Appropriate Assessment Report of Extensive Aquaculture in Dundalk Bay SAC [Site Code: 000455] and Dundalk Bay SPA [Site Code: 004026]

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1.Introduction

This is a report supporting the Appropriate Assessment of extensive aquaculture operations in Dundalk Bay SAC [Site Code: 000455] and Dundalk Bay SPA [Site Code: 004026], Co. Louth. It details the Natura Impact Statement and subsequent Appropriate Assessment and follows from a Screening exercise carried out and reported by the Marine Institute[1].

Extensive aquaculture is defined in Regulation 3(iii) of the Aquaculture (Licence Applications) (Amendment) Regulations 2018[2] as "*aquaculture activities where there is no external supply of feed and the culture depends entirely on natural processes for production and supply of feed*". Shellfish (molluscs, echinoderms, bivalves and gastropods) and seaweed aquaculture fall within this definition, finfish aquaculture does not.

This report is to consider if the proposed activities are likely to adversely affect the Qualifying Interests (QIs) of Natura 2000 sites in view of their Conservation Objectives (COs), and any adjacent sites, individually or in combination with existing or planned activities. This is achieved following the assessment process outlined in this document. This Stage 2 of the Appropriate Assessment process considers the impacts on the integrity of the Natura 2000 site with respect to the sites conservation objectives and is considered on a cumulative basis with other activities and other potentially disturbing activities.

1.1 Legislative Context

Articles 3 - 16 of the European Community (EC) Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the Habitats Directive[3]) provide the legislative means to protect habitats and species of Community interest through the conservation of an EU-wide network of protected sites, known as Natura 2000 sites[4].

The Habitats Directive was originally transposed into Irish law by the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997). The 1997 Regulations were subsequently replaced by the *European Communities (Birds and Natural Habitats) Regulations 2011*[5], as amended (referred to as the *2011 Birds and Natural Habitats Regulations*). Natura 2000 sites are referred to as European sites in these Regulations. The terms Natura 2000 sites and European sites are synonymous - the term Natura 2000 sites is used in this report. Natura 2000 sites in Ireland form part of the Natura 2000 European network of protected sites and include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

SACs are designated due to their significant ecological importance for habitats and for species protected under Annex I and Annex II respectively of the Habitats Directive. SPAs are designated for the protection of populations and habitats of bird species protected under the Birds Directive, EC 79/409/EEC[6]. The specific named habitats and/or (non-bird) species for which an SAC or SPA are selected are called the Qualifying Interests (QI), of the site. The specific named bird species

1 Report supporting Appropriate Assessment Screening of Extensive Aquaculture in Dundalk Bay SAC and SPA. Marine Institute. 2024.

2 Aquaculture (Licence Application) (Amendment) Regulations 2018 (S.I. No. 240 of 2018)

3 The Habitats Directive https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

4 Natura 2000 https://ec.europa.eu/environment/nature/natura2000/index_en.htm

5 European Communities (Birds and Natural Habitats) Regulations 2011 NPWS Link

6 The Birds Directive https://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm

for which a SPA is selected is called the 'Special Conservation Interests' (SCI). However, in practice, the common terminology of QI applies also to SCI. The term QI is used throughout this report.

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

DAFM is the aquaculture licensing authority under the *Fisheries (Amendment) Act (1997)*[7] and has responsibility for foreshore licensing functions in respect of activities wholly or primarily for the use, development or support of aquaculture under the Foreshore Act (1933)[8]. They determine applications for new, review or renewal of, aquaculture and foreshore licences. They are also the competent authority responsible for undertaking AA of aquaculture licence applications. As part of the licensing process DAFM must determine if the proposed aquaculture activities, individually or in-combination with other activities, are likely to significantly impact the Conservation Status of QIs and the integrity of the Natura 2000 site. DAFM must base its determination on an AA and is also responsible for ensuring that an AA is carried out.

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

This report supporting the AA, informs Stage 2 of the assessment process – the Natura impact statement.

1.2 Appropriate Assessment (AA) Process

The requirement for an AA derives directly from Article 6(3), which outlines the decision-making tests for considering plans and projects that may have a significant effect on a Natura 2000 site. No definition of the content or scope of AA is given in the Habitats Directive, but the concept and the requirement for an AA derives directly from Article 6(3), which outlines the decision-making tests for considering plans and projects that may have a significant effect on a Natura 2000 site. No definition of the content or scope of AA is given in the Habitats Directive, but the concept and approach are set out in EC guidance[9].

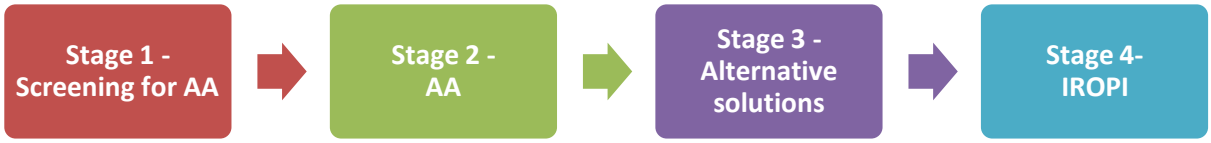
[7] Fisheries (Amendment) Act, 1997 Lawreform.ie

[8] Foreshore Act 1933 Revised Acts (lawreform.ie)

[9] EC. 2018. Guidance on Aquaculture and Natura 2000 Sustainable aquaculture activities in the context of the Natura 2000 Network Link

The *Guidance on Appropriate Assessment of Plans and Projects in Ireland* document[10] published by the Department of Environment, Heritage and Local Government (DEHLG) in 2009, sets out how an AA of plans or proposals in Natura 2000 sites in Ireland should be carried out in alignment with EC guidance. In 2021, the Office of the Planning Regulator (OPR) published a practice note on AA Screening[11], which provides guidance on how a planning authority should screen an application for planning permission for AA.

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



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

1.2.1 Stage 1: Appropriate Assessment Screening

Stage 1 AA Screening is the process that addresses and records the reasoning and conclusions in relation to whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of the site's COs. If the effects, on the basis of objective information, are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to *Stage 2 Appropriate Assessment*. Screening should be undertaken without the inclusion of mitigation. The triggers during Appropriate Assessment screening are based on the '*likelihood'* of a potential significant effect occurring and not on certainty. This test is based on the precautionary principle[12]. A high degree of evidence and justification is needed in circumstances when the process ends at screening stage on grounds of no likely significant effect.

1.2.2 Stage 2: Appropriate Assessment

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

The sensitivity of identified QIs in relation to the proposed activities is assessed and the significance of any identified adverse effects is the then determined. If adverse effects are

[10] DEHLG, 2009. Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Link

11 OPR - Office of Planning Regulator. 2021. Appropriate Assessment Screening for Development Management. March 2021. 43pp Link

12 OPR - Office of Planning Regulator (2021). Appropriate Assessment Screening for Development Management. March 2021. 43pp Link

determined to be likely, then their scale, magnitude, intensity, and duration are considered in light of the COs and relevant guidance documents. If the assessment is negative, then recommendations on mitigation measures or on licensing decisions will be made.

1.3 Data sources

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

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

- The Aquaculture Applications
- DAFM Aquaculture & Foreshore Management website
- DAFM - Aquaculture viewer
- National Parks & Wildlife (NPWS) protected site, marine habitats and community type information
- NPWS Guidance documents
- BIM profiling report[13]
- Targeted scientific studies
- Primary research literature
- Grey literature, reviews and report documents
- Expert opinion
- Direct queries to applicants through DAFM
- Fisheries (Amendment) Act 1997
- Aquaculture (Licence Application) Regulations, 1998
- Aquaculture (Licence Application) (Amendment) Regulations 2018
- Ireland's Marine Atlas
- MI/BIM Inshore fishing reports
- DHLGH Foreshore licencing database
- EPA GeoHive
- EPA maps tool
- NPWS Status of EU Protected Habitats and Species in Ireland – Article 17 (Habitats & species
- EU Commission assessments of bird's population status and trends web tool
- Marine Life Information Network
- EPA Catchments.ie dashboard
- Ordnance Survey of Ireland (OSI)
- National Biodiversity Data Centre
- European Environmental Agency
- OPR, 2021. Appropriate Assessment Screening for Development Management. March 2021; Office of Planning Regulator.

[13] BIM, 2022. Appropriate Assessment Profile – Dundalk Bay, Co Louth. (2022 - unpublished report)

- DEHLG, 2009. Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. NPWS, 2009 – updated in 2010 with reference to Natura Impact Statement.
- Möckel, S., 2017. The European ecological network "Natura 2000" and the Appropriate Assessment for projects and plans under Article 6 (3) of the Habitats Directive. Nature Conservation, 23.
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.
- EC Article 6 - Managing and protecting Natura 2000 sites
- EC Management of Natura 2000 sites: Best Practice
- EC 2000. Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.
- EC 2002. Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.
- EC 2006. Nature and biodiversity cases: Ruling of the European Court of Justice. Office for Official Publications of the European Communities, Luxembourg.
- EC 2018. Guidance on Aquaculture and Natura 2000 Sustainable aquaculture activities in the context of the Natura 2000 Network.
- EC 2012. Common methodology for assessing the impact of fisheries on marine Natura 2000. Service Contract No. 070307/2010/578174/SER/B. DGEnv Brussels.
- Poelman *et al*., 2022. Study on state-of-the-art scientific information on the impacts of aquaculture activities in Europe.
- Federal Agency for Nature Conservation information for the FFH impact assessment
- ABPMer, 2013a – h. Tools for Appropriate Assessment of Fishing and Aquaculture Activities in Marine and Coastal Natura 2000 Sites. Marine Institute.
- Marlin.ac.uk
- AMBI Sensitivity Scale
- MarESA (marlin.ac.uk)
- Marine Institute (2013). A risk assessment framework for fisheries in Natura 2000 sites in Ireland: with case study assessments. Version 1.3., Galway, 31pp.
- Open Street Maps, Google Earth, and Bing aerial photography

1.4 Assumptions made for Appropriate Assessment Reports

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

- Aquaculture sites considered in this assessment report are assumed to be fully operational and that the operations (as well as any environmental impacts) are occurring across the entire area of the site.

- Any aquaculture applications which were submitted prior to those being considered here, but still pending decisions (e.g., in process, under appeal, etc.), are also assumed to be fully operational across the entire area of the relevant sites. This ensures a conservative approach and that it assumes these activities will be operational to the maximum extent possible when considering cumulative effects.
- Where multiple species are proposed to be cultured at a site, and in the absence of specific details, the assessment assumes that the species most probable to result in likely significant effects on the surrounding ecosystem or Natura 2000 QIs will be the primary culture species considered, and that it is cultured throughout the entire area of the proposed site (e.g. where it is proposing to culture shellfish and seaweed at a site and detail on the exact size of each species production is not provided, the assessment assumes that shellfish will be the primary species produced across the entire area of the site).
- Other assumptions may be identified on a case-by-case basis and will be clearly communicated in any AA report.

2.Overview of Proposed Aquaculture Activities in Dundalk Bay

Currently within Dundalk Bay there are no sites licenced for extensive aquaculture production. This report considers the likely interactions between four proposed aquaculture sites[14] within Dundalk Bay with the potential to interact with Natura 2000 conservation features. All four sites considered are new applications (Table 2-1 and Figure 2-1). Only one of the licenses, T01-099A lies within the Dundalk Bay SAC and Dundalk Bay SPA. Site T01-097A is requesting a licence for bag and trestle culture, this would be a holding site for pacific oysters. Site T01-099A is wishing to culture pacific oyster in bag and trestles and stacked cages. Access routes for these sites are directly from land using tractor and trailer. T01-099A from the coast road (L6218) and T01-097A is directly from Cooley Point.

The other two applications, T01-1001 and T01-1002 are applying for a licence to culture blue mussel on longlines. Access for those sites is by vessel directly through the pier in Carlingford Lough. The proposed aquaculture sites and access routes to these sites are presented in Figure 2-1.

Table 2-1 Licenced aquaculture and applications for aquaculture activities considered in this report.

Site No.	Status	Species	Culture system	Total Area* (ha)	Access Indicated
T01-097A	Application	Pacific oyster	Bag and trestle	1.9	Yes
T01-099A	Application	Pacific oyster	Bag and trestle and stacked cages	25.71	Yes
T01-1001	Application	Blue mussel	Longlines	72.03	Yes
T01-1002	Application	Blue mussel	Longlines	72.05	Yes

** Site area is taken from the AquaMIS on-line database. https://dafmaps.marine.ie/aquaculture-viewer/*

[14] The AA Screening report considered 6 aquaculture applications for assessment. In the interim, 2 sites (T01-122A and T01-123A) were withdrawn from further consideration. The conclusions from the AA Screening report still stand.

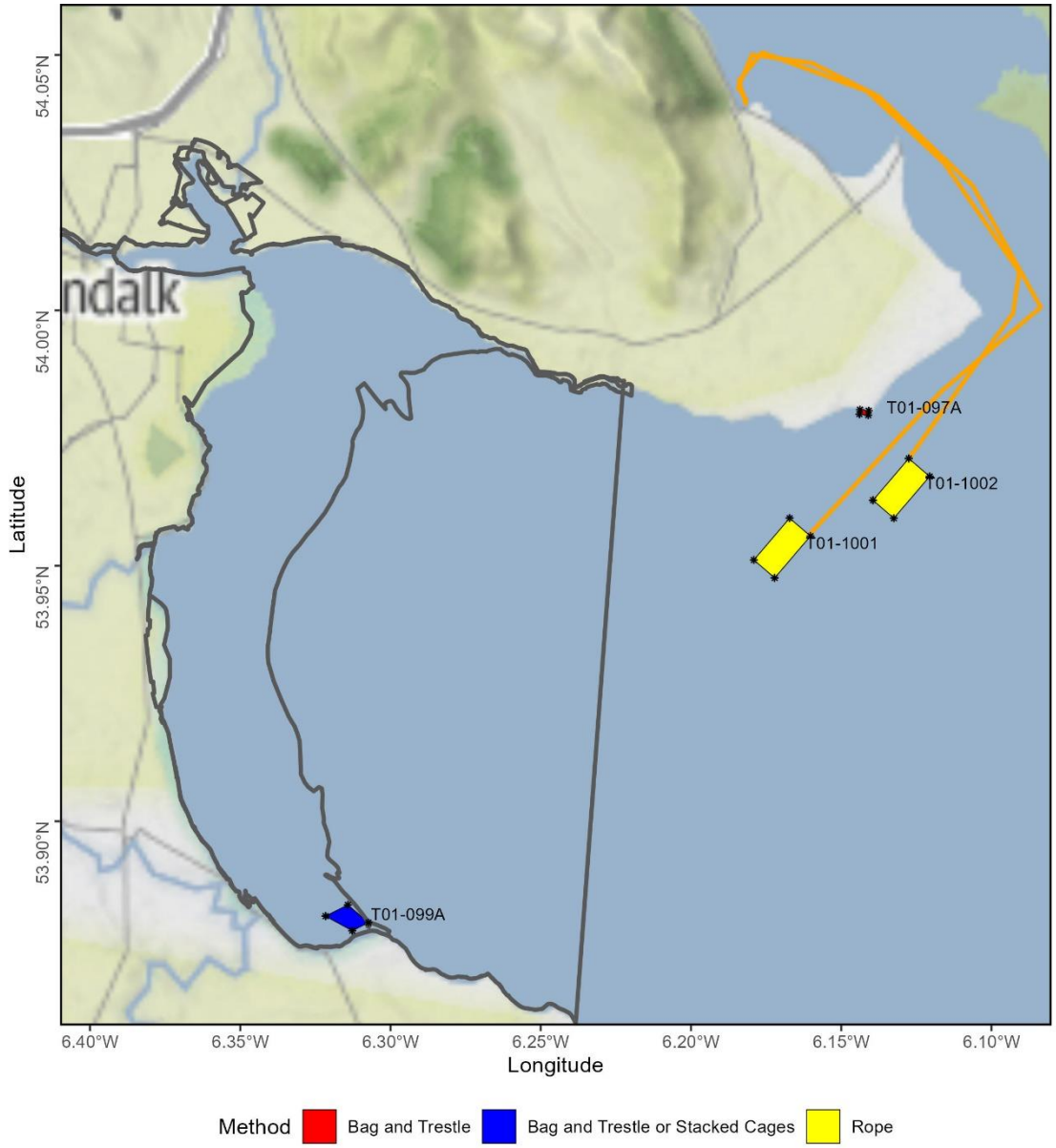


Figure 2-1 Proposed extensive aquaculture sites in Dundalk Bay. Grey outline denotes the boundary of Dundalk Bay SAC and SPA. Orange lines indicate the proposed access routes for each site. Note: Access to sites T01-097A* and T01-099A are *directly from land* (T01-097A = Cooley Point, T01-099A = Coast Road L6318) *and* are *not visible in this figure. The method for T01-097A is Bag and Trestle. Black stars denote the location of the navigational marker (intertidal shellfish – T01-097A and T01-099A) or buoys (T01-1001 and T01-1002).

3.Stage 1- Appropriate Assessment – Screening Summary

A screening exercise for Dundalk Bay SAC and SPA and surrounding Natura 2000 sites, has indicated that likely significant effects of the proposed aquaculture activities cannot be discounted for a number of habitat and species within and in the surrounding area of Dundalk Bay.

The following QI habitats in Dundalk Bay SAC and one Marine Community Type (MCT) is carried forward for further consideration given the direct overlap with proposed intertidal aquaculture activities and access routes.

- Annex I Habitat 1140 - Mudflats and sandflats not covered by seawater at low tide
    - MCT: Fine sand community complex
- Annex I Habitat 1130 - Estuaries;
    - MCT: Fine sand community complex

By virtue of the fact that the following species are wide ranging, and their distribution may overlap with the proposed suspended culture activities, it is proposed that the following mammal species; be brought forward to Stage 2 Appropriate Assessment.

- Bottlenose dolphin (*Tursiops truncatus*) [1349],
- Harbour Porpoise (*Phocoena phocoena*) [1351],
- Grey Seal *(Halichoerus grypus)* [1364],
- Harbour Seal (*Phoca vitulina)* [1365]

The initial screening for Dundalk Bay SPA has highlighted a number of bird SCIs which have been screened in for possible (S-P-R) interactions such as disturbance, exclusion from foraging habitat by structures (e.g., trestles, AtoNs) and indirect prey competition with the proposed activities. Furthermore, several species which are features of surrounding SPAs, either because the SPA is within 15 km of the proposed aquaculture activities or because their foraging range may overlap with the proposed aquaculture activities were considered. The following species are screened in for Stage 2 Appropriate Assessment.

- Light-bellied Brent goose (*Branta bernicla hrota*) [A046]
- Sandwich Tern (*Sterna sandvicensis*) [A191]
- Common Tern (*Sterna Hirundo*) [A193]
- Common Scoter (*Melanitta nigra*) [A065]
- Red-throated Diver (*Gavia stellata*) [A001]
- Great Northern Diver (*Gavia immer*) [A003]
- Manx Shearwater (*Puffinus puffinus*) [A013]
- Shag (*Phalacrocorax aristotelis*) [A018]
- Cormorant (*Phalacrocorax carbo*) [A017]
- Little Gull (*Larus minutus*) [A177]
- Herring Gull (*Larus argentatus*) [A184]
- Great Black-backed Gull (*Larus marinus*) [A187]
- Roseate Tern (*Sterna dougallii*) [A192]
- Arctic Tern (*Sterna paradisaea*) [A194]
- Little Tern (*Sterna albifrons*) [A195]
- Bar tailed godwit (*Limosa lapponica)* [A157]

- Black headed gull (*Chroicocephalus ridibundus)* [179]
- Black-tailed godwit (*Limosa limosa*) [A156]
- Common gull (*Larus canus*) [A182]
- Curlew (Numenius arquata) [A160]
- Dunlin (*Calidris alpina)* [A149]
- Golden plover (*Pluvialis apricaria)* [A140]
- Ringed plover (*Charadrius hiaticula*) [A137]
- Great Crested Grebe (*Podiceps cristatus*) [A005]
- Grey plover (*Pluvialis squatarola*) [A141]
- Herring gull (*Larus argentatus*) [A184]
- Knot (*Calidris canutus*) [A143]
- Lapwing (*Vanellus vanellus*) [A142]
- Pintail (*Anas acuta*) [A054]
- Oystercatcher (*Haematopus ostralegus*) [A130]
- Red-breasted merganser (*Mergus serrator*) [A069]
- Redshank (*Tringa totanus*) [A162]
- Shelduck (*Tadorna tadorna*) [A048]
- Sandwich Tern (*Sterna sandvicensis*) [A191]
- Common Tern (*Sterna hirundo*) [A193]
- Lesser black-backed gull (*Larus fuscus*) [A183]
- Northern Fulmar (*Fulmarus glacialis*) [A009]
- Kittiwake (*Rissa tridactyla*) [A188]
- Razorbill (*Alca torda*) [A200]
- Guillemot (*Uria aalge*) [A887]
- Atlantic Puffin (*Fratercula arctica*) [A204]
- Northern Gannet (*Morus bassanus*) [A016]
- Wetlands and waterbirds [A999]

In addition, the risk of naturalisation posed by the culture of the non-native species, the Pacific oyster (*Magallana gigas*) will be brought forward to Stage 2 Appropriate Assessment.
Finally, in-combination effects of disturbance on marine birds and species for rope mussel aquaculture, fishing activity, shipping and activity related to offshore renewable energy will also be brought forward to Stage 2 Appropriate Assessment.

SUMS markers were also screened post finalisation of the screening document. **The screening process for SUMs found no likely significant effects to either QI habitats or QI species or SCI birds and were screened out.** A brief explanation of the screening is summarised in the section below:
Intertidal oyster applications will require Aids to Navigation (AtoNs), i.e. marker poles at each of the four corners of the sites. Each marker poles comprises of a concrete filled tractor or truck tyre base measuring 1100mm diameter X 400mm depth with a 1500mm length outer pole cemented in centre. This pole measures 1100mm exposed at top and has diameter 76mm. A 6metre inner pipe extends out from this centre outer pipe which has a 2metre yellow outer sleeve and St. Andrews Cross attached at the top. A concrete base of a tyre with cement, is partially

buried in intertidal seabed substrate. This can cause physical loss and altering of habitat in the direct footprint of the moorings (i.e. smothering). There are no hanging ropes to cause abrasion therefore this pressure can be ruled out. The change in habitat pressure will continue for the entire length of time the structure is in place, however the footprint of such a change is small < 1m2 and will not move for the duration of the licence. There will be some overlap between markers at site T01-099A with the Fine Sand Community Complex MCT however overlaps are small enough that they will not cause likely significant effects. **Likely significant effects on QI habitats can therefore be ruled out.**

The intertidal markers are not of sufficient size to create a collision risk or become a barrier to species movement and there are no moving parts to create an entanglement risk. **Likely significant effects on SAC species for the intertidal markers can therefore be ruled out**.

