be interpreted in accordance with the Convention;

82.7. that Irish law and the NMPF have to be interpreted in accordance with the Directive;

82.8. that it has not been established beyond reasonable scientific doubt that the proposed project will not impair the functioning of [eg] the benthic flora and fauna on the seabed beneath the proposed project;

82.9. that there is legitimate and significant concern that the project may impair that functioning, based on some quoted scientific publication or better still expert report commissioned by the person making the submission, and attached to it; and that as a result a licence should be refused.

83. Overall, one is trying to stitch together a watertight argument that will make it difficult for the decision maker to avoid finding in one's favour.

Recommendations for Amending Legislation

84. To avoid confusion, it would be beneficial to amend S1 of the Fisheries Act 1997 to add a subsection stating that the purpose of the Act includes giving effect to the Water Framework, Marine Framework Strategy, Marine Area Planning, Habits and EIA Directives. There is a similar provision at the start of the Planning Act. S61 should be amended to require the Minister and ALAB to have regard to, and comply with, the requirements of those Directives when determining a licence application or appeal: at the moment, that obligation resides in the NMPF and there is a risk that the decision maker may not be aware that it has to be made effective through the decisions based on the plan. Legislation should also expressly require decision maker not only to have regard to, but to comply with, the NMPF, to make a determination in relation to water status, to adopt an ecosystem based approach, etc. It should be an express function of MARA to ensure that any proposed activity to which it grants authorisation is consistent with the MSF Directive, the MSP Directive, and the ecosystem based approach. There should be no exception to this requirement – for instance, at present S20 allows for the preparation of a "designated maritime area plan" subordinate to the NMPF, and S23 provides that a departure from the NMPF may be permitted. However, such a departure would only comply with the MSF Directive if it respected the ecosystem based approach.

85. The manner of appointment of members to ALAB from panels nominated by different industry sectors tends to create an inbuilt leaning towards the grant of permission. A more neutral appointment system would be beneficial. (That said, in

Salmon Watch v ALAB, the Court rejected an argument that the system creates a structural bias in favour of the grant of licences. Also, this argument was put forward some years ago when the Minister was considering amendments to the aquaculture licensing regime, and was not accepted.)

86. The definition of what is meant by an ecosystem based approach should be transposed from the Bremen Declaration into legislation, so as to make clear what the approach entails. (Having said this, there has to be a strong suspicion that its omission was deliberate, and that there may be limited interest in making it a binding feature of the approval system. One suspects the only way to achieve this change will be through litigation.)

87. Chapter 8a of Part 2 of MAPA, which limits court challenges to the NMPF is considered to be likely to contravene European law and should be removed. However, it was only inserted in the past year and is a clear policy choice based on similar provisions in the Planning Act which were further tightened in the new 2024 Planning Act. It is therefore considered that this is a position that would have to be established in Court, and that any change at the legislative level is more likely to further restrict the opportunities for challenge, than to liberalise them.

88. The manner in which environmental quality standards are set pursuant to the Water Framework Directive is a cause for concern. R19 of the European Communities (Control of Dangerous Substances in Aquaculture) Regulations 2008 provides that the Minister may establish water quality standards in respect of a particular substance or class of substances used in aquaculture in respect of an area that is the subject of an aquaculture licence, or adjacent to an area that is the subject of an aquaculture licence. There is no requirement to adopt these standards by way of regulation, or to publish them, so there is a lack of visibility as to what standards exist. This can mean that submissions that could be made, in relation to potential use of substances and breach of standards, are not made. The Regulations should be amended to provide that the Minister can adopt regulations for this purpose, or they should simply be adopted as regulations. This would mean they would be published properly and readily available for scrutiny.

89. The publication of notice of aquaculture applications is quite old fashioned, with applications being published in a local newspaper and made available for inspection at a local garda station. See section on making submissions above. Though this is partly remedied for EIA applications because all EIA applications have to be notified on the national EIA portal, this does not address applications which are not accompanied by an EIA.

90. There is no requirement to publish monitoring results. Whilst these can be accessed by Access to Information on the Environment request, the lack of publication means people are not made aware if a licensed activity is non-compliant. A7 of the Access to Information on the Environment Directive requires active dissemination of environmental information, not merely passive retention of it.
91. The criteria for determining water status, and monitoring it, are not well publicised, and the author has been unable to locate them on the EPA's website. It is thus difficult to determine how the EPA determines whether a water body complies with required standards, or what would need to happen to make it non-compliant. For instance, how often is a water body monitored, and in how many places? And how many results must be non-compliant before the Agency determines that the water does not meet the required status? This information should be made available in a readily accessible and comprehensible format.
92. At present, any discharge from a licensed aquaculture facility constitutes a discharge of trade effluent contrary to S3 of the Local Government (Water Pollution) Act 1977. There is no exception from this prohibition for aquaculture activities. Thus in theory every aquaculture activity is a crime under the 1977 Act, clearly not an intended consequence of the legislation.