There are no pressures from intertidal markers, which could impact bird SCIs within SPAs. **Likely significant effects of the intertidal markers on bird SCIs can therefore ruled out.**

The suspended mussel aquaculture sites proposed navigation plan is a marking scheme with a placement of 4 x yellow NAV02 buoys at each corner of each site. Each buoy has an inbuilt St. Andrews Cross and radar reflector. A flashing yellow light will be added to top flange of buoy. It is proposed that all lights will be synchronised. These buoys will be moored onto the seabed using 1.5 tonne mooring block measuring (1.1m x 1.1m x 0.55m) + 5 metre mooring chain (32mm), shackles + Rope – Dyneema 22mm. Sub-tidal buoys will be used mid-line to assist keep rope and chain off seabed. Length of Dyneema rope will depend on each location using 2:1 ratio for this proposed tighter mooring system.

Lighted structures pose a visual disturbance to species foraging at night-time. However, the stationary nature and synchronization of the majority of lights will allow species particularly seals to become habituated. **Likely significant effects on SAC species can be ruled out.**

The subtidal markers pose potential entanglement risk particularly for diving species. The 2:1 rope ratio and the mid-line buoy to ensure tighter mooring allied with the width of the rope (22mm) and chain all provides sufficient visual reference for diving species and reduces the likelihood of entanglement. **Likely significant effects of entanglement on diving birds can therefore be ruled out.**

The lights may present a visual disturbance which can affect nesting birds, particularly those that nest in burrows e.g. Storm Petrel[15]. There are no breeding bird populations within impact distance of the proposed AtoNs. Markers may act as a perching site for birds, primarily species such as Cormorant or Shag which will have a positive or neutral effect on bird SCIs. They can also act as fish aggregating devices which will redistribute fish species and attract piscivorous feeding birds. These will be small and very localised. **Likely significant effects of the lights used on AToNs on bird SCIs can therefore be ruled out.**

[15] Atchoi, E., Mitkus, M., Machado, B., Medeiros, V., Garcia, S., Juliano, M., Bried, J., Rodríguez, A., 2024. Do seabirds dream of artificial lights? Understanding light preferences of Procellariiformes. Journal of Experimental Biology 227, jeb247665. https://doi.org/10.1242/jeb.247665

4. Stage 2 - Appropriate Assessment - Methodology

4.1 Assessment process

This report has been prepared as it was not possible at the Screening for AA stage to rule out, as a matter of scientific certainty, that the proposed projects will not have a likely significant effect on the conservation objectives within Natura sites. An Appropriate Assessment consists of a reasoned appraisal and a conclusion. It will examine and analyse, considering the best scientific knowledge, how the proposed operations could impact on the Qualifying Interests (QIs) of Natura sites and whether the predicted impacts would adversely affect the integrity of protected sites. The process describes each aspect or effect of the project which could potentially impact on the QIs. It then evaluates those potential impacts in relation to the QIs affected and the overall effect on their Conservation Objectives (COs) - considering the duration of effect, the longevity, the proportion/importance of the interest affected, and the overall effect on COs. There should be sufficient detail to ensure all impacts have been considered and sufficiently appraised. If there is potential for the activities considered to adversely affect the QI and their conservation features, they will be considered, in-combination with similar aquaculture practices and on a cumulative basis with other aquaculture activities and other potentially impacting activities.

Site specific COs have been prepared for each of the QIs, which form a key component of the assessment framework. The potential ecological effects of activities on the COs for the site relate to the physical and biological effects of human activities and the pressures they exert on designated species and habitats. The overall effect on the conservation status will depend on the spatial and temporal extent of activities during the lifetime of the proposed plan and the nature of each of these activities in conjunction with the sensitivity of the receiving environment.

A decision must be reached, based on there being no reasonable scientific doubt as to the absence of adverse effects which would affect the achievement of the COs of the QI. If the project will not have any effect on the COs, then the integrity of the site can be expected to be able to be maintained (or have the ability to be restored).

4.2 Pressures and impacts

The proposed activities cause impact on the QIs by acting through pressures. It is these pressures for which the habitats and species are assessed for sensitivity. The activities associated with shellfish culture and the pressures they cause are presented in Table 4-1. They have been adapted from ABPmer Final Report[16] to also include the effects on Annex II species.

[16] ABPmer (2013) Tools for Appropriate Assessment of Fishing and Aquaculture Activities in Marine and Coastal Natura 2000 Sites. Reports I-VIII

Table 4-1 Pressures and impacts of aquaculture and related activities

Pressure	Substrate on-growing	Suspended production on longlines or baskets (scallops/ oysters/ mussels/clam / seaweed)	Trestles on intertidal zone (oysters)	Finfish	Dredging (harvesting)	*Additional Information*
Surface Disturbance	X				X	Abrasion at the sediment surface and redistribution of sediment
Shallow disturbance	X				X	
Deep disturbance	X				X	
Trampling - Access by foot	X		X			
Trampling - Access by vehicle	X		X			
Extraction	X				X	
Siltation (addition of fine sediments, pseudofaeces, fish food)	X	X	X	X		Suspension feeding bivalves such as oysters, scallops and clams can modify their filtration to account for increasing loads of suspended matter in the water and can increase the production of faeces and pseudofaeces (non-ingested material) which result in the transfer of both organic and inorganic particles to the seafloor. Infaunal bivalves such as clams adjust their clearance rates rather than increasing production of pseudofeces. Shellfish culture may result in increased enrichment due to production of faeces and pseudofaeces. The degree to which the material disperses away from the location of the culture depends on the density of culture stock on or above the seafloor and the current regime in the vicinity. Cumulative impacts on the seabed, especially in areas where dispersion of pseudofaeces is low, may occur over time. A number of features of the site and culture practices will govern the speed at which pseudofaeces are assimilated or dispersed by the site.
Smothering (addition of materials biological or non-biological to the surface)		X	X	X		
Collision risk	X	X	X	X	X	Physical structures on the seabed or in the water column pose a risk of collision and possible entanglement for many mobile species such as mammals and birds.
Underwater noise					X	
Visual - Boat/vehicle movements	X	X	X	X	X	The presence of boats during maintenance or harvesting can cause a visual disturbance to foraging bird species or resting mammals.
Visual - Foot/traffic	X		X			Intertidal aquaculture is often accessed on foot or by tractor during maintenance and harvesting. This can disturb foraging birds and resting seals.

Changes to sediment composition - Increased coarseness						
Changes to sediment composition - Increased fine sediment proportion	X	X	X			
Changes to water flow		X				The physical presence of structures may reduce water flow and allow suspended material (silt, clay, faeces and pseudo-faeces) to fall out of suspension to the seafloor. The build-up of material can result in accumulation of fine, organically rich sediments, which could result in the development of infaunal communities distinct from the surrounding areas.
Changes in turbidity/suspended sediment		X	X	X	X	
Organic enrichment (eutrophication) - Water column		X		X		
Organic enrichment of sediments - Sedimentation	X	X	X	X		The concentration of shellfish in a confined area may result in a risk of increased organic enrichment. The existing infaunal community could be changed as a result. Uncontained high density subtidal shellfish culture could lead to change in community structure through the addition (at high % cover) of an epi-benthic species (living on the seabed) to an infaunal sedimentary community.
Increased removal of primary production - Phytoplankton	X					
Decrease in oxygen levels - Sediment	X	X	X	X		
Decrease in oxygen levels - Water column		X		X		
Genetic impacts on wild populations and translocation of indigenous populations	X	X	X	X		There is potential risk of escapees reproducing with wild stocks creating genetic impacts.
Introduction of non-native species	X	X	X	X		There is potential risk of alien species arriving into an area among consignments of seed or stock sourced from outside of the area or as a consequence of the stock itself reproducing. When the seed is sourced locally the risk is likely zero. When seed is sourced at a small size from hatcheries in Ireland the risk is also small.
Introduction of parasites/pathogens	X	X	X	X		Due to the nature of the culture methods (high-density), the risk of transmission of disease within cultured stock is high. The risk of disease transmission from cultured oysters to other species is unknown.
Removal of target species	X			X	X	Removal of target and non-target species impacts species which rely on these for food such as bivalve feeding birds.
Removal of non-target species	X				X	Removal of target and non-target species impacts species which rely on these for food such as bivalve feeding birds.
Ecosystem services - Loss of biomass					X	
Introduction of antifoulants		X	X	X		
Introduction of medicines		X		X		
Introduction of hydrocarbons				X		

Introduction of litter	X	X	X	X	X	Aquaculture is a major source of marine litter which causes risk of entanglement and ingestion in marine mammals, birds and fish. The impacts can cause difficulties with movement, foraging and can result in mortality.
Prevention of light reaching seabed/features	X	X	X	X		
Barrier to species movement		X	X	X		Physical structures on the seabed or in the water column can cause exclusion from foraging grounds and impact migration routes.

4.3 Habitat assessment methods

4.3.1 Benthic disturbance

The habitat assessment is related to the anticipated sensitivity of benthic habitats and species to disturbance by the proposed activities. Some activities are deemed to be wholly inconsistent with long term maintenance of certain habitats while other habitats can tolerate a range of pressures deriving from activities.

Benthic disturbance, in this instance, is defined as causing a change in the characterising species of the habitat or marine community type. Such disturbance may be temporary or permanent, in the sense that change in characterising species may recover to a pre-disturbed state or may persist. The degree of change is likely a function of the sensitivity of the receiving environment to organic loading which, in turn, may be influenced by hydrodynamic conditions in addition to the density of the organisms in culture at the site. The rationale adopted to apply any threshold of change is that, while there may be persistent disturbance as a result of an activity (e.g. organic loading) which may result in a response/change to the structure of the marine community type, it is expected, however, that (some level of) function will be retained, such that impacts are lessened, to some degree. Function is considered the process whereby the animals living on and in the seafloor, by virtue of their activities, influence benthic dynamics (reflective of) related to system health (Bolam et al 2002[17]; 2004[18]). Such activities or traits are considered in relation to, among others, the organisms feeding type (e.g., scavenger, filter, deposit feeders), mobility, body size, ability to bioturbate (i.e. introduce oxygen into the sediment). All such traits can result in the removal or conversion of organic matter to biomass (i.e. secondary production). However, by virtue of the fact that the composite species may change, the result is considered a disturbance.

4.3.2 Marine Community Types

The NPWS have acknowledged that given the wide range of community types that can be found in marine environments, the application of conservation targets to these would be difficult. On this basis, they have proposed broad community complexes as management units called Marine Community Types (MCTs). These complexes (for the most part) are very broad in their description and do not have clear surrogates which might have been considered in targeted studies and thus reported in the scientific literature. On this basis, the confidence assigned to likely interactions of the community types with anthropogenic activities are, by necessity, relatively low, with the exception of community types dominated by sensitive taxa, e.g. maërl and *Zostera sp*. Directed research investigating the effect of aquaculture on the benthic environment does provide a greater degree of confidence in conclusions; for example, the output of Forde et al.[19] and

[17] Bolam, Stefan & Fernandes, Teresa & Huxham, Mark. (2002). DIVERSITY, BIOMASS, AND ECOSYSTEM PROCESSES IN THE MARINE BENTHOS. Ecological Monographs. 72. 599-615. 10.1890/0012-9615(2002)072[0599:DBAEPI]2.0.CO;2.

[18] Bolam, Stefan & Whomersley, Paul & Schratzberger, Michaela. (2004). Macrofaunal recolonization on intertidal mudflats: Effect of sediment organic and sand content. Journal of Experimental Marine Biology and Ecology. 306. 157-180. 10.1016/j.jembe.2004.01.007.

[19] Forde, J, O'Beirn, F. , O'Carroll JPJ, Patterson A, and Kennedy, R. (2015) "Impact of intertidal oyster trestle cultivation on the Ecological Status of benthic habitats." *Marine Pollution Bulletin* 95, no. 1 (2015): 223-233.

O'Carroll et al.[20] has provided greater confidence in terms of assessing likely interactions between intertidal oyster culture and marine habitats. Similarly, Wilding et al.[21] and Wilding et al.[22] provide greater confidence in benthic habitat assessments for mussel and finfish farming.

4.3.3 Sensitivity assessment

The sensitivity of a species to a given pressure is the product of the intolerance (the susceptibility of the species to damage, or death, from an external factor) of the species to the particular pressure and the time taken for its subsequent recovery (recoverability is the ability to return to a state close to that which existed before the activity or event caused change). Life history and biological traits are important determinants of sensitivity of species to pressures from aquaculture. In the case of species, habitats, and communities the separate components of sensitivity (intolerance, recoverability) are relevant to the persistence of the pressure:

- For persistent pressures (i.e. activities that occur frequently and throughout the year) recovery capacity may be of little relevance except for species/ habitats that may have extremely rapid (days/weeks) recovery capacity or whose populations can reproduce and recruit in balance with population damage caused by aquaculture. In all but these cases, and if sensitivity is moderate or high, then the species/ habitats may be negatively affected and will exist in a modified state. Such interactions between aquaculture and species/ habitat/ community represent persistent disturbance.
- In the case of episodic pressures (i.e. activities that are seasonal or discrete in time) both the intolerance and recovery components of sensitivity are relevant. If sensitivity is high but recoverability is also high relative to the frequency of application of the pressure, then the species/ habitat/ community will be in favourable conservation status (FCS) for at least a proportion of time.

The sensitivities of various habitats and their characterising species found within Irish waters have been assessed by ABPmer for the Marine Institute[23]. Further sources of information using similar methodology are found elsewhere[24]. It is these assessments which underpin this Appropriate Assessment.

4.3.4 Determining significance

A schematic outlining the determination of significant effects on marine habitats and MCTs is presented in Figure 4-1. For the Annex I habitats and their constituent community types, potential effects are identified in relation to, first and foremost, spatial overlap. Subsequent disturbance and the persistence of disturbance are considered as follows:

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[20] O'Carroll, JPJ, Quinn, C, Forde J, Patterson, A, O'Beirn, F, and Kennedy, R. (2016) "Impact of prolonged storm activity on the Ecological Status of intertidal benthic habitats within oyster (*Crassostrea gigas*) trestle cultivation sites." *Marine Pollution Bulletin* 110, no. 1 (2016): 460-469.

[21] Wilding, Thomas A., and Thomas D. Nickell. "Changes in benthos associated with mussel (Mytilus edulis L.) farms on the west-coast of Scotland." *PLoS One* 8, no. 7 (2013): e68313.

[22] Wilding, Thomas A., Chris J. Cromey, Thom D. Nickell, and David J. Hughes. "Salmon farm impacts on muddy-sediment megabenthic assemblages on the west coast of Scotland." *Aquaculture Environment Interactions* 2, no. 2 (2012): 145-156.

[23] ABPmer (2013) Tools for Appropriate Assessment of Fishing and Aquaculture Activities in Marine and Coastal Natura 2000 Sites. Reports I-VIII

[24] Tyler-Walters, H, Tillin, HM, Perry, F, Stamp, T and d'Avack, EAS 2018 *Marine Evidence-based Sensitivity Assessment (MarESA) – A Guide*. Plymouth, Marine Life Information Network, 94pp.

1. The degree to which the activity will disturb the Annex I habitat – as indicated above, disturbance is meant as a change in the characterising species, as listed in the Conservation Objective guidance of the constituent MCTs. The likelihood of change depends on the sensitivity of the characterising species to the activities in question. Sensitivity results from a combination of intolerance to the activity and/ or recoverability from the effects of the activity.
2. The persistence of the disturbance in relation to the intolerance of the community - If the activities are persistent (high frequency, high intensity) and the receiving community has a high intolerance to the activity (i.e., the characterising species of the communities are sensitive and consequently impacted) then such communities could be said to be persistently disturbed.
3. It is expected that in spite of the potential change in characterising species that certain functions are retained by the benthic communities, such that effects deriving from the aquaculture activities are alleviated.
4. In the event that such disturbance is greater than 15% of the defined area of Habitat QI or MCT, it is deemed to be significant.

For the assessment, the 15% threshold detailed in Point 4 above applies to the habitats or MCTs that are overlapped by likely disturbing aquaculture activities considered in-combination with all other likely disturbing activities (e.g. fisheries, dredging).

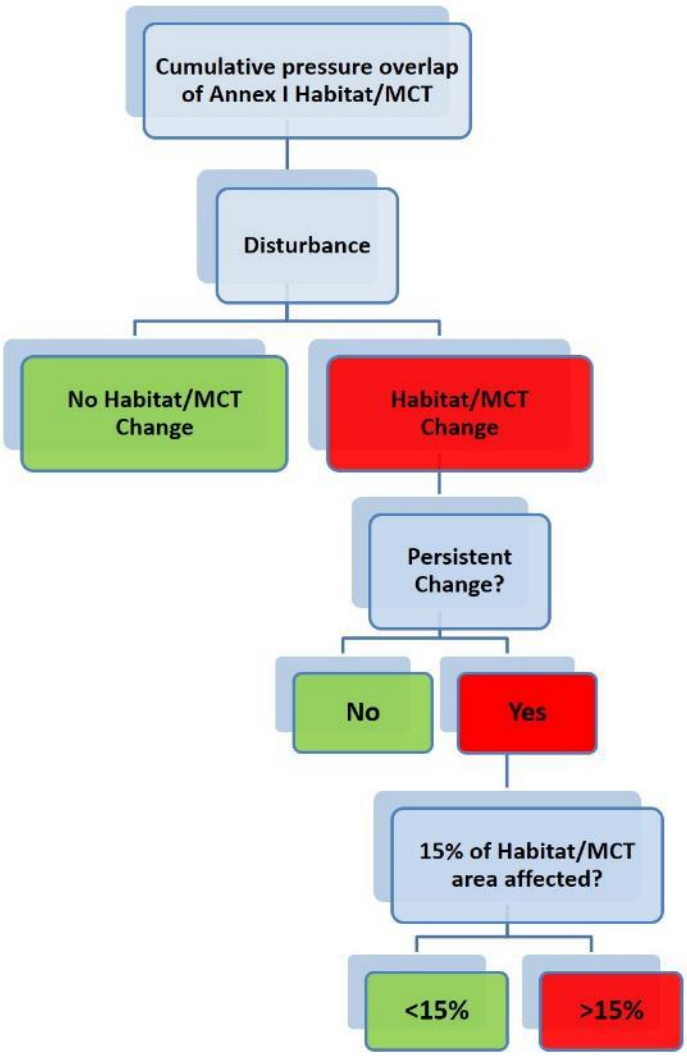

Figure 4-1 Schematic outlining the determination of likely significant effects on habitats and marine community types (MCT) (following NPWS 2014).

4.4 Bird Assessment Methods

4.4.1 Pressures

There are four main pressures from the proposed activities which may directly interact with the QIs. Noise and/or visual disturbance occur from foot or machinery traffic accessing intertidal sites, whilst in the subtidal zone the main cause of noise and visual disturbance comes from vessel activity. The risk of collision or entanglement which may lead to injury or death come from physical structures such as trestles in the intertidal zone or ropes or pens in the subtidal zone. The presence of such physical structures may also create a barrier to species movement which may cause increased energy expenditure trying to move between foraging and nest grounds or might interrupt migration routes and patterns. Finally, the intentional or unintentional removal of prey items during aquaculture activities leads to direct or indirect competition between the two and can cause reduced fitness or survival for affected bird species.

There are three additional pressures (the introduction of marine litter, introduction of contaminants or pathogens, and the introduction of non-native species) which might also cause indirect effects on marine birds. These pressures are not dealt with in the risk assessment methods since the sources of these pressures come from a wide variety of activities, the

pressures disperse widely and the source usually cannot be established. The introduction of non-native species is dealt with in Section 5.3.

4.4.2 Risk assessment

Up to date, distributional data is not available for many SPAs in Ireland. Therefore, in lieu of such information, the Marine Institute has developed, for bird species listed under the Birds Directive a methodology, adapted from Garthe and Huppop[25], to assess the risk of adverse effects on the conservation objectives arising from aquaculture activities. The risk assessment is a desk-based study of the available and most up to date literature on the parameters defined below. The risk assessment framework applied is considered both robust and flexible such that new and relevant scientific information can be used to refine the outputs. Notwithstanding, the system is also considered precautionary ensuring conclusions that result in the application of appropriate management measures.

The parameters outlined in Table 4-2 were scored from 1 (low likelihood, low level of impact, high resilience, and good status) to 5 (high likelihood, high level of impact, low resilience and poor status). The parameter, **Suitability of Aquaculture Habitat**, relates to the potential for spatial overlap and therefore interaction between the species and aquaculture. The zero score is used to rule out risk where there is no overlap and no possibility of overlap e.g. subtidal activities on intertidal waders. The parameters **Disturbance** and **Potential for entanglement or collision** deal with the level of impact these pressures are likely to have on these species. The parameters **Flexibility in Habitat Use, Foraging Range** and **Flexibility in Diet** related to the level of impact prey competition and habitat exclusion are likely to have on the species. Finally, the **Conservation status** and **Adult Survival Rate** relate to the species ability to withstand these pressures at a population level.

As with the habitat assessment, the overall assessment of significant adverse effects for birds considers the risk to the species from the pressures arising from the proposed activities (the risk assessment), the current status of the population at the site (taken from I-WEBs data or other survey data available) and the proposed conservation objectives, as defined by the NPWS at the site. With regards to activities that may interact with species assigned 'restore' conservation objectives, the requirement would be to ensure that any activities occurring in the area will have a neutral or positive impact on the species' population. It may be acceptable for activities that will interact with species with 'maintain' conservation objectives to have some negative interactions providing they do not cause population level effects.

25 Garthe, S., & Hüppop, O. (2004). Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. Journal of applied Ecology, 41(4), 724-734.

Table 4-2 The parameters scored in the risk assessment and the definition of low to high scores.

Attribute/ Score	Suitability of aquaculture habitat	Disturbance	Potential for entanglement/collision	Flexibility in habitat use	Foraging range	Flexibility in diet	Irish threat and conservation status	Adult survival rate
0	Not suitable. No chance of spatial overlap.	-	-	-	-	-	-	-
1	Aquaculture slightly overlaps a widespread foraging habitat.	None or hardly any escape/avoidance behaviour to vessels or machinery and/or very low fleeing distance	No or low possibility of collision or entanglement and no chance of direct lethal encounter	Widespread use of multiple habitats	Long foraging range (>30km)	Wide range of prey items not directly impacted by the aquaculture activities	Green	Low adult survival: <0.75
2	Aquaculture slightly overlaps a scarce foraging habitat.	Some escape/avoidance behaviour to vessels or machinery and low fleeing distance	Possibility of collision or entanglement with aquaculture activities but no chance of direct lethal encounter	Preferred habitat or territorial species but can utilise other habitats which are widespread	Medium to long foraging range (20-30km)	Wide range of prey items some of which are impacted by the aquaculture activities	-	>0.75-0.8
3	Aquaculture has some overlap with a foraging habitat.	Some escape/avoidance behaviour to vessels or machinery and/or moderate fleeing distance	Known to be attracted to aquaculture activities, high chance of collision or entanglement but no chance of direct lethal encounter	Habitat specialist on a widespread habitat	Medium foraging range (10-20km)	Wide range of prey items all of which are impacted by the aquaculture activities	Amber	>0.8-0.85
4	Aquaculture entirely within a widespread foraging habitat.	Strong escape/avoidance behaviour to vessels or machinery but low fleeing distance OR some escape/avoidance behaviour to vessels or machinery but high fleeing distance.	Possibility of collision or entanglement with aquaculture activities and/or potential for direct lethal encounter	Habitat specialist but may utilise other habitats when necessary	Short to medium foraging range (5-10km)	Preferred prey but may utilise other species, when necessary, which may or may not be impacted by the aquaculture activities	-	>0.85-0.89
5	Aquaculture entirely within a scarce foraging habitat.	Strong escape/avoidance behaviour and large fleeing distance	Known to be attracted to aquaculture activities and high chance of collision or entanglement and potential for direct lethal encounter	Habitat specialist, relies on specific habitat characteristics from one habitat	Short foraging range (<5km)	Specialises in a single type of prey which is impacted by the aquaculture activities	Red	High adult survival: >0.9

5.Stage 2 - Appropriate Assessment – Natura Impact Statement

5.1 Annex I Habitats Assessment

5.1.1 Pressures arising from the proposed activities

The predominant culture types within the current and proposed activities are Pacific oysters on bag and trestles or in cages and blue mussels grown on long lines. At sites where shellfish cultivation is proposed, it will result in high densities of culture organisms over a confined area and in the case of bivalves results in the deposition of faecal and pseudofaecal material to the seabed. This can cause siltation, smothering effects, and organic enrichment of the seabed.Oyster trestles can result in surface abrasion on the benthos from the physical structures themselves (i.e., through contact with trestle legs). The culture organisms too may cause the same siltation, smothering and organic enrichment of the seabed. Additional pressures from trestle culture arise from trampling either by foot or tractor during access and maintenance activities at the site. Longlines for mussels have anchors fixed on the seabed on fixed (and comparatively small) locations. To this end, the extent of abrasion is considerably low. Bivalve culture on longlines can cause increased turbidity from faecal and pseudofaecal deposition and organic enrichment. The overall pressure is low however (compared to other culture methods) as the ability for material to be flushed (or more widely dispersed) from the site is greater in the water column compared to the benthos.

5.1.2 Estuaries [1130]

The screening assessment concluded that Estuaries [1130] should be brought forward to Stage 2 Appropriate Assessment. This was due to the overlap with license number T01-122A. Since the screening assessment was determined this license application has been withdrawn which leaves no overlap between applications and this QI (Table 5-1).

It is concluded that there is now no S-P-R link and therefore no adverse effects from the proposed activities on the Estuaries QI.

5.1.3 Mudflats and sandflats not covered by seawater at low tide [1140]

The overarching objective for this QI is to maintain favourable conservation condition defined by the following attributes and targets[26]:

1. Habitat Area

The permanent habitat area is stable or increasing. The habitat area was estimated as 4375 ha.

2. Community distribution

The following sediment communities should be maintained:

a) Muddy fine sand community (853 ha)
b) Fine sand community complex (3520 ha)

[26] NPWS (2011) Conservation Objectives for Dundalk Bay SAC [000455]. Version 1.

Overlaps with proposed activities

The only application which overlaps with the Mudflats and Sandflats [1140] QI is T01-099A. The total area of overlap is 25.68 ha which equates to 0.6% of the total area of the QI (Table 5-1).

Assessment

The existence of trestles or cages on the seabed is not permanent and therefore will not impact the total habitat area (4375 ha). The activities proposed will not reduce the overall extent of permanent habitat within the feature. **The habitat area is likely to remain stable and, therefore, there is no significant adverse effects on this conservation objective for Mudflats and sandflats not covered by seawater at low tide [1140].**

The impacts on the Marine Community Types are described in further detail in the sections below.

Table 5-1 Overlap between application areas QIs Estuaries [1130] and Mudflats and Sandflats [1140]

Site No.	Status	Species	Site Area (ha)	1130 – Estuaries (2,779 ha[15])		1140-Mudflat and Sandflat (4,375 ha[27])	
				Area within QI (ha)	% Feature	Area within QI (ha)	% Feature
T01-099A	Application	Pacific Oyster	25.71	-	-	**25.68**	**0.6%**
T01-097A	Application	Pacific Oyster	1.9	-	-	-	-
T01-1001	Application	Blue mussel	72.03	-	-	-	-
T01-1002	Application	Blue mussel	72.05	-	-	-	-

5.1.4 Sensitivity assessment for Marine Community Types

In 2013, the Marine Institute contracted ABPmer to carry out a sensitivity assessment for marine habitats and communities to a range of pressures. Table 5-2 below shows the results of this assessment for the relevant habitats which can be linked to the marine community types which are to be assessed here.

[27] NPWS 2011. Conservation Objectives – Dundalk Bay SAC/Dundalk Bay SPA. 36pp

Table 5-2 Matrix showing the characterising habitats sensitivity scores x pressure categories for habitats with code for the categorisation of sensitivity and confidence (ABPMer 2013a-h).

Pressure Type	Physical Damage								Change in Habitat Quality								Biological/Chemical/ Physical Pressures					
Pressure	Surface Disturbance	Shallow Disturbance	Deep Disturbance	Trampling-Access by foot	Trampling-Access by vehicle	Extraction	Siltation (addition of fine sediments, pseudofaeces, fish food)	Smothering (addition of materials (non)biological to the surface)	Changes to sediment composition- increased fines	Changes to water flow	Changes in turbidity/ suspended sediment - Increase	Changes in turbidity/ suspended sediment - Decrease	Organic enrichment of sediments-sedimentation	Increased removal of primary production-phytoplankton	Decrease in oxygen - sediment	Decrease in Oxygen -water column	Genetic impacts	Introduction of non-native species	Introduction of parasites/pathogens	Removal of Target Species	Removal of Non-target species	Prevention of light reaching seabed/features
Fine sand community complex (A2.23)	NS (*)	L (*)	L (*)	NS (*)	L –NS (*)	L-M (*)	L-M (*)	L-M (*)	M (*)	L-M (*)	NS (*)	NS (*)	NS (*)	NS (*)	L-NS (*)	L-NS (*)	NE	NS (***)	NE	NS (*)	NS (*)	NS (*)
Muddy fine sand with *Thyasira flexuosa (A2.24)*	NS (***)	L (*)	L (*)	NS (*)	L (*)	L-M (*)	L-M (*)	L-M (*)	NS (*)	L-M (*)	NS (*)	NS (*)	NS (*)	NS (*)	L (*)	L (*)	NE	H (***)	NE	NS (*)	NS (*)	NS (*)

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

5.1.5 Muddy fine sand community

There is no overlap between any of the proposed sites and the muddy fine sand community complex. Therefore, there is no pathway for the pressure to be realised. **Therefore, adverse effects on the muddy fine sand community complex by the proposed activities can be ruled out.**

5.1.6 Fine sand community complex

The fine sand community complex Marine Community Type (MCT) occurs throughout Dundalk Bay SAC from the northern shores to the southern shores (Figure 5-1). There is only one application which overlaps with the MCT, T01-099A. This application is applying to culture Pacific Oyster on Bag and Trestle. The total area of overlap is 25.7 ha but given the large area of the MCT itself, the percentage of the habitat it occupied is 0.73 % (Table 5-3). The MCT has a low to medium sensitivity to pressures siltation and smothering which are the main pressures exerted by bag and trestle culture. Similarly, it has been classified as low or not sensitive to trampling by foot or vehicle. Although as a precaution we must assume potential medium sensitivity to some pressures exerted bag and trestle culture the small footprint compared to the overall extent of the MCT means that **adverse effects from the proposed activities on the Fine sand community complex can be ruled out.**

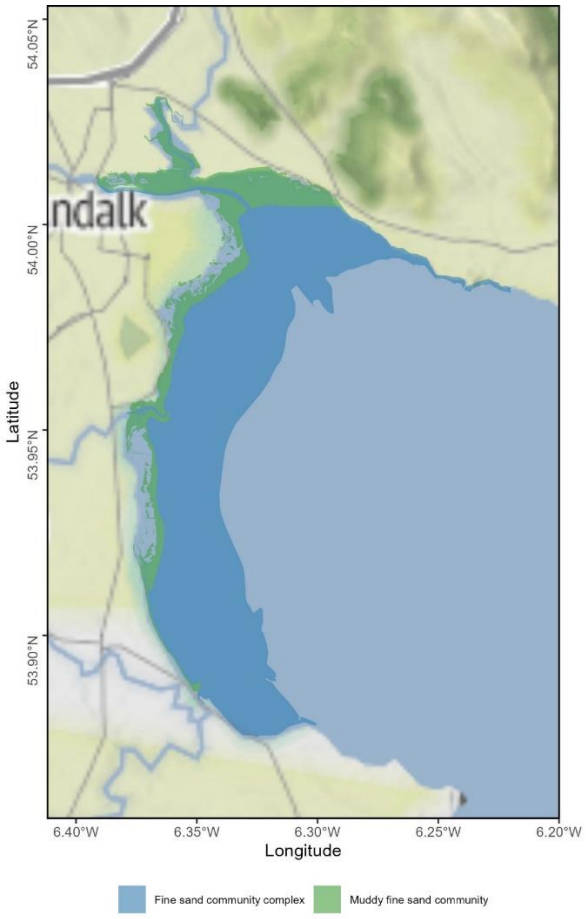

Figure 5-1 Marine Community Types mapped by NPWS within Dundalk Bay Special Area of Conservation.

Table 5-3 Overlaps between applications and the fine sand community complex MCT

Site No.	Status	Species	Site Area (ha)	Fine sand community complex (3711 ha)	
				Area overlapping MCT (ha)	% MCT
T01-099A	Application	Pacific Oyster	25.71	25.7	0.73
T01-097A	Application	Pacific Oyster	1.9	-	-
T01-1001	Application	Blue mussel	72.03	-	-
T01-1002	Application	Blue mussel	72.05	-	-

5.2 Annex II Species Assessment

5.2.1 Pressures arising from the proposed activities

The main pressure from the proposed activities is the creation of a barrier to species' movement which results in exclusion to foraging grounds or other key life stage areas. This may cause loss of body condition if the species is unable to find alternative foraging grounds. Additionally, bottlenose dolphin, harbour porpoise and seals are at risk of entanglement in ropes which can cause mortality or injury or increase susceptibility to disease. However, pressures from aquaculture are not currently thought to be the cause of significant bottlenose dolphin, harbour porpoise or seal mortality. Bottlenose dolphin do not appear to be negatively impacted by vessel presence and have been known to interact with vessels by bow riding or breaching in the vicinity of vessels. Harbour porpoise are shy mammals and are most often seen alone or in pairs. They do not approach vessels. Seals display a fleeing response to vessels which come too close to breeding, resting or moulting sites in both aquatic and terrestrial habitats. High levels of disturbance increase energy expenditure and can have population level effects.

5.2.2 Bottlenose Dolphin (*Tursiops truncatus*) [1349]

There are five SACs designated for bottlenose dolphin in Irish waters, all on the west coast (Figure 5-2) which has two genetically distinct populations of bottlenose dolphin, one in the Shannon Estuary and the second a West-coast population which ranges from Donegal to Galway[28].
The conservation objectives for bottlenose dolphin in Irish SACs are:

> **1. Access to suitable habitat – Species range within sites should not be restricted by artificial barriers to site use.**
> **2. Disturbance – Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site.**

There have only been a couple of sporadic sightings on the boundary of Dundalk Bay this area is not a major part of the natural range of bottlenose dolphin in Ireland[29]. Sites T01-097A and T01-099A are both intertidal and are thus not within the useable habitat of bottlenose dolphin. Sites T01-1001 and T01-1002 are both subtidal rope mussel farms approximately 72 ha each in size. Bottlenose dolphin in New Zealand haven shown the ability to avoid mussel farms[30], bottlenose dolphin in Irish waters are likely to display the same behaviour. This will lead to exclusion from habitat in the direct footprint of the proposed structures but given the small size of the proposed license area, the mobility of bottlenose dolphin and the availability of foraging habitat elsewhere it is not a size which will cause population level effects. Vessel presence is not a problem for bottlenose dolphin with many individuals approaching vessels. **It is concluded that the proposed activities will have no adverse effects on the bottlenose dolphin QI.**

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[28] Nykänen, Milaja, Marie Louis, Eileen Dillane, Eric Alfonsi, Simon Berrow, Joanne O'Brien, Andrew Brownlow et al. "Fine-scale population structure and connectivity of bottlenose dolphins, Tursiops truncatus, in European waters and implications for conservation." *Aquatic Conservation: Marine and Freshwater Ecosystems* 29 (2019): 197-211.

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

[30] Bath, G. E., Price, C. A., Riley, K. L., & Morris Jr, J. A. (2023). A global review of protected species interactions with marine aquaculture. *Reviews in Aquaculture*, *15*(4), 1686-1719.

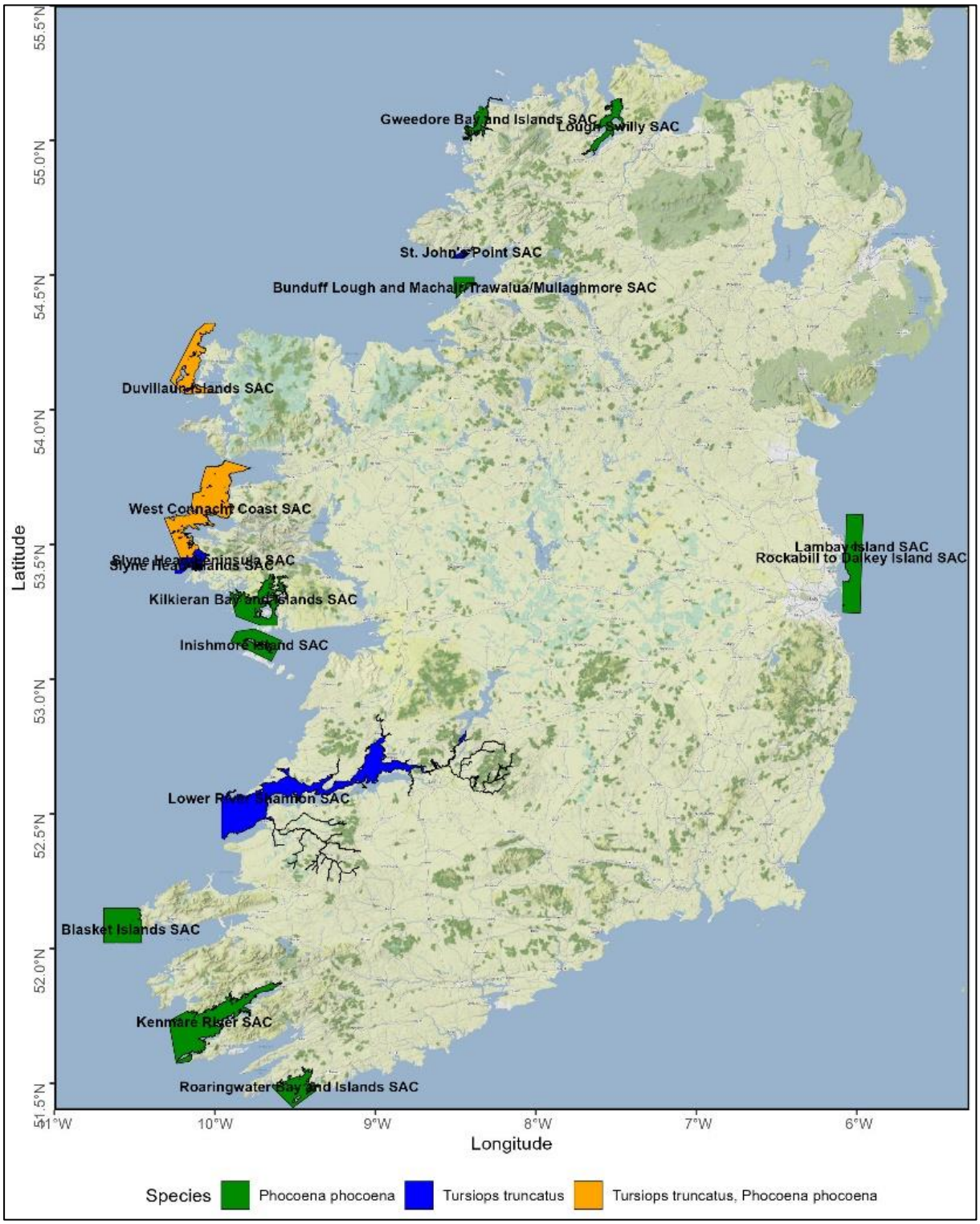

Figure 5-2 Special Areas of Conservation currently designated for Bottlenose Dolphin and Harbour Porpoise in Irish waters

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

The closest SAC designated for harbour porpoise to the proposed activities is Lambay Island SAC and Rockabill to Dalkey Island SAC. There are sightings within Dundalk Bay of harbour porpoise logged on the biodiversity data centre[31]. The Irish Sea is considered a key foraging habitat for harbour porpoise[32,33]. The conservation objectives for the SACs designated for harbour porpoise was to maintain the favourable conservation condition. Attributes and targets are:

1. **Access to suitable habitat – Species range within sites should not be restricted by artificial barriers to site use.**
2. **Disturbance – Human activities should occur at levels that do not adversely affect the harbour porpoise population at the site.**

Sites T01-097A and T01-099A are both intertidal and are thus not within the useable habitat of harbour porpoise. Sites T01-1001 and T01-1002 are both subtidal rope mussel farms approximately 72 ha each in size. Neither site is large enough to cause a barrier to species movement. There is possibility of habitat exclusion in the direct footprint of the farm which is in a known foraging area for the species, however the size of the farm will not significantly reduce that footprint. The main cause of disturbance is from vessel activity travelling to and from sites T01-1001 and T01-1002. Access routes for both sites are from the pier in Carlingford Lough. Both sites are operated by the same company so we can make the assumption that access will be by a single vessel at least twice per day. Vessel presence is likely to cause disruption to harbour porpoise however the limited number of trips is unlikely to cause detrimental effects on individuals or the population.

A paper by Bath et al.[34] recorded a single fatality of a harbour porpoise on a mussel farm spat line in Iceland so entanglement or collision can occur however the level appears to be low enough as to not be a problem for the population.

It is concluded that the proposed activities will not pose any adverse effects on the harbour porpoise QI. However, given the possibility of entanglement it is recommended that operators at sites T01-1001 and T01-1002 are required to report any entanglements of cetaceans to the appropriate authorities.

[31] Maps - Biodiversity Maps

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

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

[34] Bath, G. E., Price, C. A., Riley, K. L., & Morris Jr, J. A. (2023). A global review of protected species interactions with marine aquaculture. *Reviews in Aquaculture*, *15*(4), 1686-1719.

5.2.4 Harbour seal (*Phoca vitulina*) [1365] and Grey seal (*Halichoerus grypus*) [1364]

Harbour or common seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) both utilise the Irish Sea including the waters around Dundalk Bay. A survey undertaken in August 2024 highlighted the northern shore of Dundalk Bay as a habitat being used by both seal species[35]. Harbour and grey seals are successful aquatic predator that feeds on a wide variety of fish, cephalopod and crustacean species. For individual seals of all ages, intervals between foraging trips in coastal or offshore waters are spent resting ashore at terrestrial or inter-tidal haul-out sites, or in the water. Seals are not a QI of Dundalk Bay SAC however, Lambay Island SAC is approximately 100 km away and has both harbour and grey seals listed as a QI. The overarching conservation objective for harbour and grey seal in Lambay Island SAC is to maintain favourable conservation status which is defined by the following attributes and targets:

1. Access to suitable habitat

The targets for this attribute relate to artificial barriers ensuring that access to seal habitat is not restricted. The proposed bag and trestle culture in Dundalk Bay SAC is extensive and seals will only be overlapping with the structures during high tide when they do not pose a barrier to movement. Suspended mussel culture introduces suspended ropes and anchors into the water column however, given the size of the sites and the mobility of seals to travel through and around such structures they will not pose a barrier to individual movement.

2-4. Breeding behaviour, moulting behaviour and resting behaviour

Breeding, moulting and resting sites should be maintained in a natural condition. Seals breed, moult and rest on terrestrial habitat therefore there will be no active structures in these areas. There is potential for litter or unused structures to be left on the foreshore and it is recommended that licensing conditions regarding leaving gear of any type on the foreshore be strictly adhered to.