Effectiveness of Current Regime

93. Plans in the marine area, as in others, tend to amount to broad statements of policy, but do not define what objective is sought and what measures will be taken to obtain it, or what the constraints are, save perhaps in the broadest terms. Applications for licences or permissions tend to contain sweeping assurances that problems will not arise, rather than data from which conclusions may be reached. Decision makers then tend to rely excessively on the application documents, because they do not have the specialised expertise to interrogate what has been said; and the resulting decision tends to be little more than rubber stamping the application and dismiss the public submissions, without really engaging with them. The system of judicial review then allows the decision maker a large margin of appreciation within which it can act. Overall, this tends to lead to poor interrogation of applications, and a failure to identify improvements that could be made, or problems that will arise.
94. The best way for the public to address these issues is to raise them in submission and appeal, one case at a time. It is important to have, if possible, scientific expertise to support the arguments made – preferably a written report from a person who is a true expert in a particular area, relating to the actual application; but if this is not

available, then peer reviewed scientific publications making the points of concern in a general way, coupled to a non-expert argument based on those publications may sometimes work. If expert evidence is not available, a court challenge may fail.

95. The best way for the State to address the weaknesses in the system would, it is submitted, be to designate a national body to carry out EIA, and to require the developer to cover the cost of the expertise deployed, so that the increased cost of an effective system would be borne by the person seeking permission – an application of the polluter pays principle. A second best approach would be to have experts from private industry, appointed to a panel from which expertise could be drawn down as and when required to assess applications or appeals. Again, cost would have to be borne by the developer or person seeking the licence.
96. At a less systemic level, a recurring issue is that of treating shellfish activities as "extensive" rather than "intensive" and therefore as exempt from EIA, discussed above. This is believed to be a false distinction.
97. The 15% threshold of permissible loss of SPA / SAC area has no legal basis and is considered to be contrary to European Court case law. It should not be persisted with.

Limitation of Liability

98. This submission is intended as a general outline of legislation and issues, and should not be relied upon by any person in relation to any particular application, appeal or procedure. In all specific cases it is essential to obtain independent, case-specific legal advice. No responsibility is accepted for any loss arising as a result of reliance by any person on this document.

LEGAL RECOMMENDATIONS

1. S1 of the Fisheries Act should be amended to add a subsection stating that the purpose of the Act includes giving effect to the Water Framework, Marine Framework Strategy, Marine Area Planning, Habits and EIA Directives. S61 should be amended to require the Minister and ALAB to have regard to, and comply with, the requirements of those Directives when determining a licence application or appeal. It should also require them to have regard to, and comply with, the NMPF, to make a determination in relation to water status, to adopt an ecosystem-based approach, etc.
2. SWAN calls for reform of the process of appointing members to the Aquaculture Licence Appeals Board membership to ensure an equitable balance of environmental and industrial interests.
3. The definition of what is meant by an ecosystem-based approach should be transposed from the Bremen Declaration into marine legislation, so as to make clear what the approach entails.
4. Chapter 8a of Part 2 of MAPA, which limits court challenges to the NMPF is considered to contravene European law and should be removed.
5. SWAN calls for modernisation of the publication of notice of applications, with an accessible online portal, to be enshrined in law in addition to applications being published in local newspapers and made available for inspection at local garda stations. Notices should be put online 3 days from date of lodgement of application.
6. SWAN calls for a requirement to publish monitoring results (for example but not limited to number of fish escapees and pesticide use) from individual aquaculture operators so that the public can be made aware if a licensed activity is non-compliant. Access to underlying data should be made easily available without having to resort to Access to Information on the Environment. A7 of the Access to Information on the Environment Directive requires active dissemination of environmental information, not merely passive retention of it.
7. Review the WFD monitoring programme, in particular the adequacy of monitoring points location, number, and frequency, with public participation. Monitoring information should be made available in a timely, readily accessible and comprehensible format.
8. Adopt water quality standards under R19 of 2008 Regulations by (published) Statutory Instrument, after prior public consultation.
9. SWAN does not support aquaculture farms being allowed to continue operations without a licence (allowing unregulated aquaculture activity) and calls for a repeal of Section 19A(4) of the Fisheries (Amendment) Act.

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