5. Disturbance

This attribute states that human activities should occur at levels that do not adversely affect the harbour or grey seal population at the site. Activities at sites which culture oysters using bag and trestle are accessed by tractor. Seals are vulnerable to disturbance during periods in which time is spent ashore, or in shallow waters. Two hours either side of low tide is the time when numbers of hauled-out seals is highest. The presence of people on the beach and vessels within 500m of the haul out site were both found to affect the number of grey seals in the Blasket Islands who flushed into the water[36]. Terrestrial seal activities, at haul-out locations, occur predominately during low tide which co-occurs with bag and trestle culture using tractors. Culture types and sites accessed by boat will have more temporal overlap with seal activities in the water when foraging which can also cause disturbance. A survey in 2024 found seal activity along the northern shore in the Bay near to where the proposed license T01-097A is located[34] and there is a known seal haul out site at Cooley Point directly adjacent to the proposed site T01-097A. Any seals resting in this area are unlikely to have any habituation to tractor activity nearby.

[35] Morris, C.D, Riddoch, N.G., Duck, C.D., Waitland, S.A. & Russell, D.J.F. (2025). Aerial thermal-imaging survey of seals in Ireland in August 2024. Irish Wildlife Manuals, No. 158. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

[36] Tadeo, M. P., Gammell, M., & O'Brien, J. (2021). Assessment of Anthropogenic Disturbances Due to Ecotourism on a Grey Seal (*Halichoerus grypus*) Colony in the Blasket Islands SAC, Southwest Ireland and Recommendations on Best Practices. *Aquatic Mammals*, *47*(3), 268-282.

In section 5.2.3 the assumption was made that vessel activity at sites T01-1001 and T01-1002 is likely to be low (2 trips per day). Studies elsewhere in Ireland indicated that there were no differences in seal presence between mussel sites and control sites[37]. Disturbance at these sites could potentially impact individuals resting on the nearby Cooley Point or foraging near the structures however this is unlikely to cause population level effects on harbour or grey seal QIs.

Adverse effects on seals from disturbance activities at site T01-097A could not be ruled out. Adverse effects on grey and harbour seals at sites T01-099A, T01-1001 and T01-1002 can be ruled out.

Mitigation

Given the proximity of site T01-097A to known seal resting locations and the potential effects of disturbance we recommend that proposed site T01-097A is not licensed.

Given the potential for disturbance to resting or foraging seals from boat activity during site access, we recommend that operators adhere strictly to agreed access routes and maintain a consistent, slow speed, travelling in a predictable manner.

[37] Roycroft, D., Kelly, T. C., & Lewis, L. J. (2004). Birds, seals and the suspension culture of mussels in Bantry Bay, a non-seaduck area in Southwest Ireland. *Estuarine, Coastal and Shelf Science*, *61*(4), 703-712.

5.3 Birds Directive SPA Assessment

5.3.1 Pressures arising from the proposed activities

There are four main pressures which aquaculture activities may exert on birds; the chance of collision or entanglement in aquaculture gear; noise or visual disturbance from either vessels or machinery; barrier to species movement which includes permanent or temporary exclusion from foraging grounds; and direct prey competition.

Collision and entanglement can lead to the chance for injury and the possibility of fatal encounters. If the death of individuals occurs at a high enough level it will affect the total population but also if breeding adults are affected will change the reproductive success and will have knock on effects to the future population size. Bird species have varying degrees of reaction to noise disturbance or visual disturbance.

Figure 5-3 demonstrates the shellfish aquaculture activities which either exist or have been applied for in Dundalk Bay SPA and how they link to the broad pressures which act on bird SCIs.

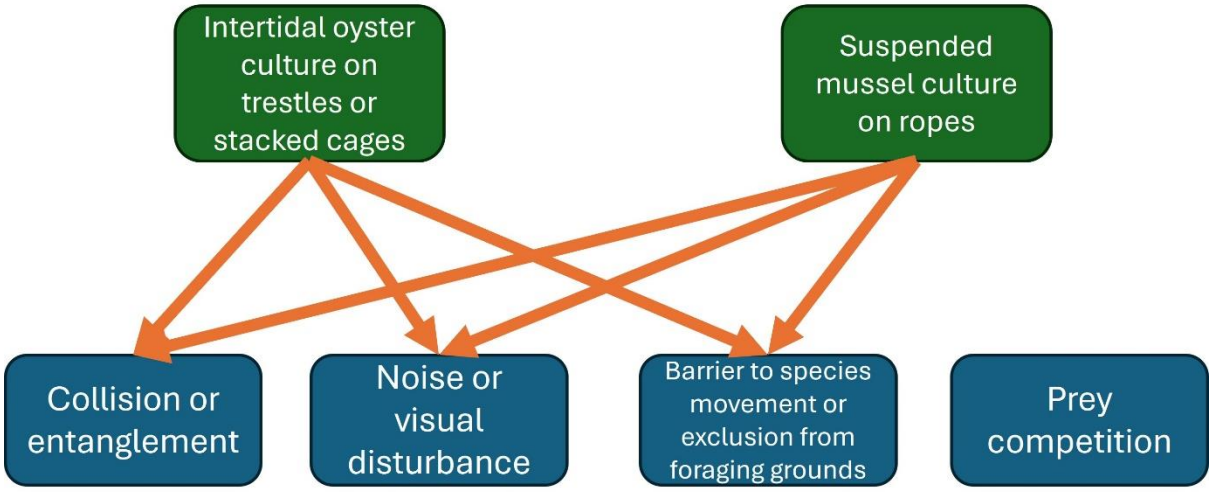

Figure 5-3 The current and proposed activities in Dundalk Bay SPA and the subsequent pressures they may exert on marine bird SCIs in Dundalk Bay and surrounding SPAs.

Intertidal culture for oyster using both trestles and stacked cages are proposed within and just outside Dundalk Bay SPA (T01-099A and T01-097A). Intertidal aquaculture can cause permanent or temporary exclusion from foraging grounds. Disturbance at sites is largely from machinery (mainly tractors) being operated at sites during maintenance and harvesting activities. There is a risk of entanglement of in discarded equipment at the site, specifically bags and bands used to hold bags closed. This could lead to reduced ability to forage and eventually in some cases indirectly to fatality.

There are two suspended mussel culture sites proposed which are outside the Dundalk Bay SPA boundary each of which is approximately 72 ha in area. Suspended mussel culture can create a barrier to species movement if extensive and also causes exclusion in the direct vicinity of the structures. Disturbance is possible when vessels are commuting to and from sites for maintenance or harvesting activities.

The following sections will consider per SCI species, the risk from each pressure and activity given the conservation objectives at the site.

5.3.2 Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]

Baseline and conservation status

The conservation objective for Light-bellied Brent goose is to maintain a favourable conservation status. Specifically, a long-term population trend is stable or increasing and there is no significant decrease in the number and range of areas used by the species[38]. The baseline number for the Bay is 370 (five year mean peak for the period 1995/96 to 1999/2000) which rose to 1075 in the 2005/06 – 2009/10 period[39]. The baseline conservation condition was established as favourable, with an increasing trend. The current conservation status in Irish waters is amber[40]. The winter I-WEBs high tide survey counts species in Dundalk Bay over the last ten years (Figure 5-4). Number for Brent Goose indicates that numbers in the Bay have been variable but generally there is a declining trend which is still higher than the baseline figure from 1995/6.

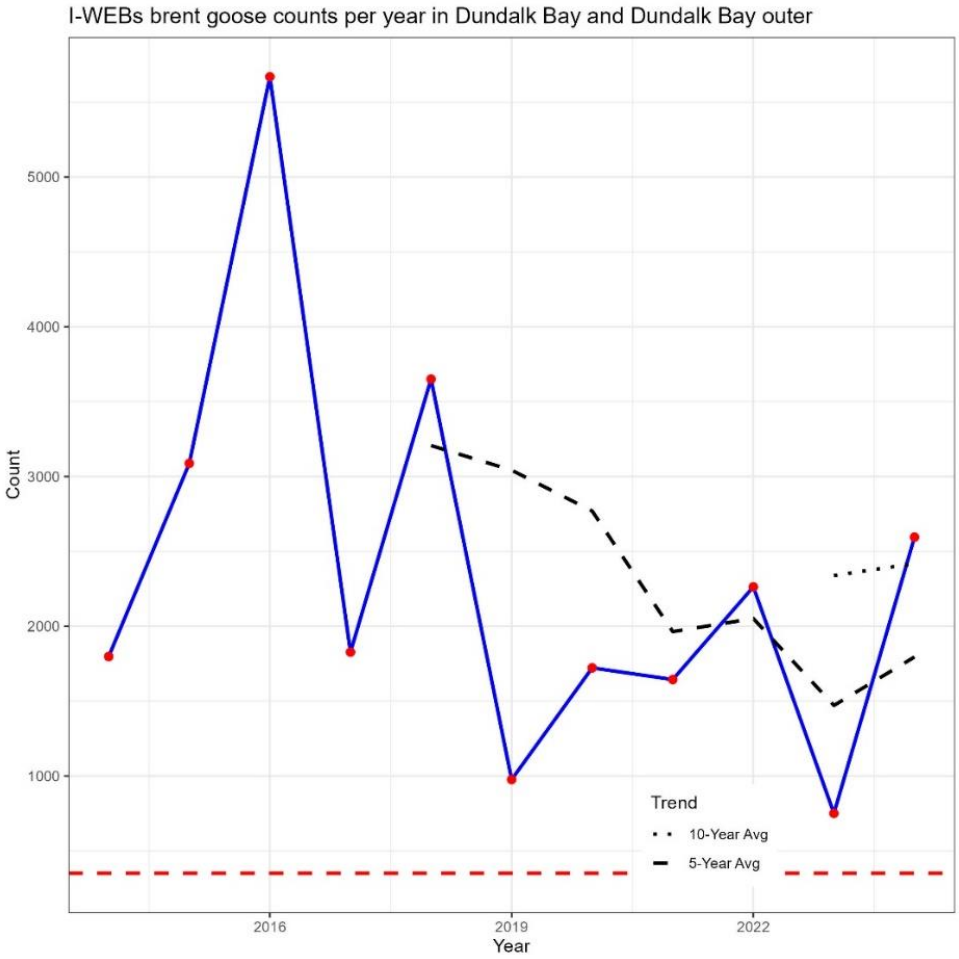

Figure 5-4 I-WEBs Brent Goose counts per year in Dundalk Bay between winters of 2014/15 and 2024/25. Red dashed line indicates the baseline from NPWS counts in 1995/1996. Black dashed line indicates the calculated 5-year rolling average.

[38] NPWS 2011. Dundalk Bay SAC and SPA. Conservation Objectives

[39] NPWS 2011. Dundalk bay SPA (Site code 4026). Conservation objectives supporting documents. Version 1.

[40] Gilbert, Gillian, Andrew Stanbury, and Lesley Lewis. "Birds of conservation concern in Ireland 4: 2020–2026." Irish Birds 43 (2021): 1-22.

Ecology

Brent Geese migrate from the northern regions to overwinter in Irish waters every year. They show high wintering site fidelity, and the same individuals are regularly resighted in the same site year on year. Brent Geese are a vegetarian species which feed predominantly eelgrass or other green algae species on the intertidal zone during the winter. They are occasionally sighted foraging on surrounding grassland towards the end of the winter season.

Risk Assessment

An internal Marine Institute study assessed the risk of marine birds to different aquaculture types (See section 4.4.2 and Table 4-2 for details on methods). The results of that risk assessment specific to brent geese can be seen in Table 5-4 and are summarised in the relevant sections below.

Table 5-4 Risk assessment for Light-bellied Brent Goose. Risk scores range from 0 - 5. Full details of parameters and score explanation can be found in the methods section. See section 4.4.2 and Table 4-2 for details on methods and scores.

Life history stage in COs	Likelihood of overlap	Disturbance	Potential for entanglement/ collision	Flexibility in habitat use	Foraging range	Flexibility in diet	Irish threat and conservation status	Adult survival rate
Intertidal shellfish on trestles or stacked cages								
Winter	5	3	4	5	4	5	3	4
Suspended mussel culture								
Winter	0	3	2	5	4	5	3	4

Intertidal aquaculture (bag and trestle and stacked cages)

The two intertidal aquaculture sites both occupy the main foraging habitat of brent geese, intertidal mudflats (likelihood of overlap scored = 5, foraging range scored = 4). Furthermore, given the specialist diet, eelgrass and other green algae, of Brent Geese their ability to move elsewhere is limited (flexibility in diet score = 5). NPWS surveys undertaken in Dundalk Bay in 2007 and 2008 did not map any areas of eelgrass within Dundalk Bay. Eelgrass beds are noted in neighbouring Carlingford Lough and it is likely that geese from Dundalk Bay are foraging within Carlingford Lough and roosting within Dundalk Bay. Brent Geese do forage terrestrially and on other green algae when food sources are low. With no known eelgrass beds within a distance of the two proposed sites there is unlikely to be any exclusion from key foraging habitat. Similarly, any disturbance from foraging brent geese is unlikely as individuals are may only be in the area during high tide when they are roosting and when aquaculture activity ceases.

It is therefore, concluded that there will be no adverse effects from the proposed activities on Brent Goose SCI.

Suspended mussel culture

The suspended mussel culture sites are both subtidal in nature and do not overlap with the foraging habitat of Brent Goose. **It is, therefore, concluded that there will be no adverse effects from the proposed activities on the Brent Goose SCI.**

Conclusions and recommendations

1. **There will be no adverse effects from the proposed activities on Ligh-bellied Brent Geese.**
2. **Given the 18-year gap from the last intertidal survey it is recommended that a new intertidal survey is undertaken which includes mapping any eelgrass beds which foraging Brent Geese might be utilising.**

5.3.3 Ducks and divers

Baseline and conservation status

The following ducks and divers are screened in for further assessment; Common Scoter (*Melanitta nigra*) [A065], Red-throated Diver (*Gavia stellata*) [A001], Great Northern Diver (*Gavia immer*) [A003], Great Crested Grebe (*Podiceps cristatus*) [A005], Pintail (*Anas acuta*) [A054], Red-breasted Merganser (*Mergus serrator*) [A069], Shelduck (*Tadorna tadorna*) [A048]. All species except the two diver species are SCIs within Dundalk Bay SPA. The two diver species are SCIs are within the North-west Irish Sea SPA.

The conservation objective for all species is to maintain a favourable conservation status. For the Dundalk Bay species the specific targets and attributes are; a long-term population trend is stable or increasing and there is no significant decrease in the number and range of areas used by the species. Attributes and targets for the two diver species are; no significant decline in the non-breeding population, sufficient number of locations, area and availability of suitable habitat to support the population, sufficient foraging biomass to support the population, the intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the population targets and spatial distribution, there are no barriers to connectivity and site use that will impact the populations access or other ecologically important sites outside the SPA.

The baseline populations and conservation status and condition for ducks and diving species can be found in Table 5-5.

Table 5-5 Screened in dabbling and diving ducks protected in Dundalk Bay SPA, their baseline population calculated from I-WEBs data between 1995/6-1999/00, the current Irish conservation status of these species and the 2011 assessed conservation condition at the site.

Species	Baseline population (1995/96 – 1999/00)[41]	Current conservation status Ireland[42]	Conservation condition at baseline
Common Scoter (*Melanitta nigra*) [A065]	581	Red	Intermediate (unfavourable)
Red-breasted Merganser (*Mergus serrator*) [A069]	121	Amber	Favourable
Pintail (*Anas acuta*) [A054]	117	Amber	Favourable
Shelduck (*Tadorna tadorna*) [A048]	522	Amber	Favourable
Great Crested Grebe (*Podiceps cristatus*) [A005]	303	Amber	Moderately unfavourable

[41] NPWS (2011) Version 1. Dundalk Bay Special Protection Area. Site Code 4026 Conservation Objectives Supporting Document.
[42] Gilbert, Gillian, Andrew Stanbury, and Lesley Lewis. "Birds of conservation concern in Ireland 4: 2020–2026." Irish Birds 43 (2021): 1-22.

Red-throated Diver (*Gavia stellata*) [A001]	538	Amber	Not available
Great Northern Diver (*Gavia immer*) [A003]	Not available	Amber	Not available

The Irish Wetland Bird Survey (I-WEBs) has surveyed in Dundalk Bay SPA on a consistent basis since the winter of 1994/95. The winter peak counts for Common Scoter in Dundalk Bay have shown an increase from the early 2000's to a peak in 2014 and a current decreasing rolling 5-year and 10-year average (Figure 5-5). Great Crested Grebe numbers were at a peak in the late 1990's, decreased up until 2010 and have been variable but steady since (Figure 5-5). Great Northern Diver numbers were low in the 2000's and increased until 2011, recent years have shown a decline in numbers (Figure 5-5). Pintail counts have been very variable in Dundalk Bay but show a decreasing 5-year rolling average since 2010 (Figure 5-5). Red-breasted Merganser have been decreasing steadily (5-year and 10-year averages) since 2009 (Figure 5-5). Red-throated Diver numbers in Dundalk Bay are generally low and have been steady since records began. Shelduck have been decreasing (5-year and 10-year averages) since 2010 (Figure 5-5). The most current counts for all species which are SCIs within Dundalk Bay (i.e. excluding the two diver species) are below the baseline figures from 1995/96 (Figure 5-5).

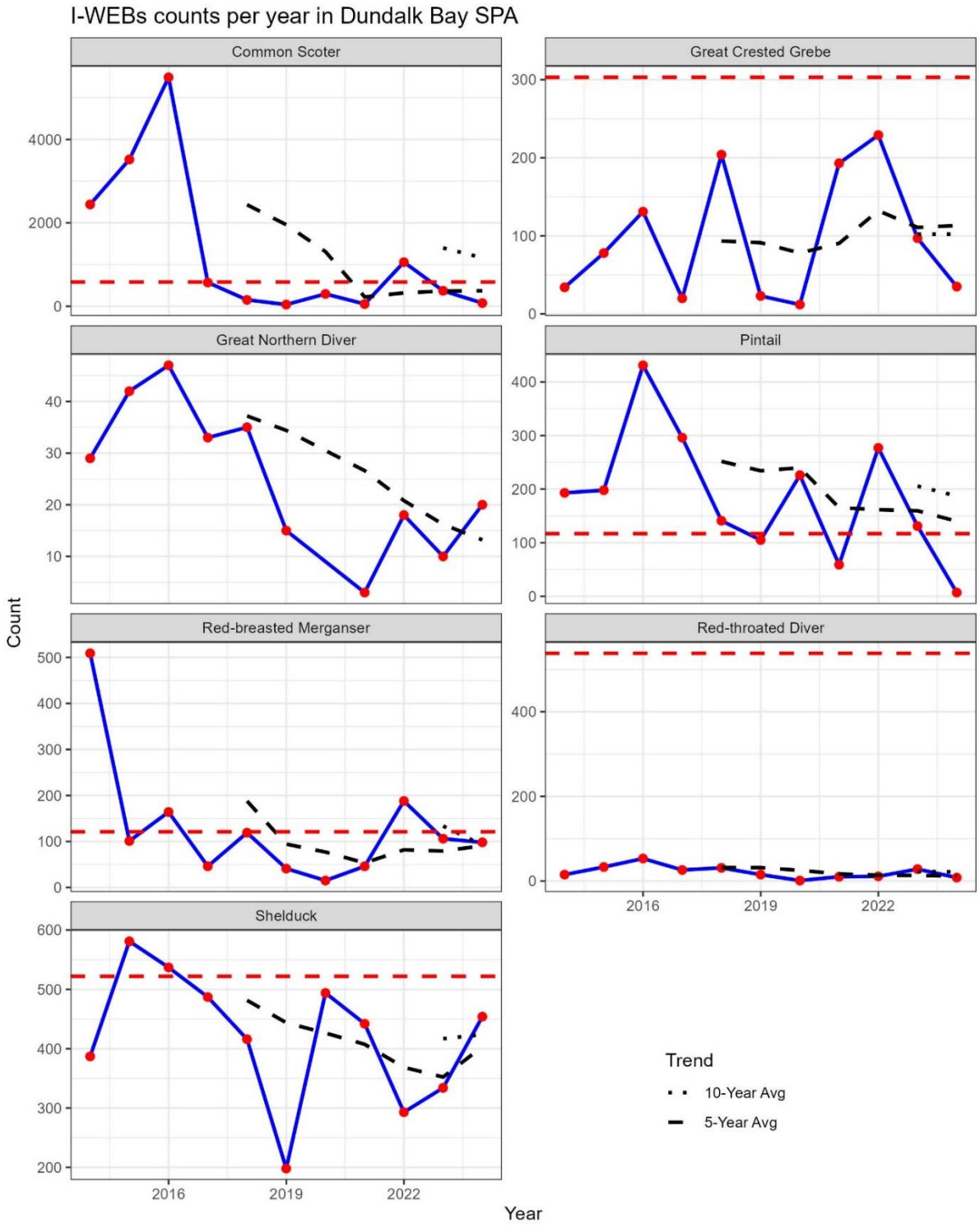

Figure 5-5 I-WEBs counts per year in Dundalk Bay SPA for ducks and diving species. Red dashed line is the NPWS reported baseline figure. Black dashed line is the 5-year average. Black dotted line is the rolling 10-year average. Note that the baseline figure for Red-throated diver is taken from the North-west Irish Sea SPA.

Ecology

Common Scoter are a large benthos feeding duck which dive up to 30 m to feed on bivalves in sandy sediment[43]. Their site fidelity is unknown, but they have highly specialised prey preferences and a localised winter distribution[44].

Great Crested Grebe is a pursuit diver, freshwater species, preferring fresh or brackish waters fringed by vegetation during the breeding season. They migrate to coasts and estuaries during the winter[45]. Forages on sizable fish but can also consume a wide variety of other aquatic invertebrates. Their site fidelity is listed as high by NPWS[46] but with a widespread winter distribution.

Great Northern Diver prefers clear waters in the littoral zone and avoids deeper waters. It frequents coastal areas in bays or coves which are sheltered from wave action. It may form large flocks in less protected waters for foraging. They are a pursuit diver which predominately feed on fish[47]. There is little known about the foraging range but distances for similar diving species is less than 5 km. The boundary of the north-west Irish Sea SPA intersects the lower boundary of the Dundalk Bay SPA.

Pintail feed a variety of plant, insect, crustaceans, worms and snails, they forage by dabbling or diving in short bursts of less than 10 seconds[48]. They are recorded has having weak site fidelity[42] but a short foraging range of 6.8 km travelling between roost and feeding grounds[49].

Red-breasted Mergansers are surface diving ducks which feed on fish species in shallow waters between 3-6 m[50]. The site fidelity of Red-breasted Mergansers is unknown but foraging range is likely to be short.

Red-throated Diver is a diving species which primarily feeds on fish. Breeds in low elevation wetlands and winters in both freshwater and marine habitats. The mean maximum foraging range for this species is 9 km[51] which is within the range of the North-west Irish Sea SPA and Dundalk Bay.

Shelduck can forage in a variety of ways including dabbling and scything and they therefore forage throughout the tidal cycle mainly on muddy habitats and shallow water up to 40 cm

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[43] Carboneras, C. and G. M. Kirwan (2020). Common Scoter (*Melanitta nigra*), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.blksco1.01

[44] NPWS (2011) Version 1. Dundalk Bay Special Protection Area. Site Code 4026 Conservation Objectives Supporting Document.

[45] Llimona, F., J. del Hoyo, D. A. Christie, F. Jutglar, and G. M. Kirwan (2020). Great Crested Grebe (*Podiceps cristatus*), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.grcgre1.01

[46] NPWS 2011. Dundalk Bay SPA (Site code 4026). Conservation Objectives Supporting Document. Version 1

[47] Paruk, J. D., D. C. Evers, J. W. McIntyre, J. F. Barr, J. Mager, and W. H. Piper (2021). Common Loon (*Gavia immer*), version 2.0. In Birds of the World (P. G. Rodewald and B. K. Keeney, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.comloo.02

[48] Clark, R. G., J. P. Fleskes, K. L. Guyn, D. A. Haukos, J. E. Austin, and M. R. Miller (2020). Northern Pintail (*Anas acuta*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.norpin.01

[49] Clark, R. G., J. P. Fleskes, K. L. Guyn, D. A. Haukos, J. E. Austin, and M. R. Miller (2020). Northern Pintail (Anas acuta), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.norpin.01

[50] Craik, S. R., J. Pearce, and R. D. Titman (2020). Red-breasted Merganser (*Mergus serrator*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.rebmer.01

[51] Woodward, Ian D., Chris B. Thaxter, Ellie Owen, Mark Bolton, Robin M. Ward, and Aonghais SCP Cook. "The value of seabird foraging ranges as a tool to investigate potential interactions with offshore wind farms." Ocean & Coastal Management 254 (2024): 107192.

deep[52]. They are recorded as having a high site fidelity[53], foraging range is generally low (<3 km) for most trips but longer ranging trips of >45 km has also been recorded[54].

Risk Assessment

An internal Marine Institute study assessed the risk of marine birds to different aquaculture types (See section 4.4.2 and Table 4-2 for details on methods). The results of that risk assessment for screened in ducks and divers can be seen in Table 5-6 and are summarised in the relevant sections below.

Table 5-6 Risk assessment for screened in Dundalk Bay QIs for two types of aquaculture (existing or proposed) in The Bay. Risk scores range from 0 - 5. Full details of parameters and score explanation can be found in the methods section. See section 4.4.2 and Table 4-2 for details on methods and scores.

COMMON NAME	Life history stage in COs	Suitability of aquaculture habitat	Disturbance	Potential for entanglement /collision	Flexibility in habitat use	Foraging range	Flexibility in diet	Irish threat and conservation status	Adult survival rate
		Intertidal shellfish on trestles							
Common Scoter	Winter	0	5	3	3	5	4	5	2
Great Crested Grebe	Winter	4	2	3	1	5	4	3	1
Great Northern Diver	Winter	0	4	3	4	4	4	3	3
Pintail	Winter	1	3	2	2	4	4	3	2
Red-breasted Merganser	Winter	4	5	2	3	4	4	3	3
Red-throated Diver	Winter	0	4	3	4	4	4	3	3
Shelduck	Winter	4	5	3	3	2	4	3	2
		Suspended mussel culture							
Common Scoter	Winter	4	5	3	3	5	4	5	2
Great Crested Grebe	Winter	0	2	3	1	5	4	3	1
Great Northern Diver	Winter	4	4	3	4	4	4	3	3
Pintail	Winter	1	3	3	2	4	4	3	2
Red-breasted Merganser	Winter	4	5	3	3	4	4	3	3
Red-throated Diver	Winter	4	4	3	4	4	4	3	3
Shelduck	Winter	0	5	1	3	2	4	3	2

Intertidal aquaculture (bag and trestle and stacked cages)

The suitability of aquaculture habitat is scored 0 (no possibility of overlap) in the risk assessment for Common Scoter, Great Northern Diver and Red-throated Diver. This is due to the depth preferences of the species and the shallow intertidal nature of the culture type. **Adverse effects for these three species can therefore be ruled out.**

Suitability for Northern Pintail is low (risk score 1) this is due to its preference for shallow waters with plenty of cover. There is unlikely therefore to be considerable overlap between the species and the two proposed sites. **Adverse effects for Northern Pintail can therefore be ruled out.**

[52] Carboneras, C. and G. M. Kirwan (2020). Common Shelduck (*Tadorna tadorna*), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.comshe.01

[53] NPWS (2011) Version 1. Dundalk Bay Special Protection Area. Site Code 4026 Conservation Objectives Supporting Document.

[54] Carboneras, C. and G. M. Kirwan (2020). Common Shelduck (*Tadorna tadorna*), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.comshe.01

Great Crested Grebe and Red-breasted Merganser are diving species which will only interact with the culture types during high tide. There will be little to no disturbance during that time as maintenance activities are carried out at low tide. Both species can forage within and among the trestles and whilst there is a change of collision with structures the chances of this happening to such an extent to cause population level changes is unlikely. The proposed activities therefore pose no exclusion, barriers to movement or disturbance to these species. **Adverse effects of intertidal aquaculture on Great Crested Grebe and Red-breasted Merganser can be ruled out.**

Shelduck forage in shallow water intertidally. There is a high chance of overlap with oyster trestles and shelduck habitat during low tide when work is being carried out at the site. Shelduck have quite specific diet of saltwater snails (*Hydrobia ulvae*), but they do have some flexibility in foraging habitat and range. Given the small number of sites proposed and the small area which they cover exclusion from any significant part of their foraging habitat is unlikely to cause population level effects. Disturbance from foraging areas is possible and the disturbance score for these species is high. Flock maps generated by the NPWS in 2010 indicate some Shelduck foraging in the vicinity of the proposed sites T01-099[55]. **Adverse effects from disturbance effects of intertidal aquaculture on Shelduck cannot be ruled out.**

Suspended mussel culture

The two suspended mussel applications (T01-1001 and T01-1002) occur outside the boundary of Dundalk Bay SPA. The water in the area of both applications is 12m. Three of the ducks and diving species (Great Crested Grebe, Shelduck and Pintail) have low risk scores for suitability of aquaculture (risk score 0 -1). These species tend to forage coastally and in shallow water and are therefore unlikely to overlap with the proposed sites. The other species, Common Scoter, Great-Northern Diver, Red-breasted Merganser, Red-throated Diver all potentially overlap with the proposed activities. All four species are high risk when flexibility of diet, habitat and foraging range are considered (risk scores 3-5) meaning that exclusion at these sites will cause pressure on all four species. Both sites are small (72 ha each) compared to the suitable available habitat in the area therefore exclusion is unlikely to cause adverse effects on the population. There is a moderate risk of entanglement or collision with ropes and gears however there is little evidence that any of these species are frequently caught in suspended mussel lines in Ireland[56] therefore any mortalities are unlikely to cause population level effects. Disturbance is possible, particularly from vessels commuting to and from the site during maintenance and harvesting activities. All four species have high risk of disturbance (risk score 4-5) which will expand the possible exclusion zone around the site and along the access routes from Carlingford Lough. The number and size of sites is small. Access is by boat assumed to be no more than 2 trips per day in one vessel. This level of disturbance is unlikely to have population level effects on Common Scoter, Great-Northern Diver, Red-breasted Merganser, Red-throated Diver. **Adverse effects on these species from mussel longlines can be ruled out.**

[55] NPWS (2011). Conservation Objectives Supporting Document Dundalk Bay SPA (Site Code 4026). Version 1. March 2011.

[56] Bath, G. E., Price, C. A., Riley, K. L., & Morris Jr, J. A. (2023). A global review of protected species interactions with marine aquaculture. *Reviews in Aquaculture*, *15*(4), 1686-1719.

Conclusions and recommendations

1. **Adverse effects of the proposed activities from disturbance on Shelduck SCI cannot be ruled out.**
2. **It is recommended that protocols around use of access routes, speed limits, no dogs permitted on the shore and not leaving engines running during maintenance and harvesting activities are implemented in Dundalk Bay SPA. If such measures were implemented, then adverse effects on shelduck could be ruled out.**
3. **It is recommended that licenses stipulate that any entanglements or collisions of protected bird species observed from mussel longlines are recorded and reported to the appropriate authority.**

5.3.4 Intertidal waders

The following intertidal waders were screened in: Bar-tailed Godwit (*Limosa lapponica)* [A157], Black-tailed Godwit (*Limosa limosa*) [A156], Curlew (*Numenius arquata*) [A160], Dunlin (*Calidris alpina)* [A149], Golden Plover (*Pluvialis apricaria)* [A140], Ringed Plover (*Charadrius hiaticula*) [A137], Grey Plover (*Pluvialis squatarola*) [A141], Knot (*Calidris canutus*) [A143], Lapwing (*Vanellus vanellus*) [A142], Oystercatcher (*Haematopus ostralegus*) [A130], Redshank (*Tringa totanus*) [A162]. All eleven species are SCIs within Dundalk Bay SPA.

Baseline and conservation status

The conservation objectives for all species are to maintain a favourable conservation status. Specifically, a long-term population trend is stable or increasing and there is no significant decrease in the number and range of areas used by the species. The baseline populations and conservation statuses and condition for intertidal waders can be found in Table 5-7.

Table 5-7 Screened in intertidal waders protected in Dundalk Bay SPA, their baseline population calculated from I-WEBs data between 1995/96 - 1999/00. the current Irish Conservation Status of these species and the 2011 assessed conservation condition at the site.

Species	Baseline population (1995/96 – 1999/00)[57]	Current conservation status Ireland[58]	Conservation condition at baseline
Bar-tailed Godwit (*Limosa lapponica*) [A157]	1950	Red	Favourable
Black-tailed godwit (*Limosa limosa*) [A156]	1100	Red	Favourable
Curlew (*Numenius arquata*) [A160]	1264	Red	Moderately Unfavourable
Dunlin (*Calidris alpina*) [149]	11,518	Red	Moderately Unfavourable
Golden Plover (*Pluvialis apricaria*) [A140]	5967	Red	Favourable
Ringed Plover (*Charadrius hiaticula*) [A137]	151	Amber	Favourable
Grey Plover (*Pluvialis squatarola*) [A141]	204	Red	Moderately Unfavourable

[57] NPWS (2011) Version 1. Dundalk Bay Special Protection Area. Site Code 4026 Conservation Objectives Supporting Document.
[58] Gilbert, Gillian, Andrew Stanbury, and Lesley Lewis. "Birds of conservation concern in Ireland 4: 2020–2026." Irish Birds 43 (2021): 1-22.

Knot (*Calidris canutus*) [A143]	9710	Red	Intermediate (Unfavourable)
Lapwing (*Vanellus vanellus*) [142]	4892	Red	Intermediate (Unfavourable)
Oystercatcher (*Haematopus ostralegus*) [A130]	8746	Red	Favourable
Redshank (*Tringa tetanus*) [A162]	1659	Red	Favourable

The latest I-WEBs data for Dundalk Bay from 2013 to 2025 for intertidal waders is shown in Figure 5-6. All species show a decline in 5 years average (Figure 5-6) with Bar-tailed Godwit, Curlew, Dunlin, Golden Plover, Grey Plover, Knot, Lapwing, Oystercatcher, Redshank and Ringed Plover showing 5-year rolling average which is below the baseline figure from 1995/96 reported by NPWS. All wading species screened in apart from Ringed Plover (Amber) are currently listed as threatened (Red) in Ireland compared to favourable or moderately/intermediate unfavourable at status at the baseline.

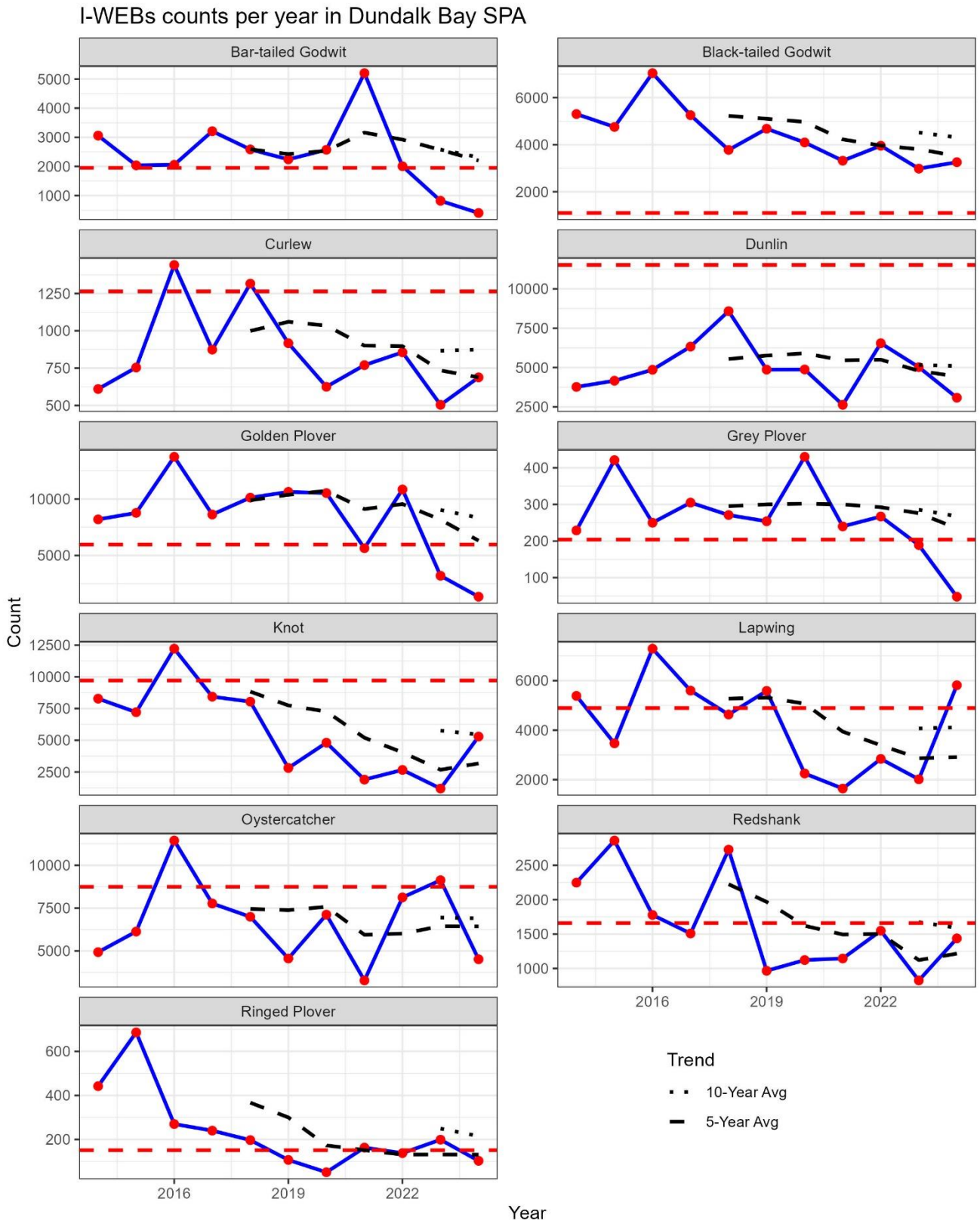

Figure 5-6 I-WEBs counts per year in Dundalk Bay SPA for wading species. Red dashed line is the NPWS reported baseline figure. Black dashed line is the 5-year average. Black dotted line is the rolling 10-year average.

Ecology

Waders are birds which forage by bill probing in the intertidal zone for usually invertebrate prey, mainly polychaetes worms. Species such as Knot and Oystercatcher focus mainly on small bivalves particularly cockles and mussels[59,60]. Often there can be species specific selection on habitat and/or particle size with species such as Bar-tailed Godwit focusing mainly on sandier substrates[61] whilst other species such as Redshank and Dunlin prefer muddy substrates. Species tend to roost during high tides and then move down to the tide line at low tides to forage. Occasionally, some species may supplement intertidal foraging with foraging in marginal habitats such as terrestrial grasslands if prey resources become scarce. Lapwing and Golden Plover are often associated together outside the breeding season. They tend to winter in open arable land farmland where they forage and are occasionally seen in mudflats, saltmarshes in shallow bays and estuaries for roosting and high tide[62,63].

The foraging range and site fidelity of all species is such that they could overlap with sites T01-097A and T01-099A.

Risk Assessment

An internal Marine Institute study assessed the risk of marine birds to different aquaculture types (See Section 4.4.2 and Table 4-2 for details on methods). The results of that risk assessment specific to intertidal waders can be seen in Table 5-8 and are summarised in the relevant sections below.

Table 5-8 Risk assessment for screened in Dundalk Bay SPA QIs for two types of aquaculture (existing or proposed) in The Bay. Risk scores range from 0 - 5. Full details of parameters and score explanation can be found in the methods section. See section 4.4.2 and Table 4-2 for details on methods and scores.

COMMON NAME	Life cycle stage in COs	Suitability of aquaculture habitat	Disturbance	Potential for entanglement collision	Flexibility in habitat use	Foraging range	Flexibility in diet	Irish threat and conservation status	Adult survival rate
		Intertidal shellfish aquaculture							
Bar-tailed Godwit	**Winter**	5	4	3	5	5	3	5	5
Black-tailed Godwit	**Winter**	4	3	3	2	1	2	5	5

[59] Winkler, D. W., S. M. Billerman, and I. J. Lovette (2020). Oystercatchers (*Haematopodidae*), version 1.0. In Birds of the World (S. M. Billerman, B. K. Keeney, P. G. Rodewald, and T. S. Schulenberg, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.haemat1.01

[60] Baker, A., P. Gonzalez, R. I. G. Morrison, and B. A. Harrington (2020). Red Knot (*Calidris canutus*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.redkno.01

[61] Stillman, R. A., Biermann, L. K. & Morris, S. E. (2023) Intertidal oyster cultivation and shorebirds in Dungarvan Harbour: predictions from an individual-based model. BU Global Environmental Solutions report BUG2889 to WS Atkins Ireland Limited. 74 pp.

[62] Wiersma, P., G. M. Kirwan, and C. J. Sharpe (2020). Northern Lapwing (*Vanellus vanellus*), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.norlap.01

[63] Wiersma, P., G. M. Kirwan, and P. F. D. Boesman (2020). European Golden-Plover (*Pluvialis apricaria*), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.eugplo.01

Curlew	**Winter**	4	5	4	2	5	2	5	5
Dunlin	**Winter**	4	3	3	2	3	2	5	1
Golden Plover	**Winter**	4	4	3	1	4	2	5	1
Grey Plover	**Winter**	4	4	3	2	5	2	5	4
Knot	**Winter**	4	4	3	1	4	4	5	3
Lapwing	**Winter**	4	5	3	2	5	4	5	2
Oystercatcher	**Winter**	4	4	4	2	4	4	5	4
Redshank	**Winter**	4	4	4	3	4	2	5	2
Ringed Plover	**Winter**	4	5	3	3	5	3	3	4
		Suspended shellfish – mussels							
Bar-tailed Godwit	**Winter**	0	4	1	5	5	1	5	5
Black-tailed Godwit	**Winter**	0	3	1	2	1	1	5	5
Curlew	**Winter**	0	5	1	2	5	1	5	5
Dunlin	**Winter**	0	3	1	2	3	1	5	1
Golden Plover	**Winter**	0	4	1	1	4	2	5	1
Grey Plover	**Winter**	0	4	1	2	5	1	5	4
Knot	**Winter**	0	4	1	1	4	4	5	3
Lapwing	**Winter**	0	5	1	2	5	4	5	2
Oystercatcher	**Winter**	0	4	1	2	4	4	5	4
Redshank	**Winter**	0	4	1	3	4	1	5	2
Ringed Plover	**Winter**	0	5	1	3	5	1	3	4

Intertidal aquaculture (bag and trestle and stacked cages)

There is significant potential for overlap with the main foraging habitats of all screened in wading species, all species scored a 4 in the risk assessment (Table 5-8) meaning that at least one of the habitats utilised by the species is entirely within the same habitat used by the proposed activities. Of the two intertidal aquaculture sites only T01-099A is within Dundalk Bay SPA although wading species may also utilise the habitat at site T01-097A also. The main pressures which might be exerted from the proposed activities are exclusion from foraging grounds, entanglement/collision and disturbance. Exclusion may happen in the direct footprint of the site. The two sites combined total 27.61 ha. Site T01-097A is 1.9 ha and is a holding site for Pacific Oysters. The size of these sites is small compared to the available foraging habitat within Dundalk Bay, therefore, exclusion is unlikely to cause significant loss of foraging habitat. There is potential for entanglement within discarded oyster bag bands which may get tangled around beaks or legs or be ingested (restricting feeding ability). The risk is moderate (3-4) and is higher for the three species; (Curlew, Oystercatcher and Redshank) which are known to actively forage among oyster trestles. The level of mortality from intertidal oyster trestles is unknown and would be difficult to quantify. Impacts are unlikely to cause immediate mortality and are unlikely to be at a level which will cause population level effects. Disturbance rates are between moderate – high (3-5) for all wading species. Curlew, Oystercatcher and Redshank are unknown to have positive or neutral

association with oyster trestles so impacts on those species can be ruled out[64]. The other species are potentially affected by tractor activities travelling to and from the site for maintenance and harvesting which could exclude them from foraging grounds. This would particularly impact species like Bar-tailed Godwit which have low ability to move to other habitats and small foraging ranges. The activities in these areas are also new there are no other licensed sites in the area so habituation to such activities will not have occurred. Low tide surveys carried out in 2009 indicated that Lapwing, Bar-tailed Godwit and Black-tailed Godwit foraging and Grey Plover, Ringed Plover, Dunlin, and Knot foraging and roosting has been noted in the general vicinity of the proposed activities[65]. There was no roosting or foraging activities noted for Golden Plover in the vicinity of T01-099[64].

Adverse effects on Lapwing, Bar-tailed Godwit, Black-tailed Godwit, Grey Plover, Ringed Plover, Dunlin and Knot from disturbance at intertidal aquaculture sites could not be ruled out.

Suspended mussel culture

None of the proposed activities for suspended mussel culture (T01-1001, T01-1002) overlap suitably habitat of these intertidal waders. **Adverse effects from suspended mussel culture for all intertidal waders can be ruled out.**

Conclusions and recommendations

1. **Adverse effects of the proposed activities from disturbance on Bar-tailed Godwit, Black-tailed Godwit, Dunlin, Grey Plover, Knot, Lapwing and Ringed Plover could not be ruled out.**
2. **Considering there is no previous aquaculture in this Bay, and the lack of data to rule out adverse effects of new trestles in these locations it is recommended proposed sites T01-097A and T01-099A are not licensed.**

5.3.5 Auks

There were three auk species screened in for Dundalk Bay SPA: Razorbill (*Alca torda*) [A200], Guillemot (*Uria aalge*) [A887], Atlantic Puffin (*Fratercula arctica*) [A204].

Baseline and conservation status

All three species were screened in as an SCI within the NW Irish Sea SPA due to the possibility of exclusion from foraging grounds and disturbance. The conservation objective for guillemot and razorbill in with Northwest Irish Sea is to maintain favourable conservation condition. The conservation objective for puffin is to restore to favourable conservation condition. The achievements of these objectives are outlined by the following attributes and targets:

1. Population size – no significant decline (guillemot/razorbill) or long term SPA population trend is stable or increasing (puffin).

[64] Gittings, T., & O'Donoghue, P. D. (2012). *The effects of intertidal oyster (Crassostrea gigas) culture on the spatial distribution of waterbirds*. Marine Institute.

[65] NPWS (2011). Conservation Objectives Supporting Document Dundalk Bay SPA (Site Code 4026). Version 1. March 2011.

2. Spatial distribution – sufficient number of locations, areas and availability of suitable habitat to support the population
3. Forage spatial distribution extent, abundance and availability – Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
4. Disturbance across the site – The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
5. Barriers to connectivity – The number, location, shape and area of barriers do not significantly impact the site populations access to the SPA or other ecologically important sites outside the SPA.

Atlantic Puffin and Razorbill are both listed as red on the Irish threat and conservation status list and Common Guillemot is listed as amber. 2016 surveys in the western Irish Sea region estimated 4638 Razorbill and 13,914 Guillemot. The breeding Puffin population is estimated to have declined by 68% over the period 1999-2015 from 265 to 158 individuals[66]. From 1999-2015, individual Guillemot population estimates at Lambay of 59,983 remained stable (-1%), and Ireland's Eye increased by 101% to 4,410[61]. From 1999-2015, individual Razorbill population estimates at Lambay of 7,353 increased by 70%, and Ireland's Eye increased by 207% to 1,600[61]. Jessopp et al. (2018) undertook summer, autumn and winter surveys of the western Irish Sea; Razorbill and Guillemot were categorised together. Based on this 18,621, 93,191, and 18,553 individuals are estimated to have occurred in the SPA respectively[61].

Ecology

Puffin are a summer visitor to Irish shores including the Northwest Irish Sea SPA where they nest in colonies in burrows in steep cliffs. They prefer offshore islands where there is less risk of predation. They are pelagic foragers primarily feeding on fish and sand eels. Their average foraging range is 62 km with a maximum of 383 km being recorded.
Guillemot and Razorbill are resident in Irish waters and occur during breeding season and winter. They occur inshore close to land during breeding season (March/April to August/September) where they nest on cliffs in large colonies. They winter offshore. Prey mainly on small fish and invertebrates caught by diving.

Risk Assessment

An internal Marine Institute study assessed the risk of marine birds to different aquaculture types (See section 4.4.2 and Table 4-2 for details on methods). The results of that risk assessment specific to puffin, razorbill and guillemot can be seen in Table 5-9 and are summarised in the relevant sections below.

Table 5-9 Risk assessment for screened in Dundalk Bay SPA QIs for two types of aquaculture (existing or proposed) in The Bay. Risk scores range from 0 - 5. Full details of parameters and score explanation

[66] NPWS (2023) Conservation Objectives: North-west Irish Sea SPA 004236. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

can be found in the methods section. See section 4.4.2 and Table 4-2 for details on methods and scores.

COMMON NAME	Life cycle stage in COs	Suitability of aquaculture habitat	Disturbance	Potential for entanglement collision	Flexibility in habitat use	Foraging range	Flexibility in diet	Irish threat and conservation status	Adult survival rate
		Intertidal shellfish aquaculture							
Razorbill	**Breeding**	2	3	2	3	1	4	5	5
Puffin	**Breeding**	1	2	2	3	1	4	5	5
Guillemot	**Breeding**	1	3	2	3	1	4	3	4
		Suspended shellfish - mussels							
Razorbill	**Breeding**	4	3	3	3	1	5	5	5
Puffin	**Breeding**	4	2	3	3	1	5	5	5
Guillemot	**Breeding**	4	3	3	3	1	5	3	4

Intertidal aquaculture (bag and trestle and stacked cages)

The location of the two proposed intertidal aquaculture licenses (T01-097A and T01-099A) are at inshore locations with very low chances of overlap with the main foraging habitat of either Razorbill, Puffin or Guillemot (risk score 1-2). Furthermore, all three species have low to moderate risk for disturbance or entanglement (risk scores 1-3). **It is concluded, therefore, that there will be no adverse effects from the proposed aquaculture to Puffin, Guillemot or Razorbill SCIs.**

Suspended mussel culture

The two proposed suspended shellfish aquaculture sites are 72 ha in area each. Both sites are within the main foraging habitat of Razorbill, Puffin and Guillemot. The site size is small compared to the available foraging habitat and the high foraging range (risk score 1) for all species meaning that the small amount of habitat lost is not significant. Furthermore, mussel longlines are thought to increase the amount of available fish in the area by acting as aggregating devices where fish are more prevalent in the vicinity of the structures[67] making foraging much easier for diving species. Risk of entanglement is moderate (risk score 3) because of the increased likelihood of foraging occurring close to the mussel lines however accidental catches or entanglements in mussel longlines have not been reported to be a problem for Puffin, Razorbill or Guillemot, certainly not at a level which would cause population effects. **It is concluded, therefore, that there will be no adverse effects from the proposed activities on the conservation objectives for Puffin, Guillemot or Razorbill.**

Conclusions and recommendations

1. **It is recommended that any future licenses for mussel longlines report any accidental catches or entanglements to the appropriate authorities.**

[67] Bath, G. E., Price, C. A., Riley, K. L., & Morris Jr, J. A. (2023). A global review of protected species interactions with marine aquaculture. *Reviews in Aquaculture*, *15*(4), 1686-1719.

5.3.6 Terns

There are five tern species screened in in Dundalk Bay SPA: Roseate Tern (*Sterna dougallii*) [A192], Arctic Tern (*Sterna paradisaea*) [A194], Little Tern (*Sterna albifrons*) [A195], Sandwich Tern (*Sterna sandvicensis*) [A191], Common Tern (*Sterna hirundo*) [A193]. Common Tern and Sandwich Tern are SCIs within Carlingford Lough NI SPA and the remaining species including common tern are SCIs within the Northwest Irish Sea. All species are listed for breeding populations.

Baseline and conservation status

The NPWS has listed baseline numbers for breeding pairs of arctic tern in Rockabill SPA in 2022 as (49-60 pairs) which is similar to the 1995 estimate of 49 pairs. The Irish Threat and Conservation Status is Amber. The conservation objective for foraging arctic tern in the Northwest Irish Sea SPA is to maintain favourable conservation condition.

Roseate Tern are a breeding feature in Rockabill SPA where is breeding pairs is recorded as 1834, a 231% increase from 1995. The Irish Threat and Conservation Status is Amber. The conservation objective for foraging arctic tern in the Northwest Irish Sea SPA is to maintain favourable conservation condition.

Common Tern are breeding SCIs are two nearby SPAs, Rockabill SPA and at the ESB Dolphin nesting platform in the South Dublin and River Tolka Estuary SPA. Numbers there have increased 328% to 1503 pairs and 45% to 138 at the nesting platform and 138 pairs are also recorded nearby outside the boundary of the SPA. Trends are therefore increasing. The conservation objective is the maintain favourable conservation condition and the Irish Threat and Conservation Status is Amber.

There is a breeding population of little terns in the Boyne Estuary SPA the population size of which has fluctuated over the years with the latest figure in 2022 of 84 pairs and increase of 500% from the 1995 All-Ireland Tern Survey. The conservation objective for little tern within the Northwest Irish Sea is to maintain favourable conservation condition and the Irish Threat and Conservation Status is Amber.

Sandwich Tern are in SCI of the Northern Irish portion of the Carlingford Lough SPA. The baseline population figure is 270 (1994-1998) whilst the current population although outdated (1995-2000) is listed as 650. The objectives for sandwich tern are to maintain or enhance the population of sandwich terns. They nest at two localities in Carlingford Lough, Green Island and Greencastle Point.

All species within the Northwest Irish Sea SPA conservation objectives are outlined by the following attributes and targets:

The achievements of these objectives are outlined by the following attributes and targets:

1. Breeding population size – no significant decline
2. Spatial distribution – sufficient number of locations, areas and availability of suitable habitat to support the population
3. Forage spatial distribution extent, abundance and availability – Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.

4. Disturbance across the site – The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
5. Barriers to connectivity – The number, location, shape and area of barriers do not significantly impact the site populations access to the SPA or other ecologically important sites outside the SPA.

The attributes and targets for Common Tern and Sandwich Tern within Carlingford Lough NI SPA are to maintain or enhance the population of the SCIs by the following attributes and targets:

- Fledging success sufficient to maintain or enhance population;
- To maintain or enhance the range of habitats utilised by the qualifying species;
- To ensure that the integrity of the site is maintained;
- To ensure there is no significant disturbance of the species; and,
- To ensure that the following are maintained in the long term:
    - Population of the species as a viable component of the site
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species

Ecology

Breeding populations of Common Tern and Sandwich Tern are protected in the Northern Irish portion of Carlingford Lough. The foraging grounds of breeding populations of Common Tern, Arctic Tern, Roseate Tern and Little Tern are protected within the Northwest Irish Sea SPA.
All terns feed primarily on small marine fish, squid and crustaceans by diving in surface waters. The mean global mean foraging range for Common Tern is 6.4 km, for Sandwich Tern is 9 km, Little Tern is 3.5 km, Arctic Tern is 6.1 km, Roseate Tern is 4.1 km so small foraging ranges from breeding sites. During breeding, the foraging range is constrained by the distance to nest sites therefore global mean is used rather than the mean maximum.

Rockabill SPA boundary is over 30 km away from any of the proposed aquaculture sites, The Boyne Estuary SPA is over 15 km from the nearest proposed aquaculture site, The South Dublin and River Tolka Estuary SPA is over 59 km away from the nearest proposed aquaculture site and Greencastle head is approximately 6 km away from the nearest proposed activities which is an intertidal oyster site and approximately 9 km away from the suspended mussel sites. **Given these foraging ranges and the distance from breeding sites adverse effects on Common Tern, Arctic Tern, Roseate Tern and Little Tern protected within the Northwest Irish Sea SPA can be ruled out. There is the possibility of spatial overlap between Common Tern and Sandwich Tern within the Northern Irish Carlingford Lough SPA.**

Risk Assessment

An internal Marine Institute study assessed the risk of marine birds to different aquaculture types (See section 4.4.2 and Table 4-2 for details on methods). The results of that risk assessment specific to gulls and terns can be seen in Table 5-10 and are summarised in the relevant sections below.

Table 5-10 Risk assessment for screened in Dundalk Bay SPA QIs for two types of aquaculture (existing or proposed) in the Bay. Risk scores range from 0 - 5. Full details of parameters and score explanation can be found in the methods section. See section 4.4.2 and Table 4-2 for details on methods and scores.

COMMON NAME	Life cycle stage	Suitability of aquaculture habitat	Disturbance	Potential for entanglement / collision	Flexibility in habitat use	Foraging range	Flexibility in diet	Irish threat and conservation	Adult survival rate
Intertidal shellfish aquaculture									
Common Tern	**Breeding**	4	5	3	4	4	4	3	4
Sandwich Tern	**Breeding**	4	4	3	4	4	4	3	4
Suspended shellfish culture - mussels									
Common Tern	**Breeding**	4	5	3	4	4	4	3	4
Sandwich Tern	**Breeding**	4	4	3	4	4	4	3	4

Intertidal aquaculture (bag and trestle and stacked cages)

Site T01-099A is over 20 km from the breeding site at Greencastle and therefore is unlikely to overlap with the foraging grounds of either species. This site can be ruled out for adverse effects. Both tern species are surface diving foragers including over intertidal sites at high tide therefore the possibility of spatial overlap with T01-097A is high (risk score 4). However, neither tern species is likely to come into contact with structures as they only forage in intertidal sites during high tide and their surface feeding nature is unlikely to interact with structures**. Adverse effects on both sites T01-099A and T01-097A on Common or Sandwich Terns within Carlingford Lough NI SPA can therefore be ruled out.**

Suspended mussel culture

Both suspended mussel farm applications are outside the mean foraging range for common tern and can therefore be ruled out from adverse effects. Both sites are on the very edge of the foraging range of Sandwich Tern and could therefore potentially interact. The flexibility of habitat, diet and foraging range are all high risk (risk score 4) for sandwich tern so extensive structures in this area may cause exclusion of habitat. The size of the sites, however, is small compared to the available habitat for foraging and additionally it has been reported that such structures increase the amount of available forage fish in the vicinity making for a neutral or positive effect on foraging Sandwich Terns[68]. The disturbance risk score for both species is high (Common Tern = 5 and Sandwich Tern = 4). These scores related to literature which suggests a buffer zone around nesting sites of >200 m for Sandwich Tern and between 200-400 m for Common Tern[69]. The access routes from the pier in Carlingford is over 1.5 km away and is

[68] Bath, G. E., Price, C. A., Riley, K. L., & Morris Jr, J. A. (2023). A global review of protected species interactions with marine aquaculture. *Reviews in Aquaculture*, *15*(4), 1686-1719.

[69] Goodship, N.M. and Furness, R.W. (MacArthur Green) Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. NatureScot Research Report 1283.

therefore well outside the suggest buffer distance. **Adverse effects of the proposed activities on Sandwich Tern can therefore be ruled out.**

5.3.7 Gulls

There are seven gull species screened in for proposed activities within Dundalk Bay SPA: Little Gull (*Larus minutus*) [A177], Herring Gull (*Larus argentatus*) [A184], Great Black-backed Gull (*Larus marinus*) [A187], Black headed gull (*Chroicocephalus ridibundus)* [A179], Lesser black-backed gull (*Larus fuscus*) [A183], Common Gull (*Larus canus*) [A182], and Kittiwake (*Rissa tridactyla*) [A188]. Common Gull, Black-headed Gull and Herring Gull are all SCIs within Dundalk Bay SPA. Kittiwake, Little Gull, Black-headed Gull, Common Gull, Lesser Black-backed Gull, Herring Gull, Greater Black-backed Gull are all features within the Northwest Irish Sea SPA.

Baseline and conservation status

The conservation objectives for the three gull species within Dundalk Bay SPA is to maintain favourable conservation condition. Described by the following attributes and targets. Specifically, a long-term population trend is stable or increasing and the number and there is no significant decrease in the number and range of areas used by the species. For the species within the Northwest Irish Sea SPA, the conservation objectives are to maintain favourable conservation condition for Little Gull, Great Black-backed Gull, Lesser Black-backed Gull, Common Gull and Black-headed Gull and to restore to conservation condition for Kittiwake and Herring gull. The attributes and targets of such are as follows:
The achievements of these objectives are outlined by the following attributes and targets:

1. Breeding population size – no significant decline (for maintain objective) or the long-tern population trend is stable or increasing (for restore objectives).
2. Spatial distribution – sufficient number of locations, areas and availability of suitable habitat to support the population
3. Forage spatial distribution extent, abundance and availability – Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
4. Disturbance across the site – The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.

The baseline populations and conservation statuses and condition for gull species can be found in Table 5-11.

Table 5-11 Screened in gulls protected in Dundalk Bay SPA, their baseline population calculated from I-WEBs data between 1995/96 - 1999/00. The current Irish Conservation Status of these species and the conservation condition at the baseline. NA = Not available

Species	Baseline population (1995/96 – 1999/00)[70]	Current conservation status Ireland[71]	Conservation condition at baseline

[70] NPWS (2011) Version 1. Dundalk Bay Special Protection Area. Site Code 4026 Conservation Objectives Supporting Document.
[71] Gilbert, Gillian, Andrew Stanbury, and Lesley Lewis. "Birds of conservation concern in Ireland 4: 2020–2026." Irish Birds 43 (2021): 1-22.

Dundalk Bay: Common gull (*Larus canus*) [A182]	551	Amber	Favourable
Dundalk Bay: Herring Gull (*Larus argentatus*) [A184]	754	Amber	Moderately unfavourable
Dundalk Bay: Black headed gull (*Chroicocephalus ridibundus)* [A179]	6643	Amber	Moderately unfavourable
NWIS SPA: Common gull	2866	Amber	NA
NWIS SPA: Herring gull	NA	Amber	NA
NWIS SPA: Little gull	391	Amber	NA
NWIS SPA: Great black-backed gull	2096	Green	NA
NWIS SPA: Black headed gull	508	Amber	NA
NWIS SPA: Lesser black-backed gull	NA	Amber	NA
NWIS SPA: Kittiwake	944	Red	NA

The NPWS I-WEBS survey does record gull species however the survey is not targeted at wide ranging gull species. Black-headed Gull numbers have been lower than the baseline since 2013 showing a slight declining 5-year rolling average (Figure 5-7). Common Gull numbers in Dundalk Bay SPA have been variable with a slightly declining 5-year rolling average (Figure 5-7). Numbers however continue to be above the baseline figure. Numbers of Great Black-backed Gull have been persistently low especially compared to the baseline figure from the Northwest Irish Sea SPA (Figure 5-7). Herring Gull numbers have reminded stable around the baseline figure. Lesser Black-backed Gull numbers have shown a sharp decline since 2013 (Figure 5-7).

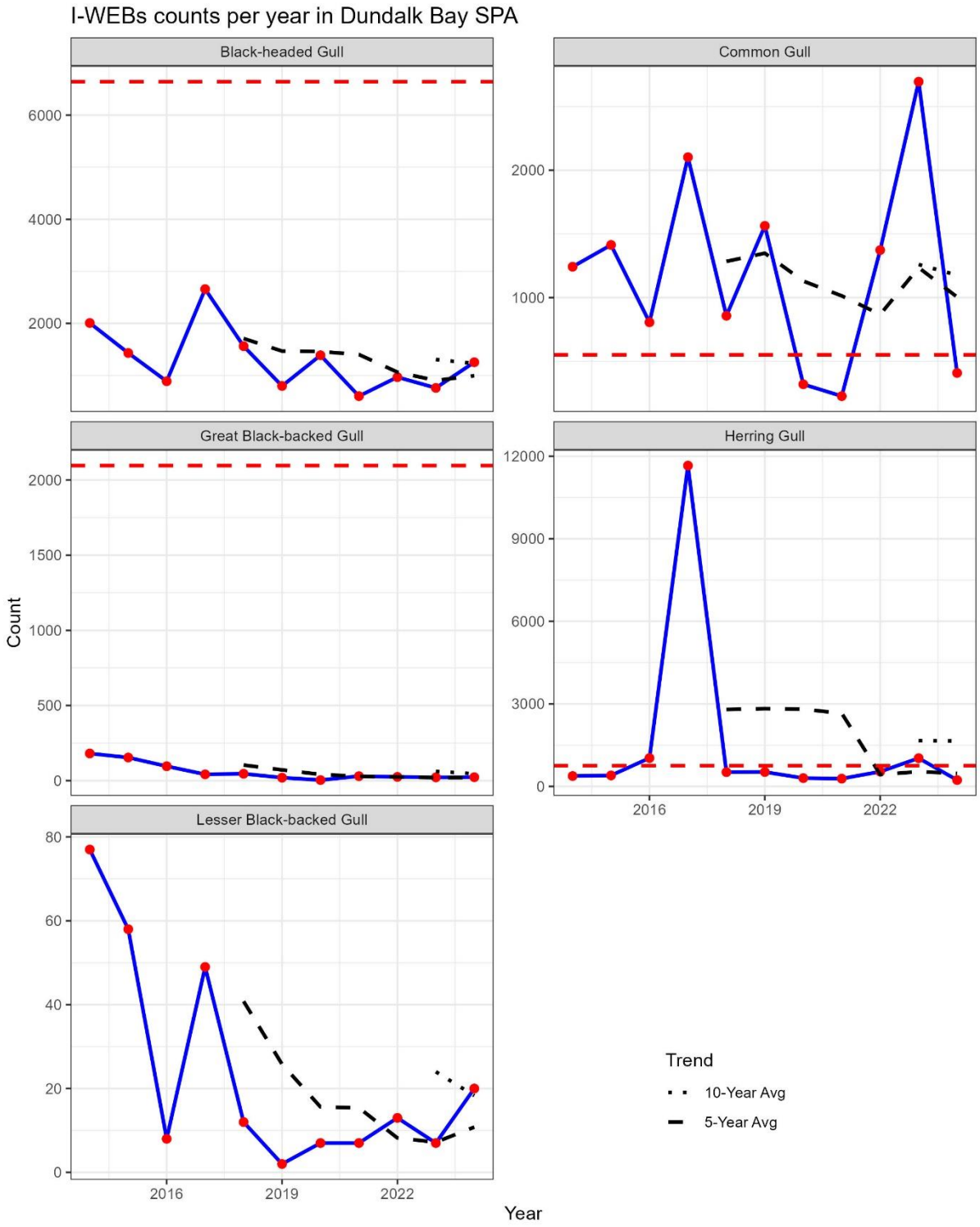

Figure 5-7 I-WEBs counts per year in Dundalk Bay SPA for gull species. Red dashed line is the NPWS reported baseline figure in Dundalk Bay SPA and Northwest Irish Sea SPA for Great Black-backed Gull. Black dashed line is the 5-year average. Black dotted line is the rolling 10-year average.

Ecology

Common Gull are mostly widely seen during winter and is associated with nearshore waters and coasts, river estuaries, beaches, mudflats, harbours and sewage outfalls. They are omnivorous feeding on both terrestrial and marine invertebrates, but this varies greatly by location. In the UK they are predominantly found in fields and other terrestrial habitats whilst the intertidal zone is

also recorded as a secondary habitat[72]. The most up to date mean maximum foraging range for Common Gull is 50 km[73].

Herring Gull predominantly occur in coastal or near coastal habitats, they regularly forage at sea but rarely far from land. They have also been recorded inland at large lakes or reservoirs. Herring Gull is a generalist and opportunistic feeder that will eat almost anything[74]. Their mean maximum foraging range is 58.8 km.

Black-headed Gull in wintertime mostly occur in coastal habitats but are also seen in low lying inland habitats. Diet is broad and opportunistic and is taken in a variety of ways including surface diving or walking on mudflats. Their mean maximum foraging range is 18.5 km.

Lesser Black-backed Gull frequents a wide variety of coastal and inland waters and is much more likely to be found foraging out to sea than other *Larus* species[75]. They nest mainly on sandy, rocky or grassy sea coasts as well as sea cliffs but it will avoid cliffs occupied by Herring Gull. Lesser Black-backed gull has a diverse and opportunistic food selection which includes fish, aquatic invertebrates, birds' eggs and chicks, rodents and berries[62]. The global mean foraging range of Lesser Black-backed Gull is 43.3 km.

Little Gull frequents coastal areas, lagoons and sandy beaches. They nest at low elevation, close to or over water in large areas of wet vegetation. Daytime roosts in winter are noted on beaches, mudflats, lawns and airports[76]. They feed on flying insects, small fish and aquatic invertebrates[71]. The mean maximum foraging range for little gull has not been accurately reported however the average foraging range for all gull species is 54.2 km.

Great Black-backed Gull is mainly a coastal species which roosts near ports and docks and in estuaries during the non-breeding season[77]. They are a generalist predator mainly on fish, pelagic and intertidal marine invertebrates, mammals, insects, eggs, other breeding seabirds and waterfowl[72]. The mean maximum foraging range for the great black-backed gull is 72 km.

Kittiwake prefer open waters and nest on steep cliffs and narrow ledges[78]. They forage out to sea by taking mainly fish from the waters surface[73]. The global mean foraging range is 54.7 km[68].

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[72] Moskoff, W., L. R. Bevier, and P. C. Rasmussen (2021). Common Gull (*Larus canus*), version 1.1. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.mewgul.01.1

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

[74] Weseloh, D. V., C. E. Hebert, A. F. Poole, J. C. Ellis, P. Pyle, and M. A. Patten (2024). European Herring Gull (*Larus argentatus*), version 1.0. In Birds of the World (B. K. Keeney and S. M. Billerman, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.euhgul1.01

[75] Burger, J., M. Gochfeld, G. M. Kirwan, D. A. Christie, and E. de Juana (2020). Lesser Black-backed Gull (*Larus fuscus*), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.lbbgul.01

[76] Ewins, P. J. and D. V. Weseloh (2020). Little Gull (*Hydrocoloeus minutus*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.litgul.01

[77] Good, T. P. (2020). Great Black-backed Gull (*Larus marinus*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.gbbgul.01

[78] Hatch, S. A., G. J. Robertson, and P. Baird (2020). Black-legged Kittiwake (*Rissa tridactyla*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.bklkit.01

Risk Assessment

An internal Marine Institute study assessed the risk of marine birds to different aquaculture types (See section 4.4.2 and Table 4-2 for details on methods). The results of that risk assessment specific to gulls and terns can be seen in Table 5-12 and are summarised in the relevant sections below.

Table 5-12 Risk assessment for screened in Dundalk Bay SPA QIs for two types of aquaculture (existing or proposed) in the Bay. Risk scores range from 0 - 5. Full details of parameters and score explanation can be found in the methods section. See section 4.4.2 and Table 4-2 for details on methods and scores.

COMMON NAME	Life cycle stage	Suitability of aquaculture habitat	Disturbance	Potential for entanglement / collision	Flexibility in habitat use	Foraging range	Flexibility in diet	Irish threat and conservation status	Adult survival rate
Intertidal shellfish aquaculture									
Black-headed Gull	**Winter**	3	2	4	1	2	2	3	3
Herring Gull	**Winter**	4	2	4	1	1	2	3	5
Common Gull	**Winter**	4	2	4	1	1	2	3	4
Little Gull	**Winter**	4	1	4	1	1	4	3	2
Lesser Black-backed Gull	**Winter**	4	2	4	1	1	2	3	5
Kittiwake	**Breeding**	0	2	2	3	3	4	1	5
Great Black-backed Gull	**Breeding**	4	2	4	1	1	2	5	3
Suspended shellfish culture - mussels									
Black-headed Gull	**Winter**	3	2	3	1	2	2	3	3
Herring gull	**Winter**	4	2	3	1	1	2	3	5
Common Gull	**Winter**	4	2	3	1	1	2	3	4
Little Gull	**Winter**	4	1	3	1	1	4	3	2
Lesser Black-backed Gull	**Winter**	4	2	3	1	1	2	3	5
Kittiwake	**Breeding**	4	2	3	1	3	2	1	5
Great Black-backed Gull	**Breeding**	3	2	3	3	1	5	5	3

Intertidal aquaculture (bag and trestle and stacked cages)

Kittiwake are an open ocean feeder and therefore will not overlap with the proposed license sites T01-097A and T01-099A. **Adverse effects on kittiwake from these licenses can be ruled out.**

The remaining species are all coastal species which roost and forage at locations which could overlap the proposed licenses. Exclusion from the direct footprint of the license site is possible however, all species have high flexibility to habitat (risk scores 1-2) and a wide foraging range (risk scores 1-2), considering this alongside the small size of area excluded means that risk are low. There is the possibility of disturbance at the site from tractor activity during maintenance. However, all gull species have high recorded tolerance of disturbance (risk scores 1-2). Entanglement or collision is a threat due to the chances of entanglement in debris from farms (risk score 4) however the risk of this causing direct mortality and subsequent population level effects is minimal. **Adverse effects on all gull species from license sites T01-097A and T01-099A can be ruled out.**

Suspended mussel culture

All species have the potential to overlap with the license sites T01-1001 and T01-1002 (risk scores 3-4). Exclusion from the direct footprint of the license site is possible however, all species have high flexibility to habitat (risk scores 1-2) and a wide foraging range (risk scores 1-2), considering this, alongside the small size of area excluded, means that risk is low. There is the possibility of disturbance at the site from vessels commuting to and from sites during maintenance and harvesting activities. The number of trips per day is likely to be small (maximum 2 trips for both sites). All gull species have high recorded tolerance of disturbance (risk scores 1-2). Entanglement or collision is a moderate threat due to the chances of entanglement in drop ropes (risk score 3) however the risk of this causing direct mortality and subsequent population level effects is minimal[79].
Adverse effects on all gull species from license sites T01-1001 and T01-1002 can be ruled out.

Recommendations

1. **Although the risk is low for entanglement within aquaculture structures, it is recommended that any further licenses stipulate that any collision, entanglements causing mortality or injury is reported to the relevant authorities.**

5.3.8 Northern Fulmar (*Fulmarus glacialis*) [A009], Northern Gannet (*Morus bassanus*) [A016], Manx Shearwater (*Puffinus puffinus*) [A013]

Fulmar and Manx Shearwater were screened in to Dundalk Bay SPA due to it being a feature of the Northwest Irish Sea SPA. Gannet was screened in due to its long foraging range and breeding population on the Saltee Islands SPA which might overlap with the proposed activities.

Baseline and conservation status

The conservation objective for Fulmar in the Northwest Irish Sea SPA is to restore to conservation condition. Fulmar are a breeding SCI of Lambay Island SPA and numbers have declined there my 36% between 1999-2015 to 375 pairs. The current Irish Threat and Conservation Status lists Fulmar as Amber. The conservation objective for Manx Shearwater is to maintain favourable conservation condition. There are several breeding colonies of Manx Shearwater around the Irish

[79] Bath, G. E., Price, C. A., Riley, K. L., & Morris Jr, J. A. (2023). A global review of protected species interactions with marine aquaculture. *Reviews in Aquaculture*, *15*(4), 1686-1719.

Sea and the waters along western Irish Sea are key foraging waters for the species. A summer 2016 survey estimated 13,010 individuals within the Northwest Irish Sea SPA[80]. A trend or time-series of these data is not currently available. The current Irish Threat and Conservation Status lists Manx Shearwater as Amber.

The achievements of these objectives are outlined by the following attributes and targets:

1. Breeding population size – no significant decline (for maintain objective) or the long-tern population trend is stable or increasing (for restore objectives).
2. Spatial distribution – sufficient number of locations, areas and availability of suitable habitat to support the population
3. Forage spatial distribution extent, abundance and availability – Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
4. Disturbance across the site – The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.

Northern Gannet conservation objectives to maintain conservation condition on the Saltee Islands SPA for the breeding population of 2446 pairs documented in 2004. The current Irish Threat and Conservation Status lists Gannet as Amber. The achievements of these objectives are outlined by the following attributes and targets:

1. Breeding population abundance (apparently occupied nests): No significant decline
2. Productivity rate: No significant decline
3. Distribution of breeding colonies: No significant decline
4. Prey biomass available: No significant decline
5. Barriers to connectivity: No significant increase
6. Distribution at the breeding site: No significant increase
7. Disturbance at marine areas immediately adjacent to the colony: No significant increase

Ecology

Northern Fulmar are a predominately marine species in continental shelf waters. They breed on sea cliffs on islands or mainland promontories in mixed colonies[81]. Fulmar are omnivorous with the main food being fish and cephalopods, zooplankton, offal and carrion. They are regularly associated with local upwellings, tide and rip currents and eddies and have an extremely large foraging range (maximum 2,736 km) with a global mean of 134.6 km.

Manx Shearwater is an entirely marine continental shelf species which forages over upwelling zones on small school bait fish from the water's surface[82]. They breed in colonies on remote uninhabited, turfy islands and headlands. The foraging range is broad at 136 km global mean[83].

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[80] NPWS (2023) Conservation Objectives: North-west Irish Sea SPA 004236. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

[81] Mallory, M. L., S. A. Hatch, and D. N. Nettleship (2020). Northern Fulmar (*Fulmarus glacialis*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.norful.01

[82] Lee, D. S., J. C. Haney, C. Carboneras, F. Jutglar, and G. M. Kirwan (2023). Manx Shearwater (*Puffinus puffinus*), version 1.1. In Birds of the World (N. D. Sly, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.manshe.01.1

[83] Woodward, Ian D., Chris B. Thaxter, Ellie Owen, Mark Bolton, Robin M. Ward, and Aonghais SCP Cook. "The value of seabird foraging ranges as a tool to investigate potential interactions with offshore wind farms." Ocean & Coastal Management 254 (2024): 107192.

Northern Gannet is a marine continental shelf species that breeds in dense colonies on isolated stacks or small inhibited islands[84]. Nests on cliff ledges on bare rock surfaces[78]. Forages over open ocean over upwelling areas targeting surface schooling fish and squid by plunge diving[78]. The foraging range of gannet is listed as 120 km[77].

Risk Assessment

An internal Marine Institute study assessed the risk of marine birds to different aquaculture types (See section 4.4.2 and Table 4-2 for details on methods). The results of that risk assessment specific to gulls and terns can be seen in Table 5-13 and are summarised in the relevant sections below.

Table 5-13 Risk assessment for screened in Dundalk Bay SPA QIs for two types of aquaculture (existing or proposed) in the Bay. Risk scores range from 0 - 5. Full details of parameters and score explanation can be found in the methods section. See section 4.4.2 and Table 4-2 for details on methods and scores.

COMMON NAME	Life cycle stage	Suitability of aquaculture habitat	Disturbance	Potential for entanglement / collision	Flexibility in habitat use	Foraging range	Flexibility in diet	Irish threat and conservation status	Adult survival rate
Intertidal shellfish aquaculture									
Fulmar	**Breeding**	1	1	2	3	1	4	3	5
Gannet	**Breeding**	1	2	2	3	1	4	3	5
Manx Shearwater	**Breeding**	0	2	2	3	1	4	3	5
Suspended shellfish culture - mussels									
Fulmar	**Breeding**	5	1	3	3	1	4	3	5
Gannet	**Breeding**	4	2	3	3	1	5	3	5
Manx Shearwater	**Breeding**	1	2	3	3	1	4	3	5

Intertidal aquaculture (bag and trestle and stacked cages)

All three species are almost entirely marine except when nesting. Whilst Fulmar and Gannet might forage over intertidal areas this is mostly likely near nesting areas and only during high tide. There will not, therefore, be overlap with the proposed licenses at T01-097A and T01-099A. **Adverse effects on Fulmar, Gannet and Manx Shearwater can be ruled out.**

Suspended mussel culture

For license sites T01-1001 and T01-1002, which are in subtidal locations, there is the possibility of overlap with the foraging grounds of all three species (risk scores 1-5). Exclusion from the

[84] Mowbray, T. B. (2020). Northern Gannet (*Morus bassanus*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.norgan.01

direct footprint of the license site is possible however, all species a wide foraging range (risk scores 1) and a moderate flexibility to foraging (risk score 3) due to their preference for frontal systems. Considering these factors, alongside the small size of area excluded, means that risk is low. There is a possibility of disturbance at the site from vessels commuting to and from sites during maintenance and harvesting activities. The number of trips per day is likely to be small (maximum 2 trips for both sites). All species have high recorded tolerance of disturbance (risk scores 1-2). Entanglement or collision is a moderate threat due to the chances of entanglement drop ropes (risk score 3) however, the risk of this causing direct mortality and subsequent population level effects is minimal.

Adverse effects on Fulmar, Gannet and Manx Shearwater from license sites T01-1001 and T01-1002 can be ruled out.

Recommendations

1. **Although the risk is low for entanglement within aquaculture structures, it is recommended that any further licenses stipulate that any collision, entanglements causing mortality or injury is reported to the relevant authorities.**

5.3.9 Wetlands and waterbirds [A999]

The conservation objectives for the wetland and waterbirds SCI for Dundalk Bay SPA are to maintain the favourable conservation condition of the wetland habitat in Dundalk Bay. The target is that the permanent habitat area is stable and is listed as 8136 for subtidal, 4372 for intertidal and 649 for supratidal habitats.

Only one of the license sites T01-099A sits within the boundary of the SPA and therefore overlaps with the intertidal habitat. This site is listed for intertidal aquaculture. The structures themselves are not permanent and are in-situ only for the length of the license. There will therefore be no permanent change in the amount of intertidal habitat available within Dundalk Bay SPA. **Adverse effects on the Wetlands and waterbirds SCI for proposed activities can, therefore, be ruled out.**

5.4 Assessment for the Introduction of Non-native Species

Blue mussel (*Mytilis edulis)* is native to Ireland and seed settles naturally onto the mussel longlines, no seed is being moved from elsewhere during the operation. There is therefore no risk of introducing non-native species during the operations for sites T01-1001 and T01-1002. **Adverse effects for sites T01-1001 and T01-1002 can therefore be ruled out.**

The proposed activities for sites T01-097A and T01-099A are requesting to culture Pacific Oyster. Pacific Oysters (*Magallana gigas*) are not native to Ireland. Kochmann et al.[85] and Zwerschke et al. [86] identified feral Pacific oyster populations at several sites in Ireland, Dundalk Bay was not sampled in these surveys, but feral pacific oyster was found in the nearby Carlingford Lough. Factors affecting the ability of *M. gigas* to reproduce successfully include water temperature, bay characteristics (sheltered, shallow, large inter-tidal area), residence time and flow rate of water in the bay, and the presence of high-density population. Pacific oyster predominantly affects habitats. When established, it creates a new reef structure in place of another habitat. Additionally, it competes with native oyster (*Ostrea edulis*) and can negatively affect the distribution of native oyster beds.

The Fine Sand Community Complex overlaps with T01-099A within Dundalk Bay SPA. The benthic habitat is listed as being 'not sensitive' to non-native species therefore there is no possibility of adverse effects from the proposed activities on this Community Type. The Wetlands and Waterbirds conservation feature also overlaps the T01-099A. This feature could be permanently affected by the development of a feral Pacific oyster reef within the area. It would cause the removal of habitat important for foraging birds particularly waders.

Given the current spread of feral *M. gigas* throughout the Irish coast a precautionary approach should be taken to ensure the risk of spread is minimised.

Adverse effects to the conservation objectives for Fine Sand Community Complex within Dundalk Bay SAC can be ruled out however adverse effects to the conservation objectives for the Wetlands and Waterbirds feature within Dundalk Bay SPA cannot be ruled out.

Mitigation

In order to manage the recruitment of feral oysters at aquaculture sites, DAFM has implemented monitoring and control measures, advising that triploid seed should be the only stock used on sites. Farmers have undertaken to only use triploid seed/stock for the cultivation of Pacific (*Magallana gigas*) oysters at their sites however this is not the case for all farmers. Other control measures include regular cleaning and removal of oysters from sites and equipment according to their biosecurity plan, along with active site monitoring to assess changes over time and the response to control measures. **It is recommended that, should licences be granted, all Pacific Oyster licences stipulate the use of triploid seed at all sites as well as compliance with all biosecurity measures.**

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[85] Kochmann, J., O'Beirn, F., Yearsley, J., & Crowe, T. P. (2013). Environmental factors associated with invasion: modelling occurrence data from a coordinated sampling programme for Pacific oysters. Biological invasions, 15(10), 2265-2279.

[86] Zwerschke, N., Kochmann, J., Ashton, E. C., Crowe, T. P., Roberts, D., & O'connor, N. E. (2018). Co-occurrence of native Ostrea edulis and non-native Crassostrea gigas revealed by monitoring of intertidal oyster populations. *Journal of the Marine Biological Association of the United Kingdom*, *98*(8), 2029-2038.

5.5 In-combination effects

5.5.1 Other aquaculture – Intertidal oyster culture on trestles and bottom mussels

The screening highlighted potential in-combination effects with other types of aquaculture within nearby Carlingford Lough. There are two culture types in the Lough: bottom mussel culture and intertidal oyster trestles. The main pressures which were screened in were disturbance and potential displacement from foraging grounds. It is likely that a significant number of birds commute between Dundalk Bay and Carlingford Lough to forage. Those species have been considered fully in an Appropriate Assessment for Carlingford Lough[87] and are summarized briefly below.

Red-breasted Merganser was considered to potentially forage within Carlingford Lough, adverse effects for this species was ruled out due to the small number of birds using Carlingford Lough and the lack of overlap with intertidal trestles and the small number of vessels using the bottom mussel beds means that disturbance is minimal.
Redshank, Lapwing, Dunlin, Knot and Golden Plover were all intertidal waders considered to potentially move between Dundalk Bay and Carlingford Lough. Redshank was ruled out of adverse effects due to having a neutral or positive association with oyster trestles with little evidence of disturbance. Waders were considered to have no adverse effects from disturbance from bottom mussel fishing as the number of vessels used in both the bottom mussel and long line aquaculture is low.
Potentially negative effects were noted in Carlingford Lough for Lapwing, Dunlin, Knot and Golden Plover due to negative association with oyster trestles. Adverse effects on birds in Carlingford Lough were ruled out due to the considerable amount of available habitat elsewhere, particularly within Dundalk Bay. The addition of two new intertidal sites which are small in area are unlikely to affect the population of birds within Dundalk Bay. They do however have potential to affect the number of areas available to use within Dundalk Bay. This is particularly true given that both sites have no existing aquaculture located in the area. This means that birds are unlikely to be habituated to aquaculture trestles and their associated activities. **In-combination effects of exclusion on the number of areas available to use objective between intertidal oyster culture in Dundalk Bay and Carlingford Lough cannot be ruled out.**

Black-headed Gull (Dundalk Bay SPA), Common Gull (Dundalk Bay SPA), Herring Gull (Dundalk Bay SPA), and Lesser Black-backed Gull (Lambay Island SPA – 59.7 km), Sandwich Tern (Carlingford Lough SPA NI), Common Tern (Carlingford Lough SPA NI) and Northern Fulmar (Lambay Island SPA – 59.7 km) were also considered within the Carlingford Lough AA. The main pressure here is the disturbance from vessels within the bottom mussel aquaculture and the vessels commuting to sites T01-1001 and T01-1002. Fulmar and Lesser Black-backed Gull were ruled out from effects as they were deemed unlikely to forage within Carlingford Lough. The remaining species were ruled out from effects of intertidal oyster culture and bottom mussel culture due to low risk of exclusion as habitat flexibility is high and foraging range is high for all

[87] MI 2026. Appropriate Assessment Report of Extensive Aquaculture in Carlingford Shore SAC and Carlingford Lough SPA, Co. Louth. In draft

gull and tern species. Disturbance risk is also low therefore effects from bottom mussel culture and suspended mussel culture is also low.
All species were ruled out of adverse effects of both bottom mussel culture and intertidal oyster culture within Carlingford Lough. The new aquaculture sites T01-097A and T01-099A in Dundalk Bay have the potential to act in-combination with the existing and proposed licenses in Carlingford to further reduce the number of foraging or roosting locations for wading species Lapwing, Dunlin, Knot and Golden Plover. The definition of significant decline is not defined by NPWS however since the number of areas is small and the size of both license sites is small there is unlikely to be a decline in the number of areas used to the extent that it would have population level effects. **Adverse in-combination effects can be ruled out however some precaution should be taken when new locations are being designated for intertidal oyster culture.**

Mitigation

It is recommended that should licenses be granted, a monitoring programme is established for intertidal waders to ensure that bird species are not being excluded from the area.

5.5.2 Fishing

The main fishing activities which occur in Dundalk Bay SAC and SPA, which were highlighted in the screening exercise as being potentially creating in-combination effects, were cockle and razor clam dredging, bottom otter trawling effort, pelagic trawling and some inshore netting (Figure 5-9)[88]. The presence of fishing activities in an area can cause surface and sub-surface abrasion, disturbance, exclusion from fishing grounds and possibly direct and indirect prey competition. The intensity of this pressure is a result of the number of vessels active and the number of days and hours per day that those vessels are in operation. The impact also depends on the distribution of vessels throughout the area used by the species and the size of the foraging area available to the species. Table 5-14 indicates how many vessels there are in each fleet and how often those vessels are working throughout the year[89]. Disturbance can occur during any form of vessel presence whether fishing is occurring or not.

Intertidal fishing activities

The cockle fishery takes place in the intertidal area of Dundalk Bay. The number of vessels is small (28), and it only operates between July and November. It occurs throughout the intertidal area, becoming more widespread between 2021 – 2024 although the vast majority of activity is still in the northern part of The Bay (Figure 5-8). The fishery is subject to an Appropriate Assessment, the latest of which is currently being conducted for the 2026-2030 time period. That assessment concludes that although the total area of disturbed habitat was more than 15%, empirical control impact studies in Dundalk Bay failed to detect significant effects of cockle fishing on the mortality of the characterising species of the Marine Community Types, *Angulus tenuis*. The assessment concludes that there were no significant effects for marine communities in the SAC from intertidal cockle fishing. One site (T01-099A) lies within Dundalk Bay SAC and will overlap with the Marine Community Types. The site will cause benthic disturbance to marine community types in the direct footprint of the trestles. The pressures on the benthos are different

[88] Irelands Marine Atlas Ireland's Marine Atlas
[89] Irelands Marine Atlas Ireland's Marine Atlas

however from those exerted by hydraulic dredging. Siltation and smothering as opposed to surface and sub-surface abrasion. Never-the-less, the size of the site is small enough that it will not act in-combination with intertidal cockle fishing to the extent that it will cause and adverse effects currently ruled out to now be considered a significant impact.

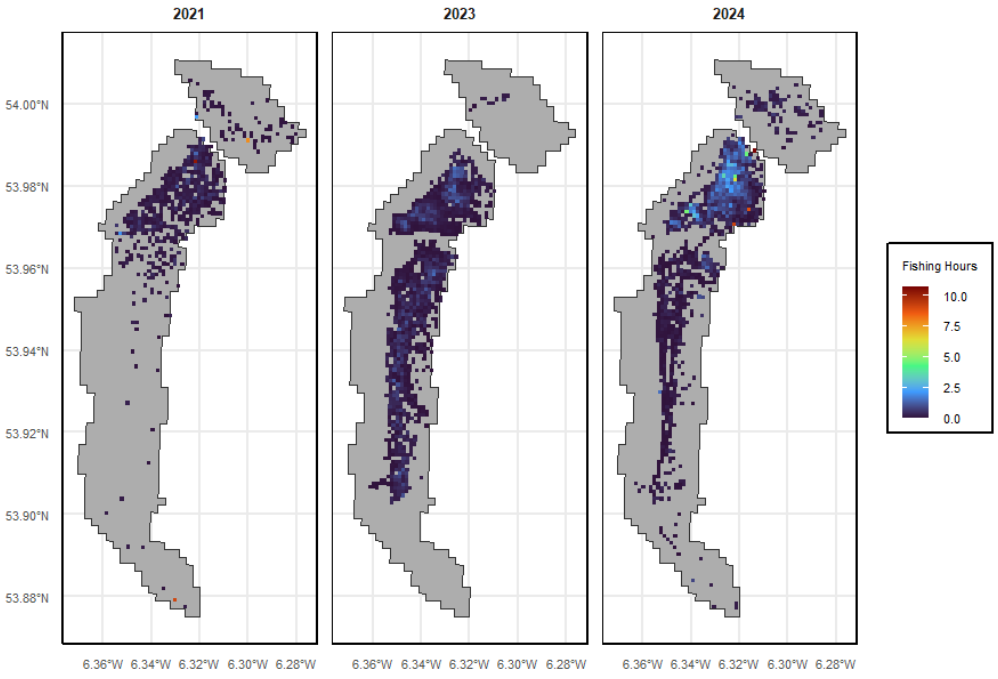

Figure 5-8 Cockle fishery (2021-2025) iVMS data showing fishing effort (total fishing hours). Note that no fishery occurred in 2022 or 2025.

Disturbance on bird SCIs is a second in-combination pressure. The fishery only operates at high tide and will not cause in-combination disturbance with the intertidal aquaculture activities. The maintenance vessels operating out of Carlingford Lough to sites T01-1001 and T01-1002 will potentially be operational at the same time as the cockle fishery for the months that it is active. However, there is significant spatial separation between the operational areas meaning that the same birds are unlikely to be affected, furthermore, there are very low number of small vessels and limited temporal overlap.

Subtidal fishing activities

The over 12 m fleet in the Irish Sea includes predominately bottom otter trawling and pelagic trawling with smaller amounts of beam trawling and netting (Figure 11a and Table 5-14). The subtidal fisheries include razor clam dredging and potting, all of which are under 12 m in length (Figure 5-9b and Table 5-13). All fisheries cause disturbance pressure with the highest pressure coming from larger boats which move faster. The spatial footprint of fishing activity can be used as a proxy for the distribution of disturbance pressure too although there will be some added disturbance when steaming to and from port and between fishing locations which is not captured from effort plots. The main fishing effort is in the north-east and along the coast from Dundalk down to Dublin (Figure 5-9).

The screened in species which are likely to be foraging in these areas are all ducks and divers aside from Shelduck, all gull and tern species as well as Fulmar, Gannet and Manx Shearwater.

The disturbance risk scores for the gull species and Fulmar are low (1-2) indicating that there is little escape avoidance behaviour around vessels. Many of these species will actively follow fishing vessels.

Red-breasted Merganser and Common Scoter both have a high risk of disturbance (risk score 5) from vessels in subtidal locations. The two subtidal licence locations T01-1001 and T01-1002 potentially add to the disturbance effect on these species by the addition of extra vessels commuting to and from the site. It is predicted that since both sites are operated by a single operator there would be maximum of two trip per day in one vessel. This low level of vessel activity, especially when compared to the number of vessels and trips involved in the fishing industry the proposed activities will not cause significant additional disturbance impact on these species to the extent that previously ruled out adverse effects would now need to be ruled in.

The five tern species may forage over areas where both fisheries and subtidal mussel sites T01-1001 and T01-1002 are situated. They have a risk score for disturbance (risk score 4-5) during their breeding season. However, the two proposed licenses sites are not within a distance of any tern colonies which could cause disturbance during nesting. There would be no additional adverse effects of disturbance on terns from these sites which would act in-combination with fishing activities.

Table 5-14 Summary of the approximate number of vessels, timing of activities and number of days at sea for the main fishing fleets in the Irish Sea. * These values are the maximum number of vessels given in a single grid cell in the Irish Sea taken from the Irish Marine Atlas.

Fishery	Number of vessels	Timing of activities	Number of days at sea
Cockle	28	Mid – late July – 1st Nov unless biomass falls below 250kg per boat per day, averaged over 1 week.	7 days per week
Razor Clam	50-70	July – May.	6 days per week
Beam trawls	5*	Year round	NA
Bottom otter trawls	30*	Year round	NA
Pelagic trawls	6*	Year round	NA
Potting	3*	Year round	NA

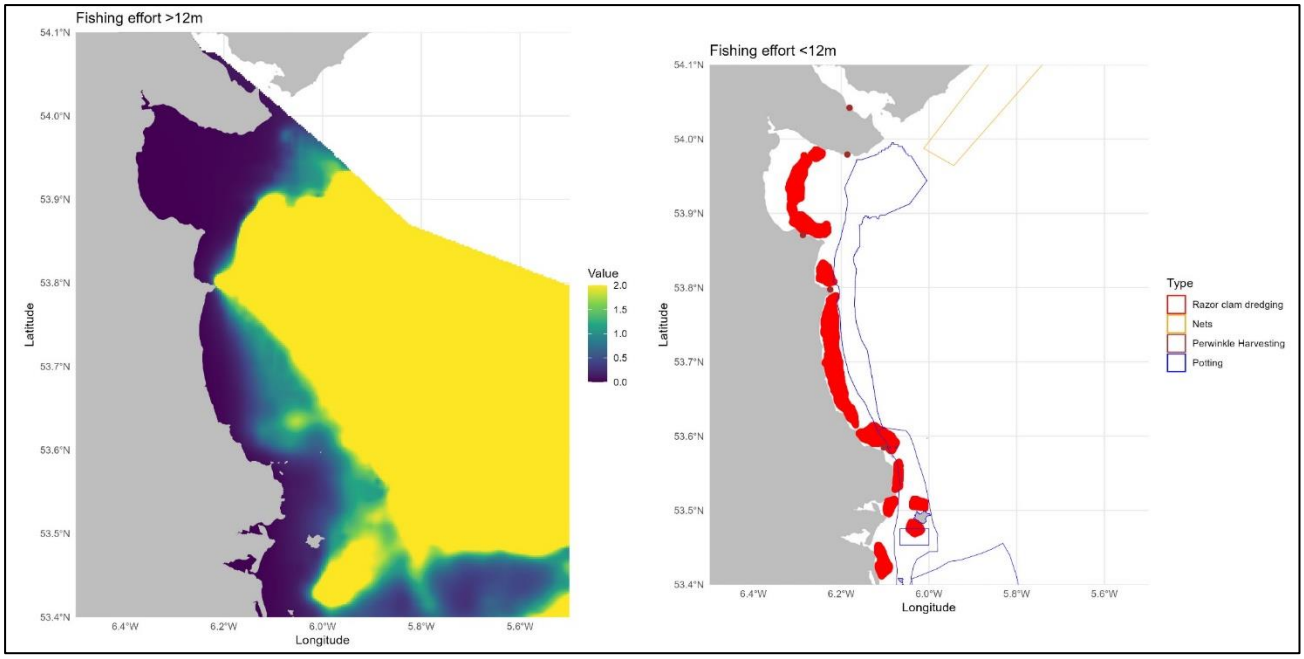

Figure 5-9 Fishing effort for the over 12m using VMS data and under 12m fleets using polygons outlines for the main fishing grounds. NB. Both data sets shows only where fishing is occurring and not vessel presence. Vessel presence also occurs which vessel are commuting to and from the main ports i.e. Dundalk Harbour and Carlingford Harbour in this area and will also cause disturbance pressure.

Adverse effects on the benthos from in-combination effects between aquaculture and fisheries can be ruled out.

Adverse effects on bird SCIs from in-combination effects between aquaculture and fisheries can also be ruled out.

Shipping

The shipping routes for both cargo and passenger vessels can be seen in Figure 5-10. There is no shipping activity within Dundalk Bay and some vessel activity within Carlingford mainly towards the mouth of the Lough where access routes are indicated for sites T01-1001 and T01-1002. The bulk of the shipping pressure in the Irish Sea is located in Dublin and Belfast. The only pressure which might act in-combination with pressures from aquaculture is disturbance from other fishing vessels in the sub-tidal zone. Ships are large and move in predicted fashion and will not directly overlap with the area used by any of the aquaculture licenses. The density of ships generally in the Irish Sea including in Dundalk Bay and Carlingford Lough is low. Some individual disturbance events may occur to SCIs which forage out to sea i.e. gulls, terns, Fulmar, Gannet and Manx Shearwater whoever all of these species also have a low risk to disturbance. The two tern species which breed in Carlingford Lough are highest risk to disturbance (risk score 4-5) particularly around breeding colonies in the Northern Irish part of the lough. Access routes to sites T01-1001 and T01-1002 will be more than 3km away from tern nesting sites so disturbance at these locations will not occur. Whilst there is expected to be some individual disturbance during foraging which would act in-combination with disturbance in other locations it is not expected to be at such a level that population or distribution level effects on the conservation objectives would occur. **Adverse in-combination effects with shipping can therefore be ruled out.**

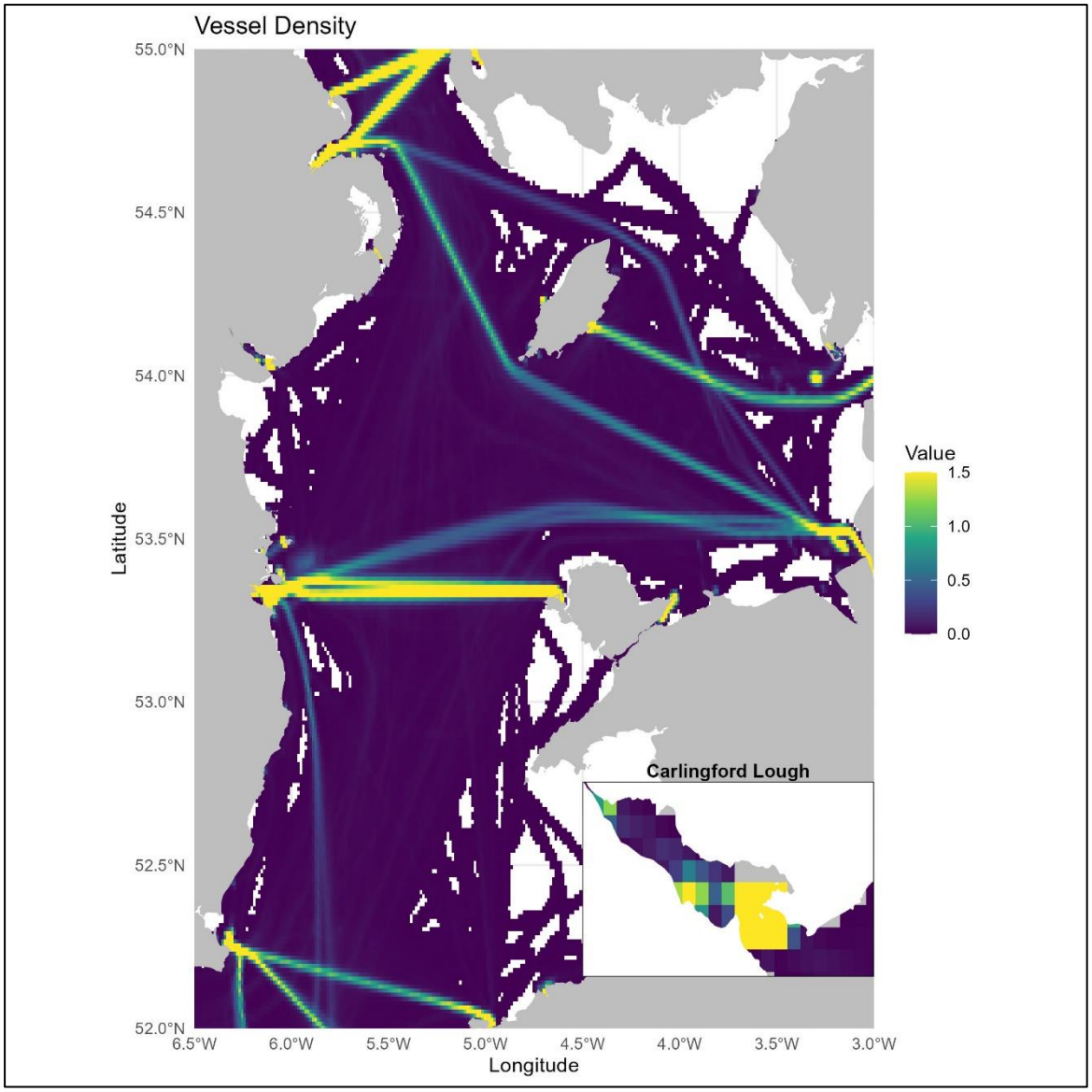

Figure 5-10 Shipping density of passenger and cargo vessels in the Irish Sea. Inset map: Vessel density within Carlingford Lough. Source: EMODNET

Offshore renewable energy

The oriel windfarm project is proposed to be situated off the coast of Dundalk Bay and makes landfall at Dunany Point. The only pressure which would act in-combination with aquaculture is disturbance pressure from construction and maintenance vessels commuting to and from the site. The construction and maintenance base are currently not known therefore we cannot comment on the location on commuting routes, but they are likely to be at large ports e.g. Belfast and not through Dundalk Bay or Carlingford Lough where access to sites T01-1001 and T01-1002 is from[90]. The distance between the proposed activities and any potential disturbance from ORE activities means that foraging individual bird species are unlikely to face disturbance from both activities. **Adverse in-combination activities from offshore renewable energy can therefore be ruled out.**

[90] Oriel Wind Farm Project. Natura Impact Statement

Disturbance pressure in-combination with all activities

The previous sections have considered activities which might cause in-combination pressures with aquaculture in Dundalk Bay and Carlingford Lough (access to sites T01-1001 and T01-1002). The single pressure coming from all activities is disturbance pressure on birds. All activities causing disturbance on birds will now be considered as a whole.

Combined, these activities will mean that vessel activity causing disturbance is spread across Dundalk Bay and Carlingford Lough and out into the northern part of the Irish Sea. Vessels are most numerous from the fishing sector and activity will take place somewhere on every day of the year and potentially during all tidal cycles. Vessel activity at sites T01-1001 and T01-1002 will use a maximum of 1 vessel (2 trips per day) commuting from Carlingford Lough to the site and back. It is not near key nesting sites for high-risk species (Breeding Common and Arctic Tern). **Therefore, it is concluded that whilst aquaculture activities will contribute to disturbance on bird SCIs within Dundalk Bay and Carlingford Lough it is not at such a level that it will act in-combination with other activities to the point which adverse effects previously ruled out would now be considered significant.**

6.Conclusion and recommendations

In Dundalk Bay SPA there are four applications for new licences for extensive aquaculture activities. Two of these sites, T01-097A and T01-099A, were for bag and trestle or stacked cages of intertidal oyster culture. The remaining two sites, T01-1001 and T01-1002, are for subtidal mussel culture. Based on this, the likely interactions between these applications and the conservation features (habitats and species) of the site were considered. An overview of the conclusions for the application sites is presented in Table 6-1.

6.1 SAC Habitats

The interactions between the SAC QIs of Estuaries and Mudflats and Sandflats and the Marine Community Types of 'Fine Sand Community Complex' and 'Muddy Fine Sand Community'. Estuaries and 'Muddy Fine Sand Community' were ruled out of adverse effects due to no overlap with the proposed activities. 'Fine Sand Community Complex' and Mudflats and Sandflats were ruled out of adverse effects due to low sensitivity to the pressures, no permanent effects and small overlap.

6.2 SAC Species

The interactions between the proposed aquaculture activities and the Annex II species Bottlenose dolphin, Harbour Porpoise, Grey Seal and Harbour Seal were considered. All species have been included as a potential long-ranging species and sporadic sightings of this species have been recorded at the entrance of the Lough.

Potential disturbance from intertidal activities at oyster farms is possible and it is recommended that site T01-097A is not licensed due to the proximity of seal resting sites. Furthermore for sites T01-1001 and T01-1002 which is in the vicinity of a seal haul-out site it is recommended that measures such as speed limits are enacted and enforced.

Additionally, there is a minor risk of entanglement of these species in subtidal mussel longlines and we therefore recommend that any collisions or entanglements are reported to the relevant authority by the operator.

Adverse effects for other species and pressures have been ruled out due to no or low risk from the pressures.

6.3 SPAs

We considered the interactions of the proposed activities on 7 ducks and diving species, 11 wading bird species, 3 auk species, 5 tern species and 7 gull species as well as Fulmar, Gannet, Manx Shearwater, Light Bellied Brent Geese and the Wetland and Waterbirds SCI. Adverse effects for all activities on the gulls, terns, divers, all ducks apart from Shelduck, Fulmar, Gannet, Manx Shearwater and Light Bellied-brent Geese were ruled out. The risk of entanglement in subtidal mussels is low, but it is recommended that any collisions or entanglement be reported to the relevant authorities.

Adverse effects of disturbance from activities for wading species and Shelduck could not be ruled out due to lack of data on bird activity in this area and the potential effects of trestles being introduced to the area. It is therefore recommended that intertidal aquaculture at proposed sites T01-097A and T01-099A are not licensed.

6.4 Non-native species

The risk of successful reproduction of the Pacific Oyster, *Magallana gigas,* in the bay is high given that some feral individuals have been discovered around the Irish coastline. Adverse significant effects on the Wetlands and Waterbirds conservation objectives cannot be ruled out.

As a mitigation measure, it is recommended that all future oyster culture operations utilise 100% triploid *M. gigas* oysters and the incidence of Pacific Oyster recruitment be monitored on an ongoing basis. Triploid oysters are, for the most part, considered reproductively sterile. Other control measures include regular cleaning and removal of oysters from sites and equipment according to their biosecurity plan, along with active site monitoring to assess changes over time and the response to control measures. The implementation of these measures will minimise the risk of recruitment of Pacific oysters deriving from aquaculture operations and therefore, result in no adverse effect on the integrity of the SPA from this activity.

6.5 In-combination effects

The in-combination effects within bottom mussel and intertidal oyster culture in Carlingford Lough, fishing, shipping and offshore windfarm activities were considered, in full, in this Appropriate Assessment. The majority of these activities occur out-side the boundaries of both the SAC and SPA apart from the cockle fishery and the razor clam fishery. The only in-combination pressure with aquaculture is vessel disturbance on SCI features. Given the small number of vessels and localised effects, significant adverse effects were ruled out.

Table 6-1 Summary table of conclusions for proposed applications

License No.	Status	Aquaculture Type	Species	Habitat	Species	Birds	NIS	In-combination effects
N = No adverse effect, P = Adverse effect present, M = Mitigation proposed, A = Amendments proposed								
T01-097A	New	Bag and Trestle	Pacific Oyster	N	P, M	P, M	P, M	N
T01-099A	New	Bag and Trestle	Pacific Oyster	N	P, M	P, M	P, M	N
T01-1001	New	Suspended mussel	Blue mussel	N	N	N	P, M	N
T01-1002	New	Suspended mussel	Blue mussel	N	N	N	P, M	N